Shell Canada Limited

Muskeg River Mine Project

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ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

SHELL CANADA LIMITED
APPLICATION TO CONSTRUCT AND OPERATE
AN OIL SANDS MINE **Decision 99-2**
IN THE FORT MCMURRAY AREA **Application No. 970588**

1 APPLICATION

Shell Canada Limited (Shell) applied pursuant to Section 10 of the Oil Sands Conservation Act for approval to construct, operate, and reclaim an oil sands mine and associated bitumen extraction facilities (Muskeg River Mine) in the Fort McMurray area. The Muskeg River Mine would be located east of the Athabasca River, approximately 70 kilometres (km) north of Fort McMurray in Township 95, Ranges 9 and 10, West of the 4th Meridian within the Regional Municipality of Wood Buffalo.

The project includes the mining and processing of oil sands from the western portion of Lease 13, to produce approximately 8 700 000 cubic metres (m^3) of bitumen product per year or an average of 23 850 m^3 (150 000 barrels) per day. The application consists of approval for a truck and shovel mining operation, a bitumen extraction plant, a bitumen froth treatment plant, and supporting utility infrastructure (Figure 1). Shell has also applied for approval to obtain off-lease oil sands and bitumen froth. At the Hearing, Shell indicated that Board approval prior to the end of March 1999 was required for the company to meet its intended schedule.

Under a coordinated application process adopted by Alberta Environmental Protection (AEP) and the Alberta Energy and Utilities Board (the Board), Shell filed a joint Application and Environmental Impact Assessment (EIA). Shell also filed for specific approvals under the Alberta Environmental Protection and Enhancement Act (EPEA) and the Water Resources Act.

The Shell oil sands project consists of three separate, but integrated components. These are the mine and extraction plant on Lease 13, the proposed Scotford Upgrader located within Strathcona County, and a pipeline connecting the two. This Decision only relates to the Lease 13 application.

2 DECISION

The Board has carefully considered all of the evidence pertaining to the application and finds the project to be in the public interest. Accordingly, the Board is prepared, with the approval of the Lieutenant Governor in Council, to approve the Muskeg River Mine application, with conditions that will be specified in the Approval and subject to Shell meeting all its commitments made during these proceedings.

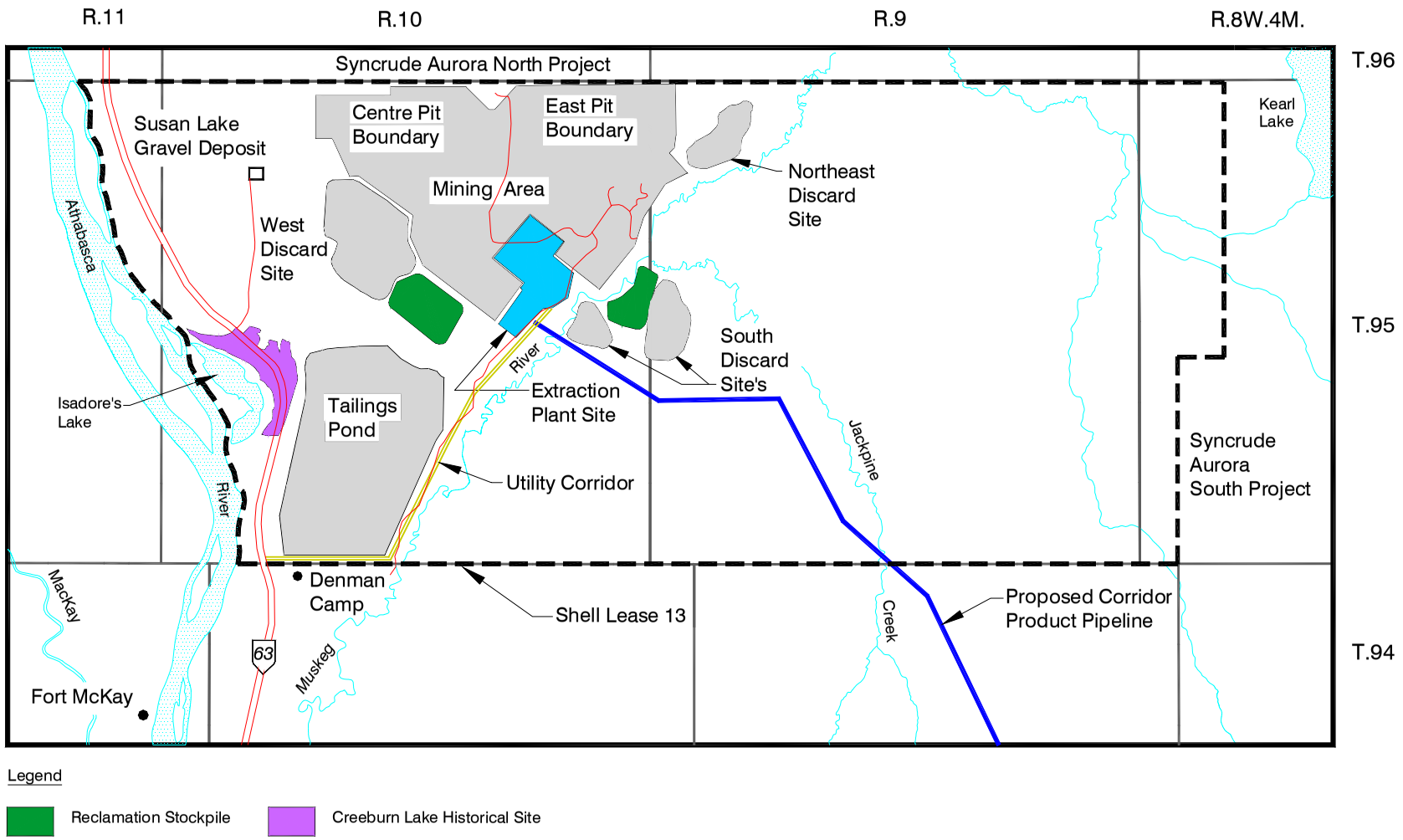

Figure 1 Muskeg River Mine

Application No. 970588

Shell Canada Limited

3 CONCLUSIONS

1. The Board is satisfied that the proposed facility is in the public interest, provided that the conditions of the Board's and AEP's approvals are met.

2. The Board concludes that Shell in carrying out its consultation with the various stakeholders, including First Nations and Métis communities, made an adequate effort to explain the impacts of the Muskeg River Mine and to address their concerns.

3. The Board expects that Shell will continue to use its leadership skills to promote education, employment, and business opportunities for all residents of the region, including First Nations and Métis people, in addition to the efforts currently underway with its closest community, Fort McKay.

4. The Board accepts Shell's overall mining plan as being appropriate, including the use of a cutoff grade of 7 per cent and 3 metre selectivity. The Board will require some additional investigation in order to ensure that resource recovery is optimized. These include:

    - Re-evaluation of the south discard site geological data to ensure resource sterilization is minimized, with a report to be submitted six months prior to clearing.

    - Continued evaluation of the lease boundaries, with submission of an initial report satisfactory to the Board by 1 October 1999.

    - Submission of a report two years prior to depositing consolidated tailings (CT) in the first mine pit which evaluates the maximization of resource recovery adjacent to and below the portion of the Muskeg River next to the first mine pit.

5. The Board believes that a broadly accepted regional development plan for the Muskeg River Basin that maximizes resource recovery while minimizing environmental impacts will provide a baseline upon which individual applications could build, focusing on important site-specific issues. The Board notes Shell's commitment to the regional development initiative.

6. The Board accepts Shell's proposed extraction process and its commitment to an eventual 92 per cent overall bitumen recovery and an annual average loss of 4 units of solvent per 1000 units of bitumen produced. The Board is not prepared to accept the release of untreated froth treatment tailings directly into the tailings pond. Shell must report to the Board six months prior to plant construction on the methods it proposes to use to manage froth treatment tailings.

7. The Board accepts that the use of CT currently represents Shell's preferred tailings management strategy for the Muskeg River Mine and is prepared to accept that approach at this time. The Board also believes, however, that better tailings management options are likely to become economic in the future and will require that Shell and other oil

sands operators to continue to test alternative tailings management technologies. The Board will require Shell to submit progress report on its tailings research annually until commencement of operation and then every second year thereafter.

8. The Board expects Shell to participate in AEP's Sustainable Development Strategy and to meet its commitment to participate in the Oil Sands Environmental Coalition (OSEC) Memorandum of Understanding (MOU) on oxides of nitrogen (NO_x) and sulphur dioxide (SO_2) emissions.

9. The Board supports Shell's commitment to convene a forum of technical experts and stakeholders to review the matter of ground level ozone formation. The Board will require Shell, based on the results of that forum, to assess the need for follow-up actions to further reduce the levels of ozone and/or ozone precursors resulting from Muskeg River Mine operations and to report back to the Board regarding those plans.

10. The Board is prepared to accept Shell's commitment to prepare a Greenhouse Gas Management Plan that includes emissions reduction targets for its Muskeg River Mine.

11. The Board concludes that the impacts to air and water quality due to the Muskeg River Mine are acceptable in most cases, but believes that ongoing monitoring will be required to ensure that predicted emission in levels in particular are met. Areas identified for additional research include:

    - Long term monitoring of acidifying emissions and the further assessment of terrestrial and aquatic receptors that characterize acid deposition and its environmental effects.

    - Additional monitoring information regarding ozone formation from precursor compounds and associated impacts on potential ozone receptors.

    - Participation in long-term monitoring of human health exposures to improve the understanding of the relationships between human health and volatile organic carbon (VOC) emissions.

    - Monitoring of any waters discharged from the mine to ensure that all water quality and flow volume requirements established by AEP are met.

    - Periodic monitoring of noise levels with Fort McKay to ensure permissible noise levels are not exceeded.

12. The Board believes there is a reasonable risk that residents of Fort McKay, without changes to the current proposal, could be affected by off-site odours due to emissions from Shell's tailings pond. Shell is expected to specify, prior to commencement of operations,what mitigation strategies it will use to address this issue.

13. The Board believes that ambient air quality guidelines for VOC would improve the ability of operators to track emissions sources, and more importantly, to more effectively address stakeholder concerns. The Board intends to work with AEP, industry, and the public in establishing these criteria.

14. With respect to reclamation, the Board accepts Shell's and AEP's commitments that the site will be restored in an acceptable manner. The Board also notes that future improvements in tailings management may require Shell to adopt alternative reclamation plans.

15. The Board supports AEP's Sustainable Development Strategy and the industry led Cumulative Environmental Effects Management initiative. The Board expects that all companies in the region that hold Board approvals will continue to address these issues in a timely and effective fashion, including appropriate levels of stakeholder involvement. During the upcoming year, the Board will ask its staff to monitor the progress made in order to assure itself that the process is proceeding appropriately and no further action by the Board is required.

    The Board is not prepared to consider the OSEC request for a Section 22 public inquiry into regional environmental impacts at this time, but is prepared to reconsider the application should the above processes be unable to meet their goals. The Board affirms its support of OSEC's MOU for NO_x and SO_2.

4 RELATED APPLICATIONS

The Shell oil sands project consists of three separate but integrated components. These are the mine and extraction plant on Lease 13, the proposed Scotford Upgrader located within Strathcona County, and a connecting pipeline. The proposed Upgrader would be located adjacent to Shell's existing Scotford Refinery in order to take advantage of the potential synergies between the two facilities. The application for the proposed Upgrader was heard at a Board Hearing on 26 and 27 October 1998. The pipeline application has been submitted to the Board and a public hearing on this application is currently scheduled for 9 March 1999.

