



Intrepid Energy Corporation

Applications for Licences for Gas Wells, Pipelines, and
Facilities

Tindastoll Field

October 30, 2007

ALBERTA ENERGY AND UTILITIES BOARD

Decision 2007-080: Intrepid Energy Corporation, Applications for Licences for Gas Wells,
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ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

**INTREPID ENERGY CORPORATION
APPLICATIONS FOR LICENCES FOR
GAS WELLS, PIPELINES, AND FACILITIES
TINDASTOLL FIELD**

**Decision 2007-080
Applications No. 1462172, 1486686,
1486688, 1491537, 1491541, 1493237,
1500670, 1507656, 1507707, and 1507722**

1 DECISION

Having carefully considered all of the evidence, the Alberta Energy and Utilities Board (EUB/Board) hereby denies gas well Applications No. 1491537, 1491541, and 1493237, without prejudice to future applications to develop natural gas reserves under Section 18, Township, 36, Range 1, West of the 5th Meridian (Section 18).

The Board also denies Applications No. 1462172, 1486686, 1486688, 1500670, 1507656, 1507707, and 1507722, as there is no need for these facilities without the gas well licences.

2 INTRODUCTION

2.1 Applications

Intrepid Energy Corporation (Intrepid) applied pursuant to Section 2.020 of the *Oil and Gas Conservation Regulations* for licences to drill three natural gas wells from surface locations in Legal Subdivision (LSD) 13-18-36-1W5M (13-18), LSD 8-18-36-1W5M (8-18), and LSD 5-18-36-1W5M (5-18). No hydrogen sulphide was expected to be encountered. The purpose of the wells was to obtain natural gas production from the Horseshoe Canyon Formation of the Edmonton Group.

Intrepid applied in accordance with Section 7.001 of the *Oil and Gas Conservation Regulations* for approval to construct and operate three single-well gas batteries with compression at each of the proposed well sites. In addition, Intrepid applied in accordance with Part 4 of the *Pipeline Act* for approval to construct and operate four pipelines for the purpose of transporting natural gas from each of the wells to tie-in points on existing pipelines.

The proposed development was located about 12 kilometres (km) northwest of Innisfail, Alberta.

2.2 Interventions

The following parties opposed the proposed project:

- Dale Christian and Glennis Christian (Mr. and Mrs. Christian),
- Joel Christian (J. Christian),
- Trevor Christian (T. Christian),
- Suzanne Telford and Jason Telford (the Telfords),
- Adele McKechnie and John McKechnie (the McKechnies),

- Iris Penney and Wayne Penney (the Penneys),
- Candace Abraham,
- Dorene Rew,
- Randy Hofer, and
- the Butte Action Committee (BAC).

The interveners raised issues concerning drilling operations and the installation of pipelines within an unconfined aquifer and a floodplain, noise, visual impacts, and impacts on water wells and farming operations.

Prior to the start of the hearing, Randy Hofer withdrew his objection.

2.3 Standing and Background Information

When identifying who may participate at a public hearing, the Board is governed by Section 26 of the *Energy Resources Conservation Act*, which provides that those persons whose rights may be directly and adversely affected by the approval of any energy development are entitled to an opportunity to lead evidence, cross-examine, and give argument. The Board defines such full participation at a hearing as “standing.”

Others who may not be able to meet the “standing” test (for example, landowners who do not own the lands where the proposed energy development is to be located) are not afforded these participation rights. However, it is the long-standing practice of the Board to allow those persons who would otherwise not have standing to participate to some extent at a public hearing, at their own expense, provided they offer relevant information.

Initially, Intrepid applied for the proposed 13-18 well and the associated pipeline in March and May 2006 respectively. Objections to Intrepid’s proposed development at 13-18 were received from the parties identified above. By letter dated August 23, 2006, the Board granted standing to the Telfords, because they owned and resided on the northwest quarter of Section 18 and operated a dog breeding and kennel operation adjacent to their home. The Board also granted standing to T. Christian, as he leased and farmed a portion of the Telfords’ lands. At that time, the Board did not grant standing to other members of the Christian family with respect to the 13-18 application.

By letter dated October 6, 2006, Intrepid requested that the Board postpone its hearing process with respect to the 13-18 development for the purpose of allowing Intrepid to bring forth additional applications for the south half of Section 18. The Board granted Intrepid’s request on October 16, 2006, requesting that Intrepid submit its new applications by December 1, 2006.

Intrepid filed its additional applications for the proposed 8-18 and 5-18 wells and associated pipelines and facilities in December 2006 and January 2007. As a result of Intrepid proposing additional development in the south half of Section 18, the Board amended its procedural ruling regarding standing on April 5, 2007, to add Mr. and Mrs. Christian and J. Christian. The Board noted that T. Christian owned the southwest quarter and resided on the southeast quarter of Section 18. J. Christian owned and resided on the southeast quarter of Section 18 and Mr. and Mrs. Christian resided on the southwest quarter of Section 18.

Candace Abraham, the McKechnies, Dorene Rew, and the BAC provided written submissions to the hearing and were provided an opportunity by the Board to make statements during the hearing. Candace Abraham and the McKechnies declined to do so.

The interveners indicated that in an attempt to coordinate their efforts, the Christians focused on issues relating to oil and gas development in the shallow aquifer and floodplain, while the Telfords focused on impacts to their kennel operations. The Christians and the Telfords noted that they supported the concerns and positions expressed by each other.

