



## BlackRock Ventures Inc.

Application for a Steam-Assisted Gravity Drainage  
Project for the Recovery of Bitumen

Cold Lake Oil Sands Area

October 19, 2004

**ALBERTA ENERGY AND UTILITIES BOARD**

Decision 2004-089: BlackRock Ventures Inc., Application for a Steam-Assisted Gravity  
Drainage Project for the Recovery of Bitumen

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# ALBERTA ENERGY AND UTILITIES BOARD

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Calgary Alberta

**BLACKROCK VENTURES INC.**

**APPLICATION FOR A STEAM-ASSISTED GRAVITY  
DRAINAGE PROJECT FOR THE RECOVERY OF BITUMEN  
COLD LAKE OIL SANDS AREA**

**Decision 2004-089  
Application No. 1241564**

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## 1 DECISION

Having carefully considered all of the evidence, the Alberta Energy and Utilities Board (EUB/Board) hereby approves Application No. 1241564 subject to conditions listed in Appendix 2 and the approval of the Lieutenant Governor in Council pursuant to Section 10(3)(a) of the *Oil Sands Conservation Act* (OSCA). The Board finds approval of the application to be in the public interest on the basis of the application meeting the legislative requirements, the conditions that have been imposed by the EUB, and the commitments made by BlackRock.

## 2 INTRODUCTION

### 2.1 Application

BlackRock Ventures Inc. (BlackRock) filed Application No. 1241564 with the EUB, pursuant to Section 10 of the OSCA, for approval to construct and operate a thermal bitumen recovery project using steam-assisted gravity drainage (SAGD) near Hilda Lake in the Cold Lake Oil Sands Area. The proposed project (Orion Project) would be located in the north half of Section 9, the north half of Section 10, Sections 15, 16 and 17, Township 64, Range 3, West of the 4th Meridian.

The project would be developed in two phases. Phase 1 would consist of up to 56 SAGD well pairs and associated infrastructure and steam generation, water recycle, and bitumen processing facilities, with a capacity of 1590 cubic metres per day (m<sup>3</sup>/d) of bitumen production. Phase 2 would consist of up to an additional 60 well pairs and associated infrastructure and steam generation, water recycle, and bitumen processing facilities, with an additional 1590 m<sup>3</sup>/d of bitumen production capacity integrated at the phase 1 plant site. The locations of the plant and well pads are shown in Figure 1. The total project would have a capacity of 3180 m<sup>3</sup>/d of bitumen production and be expected to have a life expectancy of about 30 years.

### 2.2 Interventions

Interventions were filed by D. Stone, I. Stone, J. Harwerth, and B. Kolhaas (the interveners), who submitted that approval of the application would have a detrimental impact upon their lives and their property given the proximity of the proposed project to their homes and land. An objection concerning lease boundary setback distances filed by Imperial Oil Resources (Imperial) was withdrawn prior to the hearing. The Board received an objection concerning potential impacts on air and water quality from E. Duckett and family, but the Duckett family did not attend the hearing. D. Savard, of the Marie Lake Air Watershed Society, and R. Pernarowski had originally objected to the application but withdrew their objections after each reached an agreement with BlackRock on a number of issues, including the ongoing monitoring of air and water, and on a framework to cooperatively address other matters of concern. Notwithstanding

the withdrawal of their objections, Mr. Savard and Mr. Pernarowski made individual verbal presentations at the public hearing.

### **2.3 Hearing**

The Board held a public hearing in Cold Lake, Alberta, on July 13-15, 2004, before Board Member T. McGee (Presiding Member) and Acting Board Members R. Houlihan, P.Eng., Ph.D., and H. Lillo, P.Eng. Those who appeared at the hearing are listed in Appendix 1.

Final arguments and rebuttal arguments were completed on July 26 and July 29, 2004, respectively. Accordingly, the Board considers that the record was completed on July 29, 2004.

The panel and staff conducted a site visit to the properties of the interveners and the existing BlackRock pilot operations on July 13, 2004, without the presence of the applicant or any of the interveners.

## **3 ISSUES**

The Board finds that the issues relating to the application are

- need for the proposed project,
- operational technical issues,
- environmental technical issues, and
- consultation process.

## **4 COMMITMENTS AND CONDITIONS**

BlackRock made a number of commitments as part of its application. All of these commitments are summarized in Appendix 2 and are not necessarily discussed in the body of this report. Appendix 2 also contains a summary of the conditions attached to the BlackRock approval.

## **5 NEED FOR THE PROPOSED PROJECT**

BlackRock submitted that there was a need for the proposed project. BlackRock stated that it had operated a SAGD pilot project in the project area since 1997, which proved the technical feasibility of the recovery technique. BlackRock estimated in-place bitumen resources of 51.4 million m<sup>3</sup> in the development area. Commercial development of the Orion Project would generate a total of \$1.9 billion in provincial and federal taxes and would also generate hundreds of man-years of employment, with a total of 40 permanent jobs created when both phases were implemented.

The intervening parties did not submit any direct evidence concerning the need for the project. The Board notes that BlackRock is the mineral leaseholder and that its proposal would allow for recovery of the resource. The Board believes that an expansion of the current pilot SAGD operations to a full commercial scheme would result in efficient and orderly extraction of

bitumen resource from the Clearwater Formation. Subject to other concerns and requirements, the Board is satisfied that there is a need for the commercial operation.

## **6 OPERATIONAL TECHNICAL ISSUES**

### **6.1 Resource Recovery**

BlackRock acknowledged that it had initially applied to implement a 50 m setback from the lease boundary edges and that this distance was a reduction from the 100 m implemented in the pilot project.

BlackRock stated that Imperial had expressed concerns that implementation of a 50 m setback could result in resource recovery from an area beyond the BlackRock lease. BlackRock then proposed a temporary increase to the lease boundary setback to 150 m where offset by the Imperial operations, to facilitate a withdrawal of Imperial's intervention. BlackRock submitted that this would provide for the drilling of additional infill well pairs in the future at a setback distance of 50 m when additional steam chamber growth monitoring information became available to help address the stated concerns of Imperial.

