



Highpine Oil & Gas Limited

Applications for Well Licences
Pembina Field

March 6, 2008

ALBERTA ENERGY AND UTILITIES BOARD

Decision 2008-018: Highpine Oil & Gas Limited, Applications for Well Licences, Pembina Field

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Alberta Energy and Utilities Board
640 – 5 Avenue SW
Calgary, Alberta
T2P 3G4

Telephone: (403) 297-8311
Fax: (403) 297-7040
E-mail: eub.infoservices@eub.ca
Web site: www.eub.ca

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ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

**HIGHPINE OIL & GAS LIMITED
APPLICATIONS FOR WELL LICENCES
PEMBINA FIELD**

**Decision 2008-018
Applications No. 1480869 and 1486164**

1 DECISION

Having carefully considered all of the evidence, the Alberta Energy and Utilities Board (EUB/Board) hereby approves Applications No. 1480869 and 1486164.

2 INTRODUCTION

2.1 Applications

Highpine Oil & Gas Limited (Highpine) applied to the EUB, pursuant to Section 2.020 of the *Oil and Gas Conservation Regulations*, for licences to drill two level-2 critical sour wells. The first well would be drilled directionally from a surface location in Legal Subdivision (LSD) 16 of Section 14, Township 50, Range 7, West of the 5th Meridian, to a projected bottomhole in LSD 16-14-50-7W5M (16-14 well). The second well would be drilled directionally from a surface location in LSD 14-18-50-6W5M to a projected bottomhole location in LSD 16-13-50-7W5M (16-13 well). For emergency planning purposes, the maximum hydrogen sulphide (H₂S) concentration expected to be encountered in both wells would be about 216.7 moles per kilomole (21.67 per cent [%]). The cumulative drilling and completion/servicing H₂S release rates for each well would be 2.044 cubic metres per second (m³/s), with corresponding emergency planning zones (EPZs) of 3.74 kilometres (km). The suspended/producing H₂S release rate for each well would be 0.387 m³/s, with corresponding EPZs of 1.21 km. The purpose of the wells would be to obtain crude oil production from the Nisku Formation. The proposed wells would be located about 6.5 km northeast of Rocky Rapids.

2.2 Interventions

Objections were received from several parties. They expressed concerns related to health and safety, air and water quality, impacts on the environment, effect on property value and damage, and adequacy of the emergency response planning. The concerns were expressed during Highpine's public consultation and notification process and throughout the EUB process leading up to the hearing.

A number of individuals that resided within one or both of the associated EPZs for the applied-for wells formed a group called the Rocky Rapids Concerned Citizens (RRCC).

The RRCC filed a Notice of Question of Constitutional Law. This claim was sent to the Attorney General of Alberta (the AG), who attended the hearing solely for this issue. As such, the AG's views are only discussed in the section of the decision that deals with the question of constitutional law.

2.3 Board's Jurisdiction

In making a decision, the Board considers the technical merits of the applications together with concerns raised by the intervening parties. The Board must weigh the evidence presented and the submissions of the applicant and the intervening parties regarding the completeness of the applications as set out in its regulations and directives, together with the potential risks to and impacts on the safety of the public and environment associated with the proposed applications. The Board also considers whether the applications are in the public interest, in accordance with Section 3 of the *Energy Resources Conservation Act*.

The Board's jurisdiction regarding consideration of these applications is defined by the various statutes that it is charged with administering. It is clear that the Board does not deal with matters of compensation. Matters related to the Livestock Protocol that were identified during the hearing deal with a compensation scenario and are not discussed in this decision.

The Board also conducts mandatory inspections of critical wells. *EUB Directive 019: EUB Compliance Assurance—Enforcement* outlines the Board's enforcement process. The Board encourages all parties to read *Directive 019* to better understand the various nuances related to the Board's enforcement and compliance program.

2.4 Hearing

The Board held a public hearing in Drayton Valley, Alberta, and Lodgepole, Alberta, which commenced on September 27, 2007, and concluded on December 7, 2007, before Acting Board Members K. G. Sharp, P.Eng. (Presiding Member), D. K. Boyler, P.Eng., and J. G. Gilmour, LL.B. On September 27, 2007, the panel and staff conducted a site visit. Those who appeared at the hearing are listed in [Appendix 1](#).

Due to the availability of various parties, the hearing was adjourned on September 28, 2007, and resumed on October 9, 2007. The hearing was further adjourned on October 10, 2007, due to scheduling conflicts. The hearing continued on November 13, 2007, and subsequently adjourned on November 16, 2007, to allow parties time to prepare written arguments related to constitutional matters. Final written argument was completed on December 7, 2007. The total oral hearing portion was 8 days. The Board considers the hearing to be closed on December 7, 2007.

3 ISSUES

The Board considers the issues respecting the applications to be

- need for the wells,
- location of the wells,
- public consultation,
- H₂S release rate presubmission,
- safety (well design, hazard, risk, and emergency response planning),
- general issues (compliance history, traffic, noise, and environment),

- question of constitutional law, and
- planning and proliferation.

In reaching the determinations contained within this decision, the Board has considered all relevant materials constituting the record of this proceeding, including the evidence and argument provided by each party. Accordingly, references in this decision to specific parts of the record are intended to assist the reader in understanding the Board's reasoning relating to a particular matter and should not be taken as an indication that the Board did not consider all relevant portions of the record with respect to that matter.

4 NEED FOR THE WELLS

4.1 Views of the Applicant

Highpine stated that the purpose of the wells would be to obtain oil production from the Nisku Formation. Highpine explained that it acquired the necessary mineral rights in Sections 13 and 14-50-7W5M to drill the proposed wells, as it had no other wellbores in the area that would be capable of evaluating the potential production from these two sections. Highpine emphasized that the wells were needed in order for Highpine to access its mineral rights.

Highpine stated that it felt these wells would provide economic benefits in terms of local employment and contracting opportunities, as well as provide royalties to the Province of Alberta, which would benefit all Albertans. Highpine also stated that a possible additional benefit from the applied-for wells would be further information and data the wells may provide regarding the geology and occurrence of hydrocarbons in the wider Rocky Rapids and Tomahawk area. Highpine stated that if the wells were successful, the expected life of each well would be anywhere between a few years to 10 years.

Highpine stated that because the wells were independent of each other, it would drill both wells consecutively and completion operations would also be completed consecutively. Highpine stated that if the wells were successful, additional equipment at the well sites would be required, including a well subsurface control valve, an emergency shutdown valve (ESD), a line heater with a flow control valve, a SCADA unit, an H₂S detection system, an instrument air compressor, a radio antenna, and a pipeline header at both wells. Highpine further explained that it would install a satellite at the 16-14 well site and tie the 16-13 well into the 16-14 satellite, which would be done with a 4 inch emulsion pipeline and a 2 inch fuel gas pipeline. Highpine explained that the 16-14 satellite would be used to measure oil, gas, and water produced from the 16-13 and 16-14 wells. It explained that the additional equipment required at the 16-14 satellite would be two three-phase separators, a flare stack, and a flare knockout drum. Highpine stated that it would install two 6 inch emulsion pipelines with ESDs and one fuel gas pipeline from the 16-14 well site to the Keyera Easyford 11-14-50-8W5M battery (11-14 battery). Highpine explained that the two 6 inch pipelines would become its main gathering system from the Rocky Rapids area and that ESD valve stations would be placed along the pipelines to reduce the release volume in the event of a pipeline failure. It also stated that each station would have H₂S monitoring equipment. Highpine further explained that these two 6 inch pipelines would allow enough capacity to accommodate production from future proposed wells to be drilled in the Rocky Rapids area and that by installing the extra pipeline at the same time, it would reduce the

impact on landowners by not having to install a second pipeline at a later date. Highpine emphasized that tying into Keyera's 11-14 battery eliminated the need to construct another major sour battery in the area.

4.2 Views of the Interveners

The RRCC did not dispute Highpine's right to access their mineral rights. Furthermore, the RRCC did not comment on the local, regional, and provincial economic benefits that may be attributed to a successful oilfield development.

The RRCC argued that if Highpine received its well licences, it should drill and complete the first well prior to drilling and completing the second well. The RRCC proposed that having the complete information on one well would directly impact how Highpine should approach the second well.

4.3 Views of the Board

Within Alberta there are two sets of ownership rights: the rights of the mineral lessee to access hydrocarbon resources and the rights of the surface holders. Under its enabling legislation, the Board is obligated to balance and adjudicate between the interests of the applicant to exploit its subsurface minerals and the interests of the surface owners and residents.

The Board accepts Highpine's claim as to the potential economic benefits that may be accrued from the proposed wells.

The Board is familiar with the area and the small individual pool nature of the resource and accepts Highpine's argument for the necessity of drilling to access the reservoir prior to making a determination as to the nature of the fluids contained in the reservoir. The Board notes the RRCC's suggestion that sequential drilling would significantly reduce the risks associated with drilling in the area. It also notes Highpine's explanation that these two wells are targeting two separate pools. As such, information from one well would not necessarily impact the drilling plan of the second well. The Board further notes that restrictions exist related to its emergency planning requirements that would not allow Highpine to initiate entry into the critical sour zones of multiple wells at the same time where the EPZs overlap. The Board accepts Highpine's drilling and completions schedules for the wells, recognizing the separate nature of the pools.

The Board also notes Highpine's conceptual development plan for producing the wells and is aware that there could be changes to this plan depending on further development in the area.

The Board has carefully assessed the need for the wells and weighed them against the impacts on surrounding surface landowners. The Board notes that Highpine has obtained the necessary mineral rights to access the resource and that the RRCC did not contest this. Therefore, the Board accepts that the wells are needed in order for Highpine to access and recover the resource.

5 LOCATION OF THE WELLS

5.1 Views of the Applicant

Highpine stated that it was targeting the oil contained within the carbonate patch reefs associated with the Nisku bank edge trend extending from Lodgepole through Drayton Valley and Tomahawk. It explained that the coral reef was formed in shallow, warm seawater. Over geological time (several hundreds of thousands of years) the continual changing water depth caused the reef to continue to grow across the area, forming the Nisku platform. As the water levels continued to fluctuate, patch reefs grew on top of the Nisku platform, some forming heights of 20 or 30 m and breadths varying from a few hundred metres to several kilometres. Highpine further explained that the patch reefs were not located everywhere, but only located in specific places where conditions were right for reef growth. Eventually the patch reefs stopped growing and other sedimentary deposition occurred around these reefs, providing a seal or cap around the reefs. If shale encased the reef, it would form an impermeable seal that would effectively trap any migrating hydrocarbons within the porous reef. Highpine further explained that a modern-day example of this type of geological deposition is Australia's Great Barrier Reef.