2.4 Hearing

The Board originally scheduled a public hearing to commence on September 25, 2006, in Innisfail, Alberta. On August 29, 2006, the Board issued a Notice of Rescheduling of Hearing, advising that the rescheduled hearing would commence on October 24, 2006. On September 29, 2006, the Board issued a Notice of Change of Venue of Hearing. On October 18, 2006, the Board issued a Notice of Adjournment of Hearing to allow for additional applications to be submitted by Intrepid. On April 5, 2007, the Board reissued a Notice of Hearing, setting the hearing down for June 27, 2007.

The Board held a public hearing in Red Deer, Alberta, which was held from June 27 to June 29, 2007, before Board Member J. D. Dilay, P.Eng. (Presiding Member) and Acting Board Members D. K. Boyler, P.Eng., and W. G. Remmer, P.Eng. A site visit was conducted on June 26, 2007. Those who appeared at the hearing are listed in [Appendix 1](#).

Following the close of the oral portion of the hearing, the parties submitted written final arguments on July 27, 2007, and replies to the final arguments on August 3, 2007. Therefore, the Board considers the hearing to be closed as of August 3, 2007.

3 ISSUES

The Board considers the issues respecting the applications to be

- communication and participant involvement,
- locations of the wells sites, and
- the impacts of
 - drilling the wells within an unconfined aquifer,
 - operation of the wells in a floodplain, and
 - noise and visual impacts.

The Board notes that the need for the wells was not contested by the interveners. The Board believes that there is a need for wells in order for Intrepid to be able to recover its reserves.

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.

In this decision, the Board has addressed the main issues it drew on in determining that these applications should be denied without prejudice. As such, all matters raised by the applicant and the interveners through the course of the EUB's hearing process may not be addressed within this report.

4 COMMUNICATION AND PARTICIPANT INVOLVEMENT

4.1 Views of the Applicant

Intrepid said that it had made every reasonable effort to communicate with landowners and address their concerns, but that the results of its consultation efforts were poor.

Intrepid described its corporate participant involvement program as follows. Once it selects a proposed location, it retains a land consulting company to make the initial contact with the landowners. Intrepid engineering staff become involved in the consultation process if the landowners raise concerns. Intrepid noted that its well site construction consultants work with the surveyors and the landowners to determine if changes to the proposed location of the facility are feasible. Intrepid stated that if landowner concerns could not be resolved, it would engage directly in negotiation and would consider using the EUB's Appropriate Dispute Resolution (ADR) program.

For the applied-for project, Intrepid stated that all interested parties and residents within Section 18 were contacted and given notification, in accordance with the requirements of *Directive 056: Energy Development Applications and Schedules*. Intrepid acknowledged, however, that its project-specific information packages included generic project descriptions, which gave the longest potential timeframe for completion of operations at each of its specified locations.

Intrepid stated that it had sought to meet directly with the Christians to discuss the initially proposed 13-18 well; however, the Christians would not provide a date to meet. Intrepid noted that early in its participant involvement program, Mrs. Christian advised the Board and Intrepid that she represented T. Christian and J. Christian. Therefore, Intrepid directed its communication to Mrs. Christian. Intrepid acknowledged a letter sent by Mrs. Christian on October 24, 2006, wherein she requested that Intrepid direct its correspondence related to its applications to T. Christian, who at the time was the only family member granted standing regarding the proposed 13-18 well and associated pipeline.

Regarding the 5-18 and 8-18 locations, Intrepid stated that J. Christian and T. Christian would not provide permission for Intrepid to survey and therefore further meetings and consultation did not take place. Intrepid stated that under right of entry, it was not required to obtain consent from a landowner to survey. Intrepid noted that it had attempted by e-mail, fax, and phone to obtain input from J. Christian and T. Christian on the location of the proposed 5-18 and 8-18 well sites but stated that the Christian family did not respond to these attempts.

Referring to the Christians' request for a three-week hiatus from the consultation process to attend to farming operations, Intrepid asserted that the Christians were aware that such a delay

would jeopardize Intrepid's ability to meet the Board's request that it file any new applications by December 1, 2006.

Intrepid stated that it believed Mrs. Christian would object to its applications notwithstanding its efforts to address her concerns. Intrepid indicated that for this reason, it believed that neither negotiation nor ADR would have been successful. Intrepid stated that it believed Mrs. Christian would consider withdrawing her objection only if Intrepid were to commit not to drill through the underlying Medicine River Flats Sand and Gravel Aquifer at the proposed 13-18 and 5-18 locations. Intrepid stated that it believed that pursuit of discussions, in light of the family's opposition to any energy development in Section 18, would only further frustrate the Christians.

Intrepid asserted that it had a competing land interest to the Christians' in the form of oil and gas leases granted by Freehold and Alberta Crown Mineral Sales and therefore had the right to develop the petroleum and natural gas resources in Section 18. Intrepid stated that it believed that it had clearly expressed a willingness to negotiate with the Christians, but that the family's failure to reciprocate led to the need for a hearing.

Intrepid noted that it had initially approached the Telfords through land consultants and that its own staff did attend at the site to consult with the Telfords. With respect to the Christians' request that Intrepid meet with the BAC, Intrepid stated that it chose not to hold a community meeting as it was not normal practice to do so with respect to single-well licence applications. Intrepid noted that its approach was to work with landowners on a one-on-one basis. Intrepid stated that groups such as the BAC, having no direct intervenor status at hearings involving a small project, had more relevance to broader industry initiatives. It also noted that a discussion of best practices or other area issues should include other area operators.