The interveners expressed reservations about the planned changes regarding the lease boundary setback distances. They were concerned that there was potential for the planned infill wells at a 50 m distance never being drilled, which could result in the sterilization of a significant resource. The interveners also questioned why BlackRock was able to accommodate a setback change with Imperial while not being able to come to the same type of agreement to address their needs for a greater setback from the planned surface facilities and development from their land.

The Board expects BlackRock to work with Imperial to ensure that resource recovery is maximized along lease boundaries. The Board notes that BlackRock and Imperial have only just begun to work on the issues surrounding the lease setback distance and have not come to a final agreement on the exact conditions required to satisfy all concerns before infill drilling can occur. The Board requires the agreement reached between BlackRock and Imperial for implementation of an altered reservoir setback distance to be submitted by June 30, 2005, for review and approval. The EUB will continue to work with operators to ensure that the maximum resource recovery is achieved.

The Board finds that temporarily increasing the lease boundary setback to address conservation of the resource and an offsetting leaseholder's equity issue is different in nature from the interveners' concern about additional setbacks from the boundary of their properties. In the former case, the greater setback is temporary and is acceptable because it will allow for the ultimate maximum recovery of the resource by both leaseholders. In the latter case, BlackRock will not have wells or facilities within 500 m of the interveners' residences, and the Board is not persuaded by the evidence provided at the hearing that the potential impacts, visual and otherwise, require a greater setback. The issue of surface setbacks and associated visual and auditory impacts are dealt with further in this report in Section 6.5.

### **6.2 Geology and Hydrogeology**

BlackRock described how its project produces bitumen from the Lower Cretaceous Clearwater Formation, at a depth of about 400 m below surface in the project area. Figure 2 illustrates the relationship of the Clearwater to overlying and underlying stratigraphic units.

BlackRock noted that brackish water extracted from the underlying McMurray Formation (450 m) would be used for steam generation purposes. It stated that potable water would only be used for domestic purposes and for temporary steam generation in the event of a failure of the brackish water treatment system. It also noted that the Cambrian, Granite Wash Formation (1185 m) would be used as the deep saltwater disposal zone for the project.

BlackRock testified that the Clearwater reservoir is separated from the drinking water aquifers of the Quaternary deposits by the overlying Grand Rapids Formation and the Colorado shales. In its application, BlackRock described the Grand Rapids (105 m thick) and the Colorado (190 m thick) as sufficient barriers to prevent Clearwater fluids from impacting shallow Quaternary aquifers.

BlackRock explained that a small component of the water entering both Hilda and Ethel Lakes is groundwater; however, because the lakes intersect different strata, the groundwater contribution to each is different. BlackRock noted that the base of Hilda Lake intersects the low-permeability Grande Centre Formation and thus only receives about 0.002 cubic metres per second ( $\text{m}^3/\text{s}$ ) of net groundwater flow, whereas the base of Ethel Lake intersects the more permeable Sand River Formation and receives about 0.014  $\text{m}^3/\text{s}$  of net groundwater flow.

BlackRock noted that it would be developing a shallow groundwater monitoring program for consideration by Alberta Environment (AENV) as part the requirements for its *Environmental Protection and Enhancement Act* (EPEA) approval. It stated that this monitoring system would be designed to provide sentinel monitoring of shallow groundwater between its project and down-gradient receptors, including private water wells and surface water bodies, such as the lakes. BlackRock believed that this monitoring system would allow it to respond in a timely manner to any project-related issues that might arise. BlackRock also committed to participate in the Lakeland Industry and Community Association's (LICA's) regional groundwater initiative, designed to document changes in groundwater levels, flow directions, and water quality.

The interveners agreed that BlackRock's selection of the Granite Wash Formation for deep saltwater disposal was appropriate.

The interveners expressed concern that the details of BlackRock's groundwater monitoring system were not included in its application. They indicated that this information would have been helpful to them in their review of the application.

The Board agrees that the Colorado and Grand Rapids strata are adequate to prevent migration of production fluids from the Clearwater. The Board also agrees that the Granite Wash is a suitable disposal formation. The Board acknowledges BlackRock's efforts to refrain from freshwater use for steam injection and understands that AENV may restrict BlackRock's freshwater use to domestic and industrial utilities' use.

The Board understands that BlackRock is required to submit a detailed shallow groundwater monitoring plan to AENV as a requirement in the EPEA approval process. The Board recommends to AENV that BlackRock be required to explain the design of the monitoring system to the interveners that appeared at the hearing and to provide these parties with the ongoing results of the monitoring as it becomes available. The Board notes BlackRock's commitment to participate in LICA regional groundwater monitoring initiatives.



### **6.3 Wellbore and Formation Integrity**

BlackRock asserted that the vast majority of casing failures in the Cold Lake area are associated with cyclical steam stimulation (CSS) operations. It stated that the lower steam pressure SAGD operations were very unlikely to cause casing failures or fracturing of the Clearwater caprock, as its injection pressure of 4 megapascals (mPa) is well below the Clearwater Formation fracture pressure of between 6 and 8 mPa, according to the Imperial stress test data submitted by BlackRock during the hearing. As well, BlackRock explained that steam injection during SAGD operations is continuous, placing much less stress on the casing than do cyclic steam operations. BlackRock also noted that it would set its surface casing into the top of the Colorado shales, so that even in the unlikely event of a casing failure, the Quaternary aquifers would be protected behind an additional string of casing.

BlackRock stated that when casing failures occurred, these failures were related to casing collapse or thread leakage and did not result in reservoir fluids being released to overlying formations. BlackRock indicated that there had been no casing failures associated with its existing project.

The interveners acknowledged that the likelihood of casing failures related to SAGD operations was lower than that associated with cyclic steam operations, but submitted that failures were still possible. The parties recognized that BlackRock's SAGD project would operate at a lower pressure than cyclic operations, but still expressed a concern that potential uncontrolled losses of fluids from the Clearwater reservoir to an overlying aquifer or to surface water could occur. The interveners were concerned that the potential for fluid loss was greatest for those wells located under the lakebeds, as they believed that fluids escaping from the Clearwater could enter the bottom of the lakes. The interveners reiterated that the likelihood of Clearwater fluids breaching the caprock was small, but not zero, as stated by BlackRock.