At the Hearing, Shell stated that it has decided to include a co-generation plant into the Muskeg River Mine. The Board notes that a co-generation application has not been filed for its consideration and that the EIA does not include an assessment of this facility. Each of the above applications will be considered on their own merits.

5 HEARING

The applications were considered by the Board at a public Hearing held in Fort McMurray, Alberta from 16 November 1998 to 19 November 1998, before Board Members B. F. Bietz, P.Biol., A. J. Berg, P.Eng., and Acting Board Member H. O. Lillo, P.Eng.

Table 1 lists all the interveners to the application and associated abbreviations used in the report.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principles and Representatives[1] (Abbreviations Used in Report)	Witnesses
Shell Canada Limited (Shell)	
R. B. Low, Q.C. S. H. T. Denstedt K. Sibold	N. Camarta, P.Eng. R. Seeley, P.Eng. J. Smith, P.Biol. K. Firmin, P.Eng. P. Moyses, P.Eng. J. Clark of Broken Hill Property Ltd. (BHP) A. Barber of BHP M. Rankin M. Davies
Athabasca Chipewyan First Nation (ACFN)	
K. E. Buss	A. Cyprien C. Voyageur A. Bruno T. Punko
Oil Sands Environmental Coalition (OSEC)	
K. E. Buss	A. Dort-MacLean R. Kleinbub D. Smith T. Marr-Laing K. Gregory
Anzac Métis Local 334 (Anzac)	
P. E. S. Kennedy	J. Malcolm L. Lavallee B. Coulter H. Scanie
Environment Canada	
S. Mercer, P.Eng.	S. Mercer, P.Eng.
Department of Fisheries and Oceans, Fresh Water Institute (DFO)	
F. Hnytka, P.Biol.	F. Hnytka, P.Biol.

[1] Fort McKay, Northland Forest Products Limited, The Regional Municipality of Wood Buffalo, and Denman Industrial Trailers Limited submitted letters of intervention but did not attend the hearing.

TABLE 1 THOSE WHO APPEARED AT THE HEARING (cont'd)

Principles and Representatives (Abbreviations Used in Report)	Witnesses
Alberta Departments of Environmental Protection and Health (AEP and Alberta Health)	
W. A. MacDonald	A. Trimbee
J. Esbaugh	A. MacKenzie
	N. Barker
	K. Singh, P.Eng.
Corridor Pipline[2]	
C. K. Yates	
Syncrude Canada Limited[2] (Syncrude)	
B. J. Roth	
Alberta Energy and Utilities Board staff	
D. Larder	
P. Hunt	
M. Dmytriw, R.E.T.	
J. Farnell, C.E.T.	
R. Creasey, P.Biol.	
A. Larson, P.Eng.	

[2] Corridor Pipeline and Syncrude only presented closing argument.

6 ISSUES

The Board believes the issues to be considered with respect to this application are:

- Need for the project,
- Socioeconomic effects and public consultation,
- Mine planning and resource conservation,
- Extraction,
- Tailings,
- Environmental effects,
- Reclamation, and
- Cumulative effects.

7 NEED FOR THE PROJECT

7.1 Views of the Applicant

Shell indicated that the Muskeg River Mine, a partnership between Shell and Broken Hill Property Ltd. (BHP), would result in a positive contribution to the efficient development of Alberta's oil sands resources. The mine and extraction plant were intended to provide the Shell Scotford Upgrader with 23 850 m^3 (150 000 barrels) per day of bitumen feedstock. Shell stated that while it could purchase bitumen for its proposed Scotford Upgrader, the mine provided a secure, lower cost source of supply. Shell stated that, as a result, the integration of the Muskeg River Mine and the proposed Upgrader significantly reduced the risks associated with the project economics.

Shell stated that it had proceeded with its proposed oil sands development at this time for a number of reasons. First, drilling programs confirmed that Shell's Lease 13 has significant bitumen resources. Second, the capital and operating cost of producing oil sands have been significantly reduced over the years. Finally, a new oil sands royalty regime, in Shell's view, promoted oil sands investment.

Shell stated that the Muskeg River Mine would cost approximately $1.4 billion dollars. Twenty per cent of this investment would accrue to the local area, 40 per cent to the rest of Alberta and 10 per cent to other parts of Canada. Shell stated that building the mine would require a direct work force of 1 500 people at its peak and that 800 direct jobs would be created in order to operate the mine. Of the annual operating cost of $300 million dollars per year, 80 per cent would be spent in Alberta. The total taxes and royalties generated by the Muskeg River Mine would be approximately $2.1 billion dollars over the life of the project.

7.2 Views of the Interveners

The interveners did not provide comments regarding the need for the project.

7.3 Views of the Board

The Board notes that the need for the Muskeg River Mine was not questioned at the Hearing. The Board believes that there are adequate oil sands resources available to supply the project needs and that the proposed project represents the orderly development and the efficient use of the Province's energy resources.

8 SOCIO-ECONOMIC EFFECTS AND PUBLIC CONSULTATION

8.1 Views of the Applicant

Shell stated that its process of consultation with interested parties was based on principles such as communication, mutual respect, timeliness, and responsiveness.

Shell stated that in carrying out its consultation program, it had identified over sixty individual stakeholders. These stakeholders included adjacent leaseholders, contractors, educational institutions, environmental groups, federal, provincial and municipal government departments and agencies, and First Nations and Métis communities. Shell stated that it kept these groups

informed of the various aspects and impacts of the proposed Muskeg River Mine. This information provided the stakeholders the opportunity to provide their views and concerns, through meetings, open houses, mail-outs, speaking engagements, media announcements and releases, a 1-800 number, feed back forms included in some mail-outs, and an e-mail address.

Shell indicated that some consultation commenced prior to its 1996-1997 winter drilling season and that formal consultation was initiated after its Lease 13 Project Public Disclosure was issued in March 1997. Shell contended that its public consultation program was reasonable, thorough, effective, and informative.

Shell stated that it had signed an agreement with the Fort McKay First Nation and Fort McKay Métis Local 122 that addressed issues around education, economic development, employment opportunities, retention of culture, and physical infrastructure. This agreement addressed both funding and staff time provided the Muskeg River Mine proceeds.

Shell stated it had also committed to work with the Athabasca Tribal Council (ATC) and with Métis organizations to ensure that regional education issues were identified to the appropriate jurisdictions. Shell would also participate in ATC/Industry Working Group. Shell also stated it had participated in the Athabasca Oil Sands Facilitation Committee and its Regional Infrastructure Working Group.

Shell noted it had supported the designation of Creeburn Lake as a historical site and provided some funding for research into oral histories about that site.

Shell noted it had met with Anzac Métis Local 334 (Anzac) to discuss employment and business opportunities that would be available if the Muskeg River Mine were to proceed. Shell stated that it had also discussed training requirements for the different jobs that would be available. With respect to its consultation efforts with the Athabasca Chipewyan First Nation (ACFN), Shell stated that meaningful discussions had taken place through meetings (eight or more), correspondence, numerous telephone conversations, and an open house held in the Fort Chipewyan community. The issues discussed included the nature of the project and on-going project overviews. Also included in these discussions were the terms of reference for the EIA, the preparation of a socio-economic impact study by the ACFN, proposed water monitoring requirements, and the methodology used to address the project's cumulative effects. Educational, training, employment, and business opportunities during both construction and operation of the mine were also included in these discussions.

With regards to the ACFN it was Shell's view that its consultation had identified two basic concerns:

- mitigation of the project's cumulative environmental effects, and
- opportunities for direct employment and business contracts during the construction and the ultimate operation of the mine.

In one of the final meetings in July 1998 prior to the Hearing, Shell stated that it had given the ACFN the following commitments:

- to identify those job categories which would not require a grade 12 diploma,
- to study rotational shifts and transportation options,

- to ensure that it notified the ACFN of developing business contracts, and
- to work with industry to develop a water quality monitoring program.

Shell maintained that in its view there had been meaningful exchanges of views, concerns, issues, and information conducted in a genuine spirit of good will on both sides.

Shell noted that it had provided sufficient funding to allow the ACFN to hire the necessary consultants to review the Muskeg River Mine EIA and to commission a report on the socio-economic effects of the project on members of the ACFN.

Shell also argued that the level of consultation regarding impacts of its proposed mine on the traditional land use by the ACFN was satisfactory. Shell noted that it had conducted a traditional land use assessment using a Fort McKay agency and it believed this assessment would be equally applicable to the ACFN, as well as to Anzac. Shell maintained the study thoroughly addressed all traditional land uses and activities of members of Cree, Chipewyan, Métis, and non-status Indian heritage. Shell noted that its EIA was deemed complete by AEP and that it had contained a comprehensive cumulative effect assessment. Shell stated there would not be any alternate land use in the project area for many years until the land was reclaimed, the vegetation patterns were reestablished, and the wildlife returned

Shell rejected the position that a constitutional duty of consultation was owed to the ACFN, but stated that even if consultation was a constitutional requirement, the test of such consultation had been fully satisfied.

8.2 Views of ACFN

The ACFN stated that the area in and around Lease 13 is, and always has been, within their traditional lands. They stated that ACFN members have trapped, hunted, and lived in this area for many years and consequently they believed they are affected by the proposed project. Several Elders told of their families' experiences in the area and how the land had supported their families.

The ACFN believed that the cumulative environmental and social effects of increased industrial and lumber activities have significantly reduced the ability of the land to provide a living in traditional ways. The ACFN people felt they are being pulled in two directions of traditional life and the current mainstream society. The ACFN stated that it would take time for the ACFN people to adjust to the change from living in the traditional ways to a wage economy.

The ACFN stated that while it hoped to preserve traditional values, its members wanted contractual and employment opportunities. The community would like to establish agreements similar to those established between Shell and Fort McKay. ACFN asked to be dealt with in a positive and fair manner and stated that the community wished to develop a good working relationship with Shell. The ACFN were concerned about some major issues which did not seem to be reaching closure and that they would like Shell to address these issues in a shorter time frame. The ACFN noted it was anxious to build a positive working relationship between themselves and Shell.

The ACFN stated that it was not opposed to development but rather it proceed in a fashion that protected their rights and the environment, provided greater opportunity to be more involved in

decisions, and that allowed them to participate on a fair basis. The ACFN was particularly concerned with hiring practices that focused on qualifications since they recognized that many of their people did not have the educational background that Shell might prefer. They argued that in order to have an opportunity to compete for available jobs, the company would need to forgo some educational and experience requirements and allow their members to receive training on the job. The ACFN stated that it would like to see stronger support from Shell on this approach and an earlier start in providing training requirements so as to provide a better chance for them to become more employable in the oil sands industry.

The ACFN raised the issue of members being forced to leave the community in order to obtain employment in the existing as well as the proposed oil sands developments. The ACFN noted it already had members who live in Fort McKay and Fort McMurray. The ACFN noted that the further relocation of ACFN members to Fort McMurray in search of employment would further erode the ACFN's financial capability by reducing the economic base and population of the community. Consequently, it stated that it would like Shell to consider a rotational program similar to a program already initiated by Syncrude Canada Limited (Syncrude).