Highpine stated that the patch reefs it was targeting were primarily on the Nisku bank edge, where the reefs were thicker and more abundant. Highpine explained that the geological depositional environment affected the size of the accumulation of hydrocarbon, not whether the hydrocarbon would be gas or oil.

Highpine stated that by understanding how these patch reefs were deposited and by using seismic imaging covering an area of about 300 square miles, it determined that the applied-for well locations were the best surface locations to drill from in order to access the targeted resources, as they occurred in areas where the Nisku reef was thick and structurally high. Highpine further explained that the surface locations of the wells were also chosen from an operational perspective in order to accommodate future development plans. It stated that the surface locations of the applied-for wells would be the best locations for future pipeline tie-ins of the wells.

Highpine submitted that currently it was trying to minimize its footprint or land usage in the area by drilling from existing well sites or drilling multiple wells from one surface location. It explained that in the case of the applied-for wells, as the Nisku trend moved farther northeast closer to Tomahawk, the Nisku Formation became shallower, which would create a limit as to the ability to deviate and extend directional drilling. Highpine stipulated that with regard to the 16-14 well, it would use an existing access road and abut an existing well site to minimize land usage.

5.2 Views of the Interveners

The RRCC acknowledged that the trend of the reef that Highpine discussed may exist but argued that Highpine did not provide any evidence to prove that the trend actually did exist. The RRCC did not contest Highpine's explanation of how the reef was formed.

The RRCC submitted that the surface location for at least one of the applied-for wells changed multiple times and stated that this was very confusing to them. The RRCC acknowledged

Highpine's rationale behind the surface locations of the wells but stated that they were not aware how the chosen surface locations would assist Highpine with regard to future pipeline tie-ins.

The RRCC understood that Highpine would try to minimize its footprint in the area with regard to follow-up wells by using existing well sites, but noted that Highpine may be restricted in its ability to do that. The RRCC did not identify how the applied-for wells could be built to minimize Highpine's footprint or land usage in the area.

5.3 Views of the Board

The Board is familiar with the Nisku bank edge trend in the area and the complexity of the geology surrounding it. Significant geological data exist that adequately define the existence and general trend of this development. The Board has reviewed the geological interpretation submitted by Highpine and accepts its explanation of the geological setting in the area.

The Board understands that Highpine is restricted by the distance between the surface location and the bottomhole location in that the farther away the surface hole is from the bottomhole, the ability to penetrate the patch reef at an appropriate point and angle allowing enough exposure of the wellbore to the oil-bearing portion of the reef becomes increasingly difficult. In the absence of viable alternatives suggested by either party, the Board is satisfied that the chosen surface locations for the applied-for wells are appropriate to develop the targeted resource.

The Board notes that with regard to the 16-14 well, Highpine has tried to minimize its footprint by using an existing access road and abutting an existing well site. The Board believes that it is appropriate to minimize industry's footprint and continues to encourage industry to explore such options, whether it is to use existing well sites or to drill multiple wells from one well site when technically feasible.

6 PUBLIC CONSULTATION

6.1 Views of the Applicant

Highpine stated that it conducted a thorough and sincere public consultation program for both the 16-13 and 16-14 wells. It explained that it listened to local residents and area stakeholders and tried very hard to resolve concerns. Highpine acknowledged that one of the members of the RRCC was more involved with asking questions than other members and that Highpine eventually decided to stop answering her questions because it believed the questions were rhetorical and that most had been answered by other means. Highpine further explained that early on in the consultation process it felt there was a group of residents who just did not want any more oil and gas development in the neighbourhood. Highpine stated that while it did not agree with their position, it respected their right to hold a contrary view.

Highpine explained that it began consultation for the 16-13 and 16-14 wells in May and June 2006 and had hosted an open house on June 29, 2006, to help address the various concerns of area residents. Highpine stated that it notified all residents within the EPZs of both wells, posted invitations throughout the community, and published an invitation in the *Western Review*, the Drayton Valley local newspaper. Highpine indicated that it had updated new residents in August 2007.

Highpine stated that it had received numerous written objections during the initial consultation phase and explained that it responded to all objections and addressed the concerns within each of the objections. Highpine stated that it also invited people who had objections to provide further information so that it could better understand their concerns and issues.

Highpine stated that on May 15, 2007, it sent out a community update letter to the residents within the EPZ of the 16-13 and 16-14 wells. This letter included information with respect to the projects and frequently asked questions related to these well applications. Highpine further stated that it hosted a second open house on May 31, 2007.

On June 14, 2007, Highpine held a meeting with the public as a continuation of its consultation process. Highpine's emergency response plan (ERP) consultant, Bissett Resources Consultants Ltd. (Bissett), was available to explain the ERP and answer any questions in regard to the proposed wells.

Highpine stated that it continued its extensive consultation program with concerned residents through one-on-one discussions, group discussions, telephone conversations, response and commitment letters, and public meetings. Highpine asserted that it had tried hard to maintain a positive and amicable working relationship with the people and would continue to do so. Highpine stated that it felt public consultation was not an issue and emphasized that it felt it had carried out a thorough and well-intentioned program of public consultation.

6.2 Views of the Interveners

The RRCC accepted that Highpine attempted to listen and to resolve concerns of the public but emphasized that Highpine could have made a more diligent effort to address concerns that were a bit more in depth. The RRCC acknowledged that there was a member of the RRCC that was more inquisitive than other members but explained that it was because that individual wanted to be more informed regarding Highpine's plans. It argued that Highpine should have tried to address those concerns better, instead of deciding to stop addressing them altogether.

The RRCC accepted Highpine's statement that it initiated its public consultation process in May 2006 and that it updated new residents in the EPZ in August 2007. The RRCC commented that Highpine left the onus on parties outside of the 3.74 km EPZ to let Highpine know that they would be interested in being included within the EPZ.

The RRCC indicated that there may have been a better way of dealing with concerns or offering information than through the open houses that Highpine held.

6.3 Views of the Board

The overall intent of the public consultation requirements, as laid out in EUB *Directive 056: Energy Development Applications and Schedules*, is to provide the applicant an opportunity to disclose its project to interested and affected parties. It also allows interested parties to have an opportunity to identify concerns and to narrow down areas of difference where both parties may be unable to find solutions. This consultation process can also provide an opportunity for relationship building among the parties if they choose to take it. At any point in this process, either the applicant or any directly and adversely affected party can ask the Board to consider the

application before it and provide a disposition of the application that may involve a public hearing.

The Board recognizes that when significant time elapses during the disclosure and consultation period for an application, difficulties can arise in consistency of communication among all parties. Some frustration can also enter into the communication between the parties. As well, some specifics of a project may change as additional information becomes available and the applicant responds to concerns being expressed.

The Board notes that Highpine held two open houses in order to explain the project and respond to concerns regarding the project.

The Board is satisfied that Highpine has conducted its public consultation process within the intent of *Directive 056*.

7 H₂S RELEASE RATE PRESUBMISSION

7.1 Views of the Applicant

Highpine explained that in the summer of 2005 it first submitted an H₂S release rate presubmission to the EUB Geology and Reserves Group for a release rate of 1.51 m³/s, based on a 16% H₂S concentration for the applied-for wells. It further explained that the EUB reviewed the presubmission and determined that a release rate of 2.044 m³/s with an H₂S concentration of 21.67% was more appropriate, based on the information available in the area at that time. As such, Highpine stated that it proceeded with an application with an H₂S release rate approval of 2.044 m³/s, based on a 21.67% H₂S concentration.

Highpine explained that in the spring of 2007 it conducted a thorough geologic and engineering review of its Nisku projects in the general Tomahawk area to establish a reasonable, realistic, and uniform release rate for the Tomahawk area based on the most current information in the area. On May 23, 2007, using information from this review, Highpine resubmitted its presubmission to the EUB for a release rate of 1.51 m³/s based on a maximum H₂S concentration of 16%. Highpine identified that this release rate of 1.51 m³/s was subsequently approved by the EUB on June 29, 2007, for the 16-13 and 16-14 wells. Highpine stated that it submitted complete presubmissions, as required by *Directive 056*, for both wells.

Highpine explained that once an appropriate release rate was determined, an EPZ could then be calculated. As such, Highpine explained that it could have chosen to amend its applications with the lower release rate, which would have meant smaller EPZs, but stated it chose not to do so at that point in the application process because it felt it would only cause confusion. Highpine emphasized that it decided to maintain the larger EPZ of 3.74 km based on the higher release rate of 2.044 m³/s.

Highpine explained that H₂S concentrations decreased moving towards the northeast along the Nisku bank edge because northeast of Drayton Valley the fluids in the reef tended toward oil, as opposed to gas, which was prevalent towards the southwest. It explained that when the reef was formed, two types of hydrocarbons were captured within the reef: hydrocarbons that formed gas and hydrocarbons that formed oil. Highpine explained further that due to the porosity of the reef,

the gas and oil could migrate through it. Highpine added that there were two migration paths, one for gas and one for oil. It referred to these migrations as charges. Highpine stated that the gas charge, which contained higher H₂S concentrations, did not continue much farther than a point to the west of Drayton Valley, while the oil charge continued past Drayton Valley. Highpine explained that migration of the gas charge farther to the northeast was impeded by a shale reentry, which created an impermeable seal. It explained that the oil charge was not impeded and therefore was able to migrate up to and past the Rocky Rapids and Tomahawk area. Highpine emphasized that this was why it expected to encounter primarily oil with the applied-for wells.

Highpine explained that the H₂S was entrained in the gas and the higher the solution gas-oil ratio, the higher the H₂S release rate. Highpine explained that since the oil charge had migrated past the Rocky Rapids and Tomahawk area and had less anticipated associated gas, the anticipated H₂S release rate for the applied-for wells would be less than for those wells closer to Drayton Valley, which typically saw more gas associated with them.

Highpine reiterated that its original presubmission, submitted to the EUB in 2005, was based on the H₂S concentration information it had for the area at that time. It emphasized that the presubmission approval it received for 2.044 m³/s was very conservative based on data it now had from other wells in the area.