The Board finds that because BlackRock's SAGD operation will inject steam well below the formation fracture pressure, the project is unlikely to affect caprock integrity. Furthermore, as BlackRock's operating pressure will be less than the normally occurring hydrostatic gradient of the Clearwater reservoir, fluid migration from the Clearwater Formation to an overlying aquifer or any surface water is unlikely, as the fluid pressure is not sufficient to raise a column of fluid to the elevation of the Quaternary Formation. The Board considers implementation of the SAGD process appropriate in the project area.

## **7 ENVIRONMENTAL TECHNICAL ISSUES**

### **7.1 Arsenic Mobilization and Human Health**

BlackRock noted that groundwater in Quaternary aquifers can contain naturally occurring dissolved arsenic, sourced from adjacent marine shales, such as the Colorado. It encouraged all area water well owners to routinely monitor their water supply for arsenic, because of these naturally occurring conditions. BlackRock committed to sample the water supply of landowners on or adjacent to its operation to avoid landowner concern about the cost of such testing for arsenic.

BlackRock submitted that groundwater monitoring at its existing project had not shown increased arsenic concentrations in groundwater. However, BlackRock also stated that data

gathered by Imperial Oil at its Cold Lake cyclic steam stimulation project had shown that heated wellbores passing through shallow formations could increase the solubility of arsenic near the heated wellbore. The data also showed that arsenic concentration returned to background conditions at a distance of 300 to 400 m from the heated wellbore. BlackRock noted that several area residents' water supply wells were located within 400 m of its operations, but believed its shallow groundwater monitoring program would provide early warning of any changes in arsenic concentration prior to it reaching a resident's water supply. BlackRock stated that it would undertake remedial action to prevent increased arsenic levels from impacting water supplies.

BlackRock testified that its risk assessment indicated that the project would not impact the safety of area residents' drinking water and noted that its groundwater monitoring program would be designed to detect any increases in arsenic prior to reaching a receptor. BlackRock believed that the conservative approach taken in its assessment would account for sensitive individuals, such as children. BlackRock stated that it would take appropriate action to address elevated arsenic levels in groundwater attributed to its operations and committed to working through LICA to further understand arsenic issues in the area.

The interveners were concerned that the thermally induced increases in arsenic concentration could affect water wells and lakes and did not believe that BlackRock had adequately addressed their concerns regarding the safety of their water supply. The interveners were aware that groundwaters in the area could contain naturally elevated levels of arsenic and were concerned that BlackRock's operation would exacerbate the situation. The interveners were also concerned that the free routine water analysis provided by Alberta Health and Wellness did not include an analysis for arsenic.

The interveners submitted that BlackRock's risk assessment methodology resulted in an underestimation of the risks of arsenic exposure with respect to dermal exposure and to sensitive individuals, such as children. They also stated that they did not accept that the investigations to date had unequivocally determined that arsenic would precipitate out of solution within 300 to 400 m from a heated wellbore, nor did they accept that the chemical reactions involved to reprecipitate arsenic would occur with certainty.

Further, the interveners asserted that local health practitioners were not adequately trained to identify health problems related to exposure to arsenic through drinking water. They asked that BlackRock and other companies contribute to a regional health centre that would fulfill several roles, including research, training of health professionals, and providing community-based action for arsenic-related health issues.

Alberta Health and Wellness, in the Alberta Government submission, supported the conclusions of BlackRock's Human Health Assessment that human health would not be affected as a result of the Orion Project.

The Board is not persuaded that a direct application of Imperial's findings regarding thermal arsenic mobilization and transport to BlackRock's project is appropriate given the lower operating temperature, lower wellbore density, and continuous steam injection associated with BlackRock's proposed SAGD facility. The Board also notes that the Imperial study measured background arsenic levels within 300 to 400 m of the heated wellbores, but is not aware of whether this is a result of reprecipitation of the arsenic or other processes, such as diffusion and advection. However, the Board acknowledges BlackRock's position that its groundwater monitoring program will be designed for the early detection of increased arsenic concentration

and trusts that AENV will ensure that BlackRock's groundwater monitoring program is designed to ensure that project-specific information related to thermal arsenic mobilization and transport is gathered.

The Board will require BlackRock to supply the EUB with a copy of its groundwater monitoring program, after approval by AENV, and a copy of its annual groundwater monitoring report, so that the Board is aware of the content and findings of the program.

The Board finds the human health risk assessment conducted by BlackRock to be acceptable for the intended purposes. It notes that Alberta Health and Wellness, in its submission, was of the opinion that the health risk assessment employed conservative assumptions and used effects reference concentrations considered protective of reasonably sensitive receptors and thus concluded that the health risk assessment was reasonable.

The Board notes the interveners' request that BlackRock and other area operators contribute to the formation of a regional health centre dedicated to arsenic-related issues. The Board is not convinced that such a condition is required and is satisfied with BlackRock's commitment to work through LICA towards a better understanding of arsenic issues.

## **7.2 Surface Water Quantity and Quality**

BlackRock submitted that the use of brackish (saline) McMurray water for steam injection would not impact water levels of shallow aquifers or surface water bodies, such as streams or lakes, because of the significant thickness of strata, including the production horizon, between the McMurray and the Quaternary aquifers. BlackRock did not propose to monitor surface water levels in its application, because it did not believe this would provide relevant information on brackish water withdrawal from the McMurray, given that the McMurray is below the Clearwater production horizon.

BlackRock gave evidence of its membership in LICA and stated that LICA was involved in regional water management studies, such as the Cold Lake Beaver River Water Management Plan. It noted that LICA planned to assist the Alberta Lake Watch Society (ALWS) during 2004 with voluntary monitoring of Hilda Lake. BlackRock committed to conduct biological monitoring within the north basin of Hilda Lake (e.g., invertebrates) to address concerns about potential effects of acid deposition from emissions upon regional water bodies.