The ACFN submitted that Shell's consultation with the ACFN was inadequate in the following two respects:

- that the discussions had not resulted in Shell's firm commitment to provide employment and business contracts, and
- that the consultation had failed to meet the concerns of the ACFN regarding the cumulative effects of the proposed oil sand development on the traditional land uses of the ACFN on Lease 13 and adjacent lands.

The ACFN also submitted that Shell's consultation was deficient because the ACFN had not been invited to participate in the traditional land use study. It stated that no cumulative environmental assessment had been completed on the traditional land use of the ACFN. The ACFN stated that in the absence of any direct input from the ACFN, the existing land use study was relevant only to Fort McKay. It maintained that the varied activities conducted by different user groups required all such user groups to be assessed before a meaningful study could be considered to have been carried out. The ACFN also declared that it was not bound by any other aboriginal community's assent to the conclusions of the Shell land use study.

The ACFN acknowledged that Shell had provided it with funds to review the EIA and to prepare its own socio-economic study. The ACFN also stated, however, that with all the activity from various proposed projects in the region, it lacked the resources to carry out an adequate in-house assessment of either the environmental or socio economic effects from large development projects in a timely fashion.

The ACFN advanced the argument that, constitutionally, any prima facie infringement by Shell of its Treaty 8 and traditional rights on Lease 13 or adjacent lands, could only be justified if there was meaningful consultation and compensation by the provincial government, or with the consent of the ACFN, Shell. Meaningful consultation in this sense required thorough information from the ACFN regarding the direct and cumulative environmental effects of the Shell Muskeg River Mine on the ACFN as a people, on its lands, and on its ability to exercise its traditional activities on those lands. The ACFN viewed that this critical input had not been elicited.

The ACFN concluded by asking the Board to delay the issuance of any approval until proper consultation had taken place.

8.3 Views of Anzac

The members of the community of Anzac stated that they could trace their ancestry within the region over 10 000 years back to the aboriginal people of the area. Anzac stated that its members also traditionally used the area encompassed by the Muskeg River Mine and that the cumulative effects of all the industrial activity has reduced their ability to maintain their traditional way of life. In particular, Anzac noted that the ability of the land to provide trapping income, and opportunities for hunting, fishing, berry picking, and the gathering of medicinal plants had already been adversely affected by industrial activity and by an increase in the human activity in the area. Anzac also noted it had members currently living in the Fort McKay community.

Anzac stated that many of its members seeking employment have difficulty acquiring affordable housing in Fort McMurray. This situation had been made more difficult since the announcement of the Shell Muskeg River Mine and other industry projects. Anzac stated that it was also concerned about limited educational opportunities. They noted that their local school only went to Grade 6, and as a result, it was necessary to bus their children to Fort McMurray to continue their education. This, they noted, had a detrimental effect on their community and tended to discourage their children from finishing their education, greatly reducing their chances to gain employment in the region.

The Anzac community noted that it is currently working on training programs such as emergency medical response, and certified protection officer program, in order to increase community employment opportunities.

8.4 Views of the Board

The Board requires that a proponent of an energy project discuss its plans with those persons who may be interested in or affected by the proposed development. Proper consultation with the public will result in all parties engaging in genuine discussion about their respective concerns, and attempting to resolve such concerns by negotiation and mutually satisfactory agreement.

The Board does not demand that consultation result in the resolution of all or any objections, only that legitimate and well-intentioned efforts are made to that end. Applications before the Board may be denied if unsatisfactory consultative efforts have been conducted by energy companies. Examples of unsatisfactory consultation include: failure to communicate with all affected parties, misleading communications, inadequate project information, or discussions carried out in bad faith.

In this case, the Board acknowledges the extensive consultation carried out by Shell and notes that the process resulted in the resolution of many issues. This is evident, for example, in the agreements reached with Fort McKay and OSEC. The Board also acknowledges the work of the Athabasca Oil Sands Facilitation Committee that has worked with the stakeholders to identify and mitigate socio-economic impacts to the residents of the Municipality of Wood Buffalo.

The Board acknowledges that increased industrial activity will negatively affect both the historical and traditional uses in the project area, as well as a potentially much larger area around

the proposed development, at least until the area can be reclaimed. The Board also recognizes that the economic benefits from these large projects are often not evenly spread among the residents of the region. In particular, many residents are often either unable, due to lack of skills, access to affordable accommodation, etc. to gain access to these economic opportunities or are unwilling, due to the further impact on their chosen life styles.

The Board accepts that the opportunity to gain better education, training, and business opportunities are important issues for the region and for the First Nations and Métis communities in particular. These are complex issues that involve the communities themselves, the companies in the region, and the government. The Board recognizes that these issues are not solely Shell's responsibility to resolve, but it is an important shared responsibility of all oil sands operators working in concert with other stakeholders.

The Board believes open communication, a willingness to take action, and a desire to try new approaches will assist significantly in the mitigation of negative effects on neighboring communities. The Board believes these are important matters. The expected increased employment opportunities and Shell's commitments to work with local communities should make a positive contribution. The Board believes that early attention to identifying the jobs and required qualifications, and beginning the necessary training initiatives is important to achieve both Shell's and the communities' objectives. The Board expects that Shell will continue to use its leadership skills to promote education, employment, and business opportunities for all residents in the region including the First Nations and Métis peoples, in addition to the efforts currently underway with its closest neighbor, Fort McKay.

The Board notes the concern raised by both the ACFN and Anzac regarding whether Shell's assessment of traditional land uses adequately considered their particular uses of the land. In this case, however, the Board accepts that Shell's assessment of local land use was sufficiently generic to be applicable to both communities.

The Board believes that the discussions between Shell and the various stakeholders in the region do represent a genuine effort on both sides to understand the nature of the project, its immediate and long term impacts, and attempts to resolve the outstanding concerns. As a result, the Board concludes that Shell's consultation program meets the Board's requirements for reasonable and satisfactory consultation.

With respect to the constitutional issues raised by the ACFN, the Board is of the view that the ACFN did not establish the evidentiary or legal basis for the relief requested.

9 MINE PLANNING AND RESOURCE CONSERVATION

9.1 Views of the Applicant

9.1.1 Discard Sites and Plant Site

Shell stated that a number of discard sites for overburden and similar waste materials would be required for the life of the project. The south discard site would be developed first and would be located across the Muskeg River from the proposed mine development. Shell stated that it did not believe this discard site would sterilize an economically recoverable resource. Under questioning at the Hearing, Shell stated that it believed that it had adequate geological

information for this site and was not prepared to commit to any additional drilling at this time. Shell did commit to developing better delineation of the geological structure around the basal aquifer in the south discard area before deciding whether additional drilling would be needed.

Shell stated that it was not planning on expanding the proposed northeast discard site at this time. Any detailed design of the northeast discard site would be scheduled for approximately 2008. In addition to the discard sites, Shell stated that it also proposed two reclamation material storage areas to be used to supply progressive reclamation material during the project.

With regards to the proposed plant site, Shell stated that it believed that its proposed plant site is large enough to accommodate the planned extraction plant and a possible co-generation plant, and is also of sufficient size to accommodate future expansion.

9.1.2 Lease Boundaries

At the Hearing, Shell stated that it had worked with Syncrude to determine how mining of their shared lease boundaries could be accomplished without needlessly sterilizing recoverable ore. A joint lease boundary study was prepared by Shell/Syncrude that detailed the results of those discussions. The objectives of the lease boundary study were to:

- Establish a common long term planning basis for both parties along the common boundary,
- Identify sensitivities which might affect this common basis, and
- Develop a process which can be used to develop and analyze alternatives, and communicate the results of this analysis to industrial, regulatory, and other stakeholders.

The study evaluated the least cost solution for dealing with the ore at the common Shell/Syncrude lease boundary points between the Muskeg River Mine and the Syncrude Aurora North East Pit (the East Pit boundary) and the Aurora North Centre Pit (the Centre Pit boundary). The study did not identify the cost/benefits allocated to the individual companies.

Shell stated that the two companies had evaluated four possible scenarios for developing their common boundaries. The least cost solution for the Centre Pit area, Shell/Syncrude believed, would be the creation of a common dyke. The least cost solution at the East Pit boundary would be to either leave oil sands in place as a barrier pillar or to construct dykes against an oil sands core (in-situ oil sands wedge).

Shell indicated that in carrying out its analysis it was necessary to make a number of assumptions regarding the amount of oil sands that would be sterilized by the various boundary development scenarios, when that ore might be recovered if it was not sterilized, and its net present value. Shell estimated that an oil sands barrier pillar for the Centre Pit area would sterilize 45 million m^3 of oil sands while the proposed East Pit barrier pillar would sterilize 16 million m^3 of oil sands.

Shell/Syncrude's assessment for the East Pit boundary indicated that the barrier pillar and the in-situ oil sands wedge scenarios resulted in the lowest cost to the companies, based on its present value approach. This incremental present value assessment was based on a number of assumptions regarding discount factors, production profiles, operating costs, and that the incremental ore would be produced at the end of project life. Shell stated that it would, however,

continue to examine both the barrier pillar and the in-situ oil sands wedge options as the mining progressed towards that area. Furthermore, Shell stated it would expect to revisit the study if there were any major change to any of the input criteria that would fundamentally change the conclusions drawn from the study.

With respect to the discount factors used to evaluate the different options, Shell acknowledged that the Province, as owner of the resource, could be expected to prefer the use of a lower discount factor than that used by Shell/Syncrude.

At the Hearing, Shell confirmed that it was not proposing, at this time, to mine under the Muskeg River. Shell indicated it has committed to an evaluation of the general issue of mining under rivers and lakes as part of a broader regional study.

Shell stated that it had evaluated the potential impact of leaving an oil sands pillar between the Muskeg River and the mine, adjacent to the first mine pit, on future resource conservation. Shell stated that the amount of recoverable ore under the Muskeg River could not be easily quantified and that the impacts from tailings placement along the Muskeg River were difficult to establish. Despite this difficulty, Shell stated that it believed the integrity and overall economics of the ore under the river would not be compromised by its proposed development and that the ore would remain as a potentially viable resource for future development. Shell indicated that it also did not plan to create a seepage barrier in the first pit along the Muskeg River boundary, since such a barrier would significantly reduce in-pit storage volume, thereby requiring a larger tailings pond with the associated environmental and resource conservation issues.

9.1.3 Tailings Ponds

At the Hearing, Shell stated that it had considered various locations for its tailings ponds in an effort to minimize the sterilization of resources and to maximize operational efficiency. Two locations had been considered in detail and the preferred location was in the southwest corner of Lease 13. Shell stated that changing the location of the pond to the eastern portion of Lease 13 would cost an additional $300 million. It also stated that the tailings pond would provide recycle water for the life of the project but contain only five years of fluid fine tails inventory which results in the final pond footprint that would be smaller than that of conventional tailings ponds.

9.1.4 Mining Criteria

Shell stated it was applying for a three metre selectivity and a 7 per cent ore cutoff grade with an initial three year period of using an 8 per cent ore cutoff grade. The higher value would be required Shell stated until the higher grade ore was exposed on the lower benches. Shell indicated it would use a total volume to bitumen in place ratio of 12 to 1 as a guide in establishing pit limits. Shell noted that these are the same mining criteria approved for other oil sands projects.