7.2 Views of the Interveners

The RRCC noted that Highpine's first presubmission, submitted to the Board in the summer of 2005, was for a release rate of 1.51 m³/s, based on a 16% H₂S concentration, but was actually approved for a release rate of 2.044 m³/s, based on a 21.67% H₂S concentration. The RRCC went on to explain that they were confused when they found out that a second presubmission was submitted by Highpine to the EUB in the spring of 2007 for approval of a release rate of 1.51 m³/s, based on a maximum H₂S concentration of 16%, which was subsequently approved.

The RRCC argued that Highpine did not meet the EUB requirements for a presubmission as listed in *Directive 056* for the following reasons: wells that RRCC believed were reasonable were not used or were discounted by Highpine; the geological map that Highpine used did not contain Nisku wells and only one of the wells used was sour; and only one point was provided for the tabulated data. They asserted that Highpine did not have complete well applications because the presubmission was deficient.

The RRCC stated that they were confused as to which H₂S concentration Highpine was relying on for its applications.

The RRCC did not contest Highpine's explanation of the oil and gas charges, but indicated that they were not clear about how the H₂S concentrations could get lower as the trend moved to the northeast.

They argued that looking at the variability of H₂S concentrations in the area, the 21.67% H₂S concentration on which these well applications were based was too low. The RRCC further argued that wells southwest of the applied-for wells had H₂S concentrations as high as 30% and indicated that these values should have been used by Highpine when it calculated the release rates for its presubmission.

7.3 Views of the Board

The Board has carefully reviewed the evidence presented at the hearing and the arguments presented by the RRCC regarding the determination of the potential release rates from the applied-for wells. The determination of predicted release rates is not simple; it involves many technical factors and interpretation of data. The EUB's practice for these types of well applications is to have an applicant submit its suggested release rates, with appropriate geological and engineering data (in accordance with *Directive 056*) to demonstrate how its release rate was calculated and support its calculation, prior to embarking on its public consultation efforts. The EUB reviews these presubmissions and applies its own technical knowledge and all available wellbore information to arrive at its recommended release rates. An applicant can choose to adopt that release rate or be prepared to defend a release rate of its own determination. Over extended periods additional information may become available that could change the predicted release rates. As the EUB applies a highly conservative approach to each of the components of a release rate determination, additional data generally leads to reductions in predicted release rates over time. In the case that new data indicate a potential increase to release rates, the EUB acts immediately to review and apply the new data and responds accordingly. This action may include suspending activity in an area while the implications of the new data are assessed or informing applicants of the additional data regarding future wells in an affected area. This action considers precicensed, postlicensed, awaiting spud, and any on-hole operations, as appropriate.

The Board accepts that for various reasons Highpine chose to use the 2.044 m³/s release rate based on a 21.67% H₂S concentration, which incorporates a further safety factor into its release rate and determination of subsequent EPZs. The Board reviewed the support documentation of the applied-for wells and the evidence submitted at the hearing from both parties. Each party presented different release rates and H₂S concentrations in the area. The Board is satisfied that the release rates in the applied-for well applications are conservative in nature for the purposes of determining the EPZ.

The Board accepts Highpine's explanation with regard to gas and oil charges and the decrease in H₂S concentration towards the northeast of the Nisku bank edge, past the Rocky Rapids and Tomahawk area, to be a reasonable interpretation of the geological data.

8 SAFETY

8.1 Well Design

8.1.1 Views of the Applicant

Highpine stated that the wells was designed to be a sealed system, meaning that the intermediate casing would run to about 40 m above the Nisku Formation and would be cemented to surface. Highpine explained that having the intermediate casing offered an extra level of safety because if it ran into any issues while drilling the well, it could close the blowout prevention system (BOP) and secure the well while it made a decision on how to proceed. It explained that the BOP was designed with total redundancy: in the event that one system failed, the second system would be activated. Highpine explained that in order for an uncontrolled release to occur, both systems would have to fail concurrent with a significant influx of fluid from the reservoir.

Highpine stated that by having the intermediate casing installed, there was a minimal chance for an uncontrolled release to occur.

8.1.2 Views of the Interveners

The RRCC stated concerns that gas could come to surface prior to a complete evacuation of the area, pointing out that things had failed in the past and had the potential to do so again. The RRCC indicated concerns regarding blowouts and releases in locations outside of the Drayton Valley area.

8.1.3 Views of the Board

The Board understands the concerns of the RRCC and appreciates that in the 1980s this area experienced a significant blowout, which continues to be on the minds of the residents. It notes that as a result of the subsequent investigation into the blowout that occurred in the 1980s, the EUB developed and implemented new requirements to prevent such events from recurring. The EUB has developed very strict requirements regarding critical sour wells. The Board notes that in Alberta in 2007 about 100 critical wells were drilled safely. Due to the stringent regulations regarding critical wells, every rig is inspected prior to drilling into the critical sour zone and if it fails the inspection, it is not allowed to proceed until it passes inspection. The Board further notes that the releases referred to by the RRCC were of a different type and were from non-critical wells and production facilities.

The Board is satisfied that the well design and drilling plan for the applied-for wells is more than adequate to prevent an uncontrolled release during drilling operations. The Board, however, does believe it is prudent to consider the hazard and risk associated with drilling the wells, as well as appropriate emergency preparedness, which are discussed in subsequent sections.

8.2 Hazard and Risk Assessment

8.2.1 Views of the Applicant

Highpine submitted a hazard and risk assessment for the proposed wells at the hearing. It was Highpine's view that the main hazard associated with these wells was a release of H₂S, and the assessment addressed this hazard and the associated risks. Highpine argued that other hazards, such as sulphur dioxide (SO₂), radiant heat, and overpressure, represented a lesser risk to the public compared to the main hazard.

Highpine submitted that the results of the risk assessment could be compared to the individual fatality criteria of the Major Industrial Accident Council of Canada (MIACC) to determine the level of risk acceptability. Highpine stated that there were two residences located in an area that MIACC would not consider appropriate for residential land use if both wells were to be drilled and completed in a single year. Highpine believed that the risk to residents nearest to the wells could be managed by traditional methods, such as evacuation. During the production phase, Highpine asserted that the two wells would not expose residents to significant levels of risk and the coexistence of the wells and the residents was predicted to be acceptable when reviewed using the MIACC guidelines.

Highpine submitted a calculation of societal risk in the form of a plot showing the number of fatalities (N) from an uncontrolled release of H₂S versus the frequency (F) of N or more fatalities per year. This was referred to as an F-N curve. Highpine argued that the societal risk calculations for drilling shown on the F-N curve were well below the zone of intolerable risk and rapidly fell into the zone of negligible risk. Highpine disagreed with the interveners that the zones of intolerable risk and negligible risk were incorrectly identified. Highpine noted that they had not considered the critical well factor in their risk calculations, which would lower the predicted risk levels.

As part of the hazard and risk assessment, Highpine provided maximum EPZ distances that were calculated using the EUB nomographs, the draft EUBH₂S model, and its consultant's proprietary model RELEASE/SLAB. The EPZ calculations were done for an H₂S release rate of 2.044 m³/s, but for comparative purposes modelling was done using a lower release rate of 1.51 m³/s, which Highpine asserted corresponded to the lower H₂S content expected of these wells. However, for the ERP, Highpine based the EPZs on the current EUB nomograph method, which it stated was the current regulation for determining EPZs. As discussed in Section 7.1, Highpine chose to use an EPZ of 3.74 km for drilling/completions and 1.21 km for production.

Risk and modelled EPZ calculations were based on a 15-minute ignition time for drilling and completions and 60 minutes for production, based on uncontrolled gas flow to surface, which Highpine argued would be appropriate for planning purposes.

Highpine evaluated the potential air quality impacts from an ignited well blowout during the drilling and completion phases. Highpine submitted that it used a standard, yet conservative, dispersion modelling approach in its evaluation and that a combustion efficiency of 62% was assumed, but used 100% conversion of H₂S to SO₂. Highpine indicated that exceedances of the EUB evacuation criteria were predicted, but stated that the ERP would protect the public in such an emergency.

Highpine provided a modelling report of the well test flaring associated with the proposed wells. It submitted that modelling was done and the flare management plans were developed according to the requirements of EUB *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*. Highpine stated that it would apply for a flare permit if the proposed wells were approved.

8.2.2 Views of the Intervenors

The RRCC submitted that the hazard and risk assessment was deficient. They argued that Highpine had misinterpreted the MIACC individual fatality criteria in their analysis and that an additional 20 to 25 homes were in a region considered unacceptable by practitioners in Canada for an annual two-well drilling program. The RRCC declared that the societal risk calculations were incorrectly compared to zones of negligible and intolerable risk and that if the correct zones were identified, the F-N curve provided by Highpine would show societal risk mainly in the intolerable zone. They noted that in the risk assessment there was a failure to identify SO₂ as a hazard and that radiant heat damage and overpressure had been overlooked. The RRCC also said that the risk assessment was incomplete, as it did not address the cumulative risk of all development in the area and it should not consider mitigation.

The RRCC asserted that the modelling done as part of the hazard and risk assessment was deficient, which would underestimate the risk and EPZ calculations. They argued that the elapsed time to ignition should be longer and conform to the default values in the draft EUBH₂S. They submitted that Highpine had not provided evidence that it adequately assessed the H₂S content of the well and as a result the modelling would be wrong.

The RRCC argued that there were deficiencies in the modelling for an ignited well blowout, as well as for well test flaring. They suggested that the surface roughness and albedo were not captured correctly and that potentially increased concentrations could be predicted. However, they added that information provided by Highpine indicated that concentrations did not change significantly based on this. The RRCC stated concerns about the combustion efficiency of 62% used in the modelling. They asserted that the conversion efficiency could differ significantly from this value and were concerned that a lower conversion efficiency would lead to unconverted H₂S being emitted, which would be of concern even after ignition.

The RRCC suggested that Highpine should consider the 24-hour SO₂ Alberta Ambient Air Quality Objective when determining the impacts from well test flaring and that a cumulative effects assessment should be considered.

8.2.3 Views of the Board

The Board understands that hazard and risk assessments and modelling of emergency releases are not currently required but are useful in some cases to have a full understanding of the potential impacts from emergency situations and associated risks. The Board acknowledges that during an uncontrolled release from a critical sour gas well, there are other hazards in addition to H₂S and SO₂. The Board is satisfied that the main hazards during an emergency are exposure to H₂S and SO₂ and that Highpine will be able to protect the public from these hazards. The Board is also convinced that the other hazards, such as radiant heat and overpressure, would be confined to near the well site and the public would be protected from these hazards.