BlackRock also addressed landowner concerns that reservoir fluids could be released to Hilda and Ethel Lakes due to a breach of the Clearwater reservoir caprock. BlackRock clearly stated that its SAGD operations would not result in adverse impacts to either lake, due to the thick sequence of strata (Colorado and Grand Rapids) separating the Clearwater reservoir from the overlying Quaternary deposits. BlackRock believed that the greatest risk its project posed to surface water was from surface spills of production fluids, but noted that its groundwater monitoring program would provide early detection of effects from surface spills through the intersection of potential shallow aquifer pathways before the lakes. It stated that emergency response and spill management measures would be implemented to minimize surface spills.

BlackRock noted that the Cold Lake Subregional Integrated Resource Plan (1996) recommended a setback of 300 m from major water bodies to reduce the likelihood of sedimentation, contamination, and visual impacts. BlackRock indicated that it used this setback wherever possible, but in instances where project design required well pads to be located less than 300 m

from a water body, it would institute additional spill and runoff control measures, such as vegetated buffer strips.

The interveners maintained that BlackRock's industrial activity would not enable them to maintain their quality of life, as the project would affect the water quality of Ethel Lake, which was their drinking water source. The interveners believed that surface spills related to the project could travel to the lake via shallow groundwater and that casing failures in horizontal wells under the lake could release Clearwater fluids to the lake. Consequently, they requested that the EUB ensure sufficient mitigation and protection measures for the project, such as seismic monitoring or thermal scanning by remote sensing satellites. The interveners were of the opinion that these techniques would detect any migration of Clearwater fluids into Ethel Lake.

In its written submission, AENV accepted brackish water use for steam generation as an essential component for the BlackRock project to minimize environmental impacts on surface and ground waters. AENV noted that any *Water Act* approval it might issue would include a restriction limiting any freshwater use to domestic and industrial utilities' use. AENV indicated that it would require surface water and groundwater monitoring in any BlackRock EPEA approval it might issue, designed for long-term protection of Hilda, Ethel, and Moore Lakes.

The Board finds that operation of the horizontal SAGD wells is unlikely to result in a release of production fluids to Hilda or Ethel Lakes due to the thick sequence of confining strata between the Clearwater and the Quaternary. The Board agrees that the greatest risk to surface water bodies is from surface spills and notes that in addition to the mitigation measure described by BlackRock, all companies are required to comply with EUB regulations concerning waste storage, spill management, emergency response planning, and equipment standards. The Board finds that these regulations in conjunction with the use of trained and experienced personnel are reasonable precautions for reducing contamination risks to Hilda and Ethel Lakes.

The Board acknowledges AENV's intention to require surface water monitoring for the protection of Hilda, Ethel, and Moore Lakes and recommends that AENV consider cooperative regional monitoring of surface water bodies by BlackRock and other industrial operators as a means to document environmental baseline conditions, validate environmental impact assessment (EIA) predictions, and address cumulative effects.

### **7.3 Water Management**

BlackRock stated that it was committed to the use of brackish water as the sole source of makeup water for the purpose of generating steam for injection into the Clearwater reservoir. Use of fresh water would be limited to utilities and short periods of upset conditions should they occur in the produced and brackish water treatment facilities. In addition to the implementation of a brackish water source, BlackRock would implement produced water recycling to reduce the volume of water required on an ongoing operating basis.

BlackRock stated that the brackish water source might require some substitution of fresh water volumes in emergency or upset conditions that could occasionally occur in the water treatment process. For this purpose BlackRock was applying to AENV to continue the existing licence for 600 m<sup>3</sup>/d withdrawal from the Quaternary Formation.

The interveners submitted that there was no means to ensure that BlackRock actually would be implementing the use of brackish water for the purpose of generating steam. The interveners

argued that BlackRock should not be issued an extension to its current licence for withdrawal of up to 600 m<sup>3</sup>/d of fresh water from the Quaternary Formation.

The Board recognizes that BlackRock is proposing to use brackish water as the primary water source for generating steam at the planned Orion Project. The Board also notes that while BlackRock does have a request before AENV for extension of the 600 m<sup>3</sup>/d freshwater withdrawal permit from the Quaternary Formation, with the implementation of commercial project operations the Board will require BlackRock to meet a minimum recycle rate of 90 per cent on a yearly average basis. The Board notes that this rate is based on design information in BlackRock's application and is lower than that required in other oil sands projects. The Board will reassess the recycle rate requirement following review of BlackRock operational data. Following one year of commercial plant operations, the Board will require BlackRock to provide a re-evaluation of the realized water balance and compare it with the predictions made in the application. If the water balance has changed significantly from the application stage, an adjustment to the water recycle rate will be made to reflect ongoing operations.

#### 7.4 Air

BlackRock submitted that emissions from the project would not result in exceedances of the Alberta Ambient Air Quality Guidelines (AAAQG). Taking into consideration the future cumulative effects scenario, BlackRock submitted that emissions from the project, including the formation of ground-level ozone and fine particulate matter, would not significantly impact the regional ambient air quality. BlackRock submitted that it did not expect project emissions to contribute significantly to the potential acidification of soils or water in the region.

BlackRock testified that it was committed to minimize emissions from equipment leaks through the application of the Canadian Council of Ministers of the Environment (CCME) *Code of Practice Measurement and Control of Fugitive Volatile Organic Chemicals (VOC) Emissions from Equipment Leaks*. The project would incorporate vapour recovery on tanks, vessels, and pressure relief valves, which would minimize fugitive emissions in accordance with the CCME *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks*. Consistent with these guidelines, BlackRock submitted that captured gases from tanks and vessels would be sent back into the produced gas system for recovery to be used as fuel in the steam generators, while pressure relief valve discharges would be sent to the flare.

BlackRock confirmed that it was a committed member of LICA and believed that LICA was the proper organization to monitor the regional air quality. One of BlackRock's commitments in the application was to work with LICA to define regional air quality monitoring requirements and a cooperative monitoring network. BlackRock agreed to set up passive monitors around the lease area and set up a continuous monitoring trailer at the central project facility for the first six months of operation of the proposed commercial facility.