9.2 Views of the Interveners

The various interveners to the application did not provide comments regarding mine planning or resource conservation issues.

9.3 Views of the Board

The Board notes that oil sands developments require at least some out-of-pit (surface) placement of waste material, including tailings, as well as storage sites for reclamation materials and surface locations for various facilities. Therefore there is some risk that potentially mineable reserves may be sterilized. Since the Board is charged with ensuring that conservation of resources occurs, the proper placement of surface discard and other similar sites is a key issue.

In this case, the Board notes that at least some potentially mineable oil sands, as defined by the Shell mining criteria, are present below the proposed south discard site. While the Board accepts Shell's data to date with respect to the potential quality of this resource, it will require Shell to complete a further evaluation of the south discard site area before it is developed in order to ensure resource sterilization is minimized. A report shall be submitted six months prior to clearing which compares resource quality, recoverability and ultimate capacity of the south and north discard sites.

The Board notes that there are also potential resources under each proposed reclamation material stockpile, but the Board is prepared to accept Shell's commitment that these are temporary and will be removed at an appropriate time to avoid any unnecessary ore sterilization.

With regards to the plant site location and size, the Board is prepared to accept Shell's view that the proposed plant size is sufficiently large to accept the various planned and future developments, including a co-generation plant. The Board also agrees that the site appears to be optimally located relative to both operational economics and resource recovery. However, should the size not prove to be adequate in the future, the Board will require that Shell be prepared to justify any site location change or expansion.

With regards to the Shell/Syncrude Lease Boundary Study, the Board considers the study to be a significant step forward in the development of a process for dealing with resource conservation at the lease boundaries.

However, the Board is not convinced at this time that the outcomes and recommendations of the study are appropriate. The Board notes that a significant amount of oil sands resource at the lease boundary meets the mineability criteria used by both Shell and Syncrude. Furthermore, both companies have proposed in their mine plans to eventually mine in proximity to the boundary. The Board believes that the relatively high quality ore at the boundary could easily be recovered if adequate joint plans were in place. It appears that in terms of ore recovery and processing, this could be done without either company incurring incremental mining capital or operating costs, and in fact, there might be a short term savings in mining cost due to the low stripping ratio of the boundary pillar. The Board recognizes that additional tailings operating costs would be incurred by one or both of the study proponents due to the increased construction volumes required for in-pit tailings containment and as a result changes to the respective tailings deposition schedules. The relative benefit/cost ratio of this particular scenario is, in the Board's view, not yet clear.

The Board believes that the Shell/Syncrude boundary study remains insufficient for the Board to decide whether the recommended boundary development proposals provide the most advantageous combination of fairness to the proponents and benefits to the public. Therefore, the Board will require Shell and Syncrude to submit additional information in a form

satisfactory to the Board by 1 October 1999. The Board will also expect Shell to advise the Board if any significant changes in the mine plan occur that would affect the mining of the lease boundaries at any time after submission of the updated report.

With regard to future ore development within the Muskeg River Basin, the Board notes that a study of regional development in the Muskeg River Basin is intended to address, among other issues, the most appropriate treatment of lease boundary mining. It believes that further discussion is required between industry and the Board to ensure that the economic concepts, methods of analysis, and other potential merits of the different boundary treatments are completely understood and agreed to prior to the Board making a decision on this regionally important topic. The study should also evaluate maximizing resource recovery in the Muskeg River Basin and the associated environmental impacts. The Board recognizes Shell's commitment to participate in this study.

The Board notes that Shell has not applied to mine below the Muskeg River and furthermore that Shell believes its current mine plan does not impact the potential future recovery of the ore under the river. The Board is not confident, however, that the proposed mine plan will not impact the ore under the Muskeg River adjacent to the first pit, either due to the discard locations or the in-pit placement of CT. The Board will require that Shell continue to evaluate its mine plans and report back on its findings two years prior to depositing CT into the first pit in order to ensure that the risk of negatively impacting future resource recovery near the Muskeg River is minimized.

With regards to the impact of the proposed tailings pond location on resource recovery, the Board is prepared to accept Shell's view that the proposed location is optimal from an economic perspective. The Board notes that some potentially mineable oil sands will be sterilized, but agrees that the value of the ore would not justify moving the pond to a different location.

With respect to mining criteria, the Board is prepared to accept Shell's proposed average 7 per cent ore cut-off grade. The Board is also prepared to relax this requirement to 8 per cent during the initial 3 years of mining when the plant feed is coming from the upper mining benches and the pit is not sufficiently developed to allow blending of ore from different benches. The Board also accepts a mining selectivity of 3 metres. The Board will expect Shell to use a total volume to bitumen in place ratio of 12 to 1 in its initial evaluation of mineable ore.

10 EXTRACTION

10.1 Views of the Applicant

Shell stated that the extraction process selected and developed for the Muskeg River Mine would take advantage of a number of recent advancements in the recovery of bitumen from oil sands.

Shell stated that the Muskeg River Mine primary extraction process would include two identical production trains. These would incorporate: a high capacity oil sands feed system; a novel oil sands conditioning system which uses rotary breakers and agitation tanks; a warm water extraction process (45-50°C); and a froth treatment plant. Shell stated that its primary extraction process had been designed to optimize extraction efficiency while minimizing tails production. Shell stated that it would continue to assess improvements in extraction technology and in

particular would continue to assess the possibility of further reducing the extraction process temperature.

Shell stated it has been developing a new froth treatment technology, which uses paraffinic solvents, and it is currently testing the process at its pilot plant on Lease 13. Shell noted that its focus in selecting the proposed froth treatment process was to produce a bitumen product that meets pipeline specifications and that would not restrict downstream marketing opportunities or technology used to upgrade the bitumen product. Shell stated that it believed that its pilot had confirmed the success of the technology. At the Hearing, Shell indicated that it would continue to run the pilot plant in order to optimize the process design.

Shell indicated that the first stage of the froth treatment process would involve two-stage centrifugation to remove the majority of water and solids from the froth. Diluted bitumen not meeting pipeline specifications would be further treated with additional solvent in a product clean-up phase in order to remove additional water and solids and some asphaltene to precipitate. As a result of this treatment, the partially upgraded bitumen produced from the Muskeg River Mine would meet pipeline specifications.

Shell committed to an eventual 92 per cent overall bitumen recovery on whole bitumen (before asphaltene removal), based on an average ore grade of 11.4 weight per cent bitumen. Shell requested a one per cent reduction in this bitumen recovery level during the initial five years of operation to allow for startup variability and optimization of the extraction and froth treatment plants. Shell stated that another 3 to 7 weight per cent bitumen would be lost through asphaltene precipitation in the froth clean-up stage.

Shell stated that solvent would be recovered from the froth treatment tailings in a tailings solvent recovery unit (TSRU) prior to discharge to the tailings pond. Shell committed to annual average solvent losses to the tailings pond of not more than 4 volumes per 1000 volumes of bitumen produced, including downtimes and upset conditions. This would result during normal operating conditions in 95 m^3 (600 barrels) per day of solvent loss, which in turn was predicted to result in 5.8 tonnes per day (t/d) of VOC emissions to the atmosphere.

Shell stated that it would continue to optimize both its solvent recovery and extraction processes using pilot plant and bench scale work to further reduce solvent losses where technically and economically feasible. Shell agreed at the Hearing that if the TSRU were down and Shell continued to operate at full production levels, the solvent loss to the pond would be in the order of 9500 m^3 (60 000 barrels) per day. Shell stated, however, that this situation would not occur, if only because of the high cost of such volumes of solvent loss. During upset conditions, Shell stated that it would minimize solvent loss and believed that most TSRU downtime would be due to scheduled maintenance.

Shell predicted that normal levels of solvent loss would not result in either odours or health concerns at Fort McKay, which is located 4 km away from the tailings pond. At the Hearing, Shell confirmed it had not committed to the final design of the solvent recovery system, but assured the Board that it would meet its solvent volume loss commitment.

10.2 Views of the Interveners

AEP and Alberta Health believed there was still a significant amount of uncertainty regarding pond emissions and their impacts. AEP stated that it did not believe it was acceptable to release untreated tailings to the pond and would be considering this in its recommendations to the Director for any approval that AEP might eventually issue.

10.3 Views of the Board

With regards to the efficiency of the proposed extraction process, the Board is prepared to accept that the extraction process contemplated by Shell will be effective in conditioning of the oil sands and in removing bitumen. The Board also accepts Shell's need for partially upgraded bitumen for its proposed Upgrader and believes that asphaltene rejection is a reasonable approach for achieving this objective with minimal hydrocarbon loss.

The Board expects that Shell will meet is extraction recovery commitment of 92 per cent within the first five years of operation.

The Board notes that testing of both the proposed extraction and froth treatment processes at Shell's pilot plant is still continuing. The Board will require that Shell continue to issue timely reports regarding pilot performance. If the results of the pilot operations indicate that any of the operating performance criteria cannot be met, Shell will be required to report to the Board, for its review and approval, the revised expected performance and any mitigation strategies Shell is prepared to undertake.

The Board accepts Shell's commitment to an annual average loss of 4 units of solvent per 1000 units of bitumen produced and will condition the approval accordingly. The Board is not convinced, however, that Shell will be able to prevent off-site odours resulting from the volatilization of solvent and other hydrocarbons contained within its tailings pond, if it is allowed to discharge untreated froth treatment tails to the tailings pond. This is particularly true during upset conditions, when under Shell's proposed design, significant volumes of froth treatment tailings could be sent directly to the pond without solvent recovery.

Given the risk of off-site impacts, the Board does not believe that the release of untreated froth treatment tailings and associated solvent directly to the tailings pond is acceptable and will condition the approval appropriately. The Board expects Shell to identify alternative methods, such as a temporary recycle ponds further from the Fort McKay community, or the installation of redundancy in the TSRU in order to reduce the risk of off-site impacts from solvent loss to the tailings pond. Shell must report back to the Board and AEP the results of this analysis six months prior to plant construction.

11 TAILINGS

11.1 Views of the Applicant

Shell stated that it recognized that development of a tailings management scheme that minimized land disturbance for the out-of-pit tailings storage area, with the associated reduced impact on both the environment and oil sands recovery was a high priority for the public and for regulators.

Shell stated that it had evaluated a number of tailings management methods including:

- phased-in production of CT,
- production of CT from plant start-up,
- paste stacking, and
- production of solid tailings by filtration or thickeners.

Shell stated that its study of paste technology revealed substantial technical and commercial development issues that ruled it out as an option for further consideration at this time.

The production of tailings by filtration was eliminated because it requires many large and costly filtration units. Shell noted that large filtration units have not been commercially demonstrated and transportation of the filtered product to the mine pit would increase fuel consumption and air emissions.

Shell stated that it had also considered using thickeners to produce mature fine tails (MFT) from thin fine tails (TFT) but this method was not economic at this time. This option would continue to be considered, however, and any future decision to apply this technique would be based on its relative economics.

Shell concluded that in terms of technical and commercial development, CT is the most advanced demonstrated tailings management scheme available. Shell stated that it believed that CT represented the only alternative method to current tailings management practice that was sufficiently developed to be used in the project design. The CT option was also considered to be the most cost effective.

Shell recognized that ongoing research would be required to optimize CT composition, consolidation behavior, release water properties, and reclamation techniques. Shell stated that since CT would not be produced until the fifth year of operation, there would be sufficient time to resolve these issues through on going research by Shell and other oil sands operators.