The Board notes that Highpine and the RRCC had differing views on the level of risks posed to individuals and society. The Board feels that neither group provided evidence to support its claims for the appropriate thresholds of societal risk. However, the Board is of the view that Highpine did correctly compare individual risk to the MIACC individual fatality criteria and notes that the RRCC claimed that a direct comparison to the MIACC criteria is not an acceptable or common practice.

The Board notes that the presence of a facility containing hazardous materials may pose an additional risk to individuals living or working in the vicinity over and above those to which they may be exposed to if the facility did not exist. Although, the MIACC Risk Assessment Guidelines were developed in response to industrial accidents at large facilities, the Board considers that the MIACC individual fatality criteria were developed considering standard risk levels and could be applied to the location of these wells. However, the Board notes that due to the nature of oil and gas development, decisions on locating wells are influenced more by subsurface geological factors than by surface features.

The Board is aware that it is common practice not to consider mitigation when performing risk assessments and is satisfied that Highpine completed the risk assessment in this manner. For the

Board to make a decision, it needs to be satisfied that a proponent has minimized the risks to the public and thus has considered all relevant actions. The Board has additional safety requirements for drilling critical sour gas wells that are intended to ensure that no release occurs, which Highpine has implemented in its drilling plan. The Board notes that in a risk assessment these additional safety measures are sometimes considered with the use of a critical well factor that was discussed at the hearing. The Board notes that Highpine has also developed an ERP to protect the public in the event of an emergency, which is discussed in the next section. The Board is satisfied that Highpine has taken appropriate steps to minimize the risk to the public associated with the drilling of the two proposed wells.

The Board is satisfied that the two residences identified to be in an area not appropriate for residential land use, as outlined by MIACC, would be protected by measures addressed by Highpine's drilling plan and ERP, as well as the technical requirements of the EUB associated with such a development.

The Board is satisfied that the ignition times Highpine considered in the hazard and risk assessment are reasonable and consistent with what is considered achievable in the industry.

The Board understands that Highpine used the current EUB nomograph method for determining the EPZ size and is satisfied that this method is appropriate. The Board acknowledges that alternative EPZ calculations were done and the results differ from the approved EPZ distance.

The Board is satisfied that the modelling done for an ignited well blowout was satisfactory and the results are indicative of maximum SO₂ concentrations that would be experienced during an emergency.

The Board understands that Highpine submitted a dispersion modelling assessment of flaring during well testing but has yet to apply for a well test permit. This is a standard approach, as a well test permit would not be granted if the well licences were not approved. The Board acknowledges that the RRCC suggested there were deficiencies in Highpine's flaring assessment. The Board expects that when Highpine applies to the EUB for a well test permit, it will meet all the requirements of *Directive 060* with regard to dispersion modelling.

The Board appreciates the submissions and discussion at the hearing by Highpine and the RRCC with regard to the hazards and risks associated with the proposed wells. The Board has a full understanding of the hazard and risks associated the drilling and completion of the applied-for wells and is convinced that the hazards and risks can be managed through the EUB's requirements for critical sour gas wells.

8.3 Emergency Response Plan

8.3.1 Views of the Applicant

In support of its application and as required by EUB *Directive 071: Emergency Preparedness and Response Requirements for the Upstream Petroleum Industry*, Highpine submitted two site-specific drilling and completions ERPs in November 2006. Highpine contended that the site-specific ERPs would adequately provide for public protection in the case of an incident and that

the ERPs were compliant with all EUB regulations. It also noted that in some cases the ERPs exceeded regulatory requirements.

Highpine recognized that the ERPs had not been updated since submission and committed to updating them if the well licences were granted, including updating all resident information, and submitting those updates to the EUB for review.

Highpine acknowledged that no plan could guarantee safety but contended that its plan should give a high degree of confidence that public safety will be protected. Highpine explained that its plan was predicated on two principles: preparedness and early notice. It also noted that the plan could be implemented with no assistance from Brazeau County. Highpine contended that the ERPs submitted were suitable to deal with all hazards that could be present in the case of an incident.

Highpine explained that residents would be given notice prior to rig moves and prior to commencement of sour operations. It also indicated that all residents within the EPZs would be given a notice of voluntary evacuation at a level-1 emergency, followed by notice of mandatory evacuation at a level-2 emergency. Highpine explained that for each resident in the case of an incident, notice would first be given through an automated call-out system. It explained that this would be followed by a personal phone call and a visit by a rover to ensure that all residents were given notice. Highpine stated that these notices would occur prior to gas reaching surface and would give adequate time for residents to leave the EPZs prior to a hazard being present. Highpine also noted that representatives would be available daily during sour operations to answer any questions the public may have.

With regard to egress issues, Highpine committed to maintaining any roads that became impassable while conducting sour drilling or completion operations. In addition, Highpine committed to suspend drilling, if safe to do so, if any roads could not be made passable. Highpine indicated that it would be able to suspend drilling at any time by pulling up into the intermediate casing and circulating the well until roads became passable. Highpine also indicated that it would monitor the weather to prepare for any situations where roads could become impassable. Highpine noted that all members of the RRCC had two possible egress routes, one of which was away from the wells.

Highpine indicated that two rovers would scout the EPZs during sour drilling and completion operations to identify transients and recreational use of the land. It stated that this information would be recorded and used to contact transients and recreational users in the case of an emergency. Highpine stated this would assist in evacuating people within the EPZs. It also stated that members of the public could notify Highpine if they were going to be in recreational areas of the EPZs so Highpine could easily find them in the case of an emergency. Highpine noted that the number of response personnel in the EPZs would increase as the level of emergency increased.

Highpine explained that the EPZs were divided into rover areas. In the case of an incident, at a level-1 emergency two rovers would be dedicated to each rover area within the EPZs, and at a level-2 or -3 emergency an additional rover would be placed on standby and could be dispatched to each rover area if necessary. It further explained that a helicopter would also be dispatched at a level-1 emergency and would assist with locating transients and recreational users. Highpine

indicated that all rovers would undergo security checks, orientation programs, and training in emergency response.

With respect to the North Saskatchewan River, Highpine acknowledged that there were no rovers dedicated specifically to the area, but said that rovers would be adjacent to the river and monitoring its use both during normal sour operations and during an incident. It further noted that all-terrain vehicles (ATVs) could be used to identify and notify transients and residents in the river area. Highpine also stated that a boat could be obtained if necessary to deal with users of the river.

Highpine explained that area residents could contact the company at any time if there were any special circumstances, such as a gathering with a large number of people. Highpine indicated that it would adjust its plan to accommodate such circumstances in the case of an emergency.

Highpine explained that the primary method of public protection would be evacuation. It acknowledged that sheltering in place could be necessary, but that its primary response would be to evacuate the EPZ. To assist with evacuation, Highpine stated it would have buses on standby to evacuate those without transportation. Sheltering in place would most likely be used in a level-3 emergency after ignition had occurred.

Highpine contended that it would be able to ignite a release in less than 15 minutes. Highpine gave evidence that through previous ignition drills it had demonstrated that it was successfully able to ignite within 11 minutes. Highpine stated that the ignition team would be in place prior to any gas reaching surface, which would minimize the amount of time required to ignite the well. It also stated that on-site personnel had the authority to ignite the well and that no head office staff would have to be called to make that decision. Highpine committed to igniting an uncontrolled release within 15 minutes of sour gas reaching surface.

With respect to air monitoring, Highpine indicated that one mobile air monitor would be in the EPZ during normal sour drilling and completion operations. Further, Highpine stated that it would have three mobile air monitors in the EPZs at any level of emergency. This would be in addition to handheld monitors carried by responders and temporary stationary monitors installed prior to sour operations. In the case of an emergency, one mobile air monitor would be dispatched to the nearest downwind residence.

Highpine stated that staff had undergone training in emergency response and had participated in several tabletop and communication exercises. In addition, Highpine had conducted a full-scale ERP exercise of its Pembina Facility ERP in September 2007 that, it believed, successfully demonstrated its ability to respond in the case of an incident.

Highpine acknowledged that some members of the public outside of the EPZs had asked to be included in the ERPs. It stated that it did not expand the EPZ to include those members but rather that they were included in the plan and would be notified in the same manner as those residents within the EPZs. Highpine indicated that initial resources would be allocated to assist with the evacuation of the EPZs, but that as additional personnel became available, those outside the EPZs who requested to be included in the ERPs could be visited by a rover.

8.3.2 Views of the Interveners

The RRCC outlined numerous concerns with respect to emergency response, specifically with regard to evacuation, egress, ignition, sheltering, and communication.

The RRCC were not confident that evacuation of the EPZ could take place before sour gas reached surface and were concerned that sheltering in place would be necessary. They contended that sheltering-in-place directions were confusing and inconsistent and that sheltering in place would also not be effective due to the age of some homes. The RRCC did not feel that all homes were air-tight enough to ensure that H₂S or SO₂ would not enter the homes during sheltering in place. Given this, the RRCC were of the view that evacuation was the only way to ensure public safety in the case of a release. Furthermore, the RRCC stipulated that Highpine had not demonstrated in its exercises or through the ERPs that it could effectively evacuate the EPZs before a release occurred.

While the RRCC stated that each resident had two means to egress out of the EPZs, they indicated that in some cases one of those routes would take them towards the well, while the other would take them through roads that were not always passable during winter. Specifically, the RRCC mentioned the “deep creek road,” which they said was difficult to drive in winter conditions. They stated that in winter residents may not be able to evacuate the EPZs safely, as they would either be driving towards the well or on impassable roads.

In addition, the RRCC were concerned that they would not be contacted in the case of an incident. Some members indicated that they spent a great deal of time outside, away from their homes, without cell phones, and they questioned how Highpine would be able to find them on their land. Others mentioned that their cell phones did not work in certain areas and also were concerned that Highpine would not be able to contact them. Some members also expressed concerns that some residents for whom English might not be the first language might have difficulty understanding instructions to evacuate.

With respect to rovers, the RRCC were concerned that some rovers would not be familiar with the area and could be travelling from as far as two hours away. They felt that a lack of familiarity of the area could interfere with Highpine’s ability to notify residents and evacuate an EPZ in the case of an emergency.