The interveners stated that emissions from the project would degrade the quality of life for people living in the vicinity by worsening the air quality. Although they acknowledged that the contribution to regional air emissions by the project would be small, there was concern about the worsening air quality due to cumulative effects. Specifically, the interveners were concerned about acid deposition, ground-level ozone, and fine particulate matter (PM<sub>2.5</sub>). They maintained that this issue was not adequately addressed in the EIA, nor was there an adequate monitoring program in the study area to address the matter. The interveners also argued that there was

uncertainty with regard to the correct course of action when a resident detected unusual air quality or odour in the area. The interveners stated that it was unclear as to which organization or company should be contacted with their complaint.

The interveners expressed concern regarding fugitive emissions of hydrogen sulphide (H<sub>2</sub>S) from the project and the creation of dimethyl sulphate (DMS) from sulphur dioxide (SO<sub>2</sub>) in the plumes from the steam generators, which had been shown to occur in plumes from large oil- or coal-fired thermal facilities. In addition, the interveners testified about potential emissions of arsenic or arsine gas from the flare, steam generators, or well pads as a result of the mobilization of arsenic in the groundwater or rock to the heated bitumen. No empirical evidence to support this hypothesis was submitted by the interveners.

The Board accepts the evidence that emissions from BlackRock will not exceed the AAAQG and the evidence that emissions from BlackRock will not significantly contribute to acidification, the formation of ground-level ozone, or the formation of fine particulate matter. The Board supports BlackRock's commitment to an on-lease air-monitoring program consisting of six months of continuous monitoring and ongoing passive monitoring, as well as BlackRock's continuing support of regional airshed monitoring by LICA. The Board recommends that the details of the on-lease air-monitoring program be documented by AENV as part of the EPEA approval for the project. The Board recommends timely implementation of a regional air-monitoring network by LICA and the participation of AENV in this process.

The Board does not expect odour issues with respect to H<sub>2</sub>S or fugitive VOC emissions to be significant. The Board notes that BlackRock has committed to respond to air quality and odour complaints. If a resident is not certain of the source of the odour, they can direct their concerns to the EUB Bonnyville Field Centre. The Board understands that regional air quality and odour issues may also be brought to the LICA Resolution Committee.

It is the Board's view that the transformation of SO<sub>2</sub> to DMS in the steam generator plumes will not be significant. Evidence was submitted that DMS is created in the plumes of large coal- or oil-fired power plants, which have considerable emissions of SO<sub>2</sub> and particulate matter. However, the project will be using only slightly sour produced natural gas blended with sweet natural gas as fuel, so SO<sub>2</sub> and particulate emissions will be low; hence, the formation of DMS will not be significant.

The Board was made aware of the interveners' theory of arsine gas formation and emission from the project, but as the theory was not supported by any empirical evidence or detailed explanation, the Board does not find that this has been established as a plausible concern. Therefore, the EUB believes that emissions of arsine gas or arsenic from the operation of the project are unlikely.

## **7.5 Visual and Auditory Impact of the Project on Residents**

BlackRock submitted that its noise impact assessment was conducted for the primary noise source for the proposed project's operations, the commercial plant. BlackRock monitored ambient noise levels at five of the residences in the area of the proposed plant site and found that typical nighttime levels were in the range of 23 to 36 decibels (dBA).

BlackRock stated that modelling evidence suggested that at the start of phase 2 of the project in 2008, noise levels at the same five properties would remain in compliance with EUB *Interim*

*Directive (ID) 99-08: Noise Control Directive.* At one of the test residences, as an example, the modelling found that the predicted sound level with a plant in phase 2 operations was 29 dBA, at the low end of the baseline. BlackRock stated that this result would be representative of other areas downwind and to the east of the commercial plant.

BlackRock acknowledged that a noise complaint had been made by a resident in the vicinity of the pilot plant, but stated that the complaint had been addressed and efforts were under way to verify that the problem had in fact been resolved. BlackRock stressed that it was committed to address any noise issues that might arise as a result of the proposed project.

The interveners expressed concern regarding the level of noise produced by the project and how the increase in noise levels may affect their current lifestyle.

The Board accepts that according to the noise impact assessment conducted by BlackRock and in the absence of evidence to the contrary, noise levels will satisfy the EUB *ID 99-08* and should not pose a significant problem for residents in the area.

BlackRock provided a visual impact assessment that indicated there were no areas around Ethel Lake from which the proposed project would be visible, and that only 4 per cent of the land surrounding Hilda Lake would have a view of the top of the steam generator and flare stacks. BlackRock argued that since the interveners' lands were strictly in the Ethel Lake region, none of the proposed facilities would be visible from the interveners' lands.

BlackRock submitted that the phase 2 production pads located on the west side of Riverhurst Highway and in the vicinity of the Harwerth/Kolhaas property would not be visible because of a tree buffer between the facilities and the road.

The interveners identified the visual impact of the central plant as a potential problem. In particular, there was a concern that the plant's steam generator and flare stacks would be visible from the Harwerth/Kolhaas property, which reached an elevation higher than the plant site at one location. The interveners questioned whether the visibility of the flare stacks from that part of their property would result in their property being less desirable in terms of a subdivision development.

The Board accepts BlackRock's testimony that the visibility of the flare and boiler stacks is more dependent on the height of the tree line and whether it has been cleared in the region than on the height of the stacks themselves. The Board also accepts the findings of BlackRock's visual impact assessment and holds that this should alleviate the concerns about the potential for any visual impacts from the proposed project. The Board understands that the final stack height requirements will be subject to review during the AENV EPEA approval process.

## **7.6 Land Value**

BlackRock presented no direct evidence concerning property values at the hearing.