Shell noted that all of the available tailings management technologies require an initial out-of-pit storage area until there is sufficient space to place the tailings in-pit. Shell believed that its proposed mine plan minimized the out-of-pit storage area.

Shell also noted that using CT technology required the use of the tailings settling pond over the project's life to serve as a settling basin for the TFT in order to produce MFT. Shell stated that its mine plans would result in a minimal inventory of TFT and MFT at the end of mine life. Shell stated that it proposed to drain the tailings pond into an end pit lake after the completion of mining operations.

Shell noted that even if CT were made from plant start-up, CT production would be at less than 100 per cent efficiency due to variability in fines content and in operation. As a result, at least some off-spec tailings stream would be produced part of the time and storage volume would need to be available in either a tailings pond or in the in-pit area.

11.2 Views of Interveners

AEP stated that its goal would be to have the Muskeg River Mine site returned to a dry reclaimable landscape as quickly as possible. AEP believed that CT is capable of producing a dry landscape and indicated that it would accept this technology for the Muskeg River Mine.

11.3 Views of Board

Under Informational Letter 96-7, the Board shares responsibility with AEP for reclamation planning and final landscape objectives. The Board and AEP will jointly assess CT technology, review CT demonstration and performance, and evaluate reclamation practices.

In this case, the Board is prepared to accept Shell's current intention to use CT as its tailings management strategy for the Muskeg River Mine. The Board will, however, in cooperation with all the oil sands operators and AEP, continue to monitor new tailings technology. The Board notes that CT technology, while promising, is still being developed. While the current information suggests a solid trafficable landscape may be achievable using CT technology, various parameters need to be better understood to properly assess the feasibility of the approach.

In particular, the Board is uncertain that the use of CT in combination with the use of a conventional tailings pond is the best tailings management option, particularly for a green field site, such as the Muskeg River Mine. Such an approach requires a large out-of-pit tailings area to produce MFT's and to store sand. A number of other solid tailings management techniques under development appear to offer a smaller disturbed area, faster reclamation, reduced energy consumption due to immediate water recycling, and reduced water requirements and water release.

The Board will expect Shell, in conjunction with other oil sands operators, to continue to test alternative tailings technologies that reduce or eliminate the need for a conventional tailings pond. Shell will be expected to re-evaluate the Muskeg River Mine tailings scheme if these tests demonstrate the feasibility of these alternative tailings technologies. The Board will require Shell to submit progress report on its tailings research annually until commencement of operation and then every second year thereafter.

12 ENVIRONMENTAL EFFECTS

12.1 NO_x Emissions and Acidification

12.1.1 Views of the Applicant

Shell stated that NO_x emissions from mobile mine equipment would be 10 t/d and 1.9 t/d of NO_x would be produced from fixed plant sources such as gas fired heaters and boilers. Shell predicted that its emissions would constitute 6 per cent of the approximately 195 t/d of predicted regional NO_x emissions. In its environmental assessment of the Muskeg River Mine, Shell recognized potential impacts of NO_x as an air pollutant, as an acidifying emission and as a precursor of ground level ozone.

Shells stated that its predicted emissions of NO_2 from the Muskeg River Mine would comply with hourly, daily, and annual Alberta Ambient Air Quality Guidelines (AAAQG) for ground level NO_2 concentrations. The aggregate NO_2 emissions from the Muskeg River Mine with those of existing, approved, and proposed oil sands projects were also predicted to comply with AAAQG for average hourly and daily concentrations, but were predicted to exceed the annual requirements.

Shell believed that emissions from the Muskeg River Mine would not significantly contribute to acidification of soils and water in the region. In reaching this conclusion, Shell noted that its proposed project would have only negligible SO_2 emissions. Furthermore, any emissions of NO_x that exceeded the acidifying criteria for sensitive soils would be localized primarily to the Shell lease site. Shell stated that regional acid sensitive lakes were located more than 40 km from Shell's lease, while the highest NO_x emissions from Muskeg River Mine would be found within 5 km. Shell also noted that no pH reduction has been measured in the Muskeg River. The absence of a change in pH, Shell argued, was indicative of an absence of acidification impacts from other regional sources.

Shell took the position that its dispersion model predictions of emissions were founded upon conservative assumptions and that the predicted levels of acidifying emissions and Potential Acid Input (PAI) values were as a result significantly overstated in the EIA. Shell noted that it would not contribute to regional SO_2 emissions since it proposed to carry out upgrading at Scotford. In assessing the acidifying effects of regional emissions on sensitive vegetation, such as bogs and wooded fens, Shell stated that impacts were "undetermined".

In examining the cumulative effects of NO_x emissions Shell noted that the PAI target load proposed by the Clean Air Strategic Alliance (CASA) is 0.25 kilo equivalent of acid per hectare per year (keq H+/ha/yr) (Alberta Interim Critical Load for sensitive soils). Shell predicted that exceedances of the target load would occur as a result of the cumulative increase in NO_x emissions contributed by both the Muskeg River Mine and other industrial developments. The areal extent of lands in the region receiving greater than 0.25 keq H+/ha/yr of acid input was predicted by Shell to increase from 1500 km^2 to 2500 km^2.

Shell recognized that NO_x emissions were an issue for several of its stakeholders as well as the regulators. In order to manage its NO_x emissions, Shell proposed that:

- over the life of the Muskeg River Mine, the company would reduce NO_x emissions from the mobile mine fleet by 15 per cent,
- low NO_x technology vehicles would be integrated into the mine fleet as equipment manufacturers implement new Environmental Protection Agency emission standards,
- mine management planning would optimize vehicle fuel use, and
- low NO_x burners would be used in fixed plant equipment.

Shell noted that regional issues around NO_x emissions and acid deposition were being managed by industry through such working groups as the Wood Buffalo Environmental Association's Terrestrial Environmental Effects Management Group, and the NO_x/SO_2 subcommittee of the Cumulative Environmental Effects Management initiative. Shell observed that AEP's

Sustainable Development Strategy would also address NO_2 emissions and PAI. Finally, Shell provided evidence of its commitment to OSEC to reach a bi-lateral agreement for NO_x and SO_2 emissions management.

12.1.2 Views of OSEC

OSEC considered the management of NO_x emissions to be a priority issue because of the role of NO_x in regional acid deposition and the generation of ground level ozone. OSEC believed these issues had not, to date, been adequately addressed by industry and that regional acid deposition had continued to increase. OSEC observed that the CASA target load of 0.25 keq H+/ha/yr for sensitive soils was already exceeded in the oil sands regions due to existing emissions. It was OSEC's position that increased risks to both regional soils and aquatic ecosystems would be associated with the higher rates and the larger areal extent of acid deposition that would occur with new developments. OSEC's concern regarding acid deposition related primarily to the unknown effects upon aquatic ecosystems, and human, animal, and vegetation receptors.

OSEC stated that because of these concerns, it had initiated a framework agreement for the control of NO_x and SO_2 emissions. The OSEC framework agreement or MOU would establish a multi-stakeholder process for setting appropriate ambient concentrations of NO_x/SO_2, carrying capacity guidelines, and management objectives. OSEC also accepted Shell's future participation in the Wood Buffalo Environmental Association's Terrestrial Environmental Effects Management group as a potential management tool.

OSEC intended that its MOU would be signed by Shell for the Muskeg River Mine and eventually by all other oil sands operators in the region. OSEC stated that it had received agreement in principle for the MOU from Shell and the necessary support of AEP and the Board.

OSEC requested that should the Muskeg River Mine be approved, that conditions be added to the approval requiring Shell to:

- conclude the MOU process of setting emissions levels,
- not initiate any construction until the MOU commitments had been honoured, and
- comply with the pre-determined emission levels of the MOU.

OSEC commended Shell for its willingness and commitment to proceed with the MOU. Nevertheless, OSEC stated that it remained uncertain whether the MOU would be finalized and implemented. It recommended that the Board consider a mechanism for re-opening Shell's Muskeg River Mine approval in situations where the MOU process was not effective or, where amendments were necessary because NO_x or SO_2 emissions were found to have been over allocated.

12.1.3 Views of Environment Canada

Environment Canada stated that it recognized that no residual significant adverse effects were predicted from the Muskeg River Mine. However, Environment Canada believed that several uncertainties were associated with Shell's dispersion modeling and cumulative effects assessment. Environment Canada was concerned that exceedances of environmental quality

guidelines (e.g., NO_2 and Ozone) were predicted at a regional scale and that no timelines had been identified for validation studies.

Acid deposition was noted as one of Environment Canada's priority atmospheric issues for the Muskeg River Mine. The stated concern was related to the potential impacts of multiple oil sands projects, and the need to work within environmental carrying capacity limits. Environment Canada identified a need to improve the current monitoring and modeling of regional air emissions. Environment Canada also did not believe there were adequate data to evaluate the effects of acid deposition upon environmental receptors.

Environment Canada recommended that Shell further reduce its NO_x emissions from the Muskeg River Mine to help address regional issues of acid deposition and ground level ozone. In response to the rapid growth of regional NO_x emissions, Environment Canada believed that industrial operators should collectively validate predictions of NO_x concentrations and their environmental effects while implementing mitigative measures.

Environment Canada recognized AEP's Sustainable Development Strategy and the Cumulative Environmental Effects Management initiative as important multi-stakeholder forums for addressing regional air quality issues. Environment Canada looked to AEP's Sustainable Development Strategy as an appropriate vehicle to incorporate new scientific evidence and the environmental management objectives of industry and regulators into operating approvals and permits.

12.1.4 Views of AEP and Alberta Health

AEP stated that the average annual NO_2 concentrations in proximity to the Muskeg River Mine were predicted to exceed the AAAQG guideline. AEP stated that a precautionary approach towards minimization of ozone precursors (e.g., NO_x and VOC) would be warranted and that NO_x emissions should be controlled to the lowest practical limit through the use of the most appropriate pollution prevention and control technologies.

AEP characterized northeastern Alberta as an area of concern in relation to acid deposition due to the low buffering capacity of its terrain and the volume of acidifying emissions contributed by the oil sands industry. While AEP considered the SO_2 emissions expected to be generated by the Muskeg River Mine as negligible, it viewed the 11.9 t/d of NO_x predicted to be emitted as a significant source of acid deposition precursors.

AEP believed that due to substantial increases of NO_x emissions to the airshed, regional initiatives to monitor air quality and the effects upon receptors should continue through existing initiatives such as the Wood Buffalo Environmental Association, the Cumulative Environmental Effects Management initiative, and the Sustainable Development Strategy. AEP noted that some changes to existing monitoring might also be warranted in order to include both the wet and dry components of acid deposition.

AEP expressed a concern about the increasing contribution of NO_x from mobile mine equipment. It recommended that Shell and other oil sands operators consider an industry wide undertaking to minimize emissions from mobile sources. AEP stated that it expected Shell to pursue the optimization of diesel fuel specifications, equipment performance, and diesel engine design, and to share this information with other oil sands operators. AEP suggested that it was

prepared to require that Shell demonstrate that its fleet vehicles were equipped with effective emission controls and that replacement vehicles would meet the latest United States Environmental Protection Agency emission standards.