Intrepid stated that it did not see value in meeting with the BAC because the majority of its 80 members were not impacted by its proposed operations. Intrepid stated that it failed to see how meeting with the BAC would assist it in its interaction with the Telford and Christian families.

4.2 Views of the Interveners

The Christians stated that Intrepid's public consultation had been unsatisfactory from start to finish. The Christians also stated that Intrepid had been hostile to their requests to cooperate and work with the local community.

The Christians further stated that Intrepid failed to comply with both the minimum requirements and the spirit of *Directive 056*. Specifically with regard to the proposed 13-18 well site, the Christians had requested meetings with Intrepid staff. The Christians stated that in every instance of communication with Intrepid, they were asked to sign confirmation of nonobjection prior to any discussions being held. The Christians submitted that this type of precondition to a meeting was not acceptable or in accordance with the intent of public consultation set out in *Directive 056*.

The Christians noted that on October 13, 2006, they requested a three-week hiatus from the consultation process to complete their farming operations. The Christians stated that despite their request, Intrepid sent Mrs. Christian an e-mail on October 16, 2006, and a letter on October 23, 2006, and arrived unannounced at the Christians' farms on October 18 and 26, 2006. The

Christians stated that Intrepid could have resumed consultation efforts with them after the requested three-week period.

In regard to permission to survey on J. Christian's and T. Christian's properties, the Christians stated that on October 16, 2006, they informed Intrepid that a survey agreement would need to be in place before it surveyed the southwest and southeast quarters of Section 18-36-1W5M. J. Christian stated that his letter of October 16, 2006, invited Intrepid to enter into a survey agreement with him to deal with issues pertaining to his cattle, access, and resulting damages, and that he did not expect this letter to end all negotiations.

The Christians stated that on October 18, 2006, Intrepid visited them and announced plans to drill on T. Christian's and J. Christian's lands. At that time, J. Christian requested time to look over Intrepid's proposal and informed Intrepid that the logistics of surveying on short notice were poor because of the current activity of cattle on his land. J. Christian noted that this was the only meeting he had with an Intrepid representative and that it appeared to be the basis of Intrepid's characterization of his refusal to negotiate.

The Christians stated that by correspondence dated October 24, 2006, Intrepid was directed specifically to contact J. Christian and T. Christian on issues pertaining to their properties, and that no Intrepid representative contacted J. Christian after that date. The Christians noted that T. Christian had a subsequent meeting with Intrepid on October 26, 2006, when Intrepid came to his farm without an appointment and during the time the Christians had requested no contact due to the intense farming activities under way. The Christians noted that after that contact, Intrepid did not conduct any further follow-up and made no attempt to meet with the Christian family after October 26, 2006.

The Christians stated that according to Intrepid's landman's summary, Intrepid had two brief meetings with T. Christian, one meeting each with J. Christian and Mr. Christian, and no meetings with Mrs. Christian with respect to any of the applications. T. Christian stated that Intrepid did not invest significant time or effort in consultation with the Christian family.

J. Christian stated that his contact with Intrepid and its agents had been confusing, frustrating, and brief and had left him with the impression that his concerns for his property and the underlying aquifer were of little importance to Intrepid.

The Christians stated that they would have liked to have been engaged in preproject discussions regarding all of Intrepid's proposed development on Section 18. Mrs. Christian noted that when the Christians tried to engage in consultation, they were denied and ignored by Intrepid. Mrs. Christian stated that she would have appreciated honesty and full and open disclosure by Intrepid, as well as a community meeting.

The Christians stated that the EUB advised them to join a local landowner group. The Christians said that they had become members of the BAC, which they noted was a member of Synergy Alberta. The Christians stated that they had requested that Intrepid meet with the BAC as part of its public consultation process, but Intrepid had refused.

The Telfords stated that Intrepid first contacted them with respect to surveying their property in fall 2005. At that time, Mrs. Telford indicated that she did not want a well on her property. Mrs. Telford noted that she was told by Intrepid that the survey would be conducted despite her

objection. Mrs. Telford stated that the surveyors entered the northwest quarter of Section 18 on October 19, 2005, without prior arrangement and while she was away. She noted that the presence of the surveyors had agitated the dogs in her kennels to the point that some were physically affected.

Mrs. Telford explained that prior to meeting with Intrepid herself, she had asked her mother, a landman, to meet with Intrepid's landman to go over the Telfords' concerns. Mrs. Telford noted that the meeting did not result in agreement and she subsequently met with three Intrepid representatives, along with her father, a vice-president of an oil company, and her mother. Mrs. Telford stated that at that meeting Intrepid explained what it wanted to do and discussed options, but she noted that the subsequent meeting also did not result in agreement.

Mrs. Telford stated that she was not consulted with and was not aware of the proposed location of the 5-18 well site and access road. Mrs. Telford stated that she was not consulted regarding the use of the Telfords' driveway to access the proposed 5-18 well site.

4.3 Views of the Board

Directive 056 sets out minimum requirements with respect to notification and personal consultation with potentially impacted parties. Notification is the distribution of project-specific information to people who may be directly and adversely affected by the proposed energy development. Personal consultation may include phone calls, but usually includes face-to-face dialogue, so that all parties can understand each other's concerns, needs, and the reasons behind them. The Board emphasizes that it expects companies to meet or exceed the participant involvement requirements in *Directive 056*.