The interveners indicated some concern about the potential for the devaluation of their property given the proximity of the proposed project and subsequent difficulty if they proceeded with plans to subdivide their land. Specifically, the interveners noted the release of the report *Impact of Oil and Gas Activity on Rural Residential Property Values* and its finding of a potential 10 per cent devaluation of property from certain oil and gas facilities on rural residential acreages in

south-central Alberta. The interveners submitted that the findings of the report might be applicable to their own situation. However, the interveners also acknowledged that compensation is not within the Board's jurisdiction.

From the Board's perspective, land value impacts are only one factor among many that must be weighed against the overall public benefit of the application in the approval decision. Further, the Board finds it difficult to agree that land value impacts would necessarily occur, given the type of development that has already occurred in the immediate area and the absence of any significant health, visual, or noise impacts on the interveners.

With regard to the land value report, the Board notes while EUB staff contributed to the report, the conclusions, opinions, and recommendations are those of the authors and do not necessarily reflect the views of the organizations that employ them. The report does not reflect or contain the views of the Board.

The Board also notes that the report dealt with a different geographic region and different facility types than are present in the Hilda Lake/Ethel Lake area. Therefore, the Board does not believe the specific findings of the report would be applicable to the intervener's situation.

## **8 CONSULTATION PROCESS**

BlackRock submitted that it had conducted an appropriate communication and consultation process throughout the development of project plans. Its public consultation program began in 2000, when initial contact was made with area residents. The commercial project was announced through newsletters, news releases, and the issuing of background documents to local landowners, residents, and interested parties. Multiple open houses were held in 2000 and 2001, in addition to group and one-on-one meetings. BlackRock stated that it had dealt with all identified concerns in an appropriate manner when identified by a party that could be affected by the proposed project.

BlackRock noted that of the twelve parties who originally expressed concern on January 21, 2004, only two interveners remained as active hearing participants. BlackRock pointed out that the agreements for monitoring of air and water quality reached with Mr. Savard and Mr. Pernarowski were evidence of the success of its public consultation program. BlackRock stated that it was committed to ongoing consultation through the life of the project.

The interveners testified they had moved onto their properties in the area between 2002 and 2003. They also stated that they had only been informed about the proposed project on January 21, 2004, when another area landowner gave them a petition to sign opposing the project. They stated that there had been no application data received by the group until February 20, 2004, at which time they received and reviewed the application in full. After ongoing consultation with BlackRock, the parties were unable to resolve their concerns about the potential of impacts on their lives and property from the proposed project implementation. The intervening parties commented favourably on BlackRock's personal approach to the consultation process.

The Board finds that the situation encountered by BlackRock of a number of properties changing ownership during the application process makes the consultation process difficult for all parties involved. The Board notes that BlackRock's application was advertised in the local papers on numerous occasions from 2001 to 2004. While the Board believes that the applicant made good



efforts to consult with the local area stakeholders, it notes that all parties could have been more attentive to the dynamic nature of changing land ownership and land use occurring in the areas immediately adjacent to themselves.

The Board views public consultation between project proponents and parties that may be potentially adversely affected by a proposed development as an essential and ongoing part of the project development process. The Board also believes that successful consultation requires active participation and commitment from all parties to identify issues and work towards resolutions. The Board acknowledges BlackRock's commitment to continue the consultation process with the affected parties as the project develops.

Dated in Calgary, Alberta, on October 19, 2004.

### **ALBERTA ENERGY AND UTILITIES BOARD**

*(Original signed by)*

T. McGee  
Presiding Member

*(Original signed by)*

R. Houlihan, P.Eng., Ph.D.  
Acting Board Member

*(Original signed by)*

H. Lillo, P.Eng.  
Acting Board Member



## APPENDIX 1 HEARING PARTICIPANTS

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### Principals and Representatives (Abbreviations used in report)

### Witnesses

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BlackRock Ventures Inc. (BlackRock)  
S. Munro

B. Gardiner, P.Eng.  
B. Rogers, Ph.D.,  
of Toxcon Health Services Centre Inc.  
B. Zelt, Ph.D.,  
of Zelt Professional Services Inc.  
E. Gillmor, P.Geol.,  
of Westwater Environmental Ltd.  
J. Fennell, P.Eng.,  
of Komex International Ltd.  
P. Collins, P.Eng.,  
of Petroleum Geomechanics Inc.  
M. Forster, P. Biol.,  
of Golder Associates  
R. Lauzon, P.Biol.,  
of Komex International Ltd.  
R. Sturgess, P.Eng.,  
of Matrix Solutions Inc.  
C. Buma, P.Eng.,  
of Acoustical Consultants

Ethel Lake Landowners (the interveners)  
J. Hope-Ross

D. Stone  
I. Stone  
J. Harwerth  
B. Kolhaas  
S. Ulfsten  
K. McDonald, Ph.D.  
E. Nylaund, Ph.D.  
J. O. Niragu, Ph.D.  
J. Argo, Ph.D.

Alberta Environment  
D. Stepaniuk

Alberta Energy and Utilities Board staff  
D. Larder, Board Counsel  
B. Austin, P.Geol.  
P. Hunt  
C. Dickinson, G.I.T.  
K. Hale, C.E.T  
K. Siriunas, P.Eng.  
T. Molik

**APPENDIX 1 HEARING PARTICIPANTS (continued)**

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Principals and Representatives  
(Abbreviations used in report)

Witnesses

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D. Savard\*

R. Pernarowski\*

\*Participants who made an oral presentation at the hearing.

## **APPENDIX 2 SUMMARY OF COMMITMENTS AND CONDITIONS**

The Board notes throughout the application and hearing process BlackRock has undertaken to conduct certain activities in connection with its operations that are not strictly required by the EUB's regulations or guidelines. These undertakings are described as commitments and are summarized below. It is the Board's view that when a company makes commitments of this nature, it has satisfied itself that these activities will benefit both the project and the public, and the Board takes these commitments into account when arriving at its decision. The Board expects the applicant, having made the commitments, to fully carry out the undertaking or advise the EUB if, for whatever reasons, it cannot fulfill a commitment. The EUB would then assess whether the circumstances regarding the failed commitment warrant a review of the original approval. The Board also notes that the affected parties also have the right to request a review of the original approval if commitments made by the applicant remain unfulfilled.