The RRCC were concerned that Highpine had not advised them that Highpine would like to hear about special needs. The RRCC contended that they, as residents, were not aware that they should inform Highpine of any special circumstances and felt that that should have been disclosed during the consultation process.

The RRCC also questioned Highpine’s ability to isolate the EPZs, especially in relation to the river. They noted that there were no rovers devoted exclusively to the river area. They felt that the helicopter and rovers devoted to the area were not sufficient to ensure that evacuation of the river area would occur. In addition, the RRCC noted that Highpine intended to use ATVs but had not ground-truthed the routes that ATV vehicles could take in the river area. The RRCC contended that Highpine would not be able to see a transient enter the EPZ via the river in all cases, so it could not be sure that the EPZ was evacuated. They also noted that Highpine had given evidence that they could obtain a boat to use in evacuating the river, but there was no mention of this in the ERPs.

With respect to ignition, the RRCC expressed concern that ignition could take longer than 15 minutes, and therefore a release of H₂S could occur for a longer period of time. The RRCC were concerned that the decision to ignite could take a great deal of time, during which a release could be occurring.

The RRCC acknowledged that some members of the group had attended the September 2007 exercise that Highpine conducted and recognized that the exercise went well. Nonetheless, the RRCC maintained that the exercise did not adequately show that Highpine could effectively evacuate the EPZs if an incident were to occur.

The RRCC pointed out that the ERP only pertained to the drilling and completion operations of the wells. They stated that production operations were also of concern and felt that a production ERP should have been provided. Without the production ERP, the RRCC stated that it had incomplete information regarding the entire life of the project.

The RRCC also argued that the plan did not take all hazards, such as SO₂ and fires, into account. They contended that because of this, the plans did not meet the requirements of CSA Standard CAN/CSA Z-731, as required by *Directive 071*.

The RRCC suggested that the ERPs did not adequately provide for public safety and maintained that the applications should be denied.

8.3.3 Views of the Board

The Board notes that in accordance with *Directive 071*, Highpine developed two site-specific drilling and completion ERPs. The Board is of the view that the ERPs meet the minimum requirements in *Directive 071* and will provide for public safety in the case of an incident. The Board is also of the view that the ERPs take into account all hazards, including H₂S, SO₂, and fire, that could be present if an incident were to occur and met the requirements of CSA Standard CAN/CSA Z-731. The Board acknowledges that some elements of the plans, including resident information, are out of date due to the length of time from submission of the ERPs to the close of hearing. The Board notes Highpine's commitment to update its ERPs and submit them to the Board for review prior to commencing drilling operations.

With respect to the size of the EPZs, the Board notes that the EPZs were calculated using the nomograph method, in accordance with current requirements in *Directive 071*. The Board wishes to emphasize that the nomograph method of EPZ calculation is a proven approach to emergency planning and that the EUBH₂S tool is still in the developmental stage and subject to further changes. As previously discussed in Section 7, the Board accepts Highpine's decision to adopt an EPZ size of 3.74 km using the conservative drilling and completions release rate discussed in Section 7. The Board emphasizes that the EPZ is a tool used to initiate and prioritize emergency response and that an ERP must provide for potential response beyond the EPZ.

The Board agrees that evacuation is an important tool of public protection in the case of an emergency. The Board is of the view that an integral aspect of an effective evacuation is early notice. Given that Highpine has indicated that it will notify all parties within the EPZ for voluntary evacuation at a level-1 emergency and for mandatory evacuation at a level-2 emergency, the Board finds that the plan provides for reasonable early notification in a stepwise

fashion that responds to the severity of an incident that may be occurring to help ensure that people within the EPZ can be evacuated safely.

With respect to egress, the Board notes that all members of the RRCC who gave evidence indicated that they have at least two means of egress outside of the EPZ. While the Board acknowledges that some egress routes would take residents towards the wells and other routes could be difficult to traverse in winter conditions, it is of the view that given Highpine's early notice to residents and its commitment to suspend drilling operations should any roads become impassable within the EPZs, residents will have sufficient egress routes to safely exit the EPZ.

With regard to the river, the Board acknowledges that the river is a means by which the public could enter the EPZ during an incident and that there could be many recreational users in the area at any given time, but notes that Highpine had planned for this eventuality in a number of ways. This includes rovers in the area of the river and ATVs that could be used if necessary. The Board further notes that Highpine has included a helicopter that would assist in monitoring the river area for transients. In evidence at the hearing, Highpine indicated that it could also obtain a boat to assist with monitoring the river. The Board notes that the ERPs do not contain any reference to or information regarding a boat. The Board is of the view that information regarding resources that could be called upon in the case of an emergency should be included in the ERPs and, as such, expects that Highpine will include information regarding the procurement of a boat in its updates to the ERPs.

With respect to ignition, the Board finds that Highpine's commitment to ignite within 15 minutes of a release is reasonable, given that an ignition team will be in place at a level-2 emergency. The Board expects Highpine to change the ignition criteria in its ERP to reflect this ignition commitment when updating its ERP. The Board is confident that this will give Highpine adequate time to prepare and ignite the well safely within 15 minutes should a release occur.

The Board notes that Highpine indicated the plan could be implemented without the assistance of Brazeau County. The Board is of the view that responsibilities of all agencies potentially involved in emergency response should be included in an ERP. The Board agrees that Highpine's approach was correct in outlining areas where Brazeau County may be able to provide assistance in the case of an emergency. The Board is of the view that this approach will ensure that roles and responsibilities are clearly outlined to ensure that an effective response would take place.

With respect to the September 2007 exercise that Highpine conducted, the Board finds that the goals and objectives submitted in evidence at the hearing met the requirements of *Directive 071*.

9 GENERAL ISSUES

9.1 Compliance History

9.1.1 Views of the Applicant

Highpine admitted that it did not have a perfect compliance record but emphasized that it was unlikely that any operator would. Highpine admitted that it had had some problems in the past but stated that it was due to contractors who had since been let go. Highpine stipulated that it was

ultimately responsible for its contractors. It stated that it believed it had a good history and that incidents the RRCC referred to were not looked at with regard to the full picture.

Highpine explained that due to its past enforcement issues, it undertook to enhance its process to improve its compliance record. It then requested that Bissett conduct an audit on those enhanced processes. Highpine maintained that as a result of this audit, it had achieved a higher rating in the Canadian Association of Petroleum Producers' stewardship program.

9.1.2 Views of the Interveners

The RRCC stated that Highpine had a history of high risk enforcement. They indicated that Highpine had experienced trouble with its BOP, as well as chokes. The RRCC argued that these were the very things being relied upon to protect the public and Highpine's employees. The RRCC also submitted that between 2004 and 2005 Highpine had two instances where there were off-lease releases and that there were investigations into these instances. The RRCC explained that in January 2007 there was another instance of an off-lease release, but confirmed that after a thorough investigation the source was not found. The RRCC also acknowledged that Highpine was instrumental in trying to locate the source of the release.

The RRCC questioned Highpine with regard to its past compliance history against its current claim of improved performance.

9.1.3 Views of the Board

The Board understands the RRCC's concerns regarding Highpine's compliance record and whether Highpine can ensure their safety based on its record. The Board also understands Highpine's explanation regarding the incidents, which in some cases resulted in the contractor being replaced. The Board holds the licensee responsible for all actions related to the operations.

The Board takes any High Risk enforcement matters seriously and requires immediate action to correct the noncompliance and an appropriate plan to prevent recurrence. The Board notes that Highpine has taken various actions to improve its processes with respect to its compliance history. Given the Board's inspection requirements for critical sour wells, it is not persuaded that Highpine's compliance record is a factor that would cause the Board to deny the applications. The Board is confident that Highpine is capable of protecting the public's safety even though it experienced incidents in the past.

9.2 Traffic, Noise, and Environment

9.2.1 Views of the Applicant

Highpine stated that it would take about 20 days to drill each well and acknowledged that traffic would increase during that time. Highpine estimated there would be about 20 to 25 loads per well to move in the rig, which would also include the associated equipment, for example, well site shacks, tanks, and extra drill pipe. Highpine also explained that during the approximate 20-day period it would take to drill the well, cement trucks, casing trucks, a water truck, a fuel truck and a regular pickup truck would be accessing the well site multiple times daily. It stated that it had a speed limit for Highpine workers to follow and would work to ensure that was followed.

Highpine stated that for production, traffic would be minimal. Specifically, a field operator would access the well sites twice a day.

Highpine stated that there would be an increase in noise during the drilling of the wells. It acknowledged that it had received noise complaints in the past and had taken mitigative measures to help alleviate these concerns. Highpine explained that it had extended the muffler system on some rigs and put it into the ground to help dampen the noise. It also explained that it had requested workers to not trip at higher speeds, which helped to keep noise levels down. Highpine stated that the noise would be less during servicing, as the rig would not operate 24 hours a day.

In order to protect groundwater, Highpine confirmed that it would be cementing the surface casing, as well as the intermediate string of casing, to surface. Highpine emphasized that the surface casing would be cemented to 500 m, well below the base of groundwater, which it stated was about 288.6 m in the area.

9.2.2 Views of the Interveners

The RRCC accepted that they would be subjected to live with the impacts of an increase in traffic and noise from the proposed development.

A member of the RRCC stated concerns with regard to contamination of their water well. He expressed concern that no one had addressed this matter, specifically what would happen if his water well were contaminated. He stated his water well was 308 feet deep (about 94 m).

9.2.3 Views of the Board

The Board notes that there will be a short-term increase in traffic and noise during the drilling of the wells. The Board accepts that the mitigative measures Highpine outlined in order to minimize noise are appropriate.

The Board accepts that Highpine will cement both surface casing and intermediate casing to surface. It also accepts that surface casing would be cemented to a depth of 500 m, more than 200 m past the base of groundwater in the area and well below the specific water well depth that was brought forth at the hearing. The Board believes this is adequate in order to protect groundwater from contamination from the drilling operations.

10 QUESTION OF CONSTITUTIONAL LAW

10.1 Background

The Board is a designated decision-maker pursuant to the provisions of the *Administrative Procedures and Jurisdiction Act* and as such has jurisdiction to determine all questions of constitutional law raised before it.