Section 2.1 of *Directive 056* requires industry to develop and implement a participant involvement program prior to filing an application. The program includes responding to questions and concerns, discussing options, alternatives, and mitigating measures, and seeking confirmation that potentially affected parties do not object. Applicants are expected to be sensitive to timing constraints the public may have with respect to the subject application. In addition, the Board notes that the public is strongly encouraged to participate in ongoing issue identification, problem solving, and planning with respect to local energy developments. The public is also expected to be sensitive to the timing constraints of the applicant.

The Board finds that Intrepid did conduct adequate notification for parties that could be affected by the project but that there were a number of significant shortcomings in its consultations with the Telfords and the Christians. These shortcomings in communication have contributed to the Board's conclusion that Intrepid did not adequately investigate alternative locations or propose appropriate measures to mitigate the impacts, as discussed below in Sections 5 and 6 of this decision.

The Board recognizes that the communication difficulties initially encountered by Intrepid in dealing with the Christians were likely due to the Christians' strong feelings and concern regarding the need to ensure the protection of the unconfined aquifer. However, the Board finds that it was not appropriate for Intrepid to limit or cut short communications because it believed that the end result would be that the Christians would continue to object. In addition, the Board considers that by setting a precondition to communications that the Christians must be prepared to remove any objections before negotiations could commence severely affected the potential for

useful discussion to occur. As set out in *Directive 056*, the Board expects a proponent to communicate with parties to understand their issues and concerns and then investigate options and implement, where possible, measures to minimize impacts. The Board believes that Intrepid should have provided a site-specific project plan for the wells and pipelines. Furthermore, the Board finds that when Intrepid encountered communication difficulties, it should have developed and implemented a plan to deal more specifically with the issues, including having at least an initial meeting with the BAC.

The Board notes some of the specific shortcomings in Intrepid's approach to dealing with the Christians:

- Intrepid did not meet face to face with Mrs. Christian.
- Intrepid did not consider why the Christians wanted a survey agreement, nor would Intrepid agree to enter into discussions on how to minimize survey impacts.
- Intrepid neither considered nor discussed alternative well site locations the landowners considered to be more acceptable.
- Intrepid did not make sufficient attempts to communicate with the landowners of the south half of Section 18 and did not discuss options for well locations on the south half of Section 18. Consequently, Intrepid could not consider alternatives or measures to minimize impacts on the landowners, as well as special construction or operational measures needed as a result of the unconfined aquifer or the potential for flooding.

Applicants are expected to comply with both the minimum requirements and the spirit of *Directive 056*, which states in Section 2.3.3 that throughout the planning, construction, and operation of a project, an applicant must attempt to address the outstanding concerns of affected parties. Intrepid is reminded that despite the fact that a project is headed to a hearing, the applicant is expected to continue with the consultation and negotiation process. The Board believes that ongoing communication is essential in meeting application requirements and believes that the time leading up to the hearing, some eight months, could have been used by all parties to explore opportunities to resolve outstanding issues.

Likewise, Intrepid did not personally consult the Telfords with respect to using their driveway as a means of accessing the proposed well site at 5-18. The Board finds that Intrepid was obliged to discuss the use of this road with the Telfords.

The Board also believes that Intrepid could have conducted more follow-up consultation with the Telfords to understand the impact of its proposed development on their kennel operation. The Board was surprised by Intrepid's failure to consider the visual and noise impacts on the kennel operation, as outlined in Section 6 of this decision.

The Board expects Intrepid to engage in clear and transparent personal consultation with the public. The Board also expects Intrepid to review and improve on internal procedures to ensure that the planning and implementation of its participant involvement programs properly include both notification and personal consultation from the earliest stage and throughout the lifetime of a proposed development. The Board finds that it is primarily the applicant's responsibility to initiate, develop, and maintain appropriate relations with the local community. In addition, the Board expects communities to fully participate in an open dialogue with representatives of the energy industry so that issues can be properly identified and addressed on an ongoing basis.

The Board notes that the BAC requested to meet with Intrepid to discuss specific concerns related to potential impacts on the underlying aquifer in the direct vicinity of Intrepid's proposed project. Intrepid was not willing to meet with the BAC specifically for this project but would have been willing to meet with other area operators to discuss the BAC's apparent global issues. Given that the BAC expressed concerns specific to this project and that members of the BAC were directly involved in this hearing, at the very least the Board would have expected Intrepid to have an initial meeting with the BAC to assess the appropriateness of its concerns and determine if there was merit in future meetings.

The Board's decision to deny these applications on a without-prejudice basis is a result of the shortcomings in Intrepid's approach to public consultation, which subsequently led to an insufficient understanding of the interveners' concerns and insufficient consideration for options and mitigative measures that may have led to a more positive outcome.

5 LOCATIONS OF THE WELL SITES

5.1 Views of the Applicant

Intrepid submitted that the proposed locations would be optimal for potential gas recovery and expected them to cause the least amount of disturbance to the surface owners. Intrepid testified that its proposal was typical for shallow gas development and that the interveners had presented no compelling evidence to challenge Intrepid's technical reasoning for its locations. Intrepid further submitted that its locations would be environmentally sound and that the safety of the public could be assured.