AEP acknowledged that the effects of acidification and the direct effects of NO_x upon vegetation are not completely understood at present. AEP and Alberta Health recommended continued research into the impact of NO_x and ozone exposures on both human health and the environment. On-going research by the Wood Buffalo Environmental Association and the Cumulative Environmental Effects Management initiative would be supported by AEP and coordinated through its Sustainable Development Strategy.

AEP noted that the Acid Deposition Management Policy for implementing PAI critical and target loads in Alberta has not been finalized. However, significant resources have been contributed through CASA to ensure that the management objectives of AEP and its stakeholders are achieved in the near future.

12.1.5 Views of the Board

Given the uncertainty as to whether exceedances of the AAAQG for NO_2 will occur within Shell's lease area, the Board accepts the position of AEP that a precautionary approach to both NO_x and any resulting acidifying emissions is appropriate. The Board notes that Shell's largest source of NO_x originates from vehicle and mine equipment emissions. Therefore, Shell will be expected to continue its own work of optimizing diesel fuel specifications and equipment performance as well as work cooperatively with the other oil sand developers to reduce regional emissions from mobile sources. In particular, the Board accepts Shell's commitment to reduce its mine fleet emissions by 15 per cent during the life of the project. Notwithstanding this commitment, the Board will expect Shell to ensure that emissions from the Muskeg River Mine are kept in compliance with provincial standards.

The Board agrees with AEP and Alberta Health that continued research is necessary to better understand the effects of NO_x and ground level ozone upon the environment and human health. The Board will also require that Shell, in consultation with AEP, continue to participate in the long term monitoring of acidifying emissions and the further assessment of the impacts of acid deposition on terrestrial and aquatic receptors.

The significant role of NO_x in regional acid deposition, ground level ozone generation (Section 12.2), and climatic change (Section 12.4) coupled with the scale of emissions from other oil sands operations highlights the need for regional airshed management with potentially formalized emissions reduction plans by industrial operators. The Board encourages Shell to participate in AEP's Sustainable Development Strategy and to complete the MOU with OSEC in order to implement a NO_x reduction strategy.

The Board supports the continued efforts of the CASA Target Loading Subgroup to establish PAI standards. The Board looks to AEP and its stakeholders to resolve the methods to be used by industry in implementing PAI and receptor measurements at a regional scale. The Board believes that this process will be greatly enhanced with completion of AEP's Acid Deposition Management Policy.

12.2 Ground Level Ozone

12.2.1 Views of the Applicant

Shell stated that while the Muskeg River Mine was not a direct source of ozone emissions, the release of both VOC and NO_x emissions in the presence of particular meteorological conditions could potentially contribute to ground level ozone. However, Shell questioned whether the appropriate meteorological conditions for ozone generation would normally exist in the oil sands region. Shell stated that the scavenging or lowering of naturally occurring ground level ozone concentrations was attributed to industrial emissions of NO_x close to emission sources. For this reason Shell believed that maximum ozone concentrations could occur tens of kms downwind of the NO_x or VOC source emissions.

Shell stated that it had participated with Suncor and Syncrude in a joint study that evaluated the regional potential for ozone formation. The study suggested that emissions of ozone precursors from aggregate industrial sources would result in exceedances of the AAAQG for hourly average ozone concentrations. However, these elevated ozone concentrations were predicted for brief intervals only during the summer months. Shell noted that historical air monitoring data of the oil sands region indicated that previous exceedances of the daily AAAQG for ozone were comparable to those of other rural areas of Alberta.

Shell stated that it had found no evidence of stress to vegetation due to ozone emissions from the available monitoring data. Shell recognized, however, that the environmental effects of ozone were a concern for several of its stakeholders. Shell committed to further examine the issue of ground level ozone through a forum of technical experts, government, industry and other stakeholders. In addition, Shell agreed to OSEC's request to provide additional information on the synergistic effects of various air emissions upon vegetation.

Shell stated that the continued monitoring of ambient ozone concentrations and the additional evaluation of ozone modeling would continue through Shell's participation in the Wood Buffalo Environmental Association's Ozone Working Group.

12.2.2 Views of OSEC

Based on historical exceedances of the ozone AAAQG in the oil sands area and the potential incremental increases of ozone from the Muskeg River Mine, OSEC stated that it believed that the environmental effects of emissions had not been adequately assessed by Shell. OSEC stated that ground level ozone was one of the priority issues that had remained unresolved through its consultation with Shell. OSEC disagreed with Shell's view that there was limited potential for ozone formation in the oil sands region. OSEC stated that Shell's proposed forum to address ozone concerns in the Fort Saskatchewan airshed should also include regional oil sands ozone issues.

OSEC presented dispersion modeling information, based upon Shell and Syncrude ozone findings, that suggested high ozone concentrations would occur outside the boundaries of Shell's regional study area. OSEC concluded that the study area used in Shell's EIA was not adequate for assessing the impacts of ozone emissions.

OSEC requested that Shell be prepared to commit to significantly reduce its NO_2 emissions so that the AAAQG for ozone would not be exceeded by Muskeg River Mine emissions. OSEC further requested Shell to assess:

- the effects of Muskeg River Mine ozone precursor emissions upon the 24 hour average concentration of ozone,
- the effects of related AAAQG exceedances upon environmental receptors, and
- the synergistic effects of air emissions upon vegetation.

12.2.3 Views of Environment Canada

Environment Canada stated that vegetation damage was known to occur at ozone concentrations well below the existing ozone guideline of 82 parts per billion. Environment Canada stated that it believed that ground level ozone was a priority atmospheric issue. Because of the cumulative effects of industrial emissions, Environment Canada identified the need for regional ozone management. It supported AEP's Sustainable Development Strategy as an appropriate multi-stakeholder forum to manage regional air quality.

12.2.4 AEP and Alberta Health

AEP recommended that additional modeling and monitoring of air emissions was necessary to determine relationships between regional ozone concentrations and emissions of NO_x/VOC. AEP believed that the issue of ozone management could be addressed through recommendations pertaining to NO_x and VOC management arising from the Sustainable Development Strategy and by means of the Wood Buffalo Environmental Association Ozone Working Group.

12.2.5 Views of the Board

The Board believes there is moderate uncertainty regarding both the risk of formation of ground level ozone and its potential effects upon environmental receptors, particularly at a regional level. As a result, the Board will expect Shell, in collaboration with the Wood Buffalo Environmental Association, AEP, and other stakeholders to continue to compile additional monitoring information regarding ozone formation from precursor compounds and any associated impacts on potential ozone receptors.

The Board notes that Shell committed to convene a forum of technical experts to review the matter of ground level ozone formation in its Scotford Upgrader application. The Board notes that Shell confirmed at the hearing that it intended that the forum review ozone formation in general and that it would not be specific to any one area of the province. Once Shell has additional information on ozone, it should assess the need for follow-up actions for its Muskeg River Mine and advise both the Board and AEP of its proposals. The Board will require this assessment to be provided prior to the start-up of mining operations.

12.3 Volatile Organic Compounds (VOC)

12.3.1 Views of the Applicant

Shell estimated that an average of 5.8 t/d of VOC would be released from Muskeg River Mine daily. The largest volume of VOC's would be from Shell's tailings pond with smaller contributions from the exposed mine face. VOC emissions were assessed for environmental impacts due to their role as potential air toxics and as a precursor in the formation of ground level ozone.

Shell determined that no measurable change in human health risks would occur due to VOC emissions from the proposed developments and that no measurable health effects would result at either Fort McMurray or Fort McKay during both normal and upset operations. Shell stated that human health risks would remain at acceptable levels even if VOC emissions were to increase by two orders of magnitude over its predicted levels.

To address its stakeholders concerns regarding VOC's, Shell committed to monitor VOC emissions from the Muskeg River Mine, particularly at Fort McKay which would be within 4 km of the tailings pond. Shell stated that it had agreed to work cooperatively with the Fort McKay community, the Wood Buffalo Environmental Association, and OSEC to ensure that adequate VOC monitoring is in place.

Shell noted that there were no emission standards for VOCs in Alberta. Shell stated that with assistance from other oil sands operators, AEP, and residents it would develop appropriate VOC "alert" levels. These alert levels would specify a protocol for action and follow-up by Shell in the event that exceedances of predetermined VOC concentrations occurred in Fort McKay.

Should future VOC problems occur at the tailings pond, Shell committed to using other means, either technology or operations based, to improve solvent recovery from the extraction process. In reference to the Alberta Oil Sands Community Exposure and Health Effects Assessment Program, Shell agreed to participate in a consensus-based forum of stakeholders to evaluate the need for and extent of continued human health and exposure monitoring.

12.3.2 Views of OSEC

OSEC stated that its concern with VOC's was founded upon the relationship between VOC emissions and ground level ozone. OSEC believed that the management of ozone precursor emissions (e.g., NO_x) was a priority.

12.3.3 Views of Environment Canada

Environment Canada identified regional VOC emissions as an issue related to hazardous air pollutants and to the formation of ground level ozone. Environment Canada stated that, unlike other rural areas of Alberta where ozone concentrations are apparently limited by NO_x availability, ozone in the oil sands region could be limited by VOC availability. Environment Canada stated that a poor understanding of biogenic sources of VOC's had hampered model predictions of ozone levels and expected this to improve through future monitoring programs of oil sands operators and the Wood Buffalo Environmental Association.

12.3.4 Views of AEP and Alberta Health

Alberta Health and AEP stated that emissions of VOCs as well as total reduced sulphur compounds from Shell's proposed tailings pond may be a concern to nearby residents of Fort McKay. AEP identified the uncertain nature of tailings pond emissions and the absence of specific mitigation strategies to control those emissions as a significant environmental issue associated with the Muskeg River Mine application.

AEP credited Shell for its commitment to monitor pond emissions and address them in the future should they be identified as a human health risk. Nevertheless, AEP was concerned that Shell had not identified the specific interventions it would make nor described the circumstances under which it would respond. AEP also expected Shell to describe the monitoring data it would need to determine potential health effects.

AEP indicated that Shell's pilot plant would provide additional emissions data needed to assist AEP in developing emissions management criteria for Shell's EPEA licence. In order to ensure relevant technologies and operating practices had been considered for emissions management, AEP asked that Shell report on detailed engineering design options.

Upon review of Shell's pilot data, AEP stated that it might request that Shell evaluate additional emission control measures for solvent recovery and tailings management. AEP suggested alternative measures, if needed, may include:

- installation of back-up capability of the TSRU,
- operating procedures to prevent untreated tailings streams from being sent to tailings, and/or
- segregation of tailings ponds.

AEP expressed a need for additional data on the composition, quantities, and environmental effects of organic compound emissions. These monitoring data could be provided by Shell either through the Wood Buffalo Environmental Association or within an approval condition of Shell's EPEA licence.

AEP and Alberta Health accepted Shell's findings that VOC emissions from the Muskeg River Mine would very likely have negligible impacts to human health. At the same time AEP stated that additional monitoring activities related to human health were needed to address cumulative effects issues and to further the understanding of the relationship between human health and air quality in the region.

12.3.5 Views of the Board

The Board is prepared to accept that exposure to the predicted concentrations of VOC's and total reduced sulphur compounds will not result in negative health effects. The Board is less willing to accept Shell's contention that these emissions will not produce unacceptable levels of nuisance odours, particularly in the community of Fort McKay. The Board believes that there is a reasonable probability that residents of Fort McKay will be affected by off-site odours from Shell's tailings pond. This conclusion is based, in part, on the uncertainties associated with Shell's emissions modeling data, the limited test data from the Shell Pilot Plant, the current

ambient air quality at Fort McKay, and the experience of current operators with emissions from their tailings ponds.