By letter dated August 29, 2007, the RRCC served a Notice of Question of Constitutional Law (the Notice) dated August 30, 2007. The Notice included five questions:

- i. Whether s. 7 or s. 15 of the Canadian Charter of Rights and Freedoms has been breached by the EUB by not compelling Highpine Oil and Gas to answer information requests to the RRCC with respect to Highpine Oil Gas application?
- ii. Whether the provisions of Section 12.150 of the Oil and Gas Conservation Regulations is unconstitutional and contrary to s. 7 of the Charter?
- iii. Whether s. 7 and s. 15 of the Canadian Charter of Rights has been breached by the EUB by not providing to the RRCC and public a complete list of the H₂S content of wells drilled in Brazeau and Parkland County?
- iv. Whether an approval of this application will breach s.7 of the Charter of Rights and Freedoms?
- v. Whether the development and regulatory processes with respect to these well applications and planned development in the area has been in accordance with the Principles of Fundamental Justice?

The AG participated through counsel to a limited extent. Counsel for the AG attended the final argument on the final day of the oral portion of the hearing and made written submissions in response to the oral argument of the RRCC on the constitutional questions.

There is provision in Section 12.150 of the *Oil and Gas Conservation Regulations (OGCR)* for well information required by the Board to be accorded confidential status or “tight hole” status for a period of one year. Operators that risk capital on exploratory wells in a competitive area are seen as deserving of a competitive advantage for a period of time so as to gain a foothold in an area and firm up land positions. In this particular case, Highpine has applied for confidential status for its two proposed wells.

For this section only, due to the fact that the RRCC raised the constitutional issues, their views are presented first.

10.2 Views of the Interveners

The RRCC requested that they make their constitutional argument orally at the hearing and provide a written argument in reply to the written submissions of the AG.

The RRCC submitted that if the EUB were to approve the well licence applications, in light of the evidence of the hazards and risks associated with drilling and producing of the wells, those persons living in close proximity would be in an area of unacceptable risk such that Section 7 of the Charter would be infringed.

The RRCC further argued that risks to health caused by the law can be deemed to be a deprivation of security of the person. They submitted that it was a breach of Section 7 to place responsibility upon members of the public to negotiate their own safety measures with a company.

The interveners also argued that along with the risks to health, Section 7 rights also included the opportunity to have the information to understand the risks that a person would be living within. They contended that all information with respect to risk should be communicated to every person. Specifically, they suggested that H₂S content should not be held confidential. They also submitted that SO₂ is particularly concerning for those with respiratory problems.

In relation to the principles of fundamental justice, the RRCC stated that there was a requirement that all information upon which a decision would be based be placed on the record at a hearing and that parties know the case they have to meet. Reference was also made to the *Public Safety and Sour Gas Final Report* and its recommendation that the EUB review and organize its sour gas data to provide an accurate and complete database and make such a database available to industry and the public. The RRCC also stated that this report focused on improving the hearing process so the public could effectively participate and be aware of the manner in which the EUB evaluated and balanced matters of public concern when making decisions on sour gas developments.

The RRCC submitted that it was improper for the Board to consider evidence gathered outside of the hearing without that evidence being made available to a party in order to understand and cross-examine on it.

The RRCC also argued that requiring residents to relocate during critical sour operations was a breach of the protection of liberty provided by Section 7 of the Charter.

The RRCC contended that Section 12.150 of the *OGCR* was in violation of Section 7 of the Charter, as that regulation pertained to H₂S concentrations and the confidentiality it provided well data for the period of one year. They contended that the regulation resulted in relevant information being unavailable to the RRCC in a timely manner. They submitted that parties that would be directly and adversely affected by a proposed well did not have access to the information upon which the application was based. Further, they argued that they were unable to obtain H₂S information for wells that had been drilled over a year ago, and as a result were not able to inform themselves of the risk and assess the case they had to meet.

The RRCC argued that there was not a transparent process for them to understand the planning and proliferation of sour hydrocarbon activities in the area and that there was insufficient information for them to rely on at the hearing.

The RRCC stated these arguments orally at the conclusion of the hearing and augmented them in their written reply.

The RRCC submitted that the area residents had the right to be informed of the nature of hazards in their neighbourhood.

On page 5 of the written reply of the RRCC, a number of potential breaches of Section 7 were listed, including

- living near a sour gas development, which poses an inherent risk;
- risks including death or injury in the event of a release of H₂S and SO₂;
- a particular susceptibility of one intervener with asthma;
- a requirement to provide personal information in order to be safe;
- a requirement to spend time meeting with and/or seeking out Highpine in order to be protected in the case of emergency;
- changing their personal routines during drilling; and

- potential relocation during sour gas zone operations.

The RRCC pointed out that the EUB declined a request to have an EUB staff member attend the hearing and testify about the process related to release rate calculations.

The RRCC focused upon an alleged inability to obtain the H₂S content of sour gas wells in Brazeau County as the basis for stating that an approval of the applications would not be in accordance with the principles of fundamental justice. They maintain that the right to know the case put against one and the right to answer that case were not afforded the RRCC.

The RRCC complained of an inability to secure data used by Highpine in its presubmission. They stated that they made requests of both Highpine and the EUB for data relating to H₂S release rates and concentrations. They stipulated that they sought data for numerous wells within the whole of Brazeau County and the County of Parkland. They requested that Highpine provide all of the gas analyses for every well that it had drilled in the previous four or five years in the area from Lodgepole all the way up to Tomahawk. The RRCC stated that Highpine declined to provide much of the requested information.

The RRCC served numerous and voluminous information requests on Highpine.

The RRCC stated that in addition to the information that Highpine supplied, it had received a Sour Gas Well List from Information Services of the EUB in electronic form on August 29, 2007, pursuant to a request made as early as August 17, 2007. The RRCC clarified that in many cases the EUB Information Services did not have the information the RRCC requested.

The RRCC submitted the *Godbout* decision of the Supreme Court of Canada and the RRCC also stated that “residents who live close to the wells are advised that it is prudent to relocate during drilling.” The RRCC objected to having to provide personal information to Highpine for inclusion in its ERP and that the personal information would be contained in many copies of the plan available to personnel implementing the plan in the event it was necessary. The RRCC listed a number of impositions that their members felt were placed upon them during the application process, such as the relocation concern and the privacy concern mentioned above.

10.3 Views of the Applicant

Highpine did not submit any argument on the constitutional issues raised by the RRCC. It indicated that most of its evidence was presented at the hearing and was relevant to the constitutional issues.

Highpine declined to answer numerous requests for information with regard to H₂S release rates and concentrations from wells it had drilled and other issues, based on the grounds of sheer volume and relevance.

Highpine maintained that much of the information the RRCC was requesting was irrelevant from a geologic and engineering point of view largely because H₂S levels decreased significantly as the Nisku trends moved to the northeast.

Highpine provided its July 19, 2005, and August 31, 2005, presubmissions (Exhibit 03-004) to the RRCC on the eve of the hearing, which contained release rate and geologic information.

In an answer to an undertaking, Highpine responded to a list of wells in Township 48 and 49, Ranges 8 and 9W5M, that it received from the RRCC, which resulted from an undertaking, for which the RRCC had requested the H₂S analyses for Highpine wells. Highpine noted that 38 locations were in the list of wells. Highpine determined that it operated 19 wells in the four specified townships and ranges. Highpine stated it had 11 wells in the area for which gas analysis was available and it provided those analyses.

10.4 Views of the Attorney General of Alberta

The AG stated that the analysis for a challenge based upon Section 7 of the Charter was to proceed in two stages. The first was to determine whether there had been a deprivation of life, liberty, or security of the person. The second was to determine whether the deprivation had been in accordance with the fundamental principles of justice. The AG then went on to state that the RRCC had not met the first stage of the test; hence there was no need to proceed to the second stage of the test.

The AG stated that the Board had no jurisdiction to address the constitutional challenge to Section 12.150 of the *OGCR* on the basis that the challenge related to a number of sour hydrocarbon wells and prior EUB approvals in the area that were not part of Highpine's applications. It contended that informational issues that related to these other well sites should have been addressed during those original well applications or in appeals of the approvals of those well sites.

Further, the AG submitted that an administrative tribunal had no jurisdiction to grant a general declaration of invalidity. *Martin v. Nova Scotia (Workers' Compensation Board)* [2003] S.C.C. 54 was cited as authority for this stance taken by the AG. The AG did not discuss the jurisdiction of the Board as set forth in the *Administrative Procedures and Jurisdiction Act*.

The AG argued that the RRCC failed to provide any evidence that they were denied access to information as the result of Section 12.150 of the *OGCR* and pointed out that the RRCC's own evidence established only that in relation to many wells the EUB Information Services simply did not have the results of any gas analysis. The AG also pointed out that in response to search requests by the RRCC, the EUB Information Services informed the RRCC that "if the hydrogen sulphide information is not on the list then the EUB never received it." It argued that the RRCC's informational claims related to the conduct of the EUB in its informational gathering efforts and not to the operational effect of Section 12.150 of the *OGCR*.

On this point the AG concluded that without any evidence that Section 12.150 of the regulation had any effect in the matter, the stage of constitutional analysis was not reached. Further, the AG contended that the RRCC failed to articulate any connection between the operational effect of Section 12.150 of the *OGCR* and any diminishment of rights protected by Section 7 of the Charter.

The AG argued that the RRCC had not met the first stage of the test and failed to establish any evidentiary foundation that the operational effect of Section 12.150 of the *OGCR* had led to a

deprivation of security of the person, and that Charter analysis should end at this point. The AG cited *Operation Dismantle Inc. v. R.* [1985] 1 S.C.R. 441 as an example of a case in which an evidentiary basis was not made out in a constitutional challenge.

The AG pointed out that the RRCC claimed that Section 7 protected a “right to understand the risks you will be living within.” The AG argued that the scope of this claim was so broad as to be incomprehensible and that there was no case law or authority supporting the proposition that such a right existed.

10.5 Views of the Board

The Board notes that the parties provided evidence throughout the hearing that related to the constitutional issues raised by the RRCC.

The Board notes that the RRCC relied upon the following case law:

- 1) *Charkaoui v. Canada (Citizenship and Immigration)* [2007] 1 S.C.R. 350 – In this decision the Court assessed the constitutionality of the detention of permanent residents and foreign nationals based upon security certificates and the process surrounding same.
- 2) *Chaoulli v. Quebec (Attorney General)* [2005] S.C.J. No.33 – In this decision, the constitutionality of statutory prohibitions on private health insurance being sold in Quebec was considered.
- 3) *R. v. Morgentaler* [1988] S.C.J. No.1 – This case considers the constitutionality of then existing Criminal Code provisions dealing with Therapeutic Abortion Committees at hospitals providing abortions.
- 4) *Godbout v. Longueuil (City)* [1997] S.C.J. No. 95 – Here the Supreme Court of Canada reviewed the constitutionality of a municipality requiring that its employees live in the municipality.
- 5) *Murray v. Rockyview (Municipal District No. 44)* [1980] A.J. No. 649 (ABCA) – In this decision the Alberta Court of Appeal considered whether or not it was a breach of the rules of natural justice for members of a subdivision and development appeal board to have visited a recreation theme park similar to the one being proposed.