Intrepid described the Edmonton Group sands as a series of stacked, noncontinuous channel sands, which generally are difficult to correlate between wells and have limited drainage areas. Intrepid testified that it used a statistical model to select its well locations, rather than geologic mapping of the individual sands. Intrepid confirmed that each section and quarter section should be considered as prospective as the next and noted that the statistical data supported the need to drill up to four wells in Section 18 to maximize gas recovery. Intrepid agreed that it did have discretion and flexibility with respect to the location of wells within the gas target areas of Section 18. Intrepid noted that this flexibility existed for all three of the proposed locations.

However, Intrepid also stated that the proposed 13-18 well site location was based on proprietary geological mapping, which suggested continuity in some of the sands in the area. Intrepid asserted that the 13-18 location was based on a geological trend between an existing Anderson Energy Ltd. well located at LSD 12-13-36-2W5M(12-13) and an existing Intrepid well located at LSD 16-18-36-1W5M (16-18). Intrepid stated that of the three proposed locations, it had the greatest confidence in the proposed 13-18 location and would be influenced by success at 13-18 in deciding whether or not to pursue the proposed 5-18 and 8-18 locations.

Intrepid stated that it did investigate directionally drilling the proposed 13-18 well from outside the shallow gravel aquifer. It found that the maximum distance the well could be moved would be about 130 metres (m) to the west, based on a drilling plan that kicked off below the surface casing at a proposed depth of 145 m. The well would still be located within the northwest quarter of Section 18 and would require drilling through the aquifer. The well would then be drilled to the uppermost Edmonton Sands to a depth of about 380 m within the gas target area. Intrepid

stated that this directional design was based on an aggressive rate of build of 12° per 30 m to a maximum angle of 40°. Intrepid noted that its proposed rate of build and terminal angle would allow for open hole logs and that an increased rate of build would increase the risk of not being able to obtain open hole logs. Intrepid argued that no directional well in close proximity had been drilled with these high rates of build or terminal angle and that the operational risk of being able to achieve this was unknown. During the hearing, Intrepid proposed to move the 13-18 well site 100 m west, but later withdrew that offer. In closing argument, Intrepid committed that should the EUB grant a licence for the 13-18 well, it would move the location farther away, to 220 m from the west boundary of Section 18, subject to consent from the Telfords and T. Christian.

With respect to the proposed 8-18 and 5-18 well sites, Intrepid stated that it did not consider alternative locations, but noted that the proposed 8-18 location was not underlain by the shallow aquifer.

Intrepid explained that if directional wells were planned outside of Section 18, the gas from some of the shallower sands might not be recoverable as a result of the inability to intersect them. However, Intrepid agreed that it would be theoretically possible to intersect the deeper sands. In response to the Telfords' expert engineering report, the "Garden Report," Intrepid agreed that Mr. Garden's design could be possible but disagreed with the report's recommendation to directionally drill the 13-18 well from a surface location in the northwest corner of the northwest quarter of Section 18. Intrepid maintained that relocating the surface location into the northwest corner of the quarter would place the well closer to the river and in a low-lying area within the identified flood fringe area. Intrepid submitted that initiating directional drilling within the surface hole could be difficult to achieve and would increase the risk of not obtaining a successful cement job on the surface casing.

Intrepid noted that in general, directionally drilling increased cost and operational risk. Specifically, Intrepid agreed with the interveners' expert that there would be a \$45 000 incremental cost to directionally drilling each of its proposed wells. Intrepid argued that in addition, directionally drilling would increase the risk of getting drill pipe stuck in the hole and increase the risk of failing to run casing to the bottom. Based on these reasons, Intrepid stated that it was not prepared to directionally drill any of the proposed wells and as such had applied for three vertical wells.

In response to the suggestion of slant drilling the proposed wells from a single pad site, Intrepid noted that it should be possible to build one lease in LSD 10-18-36-1W5M (10-18) and slant drill to each of the southeast, southwest, and northwest quarters of Section 18. However, Intrepid observed that slant drilling would not permit it to reach its preferred bottomhole locations or intersect the uppermost sand within the gas target areas in each of the quarters. Intrepid also noted that a multiwell pad site located in 10-18 would be closer to the Telford, Hanson, and Hofer residences and that a portion of 10-18 was located within the floodway of the Medicine River. Intrepid suggested that placing a single pad site in the portion of 10-18 outside of the floodway would result in the well site being directly visible from the Telford kennels.

Intrepid agreed that slant wells would probably result in a greater area for perforations and more contact or interface with the sands than a vertical well. However, Intrepid noted that the target sands were highly permeable and said it did not think it would see any impact. Intrepid also

agreed that with a single lease it may need only one compressor, one larger methanol tank, and one pipeline, which would eliminate the need to bore a pipeline under the Medicine River.

5.2 Views of the Interveners

The Christian family contested the need for Intrepid to place the wells at the locations proposed. The Christian family was opposed to oil and gas activity within or above the unconfined aquifer or the floodplain areas. The Christians noted that with reduced spacing, Intrepid could access its resources by directional or slant drilling from alternative locations. Specifically, the Christians contested the proposed 5-18 and 13-18 surface locations and submitted that these two locations could be directionally drilled from one lease outside of the shallow aquifer. The Christians also contested the need for Intrepid to locate the proposed 8-18 well as applied for. J. Christian noted that if the 8-18 well were to be drilled, he would prefer a location as far north and east of his residence as possible.