In order to manage its pond emissions, Shell has committed to not exceed solvent losses of 4 m^3 of solvent per 1000 m^3 of bitumen produced to its tailings pond on an annual basis. Shell has not, however, proposed specific intervention measures to control tailings pond VOC's emissions should they reach unacceptable nuisance levels. In keeping with Board policy that off-site odours must not impact the public, the Board will expect Shell to address this issue. As noted earlier in this report (Section 10), the Board will require Shell to, at a minimum, implement programs to ensure that there is no discharge of untreated tailings from the froth treatment plant to the tailings pond. Should this prove to be inadequate to prevent odours in Fort McKay, Shell will be required to undertake additional remedial measures.

In assessing both the human health and environmental issues, including odours associated with VOC's, the Board was struck with the difficulty in assessing the impacts of these compounds in the absence of ambient air quality standards. For the Shell application, the Board has relied upon a risk-based analysis of human health impacts and accepted Shell's evidence that no measurable health effects are likely to result from its VOC emissions. Given the significant contribution of VOC emissions from the various oil sands developments and their potential effects within the regional airshed, the Board believes that there is a demonstrated need to monitor VOC constituents. The Board notes that the Wood Buffalo Environmental Association has initiated such a program and will expect Shell to be an active participant. The Board also believes that the setting of VOC ambient air quality guidelines would greatly improve the ability of operators to assess the impacts of the various sources of VOC emission and to more effectively address stakeholder concerns.

In order to improve the understanding of relationships between human health and VOC emissions, the Board expects Shell to participate as appropriate in any regional health assessments proposed by AEP and Alberta Health

12.4 Greenhouse Gases (GHG)

12.4.1 Views of the Applicant

Shell stated that it used a "full cycle analysis" of energy efficiency to evaluate the relative impact of the Muskeg River Mine on GHG production. Shell noted that it believed that if it were not allowed to operate the Muskeg River Mine, some other source of heavy crude oil would still be required to meet the future North American demand for oil. Shell believed that the most likely alternate source for such oil is heavy Venezuelan crude. Shell stated that the carbon dioxide (CO_2) emissions associated with synthetic crude oil produced from the Muskeg River Mine would be less than the CO_2 emissions arising from the production, partial upgrading, and transportation of a comparable volume of Venezuelan crude oil to North American markets.

Shell stated that it was committed to continuously improve the energy efficiency of the Muskeg River Mine. Shell stated that it planned to incorporate future GHG emission reduction targets at the Muskeg River Mine into its corporate plan for the Voluntary Challenge and Registry Program of Natural Resources Canada, but was unable to provide a commitment for a specific GHG emissions target at this time. Shell did agree through its public consultations to prepare a GHG Management Plan by 31 March 1999.

12.4.2 Views of OSEC

OSEC recommended that Shell establish its GHG target for Muskeg River Mine as a zero net increase in GHG emissions. This GHG target would provide the basis for Shell's Greenhouse Gas Management Plan and would incorporate the following:

- an energy efficiency target,
- a comparison of energy efficiency for oil production at the Muskeg River Mine to other oil sands, heavy oil, conventional oil, and imported oil,
- continuous improvement mechanisms for energy efficiency;
- domestic offset projects to address GHG emissions from the Muskeg River Mine within Shell Canada or other Canadian companies, and
- international offset projects within Shell International or other similar opportunities.

OSEC requested that Shell also aggressively pursue the implementation of lower temperature extraction within Muskeg River Mine to further reduce GHC emissions.

12.4.3 Views of Environment Canada

Environment Canada acknowledged Shell's reduced GHG emissions per barrel of oil produced relative to other oil sands operations and the efforts made by Shell to improve the operational efficiency of Muskeg River Mine. Environment Canada stated that the management of GHG emissions is a priority atmospheric issue as it relates to climatic change.

12.4.5 Views of the Board

The Board recognizes that a range of implementation strategies to assist Canada in meeting its international commitments under the Kyoto Protocol are underway within the energy and other industrial sectors. The Board strongly endorses Shell's commitment to optimizing energy efficiency at the Muskeg River Mine and accepts Shell's commitment to prepare a GHG Management Plan for the Muskeg River Mine that includes specific reduction targets. The Board also notes Shell's commitment to include Muskeg River Mine emissions reductions in its reporting to the Voluntary Challenge Registry of Natural Resources Canada.

12.5 Water

12.5.1 Views of the Applicant

Shell stated that its surface mining operations would alter subsurface aquifers and the flow of groundwater in the Lease 13 area, but groundwater flow would be restored after mining. Mining would also result in the direct loss of a range of surface water bodies. Shell stated that reclamation of the landscape with replacement surface drainage systems would be carried out in a manner that would compensate for the losses of open water areas. Shell stated that it believed that the Muskeg River Mine would have negligible impacts to the water flows and water levels in the Muskeg River and Mills Creek and would not adversely effect either water quality or fish populations.

Shell stated that discharges from the Muskeg River Mine were not expected to cause an increase in the risk of tainting or bioaccumulation of chemicals in fish tissue or either acute or chronic

toxic effects in fish. To address stakeholder concerns, Shell committed to participate in a fish tainting study and further research into fish health. Shell identified regional cooperative monitoring initiatives with project specific monitoring to address stakeholder issues concerning fish health, benthic invertebrate populations, sedimentation, and water quality of the Muskeg and the Athabasca Rivers.

Shell noted that some background levels for water quality parameters such as polycylic aromatic hydrocarbons (PAH's) and metals already exceeded Canadian Drinking Water Standards. Shell stated that it believed that these were from naturally occurring sources and did not result in unacceptable risks to human health.

12.5.2 Views of ACFN

The ACFN attributed a general decline in the quality of their traditional life style and deterioration in regional natural resources to increased human activity and associated levels of development in the region. Examples of impaired water quality in the Athabasca River system due to development were cited as symptomatic of broader concerns. These included unnatural foaming of the river water, discoloured river ice, and deformed and tainted fish. The ACFN believed that water from the Athabasca River was no longer safe for human consumption due to upstream emissions from a range of industries, including oil sands developments.

The ACFN took the position that deleterious environmental effects to both water quality and human health were already occurring and these issues needed to be resolved before any new impacts could be considered.

12.5.3 Views of Anzac

Anzac stated that it also had significant concerns with regional water quality and requested that the Board condition any approval to require Shell to examine the cumulative effects of discharges of magnesium, arsenic, strontium, sulphates, NO_x, naphthenic acids, PAH's, aluminum, iron, and mercury on aquatic organisms. Anzac also requested that Shell be required to comply with appropriate environmental limits for each of the above chemicals.

12.5.4 Views of OSEC

OSEC requested that Shell be required to undertake comprehensive monitoring of the environmental effects resulting from the release of water entrained within its CT. OSEC noted that Shell had agreed to OSEC's request for a detailed briefing into the results of research into CT reclamation and mitigative measures for minimizing the impacts of end pit lakes.

12.5.5 Views of AEP

Several concerns were identified by AEP respecting the uncertain water quality of Shell's proposed end pit lake. AEP was prepared to conceptually accept the presence of an end pit lake within Shell's closure plans provided that downstream water quality was not impacted and that reclamation objectives were attained. It was recognized that significant research and planning would be necessary by Shell prior to finalizing the end pit lake design. As noted earlier, AEP also expressed some concerns with the impact of acidifying emissions on sensitive regional aquatic ecosystems.

12.5.6 Views of Environment Canada

Environment Canada stated that four water quality issues required additional research to ensure that the final reclamation program would contribute to viable ecosystems. This research related to:

- potentially high levels dissolved salts in CT water,
- the toxicological effects of naphthenic acids,
- the risk associated with PAH's in sediments, and
- toxicity of end pit lake release waters.

12.5.7 Views of the Board

With regards to the disturbance of subsurface and surface aquifers, the Board does not believe that any significant impacts to either regional groundwater or surface flows or water quality will result directly from Shell's proposed mining operations. The Board does note that both surface and subsurface discharges from the mine will need to be monitored carefully in order to ensure that they meet all water quality and flow volume requirements established by AEP.

The Board also accepts Shell's contention that it will be able, upon reclamation, to re-establish new, albeit different forms of aquatic habitat at the Muskeg Mine Project site. However, the experimental nature of CT technology and the conceptual nature of the end pit lakes associated with Shell's closure plan continue to be of some concern to the Board. For this reason, the Board is prepared to accept Shell's closure plan with the provision that future amendments may be required should more suitable technologies or closure methods be developed within the operating life of the mine.

The Board will also require Shell to fulfil all commitments it has made to stakeholders and regulatory agencies respecting further research into local and regional aquatic impacts. This includes, but is not limited to: the effects of acidification on aquatic ecosystems, the potential toxicity of residual CT waters, the impacts of sediments containing PAH, and the ecological sustainability of end pit lakes.

The Board finds that Shell has proposed measures to address stakeholder concerns regarding possible fish tainting from industrial discharge waters. The Board also accepts Shell's evidence of no significant risk or adverse effects to ambient water quality, and therefore on human health as a result of the Muskeg River Mine.

12.6 Noise

12.6.1 Views of the Applicant

Shell stated that noise levels from Muskeg River Mine would comply with the requirements set out in the Board's Interim Directive (ID) 94-4. Shell committed to periodically monitor noise levels in Fort McKay during both construction and operations. Should exceedances occur, Shell stated that it would reduce its noise levels through attenuation equipment, and relocation, or rescheduling of activities or equipment. Due to the proposed tailings pond's proximity to Fort McKay, Shell committed to use bird deterrent measures with noise levels that would not impact Fort McKay residents.

Shell provided evidence that the Denman Industries Camp would also not be adversely impacted by its operation.

12.6.2 Views of the Board

The Board is prepared to accept Shell's commitment that nearby residents, including workers located in the Denman Industries Camp, will not be adversely affected by noise levels associated with either construction or operations.

The Board also accepts Shell's commitment to address noise concerns from its operations using appropriate abatement measures and in particular to employ bird deterrent methods at its tailings pond that comply with the permissible noise levels set out in ID 94-4. The Board also expects Shell to meet its commitment to carry out periodic monitoring of noise levels within Fort McKay.

13 RECLAMATION

13.1 Views of the Applicant

Shell stated that the cost of remediation and restoration was included as part of Shell's economic evaluation of the project and that the necessary funds for reclamation had been included as part of the financing of the project. Shell stated that its interest in the mine would be held by Shell Canada Limited. and the interest in the mine would not be held in a separate limited liability company. Shell advised it would set up an accrual account for the funds required for mine closure that was sufficient to cover all the costs of reclamation and restoration. Shell stated that for the years 2004 to 2022 the average annual reclamation cost in 1997 dollars would be 4 million dollars per year. The closure account, which will accrue until 2023, will be 205 million dollars (1997 dollars) to be spent on closure post-2022. Interest occurring on that amount prior to complete closure will result in the availability of 250 million dollars (1997 dollars) post-2022 for reclamation.