The Board also notes that the AG provided the following decisions:

- 1) *Martin v. Nova Scotia (Workers' Compensation Board)* [2003] S.C.C. 54 – In this case the Supreme Court considered whether or not the WCB had the jurisdiction and authority to consider the constitutional validity of challenged provisions in its enabling statute.
- 2) *Operation Dismantle Inc. v. R.* [1985] 1 S.C.R. 441 – Here the Court considered the constitutionality of cruise missile testing.

Section 7 of the Charter provides that

Everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice.

The Board acknowledges that while the Notice included reference to Section 15 of the Charter, which protects equality rights, no argument was advanced by the RRCC as to how Section 15 may have been breached. Hence no further mention of it will be made.

Issues (i) and (iii)

- i. Whether s. 7 or s. 15 of the Canadian Charter of Rights and Freedoms has been breached by the EUB by not compelling Highpine Oil and Gas to answer information requests to the RRCC with respect to Highpine Oil Gas application?
- iii. Whether s. 7 and s. 15 of the Canadian Charter of Rights has been breached by the EUB by not providing to the RRCC and public a complete list of the H₂S content of wells drilled in Brazeau and Parkland County?

As both of these issues deal with the issue of information available to the RRCC, they are dealt with concurrently. The Board accepts the submission of the AG that the analysis for a challenge based upon Section 7 of the Charter is to proceed in two stages. The first is to determine whether there has been a deprivation of life, liberty, or security of the person. The second is to determine whether the deprivation has been in accordance with the fundamental principles of justice.

Regarding the H₂S release rate and content of the wells, the Board's views have been dealt with previously in Section 7.3.

It is the opinion of the Board that the rights of the members of the RRCC pursuant to Section 7 of the Charter have not been diminished by the Board not having compelled Highpine to respond to the information requests of the RRCC. The Board understands Highpine's reluctance to provide certain information requested by the RRCC on the basis of relevance. The Board is of the view that much of the information sought was available to the public from Information Services of the EUB, and in fact the RRCC did obtain much information via that route. Where information received from the EUB is concerned, the Board notes that the EUB Information Services informed the RRCC that if H₂S information was not on the list supplied, then the EUB Information Services did not have that information. The Board believes the RRCC received sufficient information and materials before and during the hearing to know the case they had to meet.

The Board notes that consultants exist who make it their work to mine information available from the EUB. The RRCC could have obtained this information at any time.

Many hundreds of wells were listed on the Sour Gas Well List obtained from EUB Information Services. Seven wells were designated as confidential. Six of the seven wells listed as having a confidential H₂S content are of considerable distance to the southwest of the subject wells. The remaining and closest well is approximately 7 km southeast of the subject wells.

The Board notes that by way of undertaking during cross-examination, Highpine established that the LSD 13-2-50-6W5M well, which is the closest of these wells, had an H₂S concentration of 3.54%. The Board further notes that no evidence was adduced by the RRCC to establish the relevance to the proposed well applications of the balance of the search results from a geologic point of view.

The Board notes that while they questioned the H₂S concentration and release rates extensively in cross-examination, the RRCC did not present any expert evidence to establish that the requests for information were relevant to the two proposed wells under consideration. The Board does not believe a case was made by the RRCC that the H₂S release rates and concentrations used to determine the EPZs were unreasonable or that the data available to them were insufficient for the purpose of these determinations.

The Board did consider the request by the RRCC to compel answers from Highpine to informal information requests, but stresses that the informal information requests were written questions forwarded to Highpine by the RRCC outside of the formal information request process set out in the *Alberta Energy and Utilities Board Rules of Practice*. In a letter dated September 11, 2007, the Board noted that the questions were not part of the Board's established schedule for this proceeding. It further noted that it was of the view that the number of questions and amount of correspondence on the matter had been excessive and that any outstanding questions the RRCC may have could be adequately dealt with at the hearing.

With respect to issues (i) and (iii), the Board finds that there was not an infringement of the right to life and security contrary to Section 7 of the Charter.

Issue (ii)

- ii. Whether the provisions of Section 12.150 of the *Oil and Gas Conservation Regulations* is unconstitutional and contrary to s. 7 of the Charter?

The Board does not accept that Section 12.150 of the *OGCR* operates to deprive the RRCC members of life, liberty, or security of the person. The operational effect of Section 12.150 of the *OGCR* could not have by itself impaired the rights of the RRCC members to life, liberty, and the security of the person. While it is true that the drilling and completion of a sour well could endanger the life and physical or psychological well-being of a person were it to take place in an unsafe manner resulting in a loss of control of the well. The Board would not approve an operation unless it was satisfied that it could be performed in a safe manner, as discussed in Section 8.1.3.

The Board does not accept that the possibility of well information being treated as confidential pursuant to Section 12.150 of the *OGCR* is analogous to the security certificates authorizing the detention of individuals (*Charkaoui*), to the requirement that therapeutic abortions only be performed following a review by a hospital's therapeutic abortion committee (*Morgentaler*), or to potentially long medical waiting lists caused by an inability to purchase private health insurance (*Chaoulli*).

With respect to issue (ii) in the Notice, the Board finds that Section 12.150 of the *OGCR* is not unconstitutional on the basis that it is contrary to Section 7 of the Charter.

Issues (iv) and (v)

- iv. Whether an approval of this application will breach s.7 of the Charter of Rights and Freedoms?

- v. Whether the development and regulatory processes with respect to these well applications and planned development in the area has been in accordance with the Principles of Fundamental Justice?

The Board is of the opinion that these two broadly worded issues are sufficiently related that they may be conveniently dealt with together.

The Board does not agree with the suggestion that the RRCC members must incur risk as a result of the proposed sour-gas related operations “without being able to understand or see the basis of the risk they are exposed to or knowing the actual risk once the well, if approved, is drilled,” as stated in the RRCC submission. It is the opinion of the Board that the information that the RRCC received was sufficient for it to understand the case it had to meet and to sufficiently prepare for and test the well applications of Highpine.

The Board, as a result of the above, finds that there has not been a deprivation of the right to life, liberty, or the security of the person and there is no need to turn to the second branch of the test to see if there has been a breach of the principles of fundamental justice.

The Board is of the opinion that *Godbout* is authority for the proposition that Canadians are entitled to reside where they choose and that a municipality cannot impose a residency requirement upon its employees. The Board believes that the submission of the RRCC goes too far in its characterization of the evidence concerning relocation. The Board notes that Highpine testified that it is prepared to accommodate the relocation of residents on a case-by-case basis arising out of health concerns while operations are being conducted in the critical sour zone. It also notes that Highpine did not accept that there is a necessity to relocate. The Board understands that relocation is voluntary and left up to the particular resident and that they are free to remain in their homes and carry on their usual daily activities during critical sour zone operations. The Board also understands that there is not a compulsory or prohibitive requirement upon residents during drilling and completion affecting their liberty. Relocation is only mandatory in the unlikely event of a level-2 emergency.

With regard to the provision of personal information to Highpine, the Board notes that it is on an entirely voluntary basis and there is no obligation on a resident to provide such personal information. If a resident objects to providing personal information, they may refrain from doing so. The Board notes that there is legislation in place to protect this information, such as the *Freedom of Information and Protection of Privacy Act* and the *Personal Information Protection Act*.

The Board recognizes that the level of involvement a resident chooses to adopt in the application process and during the drilling of sour gas wells is a matter of individual preference.

The Board does not accept that the proliferation of sour wells in the Drayton Valley area constitutes a breach of constitutional rights of persons residing in the area. Over many decades sour wells have been drilled and produced safely in this area. The presence of numerous sour facilities in an area does not infringe upon residents’ rights to life, liberty, and security.

With respect to issues (iv) and (v), the Board finds that an approval of these applications will not breach Section 7 of the Charter and that the development and regulatory processes with respect

to these well applications and planned development in the area have been in accordance with the principles of fundamental justice.

11 PLANNING AND PROLIFERATION

During the hearing there were a number of comments regarding appropriate planning and concerns expressed about proliferation of sour gas facilities. The Board would like to comment on its planning and proliferation initiative. In December 2000 the *Public Safety and Sour Gas Report* was issued, which identified 87 recommendations for addressing public safety and sour gas. Recommendations 7, 32, and 33 noted that a greater effort was required to reduce proliferation of sour facilities near people and that more information regarding future development plans should be provided to people near sour gas development as part of the EUB's application and licensing process. An oversight committee was struck, consisting of public, industry, and regulatory participants, to implement these three recommendations.

The committee determined that industry recommended practices should be developed and that industry would voluntarily follow its own recommended practices. The committee was concerned that the uptake of the recommended practices may be slow. In order to measure the effectiveness of the recommended practices, a two-year monitoring program was developed.

The two-year trial determined that the recommended practices were followed about 50% of the time. The committee wrote an extensive report with a number of recommendations (the report is available on the EUB Web site www.eub.ca), the main recommendation that the EUB require by regulation that the recommended practices must be followed.

As a result, the EUB issued *Bulletin 2008-04: Application Requirements for Sour Gas Development*, stating that the requirement to follow the recommended practices is effective May 1, 2008.

The Board also notes that the best practices were in place at the time the applications were considered. These well applications have been reviewed against the best practices, and the Board is satisfied that the requirements have been met. The Board acknowledges that the RRCC argued that Highpine should submit any and all associated applications at the same time and has considered the reasons submitted by Highpine with regard to why it chose not to do so with the subject applications, and it has accepted Highpine's argument. The Board understands that these two proposed wells are exploratory in nature and that Highpine will evaluate further applications based on the physical findings of these wells. The Board notes that with the updated *Directive 056*, applicants are required to include a sour gas project map of the assessment area, which identifies proposed wells, pipelines, and facilities, as well as current land use and the existing infrastructure that was assessed.