The Christians suggested that all three proposed wells could be drilled from a single pad location in 10-18. The Christians further argued that a single pad site would negate the need for Intrepid to bore under the Medicine River for one of the proposed pipelines.

The Telfords' expert witness, Mr. Garden, discussed the viability of moving the surface location of the proposed 13-18 well site and directionally drilling. Mr. Garden stated that Intrepid could directionally drill a well in the northwest corner of the northwest quarter of Section 18 and still hit its specified target. Mr. Garden based his location on kicking off the well at about 50 m, using a moderate build rate of 5° per 30 m to approximately 16°, and then setting surface casing. Mr. Garden further explained that Intrepid could then drill ahead, building the angle to 45° and holding that angle to the well's total depth. Mr. Garden noted that this drilling design would still allow Intrepid to obtain open hole logs. Mr. Garden referred to a well located at 102/2-33-37-3W5M(2-33), which was drilled with more drastic build rates than what he proposed. Mr. Garden noted that open hole logs were obtainable in the 2-33 well and that this well was currently producing from the Edmonton A and W pools.

Mr. Garden noted that Intrepid's directional design used the same build rates as his design, but that his design would kick off at a shallower depth, allowing a greater reach and thus permitting the well location to be moved farther away from the Telford residence.

Regarding increased risks associated with directional drilling, Mr. Garden stated that he did not think Intrepid would have any problems obtaining logs at 45° angles and noted that he had been able to obtain logs at 60° angles. Mr. Garden agreed that directionally drilling involved additional risks when compared to vertical drilling, but said that they could be mitigated.

Mr. Garden commented that Intrepid could use slant drilling technology to drill its proposed wells. In Mr. Garden's opinion, it would be possible for Intrepid to drill all three of its proposed wells from a single pad site.

The Telfords submitted that Intrepid did little to investigate alternative locations, despite the objections of the interveners. Specifically, the Telfords noted that no alternative locations were investigated for the 8-18 or the 5-18 proposed well sites. In addition, the Telfords noted that Intrepid did not submit any geological information to assist in determining whether other

locations for the proposed wells were feasible or which would support Intrepid's insistence on the proposed locations.

With respect to a single pad site located at 10-18, the Telfords stated that this site would be located outside of the aquifer, would reduce surface facilities and pipelines, and would be located at a sufficient distance from their kennels to satisfy their concerns.

The Telfords asserted that Intrepid did little prior to submitting its application to investigate potential alternative locations for its proposed wells. The Telfords noted that Intrepid appeared to have concluded that the landowners' concerns were unfounded and/or unreasonable and need not be addressed. The Telfords argued that the evidence submitted pointed to a number of different surface locations that could address the landowners' concerns as well as allow Intrepid to recover its reserves.

5.3 Views of the Board

When considering any application for oil and gas facilities proposed for privately held lands, the Board must balance the rights of the surface holder with the rights of the mineral holder and account for the public interest associated with the economic development of Alberta's energy resources. If a surface holder has legitimate concerns regarding the location of a well on his land, the Board expects that the applicant will take reasonable steps to investigate appropriate alternatives.

The Board understands that in some situations there will be limited flexibility regarding surface or bottomhole locations due to other surface features or the underlying geology. In other situations, alternative locations can be agreed upon that meet the needs of both the landowner and the applicant. The Board considers that the applicant bears the onus of establishing that the location proposed for a well or pipeline is the most appropriate, having regard for the social, economic, and environmental circumstances. Such information is particularly vital when the applied-for development is proposed in an environmentally sensitive area.

In argument, Intrepid asserted that the proposed locations would provide optimal gas recovery. However, the Board finds that Intrepid provided no compelling evidence to demonstrate that the well sites chosen were the most appropriate for the purposes of gas recovery or for any other reason. Intrepid's evidence is that it chose the surface and bottomhole locations for the 8-18 and 5-18 wells using a statistical model, while the 13-18 location was chosen using its statistical model in conjunction with proprietary geological mapping. Intrepid did not produce its proprietary mapping at the hearing.

The reliance on a statistical approach to well site selection suggests to the Board that any location within the drilling spacing unit would have a roughly equal chance of successfully encountering economic pay. In fact, Intrepid acknowledged that it had some flexibility in choosing the ultimate surface and bottomhole locations for all three wells proposed because of its statistical model. However, despite being aware of the interveners' concerns regarding the unconfined aquifer, flooding, and other impacts on the use of their lands, the Board finds that Intrepid did not take advantage of this admitted flexibility and failed to seriously investigate alternative locations for the well sites.

The Board accepts the interveners' argument that alternative locations outside the unconfined aquifer should receive serious consideration and heard no substantive arguments from Intrepid as to why the interveners' proposal for a pad location at 10-18 should not be thoroughly investigated. The Board put little weight on the blanket statements by Intrepid that it had not considered directionally drilling the wells because of the increased costs and risks associated with this type of drilling operation. It is apparent from the evidence that Intrepid did not investigate the option of slant drilling. The Board also agrees with the interveners that a pad location could substantially reduce the environmental impact, as the number of pipelines and facilities would be reduced. Intrepid did not conduct an impact or cost benefit analysis of alternative locations, which may have assisted the Board's deliberations on the appropriate locations for the wells.