At the Hearing, Shell was asked if it was prepared to commit to maintaining its interest in the project for the project life. Shell stated that it could not make such a commitment, but noted that there was a much lower fiscal motivation to sell a large-scale oil sands project than there was for a conventional oil and gas property. Shell stated that it would prefer not to have any conditions attached to an approval for this project that potentially restricted its options to sell its interest in the future. Shell indicated, however, that it was committed to meeting its obligations for reclamation. BHP stated at the Hearing that it was normal in the mining business, which was where its expertise and interest in the project lay, for the original developer to own the mine until the economic life was over and the property was reclaimed.

13.2 Views of AEP

AEP stated that the Conservation Reclamation Regulation requires that the actual cost of reclamation be provided as security. This security must be in a form that is acceptable to the Director. The security would also be site specific and specific to the each operator. AEP noted that the actual size of the required reclamation fund for this project was still under discussion with Shell.

AEP indicated that the EPEA legislation also has “look-back” capability to the original owners in the event of a sale. As a result, the original owner retained reclamation responsibility in the event that a subsequent owner did not meet its obligations.

13.3 Views of the Board

The Board accepts Shell’s commitment to reclaim the affected area as stated in its application and its willingness to comply with current and future regulations regarding reclamation and associated financial responsibility. The Board also accepts the evidence by AEP that it will ensure that Albertans are protected from future financial liability for reclamation and restoration of the Muskeg River Mine project.

14 CUMULATIVE EFFECTS OF OIL SANDS DEVELOPMENTS

14.1 Views of the Applicant

Shell stated that it had assessed cumulative effects using a three-staged approach. First, the effects of the Muskeg River Mine in relation to existing developments were assessed. Next the effects of the Muskeg River Mine in combination with existing and approved developments were considered, and finally, the cumulative environmental effects of the Muskeg River Mine in combination with other existing developments, approved developments, and other publicly announced developments were evaluated. Shell concluded that the Muskeg River Mine would not make a significant contribution to the cumulative environmental effects of industrial development in the region, irrespective of the scenarios considered.

Shell stated that it is currently participating in the Cumulative Environmental Effects Management initiative that is an oil sands industry/stakeholder regional development review. This initiative was designed to effectively evaluate the cumulative environmental effects associated with the expected development scenarios for the oil sands region. Shell noted that this initiative has involved regulatory agencies as well as regional stakeholders.

Shell stated that it also strongly supported AEP’s Sustainable Development Strategy as a method of considering cumulative environmental effects. Shell stated that it believed that many of the regional cumulative concerns identified in its EIA, including wildlife management issues, changes in biodiversity, acidification, and ozone generation, could be addressed through the Sustainable Development Strategy. Shell expressed some uncertainty, however, regarding how other issues, such as incorporation of the end pit lake concept, might fit into the overall realm of cumulative effects as they are currently being addressed in the region.

Shell stated that its understanding was that the Sustainable Development Strategy initiative would work in parallel with the Cumulative Environmental Effects Management initiative for the Athabasca oil sands. Shell stated that it believed the Sustainable Development Strategy would take recommendations from the Cumulative Environmental Effects Management initiative and provide the regulatory framework for addressing any of the cumulative effects issues identified.

Shell committed to work with AEP and others to ensure that the appropriate regional infrastructure is in place to deal with cumulative effects.

14.2 Views of the OSEC

Prior to the outset of the Hearing, OSEC requested that the Board initiate a formal inquiry, under Section 22 of the Energy Resources Conservation Act, into the ecological capacity of the region to handle the cumulative impacts of current and planned oil sands industry developments.

Notwithstanding its request for a Section 22 inquiry, OSEC stated that it also recognized the value in dealing with the cumulative effects issue outside of a formal, and possibly adversarial, inquiry process. Accordingly, OSEC suggested at the Hearing that the Board and AEP may only have to initiate their respective regulatory decision making processes, including the requested public inquiry, if the multi-stakeholder process described by the Cumulative Environmental Effects Management initiative becomes ineffective in addressing regional cumulative effects. OSEC also noted that some form of timeline would be an appropriate condition of an approval for Shell, including an indication of substantive progress on these cumulative effect issues prior to the commencement of construction.

OSEC focused its comments on the cumulative air quality issues of the region, but also noted its strong interest in and concern with other cumulative effects issues. To address at least some cumulative air quality issues, OSEC stated that it had initiated a MOU with the industrial operators in the region. This MOU was designed to address regional NO_x and SO_2 emissions. OSEC stated that it also supports the Cumulative Environmental Effects Management initiative, although it looked to AEP's Sustainable Development Strategy for the necessary regulatory "backstop" to ensure the results of the Cumulative Environmental Effects Management initiative were acted upon.

OSEC concluded that there was a great deal of urgency to deal with oil sands projects on a cumulative basis. It also noted that there were a number of significant uncertainties that have been identified with respect to cumulative effects assessment pertaining to both individual projects and the broader regional issues. .

14.3 Views of the Department of Fisheries and Oceans (DFO)

DFO noted that the Muskeg River Mine application was the sixth oil sands mining project it had reviewed in the past five years. DFO stated that this level of activity, in addition to other industrial activity, must be accommodated within acceptable environmental limits.

DFO stated that it had identified the need for a regional development framework to address regional issues. DFO stated that it was supportive of the evolving regional initiatives (the Cumulative Environmental Effects Management initiative and the Sustainable Development Strategy) that would hopefully provide the framework needed to support both sustainable oil sands development and a healthy environment).

DFO confirmed that it intended to continue to participate in and support the various regional cumulative effects assessment initiatives, and to work with Shell, AEP, the Board, and the industry to ensure the protection of fish and fish habitat.

14.4 Views of Environment Canada

Environment Canada stated its ongoing concern with the number of oil sands developments being proposed for the area and their associated cumulative environmental effects. Environment Canada stated that, in its view, the Cumulative Environmental Effects Management initiative was not yet in a position to be able to address the cumulative effects issues, nor was its relationship to operating approvals clearly understood. Environment Canada stated that it did support AEP's Sustainable Development Strategy.

14.5 Views of ACFN and Anzac

The ACFN and Anzac described their concerns with the cumulative effects of development on their traditional land use practices. They acknowledged that the Cumulative Environmental Effects Management initiative might be a means of having their concerns addressed. Anzac did not have positive view of that process, though the ACFN remained cautiously optimistic.

14.6 Views of AEP

A draft Terms of Reference for the Sustainable Development Strategy for the Athabasca Oil Sands region was submitted by AEP in support of its intervention. AEP indicated that the Terms of Reference were before the public for review and comment prior to their implementation. As the program was in a start-up phase, there was no implementation timetable other than the date of July 1999 for tabling a Sustainable Development Strategy report by AEP.

From its review of individual oil sands EIA's, AEP stated that it and other regulators had recognized a need for the regional management of environmental effects and impacts. AEP stated that the Sustainable Development Strategy was created to address this need using a multi-stakeholder consensus-based approach founded on existing programs and initiatives such as Wood Buffalo Environmental Association and the Cumulative Environmental Effects Management initiative.

AEP stated that the Sustainable Development Strategy initiative would assist in the resolution of both current and future issues concerning resource management and environmental effects. It would contribute regional environmental thresholds and refine the existing regulatory and resource management framework. AEP stated that the Sustainable Development Strategy process also increased the visibility of decision making to stakeholders. AEP would administer the Sustainable Development Strategy through its Regional Board of Directors while assuming a coordination role among multiple stakeholders and environmental working groups.

AEP requested that the Board continue its support of the Sustainable Development Strategy and assist in program implementation. AEP recommended that the Board not condition or delay a Shell approval as a result of the initiation of the Sustainable Development Strategy. AEP stated that the Sustainable Development Strategy should be considered separate from the Shell Muskeg River Mine approval.

14.7 Views of the Board

The Board notes that Shell was required to prepare an EIA as one component of its application for the Muskeg River Mine, and in turn, that a cumulative effects assessment is part of the

requirements of an EIA prepared under EPEA. While that legislation does not define cumulative effects explicitly, the Board recognizes that Shell has compiled an analysis that incorporates the effects of other existing and approved, but not yet complete, oil sands operations. In addition, Shell has examined the effects of those oil sands operations that are not as yet constructed, but are reasonably foreseeable.

At the Hearing, the Board heard several representations regarding the potential cumulative effects of additional oil sands projects in the same regional setting. Similar views were expressed during the review of the Syncrude Aurora mine application. In its Decision 97-13, the Board acknowledged that some means of addressing regional cumulative effects was warranted and appropriate. In its review of the Muskeg River Mine application, the Board finds that this view is still relevant

In striving for a regional approach to cumulative effects that is conducted outside of the formal Hearing process, the Board notes that it cannot relinquish its regulatory duty to address those issues. The Board also believes that cumulative effects issues require a concerted approach from all stakeholders. Therefore, the Board expects that all energy industry players in the region will contribute their expertise and resources and that the affected regulatory agencies and the public must participate as well.

The Board believes an industry led multi-stakeholder approach could be effective in addressing the regional environmental issues that originate from several different projects. The Board notes that the oil sands industry did conduct a series of workshops in 1998 in response to cumulative effects concerns raised by the public and government agencies. Those workshops were conducted with intent of developing a process to document and examine cumulative effects and environmental "thresholds." The Cumulative Environmental Effects Management initiative, as this process came to be known, is still, however, under design.

The Board has participated in this activity, and will continue to do so. The Board notes, however, that well over a year has transpired since the announcement of several new development projects, yet the Cumulative Environmental Effects Management initiative is just now beginning to address certain aspects of its structure and operating process. The Board is becoming increasingly concerned that these processes may not be moving forward at a speed sufficient to meet the Board's regulatory requirements to ensure that energy developments are carried out in an orderly and efficient manner that protects the public interest.

As a parallel effort, the Board supports, and wishes to be involved in, the AEP Sustainable Development Strategy. The Board notes that several interveners have also stated that they are willing to support and participate in this process. The Board believes the Sustainable Development Strategy should complement the work of the Cumulative Environmental Effects Management initiative, and will provide the necessary regulatory support for the results from the Cumulative Environmental Effects Management initiative.

The Board continues to believe that the two processes, the Cumulative Environmental Effects Management initiative and the Sustainable Development Strategy will create an acceptable and effective framework within which regional cumulative effects can be assessed within the oil sands region. The Board recognizes that for these initiatives to meet their goals within an adequate time frame, considering the intensity of industrial development, will require the dedication and commitment of all parties.

The Board notes that OSEC has requested that the Board conduct a public inquiry into the ecological carrying capacity of the region. In this case, the Board believes that as long as the various initiatives are making adequate progress such an inquiry is unnecessary. However, it is clearly possible for a number of reasons that the proposed consensus based processes may not be able to move forward as quickly as needed. Accordingly, the Board has decided to reserve- its decision on OSEC's request for a Section 22 proceeding, and may reconsider this request at some time in the future. Until then, the Board will closely monitor the progress of the Cumulative Environmental Effects Management initiative, the Sustainable Development Strategy, and any other relevant environmental assessment processes underway in the region. The Board will be asking that Board staff monitor the level of participation in the various initiatives and their rate of progress in order to assure itself that no additional regulatory review outside of the normal application review process is needed to protect the public interest.

CONCLUSIONS AND DECISION - see pages 1 and 4

DATED at Calgary, Alberta on 12 February 1999.

B. F. Bietz, P.Biol.
Board Member

A. J. Berg, P.Eng.
Board Member

H. O. Lillo, P.Eng
Acting Board Member