### **COMMITMENTS BY BLACKROCK**

- Gather petrophysical, geological, and rock mechanic properties and in situ stresses in the caprock above the Clearwater.
- Monitor research and development activities regarding low-pressure operations and artificial lift for SAGD to determine which, if any, is applicable to the Orion Project.
- Perform surface fluid sampling of bitumen, produced water, and produced gas for composition information.
- Perform water reuse analysis to ensure that water quality is maintained to steam generator specifications.
- Monitor disposal water for pH levels and oil content.
- Undertake continuous measurement of the quantity and pressure of steam injected.
- Operate injection and production wells under continuous pressure monitoring and control.
- Monitor the quality of the cement jobs with cement bond log performed on one well per pad.
- Install culverts to maintain existing drainage patterns.
- Perform regular inspections of drainage performance to determine if additional culverts are required.
- Collect surface runoff and test prior to release.
- Monitor waste handling to ensure compliance with environmental regulations and the principles of reduce, reuse, recycle, and recover where practical.
- Create and maintain a constructive dialogue with regional stakeholders to ensure continued environmental, social, and economic sustainability.
- Monitor the results of arsenic testing and work with industry through LICA to plan further studies to resolve this issue.
- Work with LICA to define air quality monitoring requirements and define a cooperative air quality monitoring network in the region.
- Perform monitoring and inspection of the construction, operation, reclamation and post-reclamation activities with qualified environmental personnel.

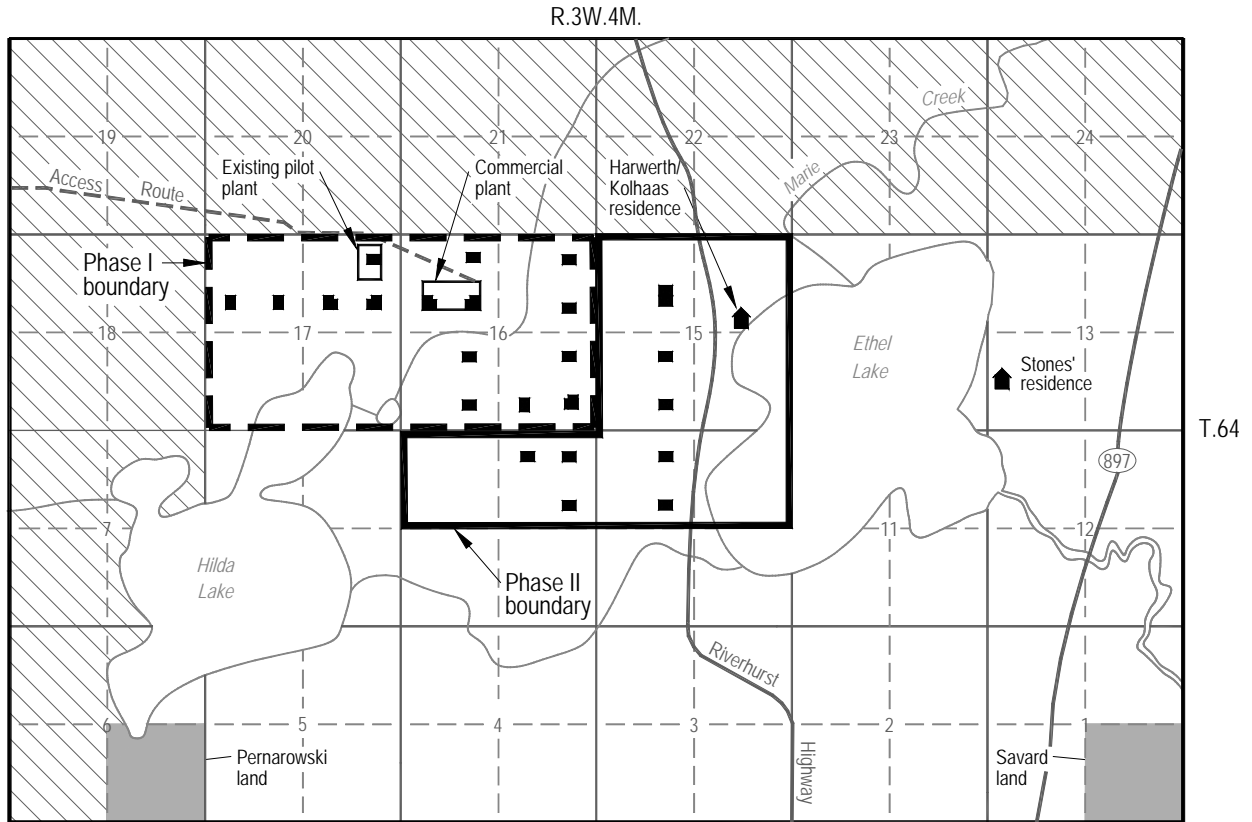
- Perform soil monitoring during the operation of facilities where substances may be released to soil.
- Develop a groundwater monitoring program for the site. Investigate changes to operations if a detrimental effect on groundwater quality is being caused by plant activities.
- Monitor water levels in the groundwater monitoring well system on a monthly basis and measure water quality on a quarterly basis.
- Monitor wells for casing leaks and conduct groundwater monitoring of water quality to detect and correct any detrimental effects.
- Implement a monitoring program to ensure that prescribed sediment and erosion control plans are effective.
- Minimize the accidental release of gasses to the atmosphere through the design and careful operation and monitoring of activities with the potential for releasing odour-causing gases.
- Participate in the regional groundwater monitoring initiative within LICA in order to document actual effects on water levels, groundwater flow, and water quality.
- Participate in a long-term cooperative monitoring program to confirm the actual effects of acid deposition on water bodies resulting from combined emissions from the regional study area (RSA).
- Participate in a long-term cooperative monitoring program to confirm the actual effects of acid deposition on soil resulting from combined emissions from the RSA.
- Continue to work with the representatives of LICA and AENV to develop reclamation plans that balance biodiversity and agricultural goals.
- Continue to work with representatives of LICA to define the need for cooperative measures to deal with the ongoing population growth in the region.
- Implement a routine monitoring program for the aquatic environment of Hilda Lake through the sampling of the benthic invertebrate community
- Review the long-term wildlife monitoring requirements associated with the operations and initiate a program after consultation with Alberta Sustainable Resource Development and regional stakeholders.
- Develop a monitoring program for the effects of the project on the relative abundance and distribution of the Canadian toad.