On the basis of the evidence, the Board finds that Intrepid failed to establish that the proposed locations are the most appropriate locations to develop reserves under Section 18. It is the Board's view that better locations may be available for the wells. In addition, the Board observes that some added costs as result from directional or slant drilling may be warranted to mitigate the impacts on the aquifer and to avoid the possible impacts from flooding.

6 IMPACTS

In Section 5.3, the Board concludes that Intrepid has not established that the proposed well locations are the most appropriate in the circumstances and therefore its applications as proposed must be denied. Given the Board's determination to deny Intrepid's application for the reasons cited in Section 5.3, it is not necessary for the Board to decide on the appropriateness of the measures proposed by Intrepid to mitigate the risks associated with drilling in an unconfined aquifer and floodplain. However, the Board considers that some comment is necessary to highlight the legitimate impacts associated with drilling and operating the proposed wells in this unique environment.

6.1 Drilling the Wells Within an Unconfined Aquifer

6.1.1 Views of the Applicant

Intrepid stated that the proposed 5-18 and 13-18 well sites were underlain by a shallow, unconfined sand and gravel aquifer, while the 8-18 location, located on the east side of the Medicine River, overlay a confined aquifer. Intrepid defined an unconfined aquifer as an aquifer in which the water surface is not restricted by impermeable material and thus is at greater risk to surface spills than aquifers that have impermeable material between them and the land surface. Intrepid acknowledged that this specific aquifer was used for drinking water by the interveners. It also stated that the general direction of water flow in the aquifer was to the east, such that the nearest receptor to the proposed 13-18 location was the Medicine River and to the proposed 5-18 location was the interveners' water wells.

Intrepid cited three reports related to the aquifer (Intrepid's *Hydrogeological Study*, prepared by Dr. Mortensen; a report prepared by Hydrogeological Consultants Ltd. [HCL] for Encal Energy Ltd. in 2000 [HCL, 2000]; and a report prepared by HCL for Ackroyd LLP in 2006 [HCL, 2006]). It noted that all three reports concluded that gas wells could be drilled safely and without any adverse impact on the aquifer. Intrepid noted that the 12-13 well was previously drilled

through this aquifer without any adverse impacts. Intrepid further noted that the 12-13 well was drilled using a conventional fluid-based method without the use of a conductor casing.

Intrepid stated that it would consider setting a liner and conductor casing prior to drilling surface holes at the proposed 5-18 and 13-18 well sites. If it chose this option, Intrepid planned to drive a liner through the aquifer and into the bedrock prior to auguring a conductor hole, to isolate the aquifer from further drilling operations. Intrepid acknowledged that if large gravel was encountered, it might not be able to install the liner prior to setting conductor casing. Contrary to Mr. Garden's comments, Intrepid argued that the liner could be set using an air-driven vibrating process, which would be quieter than using a hydraulic hammer. Intrepid stated if it decided to attempt driving in the liner, it would first consult with the Telfords, given their concerns about the impact of noise on their kennel operations.

Intrepid stated that it would auger a conductor hole through the aquifer to a depth of about 15 to 20 m and cement conductor casing into place to protect the shallow aquifer. Intrepid noted that this conductor hole would be drilled in accordance with accepted water well drilling practices. Intrepid further noted that it would have a licensed water well driller on site to supervise the installation of the conductor casing.

Intrepid stated that once the conductor casing was set, it would drill the surface hole to a depth of about 145 m and the main hole to total depth using a freshwater mud system. The surface and production casing strings would then be cemented to surface. Intrepid stated that drilling and completion of the wells would not involve any chemicals other than water, methanol, and liquid carbon dioxide and that the use of three cemented casings would prevent discharge of these compounds to the aquifer.

With respect to potential contaminants during drilling of the proposed wells, Intrepid agreed that fuel, lubricants, motor oil, and possibly hydraulic oil and antifreeze could be on site. Intrepid indicated that it would address a spill with the use of absorbent pads located on the drilling rig.

Intrepid indicated that its drilling mud did not contain toxic materials and was land-sprayed in the area. Intrepid noted that in the event it lost circulation while drilling, it would use a lost circulation material consisting of ground fibre or walnut hulls.

Intrepid stated that it had not had problems cementing its other wells in the area. Intrepid did identify one well in the area that did not achieve full cement returns and noted that it conducted remedial cementing. Intrepid noted that the lack of full cement returns in that situation was due to a lost circulation additive not being added to the cement by a contractor. Intrepid stated that it had developed new procedures to ensure that these additives were used. Intrepid was confident that these changes would ensure that this problem would not happen again.

In response to the intervener's suggestion to run cement bond logs, Intrepid argued that they do not necessarily indicate a good hydraulic seal and could be misinterpreted. Intrepid stated that the best indicator of a good cement job would be cement returns at surface.

Intrepid acknowledged that should cement returns not be obtained on its surface or production casings, it would be required to contact the local EUB Field Centre before attempting any remedial operations and added that the EUB would require Intrepid to locate the cement top and prepare a suitable remedial plan.

With respect to completing the proposed wells, Intrepid stated that the actual depths to be perforated and fracture stimulated would not be decided until after the wells were drilled. Intrepid stated that the shallowest projected perforations would be at about 400 m, which would result in perforations greater than 300 m below the bottom of the deepest nearby water well. Intrepid argued that it would not expect its perforating or fracturing activities to pose any risk to the shallow aquifer.