The Board recognizes the potential impact on the public of multiple developments and notes that future applications will be held to these new requirements.

Given the potential for future development and the new planning and proliferation guidelines, the Board encourages industry to work together with other area operators, local governments, area residents, and landowners to try to facilitate ways to work with each other.

12 CONCLUSION

Having carefully considered all of the evidence, the Board hereby approves Applications No. 1480869 and 1486164.

Dated in Calgary, Alberta, on March 6, 2008.

ALBERTA ENERGY AND UTILITIES BOARD

<original signed by>

K. G. Sharp, P.Eng.
Presiding Member

<original signed by>

D. K. Boyler, P.Eng.
Acting Board Member

<original signed by>

J. G. Gilmour, LL.B
Acting Board Member

APPENDIX 1 HEARING PARTICIPANTS

Principals and Representatives
 (Abbreviations used in report)

Witnesses

Highpine Oil & Gas Limited (Highpine)

G. Fitch
D. Farmer

C. Venardos
A. Fritz
D. Humphreys
N. Hands
D. Ganske
E. Dusterhoft
M. Hall
R. Brown
of Bissett Resource Consultants Limited
M. Davies,
of Jacques Whitford AXYS

Rocky Rapids Concerned Citizens (the RRCC)

J. Klimek
D. Bishop

D. Kessler
D. Mulroy
D. Sullivan
N. Coombs
J. Coombs
M. Mueller
K. MacKenzie
L. Dupperon
S. Kelly
B. Domke
L. McGinn
M. Ochsner
D. Schmidt
C. Dodd
S. Du, Ph.D.,
of California Air Resources Board
D. McCutcheon, P.Eng.,
of the University of Alberta

Alberta Energy and Utilities Board staff

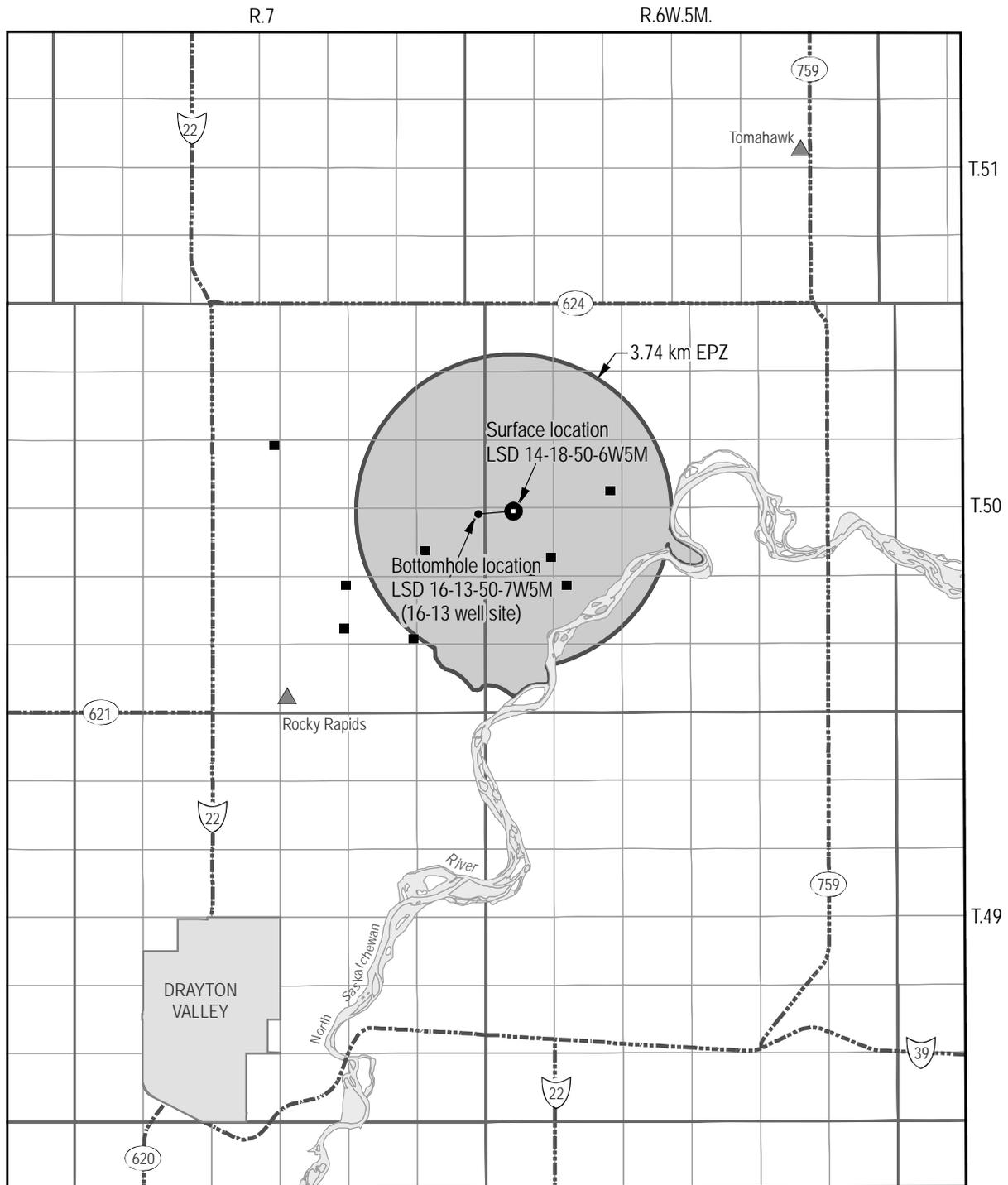
K. Stilwell, Board Counsel
G. Bentivegna, Board Counsel
R. Marx, Board Counsel
C. Giesbrecht
D. Miles
D. Schroeder
J. Miller
C. Ravensdale
K. Siriunas, P.Eng.

APPENDIX 2 SUMMARY OF COMMITMENTS

The Board notes throughout the decision report that Highpine 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 have the right to request a review of the original approval if commitments made by the applicant remain unfulfilled.

COMMITMENTS BY HIGHPINE

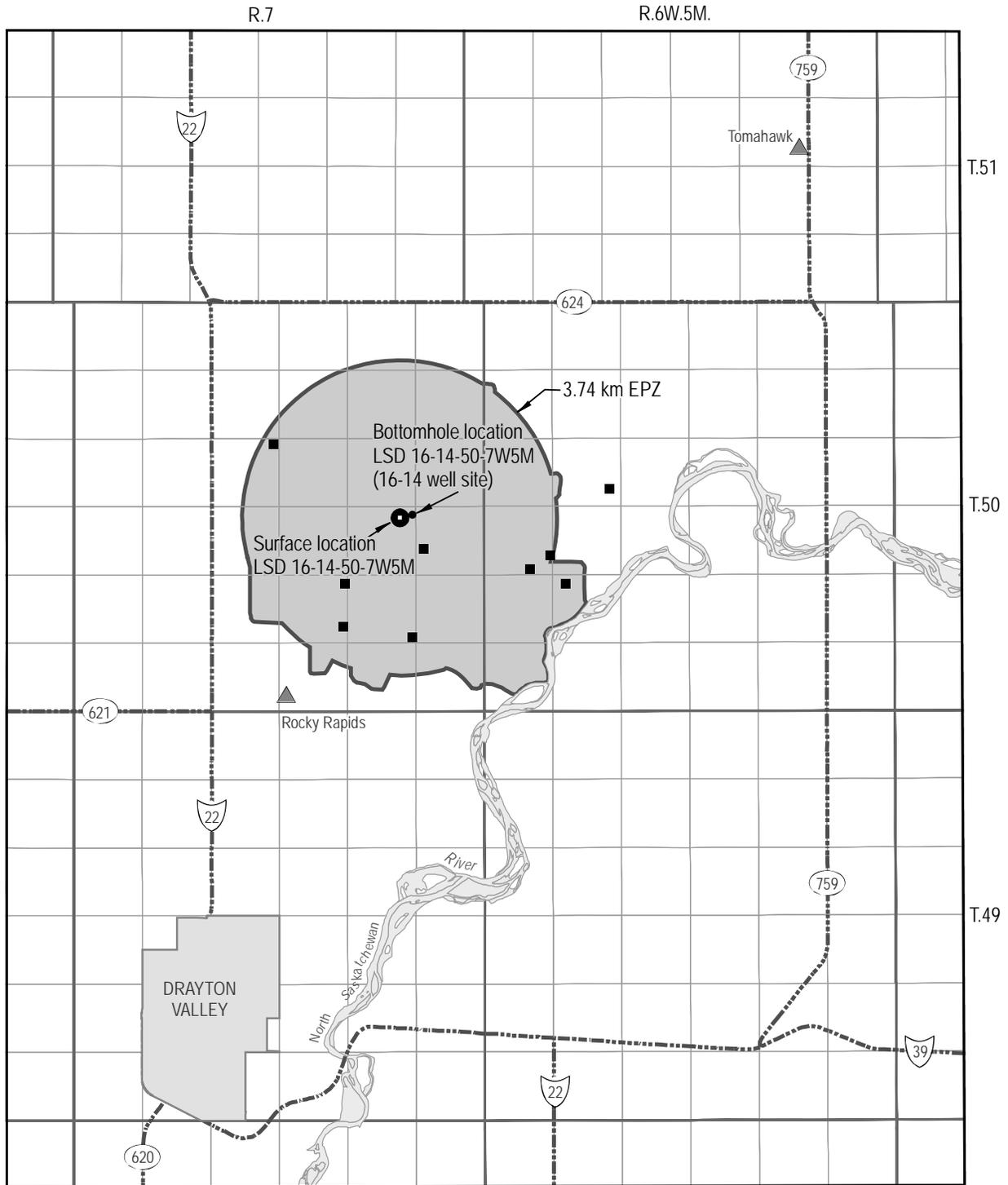
- Highpine will not flare more than eight hours in total for each well.
- Highpine will maintain roads in the EPZs to ensure that they remain passable during critical sour operations.
- Highpine will suspend operations if any roads inside the EPZs are unable to be made passable.
- Highpine will lead one full-scale emergency response exercise every year.
- Highpine will update its ERPs, including updating all resident information, and submit those updates to the EUB for review.
- Highpine will ignite an uncontrolled release within 15 minutes of sour gas reaching surface.



Legend

- Hearing participants

Figure 1. 16-13 well ERP area map



Legend

- Hearing participants

Figure 2. 16-14 well ERP area map