## CONDITIONS

The conditions imposed in the licences are summarized below. Conditions generally are requirements in addition to or otherwise expanding upon existing regulations and guidelines. An applicant must comply with conditions or it is in breach of its approval and subject to enforcement action by the EUB. Enforcement of an approval includes enforcement of the conditions attached to that licence. Sanctions imposed for the breach of such conditions may include the suspension of the approval, resulting in the shut-in of a facility.

- The operator shall comply with a minimum project area subsurface setback of 150 m on the west and north boundaries.

- The operator shall submit to the Board, for review and approval by June 30, 2005, a plan to reduce the setback distance and ensure maximum resource recovery from the lease boundary area.
- The operator shall conduct all operations to the satisfaction of the Board and in a manner that under normal operating conditions will permit the practical maximum reuse of produced water, with the minimum recycle rate being 90 per cent on an annual basis, unless otherwise stipulated by the Board.
- The operator shall, a minimum of 12 months prior to the planned commencement of construction for the planned wells and facilities, submit a report for the Board's approval detailing the information obtained from the long-term supply pump test to be performed on the McMurray Formation.
- The operator shall provide the Board after 12 months of commercial plant operations with an updated water balance for determination of the ongoing water recycle rate.
- The operator shall submit a copy of its approved groundwater monitoring program and annual monitoring reports.
- The operator shall monitor water levels in the groundwater monitoring well system in a manner consistent with AENV requirements.
- The operator shall monitor SAGD wells for casing integrity.



Legend

- Drilling pad location
- Intervener residence location
- ▨ Imperial Oil lease area
- Road

Figure 1. BlackRock Orion Project area



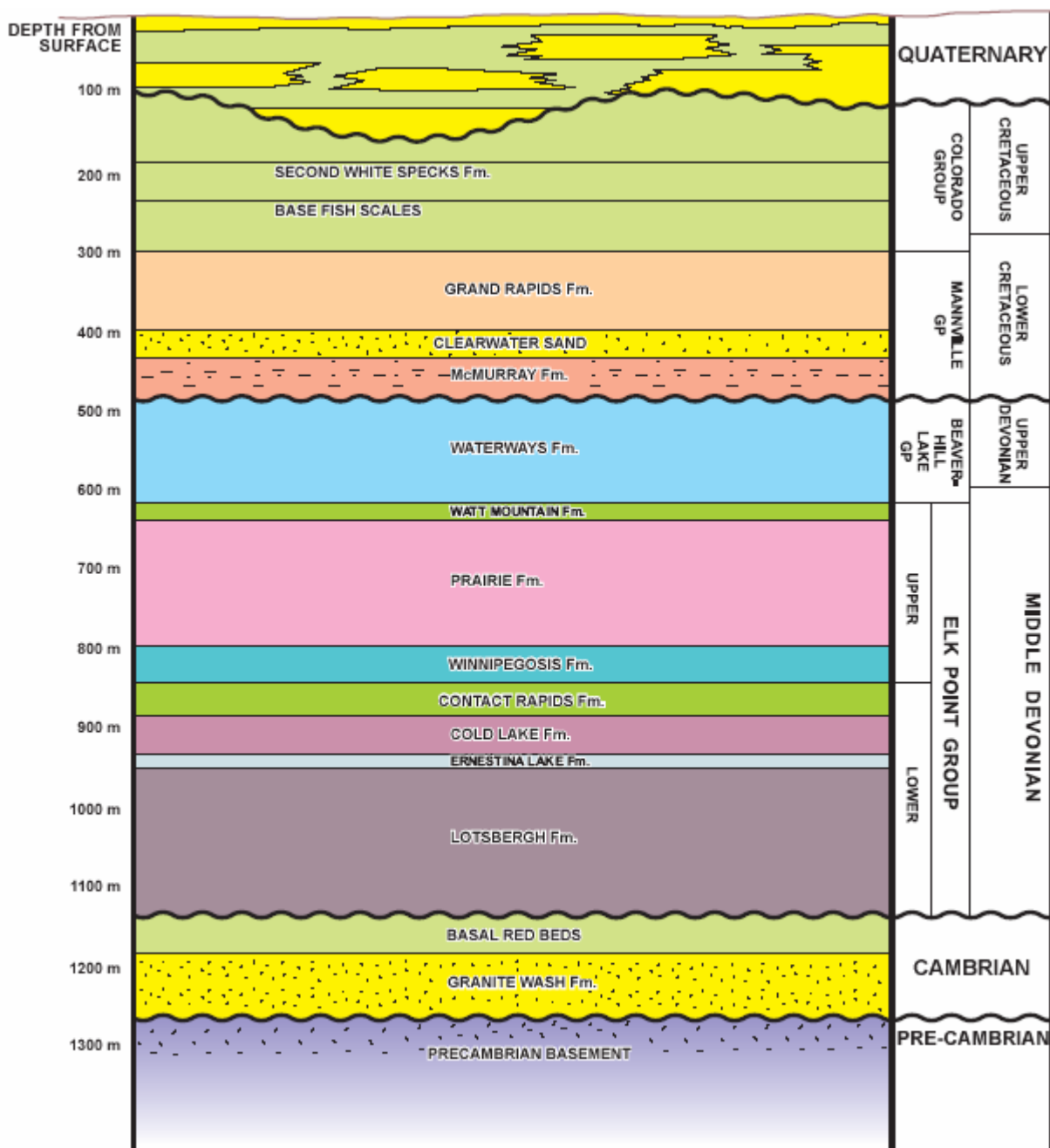


Figure 2: Stratigraphic column for the project area (from BlackRock Application No. 1241564)