Intrepid testified that fracturing fluid would be composed of water, methanol, and a gelate (guar gum). Intrepid's understanding was that the proposed fracture fluid components would not contain contaminants from an aquifer perspective and that no hazardous material would be used in its fracturing operations. Intrepid stated that it would use acidizing methods only if there was absolutely no response indicating that its initial perforations were open.

With respect to the potential for gas migration, Intrepid stated that the possibility of gas migration was very remote. Intrepid noted that it had never experienced any surface casing vent blows or gas migration around the outside of surface casing. Intrepid stated that methods were available to detect and remediate gas migration, should it occur. If a small amount of gas were released into the aquifer, Intrepid stated that the gas would rise to surface along the well casing, having no impact on the aquifer. Intrepid further noted that at the surface, gas migration could result in a small dead zone of vegetation immediately around the wellbore. Intrepid agreed that gas migration testing was something it could do periodically and that the results of gas migration testing could be passed on to the interveners.

In response to the recommendations in HCL, 2006, Intrepid noted that they failed to take into account that Intrepid would be predrilling through the shallow sand and gravel, setting a conductor casing, and cementing it into place to isolate the shallow aquifer.

Intrepid noted that it offered to test the Telfords' water well and two of the Christians' water wells before drilling in order to establish baseline data. Intrepid noted that it did not intend to test the Telfords' and Christians' water wells after drilling and completing the gas wells. Intrepid stated that the landowners should contact Alberta Environment (AENV) with any future concerns regarding their water and that AENV would be the appropriate agency to determine if additional testing were required. Intrepid believed that including AENV in this process would provide a third-party assessment of whether any impact to the water wells was due to drilling activity.

Intrepid rejected the recommendation by the Christians' hydrogeologist, Mr. Clissold, to drill and complete a recovery well and install two piezometers within the aquifer. Intrepid noted that in 2000 Mr. Clissold had prepared a report for Encal Energy Ltd., which was proposing to drill a well in LSD 10-13-36-2W5M using conductor casing. Intrepid noted that this report did not mention any requirements for recovery wells or piezometers and that Mr. Clissold concluded that the proposed operations by Encal would not have been detrimental to the groundwater under normal conditions. Intrepid argued that additional installations, such as recovery wells or piezometers, would create additional ground disturbance, possibly interfere with farm machinery, and provide additional unnecessary access and risk to the aquifer.

With respect to the recommendation to implement a full groundwater program before the hydrocarbon well was completed, Intrepid noted that it understood a full groundwater program to consist of the testing of water wells to establish baseline conditions.

Intrepid identified that the only chemical present during production at its wells would be a small amount of methanol to prevent freezing at the wellhead. Intrepid stated that its proposed wells at 5-18 and 13-18 would include a double-walled methanol tank as part of a closed system. Intrepid noted that there would be nothing underneath the tank but the skid unit itself. Intrepid argued that it would not be necessary to place a clay liner or berm around the tank, as there would be a small volume of methanol in a double-walled tank. Intrepid indicated that in the event of a small methanol spill, the methanol could vapourize and that in the event of the release of the full volume of methanol from the proposed tanks, the methanol would likely infiltrate into the ground.

Intrepid indicated that although it expected very little produced water, each proposed site would include an inlet separator on each of the skids and that any water that may drop out of the gas at separation would be stored in a tank. Intrepid indicated that it would empty its produced water tanks after the initial month of production and would not expect to see any water produced thereafter. Intrepid indicated that the tank would be monitored on a daily basis and drained if needed.

Intrepid did note that the quality of water produced depended on where the well perforations were and whether the water came from horizons found below or above the base of groundwater protection. Intrepid stated that if a spill of saline water occurred next to the tank, it would likely result in salt effects within the soil and that, depending on the volume of water released, it could affect the aquifer.

Intrepid indicated that it would comply with *Directive 044: Requirements for the Surveillance, Sampling, and Analysis of Water Production in Oil and Gas Wells Completed Above the Base of Groundwater Protection*, which requires that the water producing zone or zones be identified and segregated water samples taken. Intrepid recognized that it would not be able to commingle producing gas zones above and below the base of groundwater protection if its proposed wells were to produce more than 5 cubic metres per month of water.

With respect to the interveners' concerns about releases during access by oilfield trucks, Intrepid recognized that it would have a responsibility to ensure that its staff and contractors respected the aquifer's sensitivity. However, it noted that these concerns also applied to movement of other vehicles unrelated to Intrepid's proposed project, including farm equipment.

Intrepid agreed that groundwater in this area had the potential to be contaminated due to the shallow nature of the aquifer. In general, Intrepid noted that groundwater protection was a shared responsibility among all stakeholders, including the agricultural community. Intrepid stated that the agricultural sector should also be diligent in preventing pollutants, such as livestock waste, from entering this aquifer. Intrepid stated that it was sensitive to the need to protect this aquifer and that it was confident that its operations would pose very little risk to the aquifer. Intrepid further noted that it believed its proposed development virtually eliminated any risk to the aquifer.

6.1.2 Views of the Intervenors

The Christian family stated that it had been diligent in gaining an understanding of the aquifer underlying Section 18. The Christians presented evidence to show that the aquifer was present over an area of about 7 square kilometres and occupied most of Section 13-36-2W5M, the north

half of Section 12-36-2W5M, the west half of Section 18-36-1W5M, and the north half of Section 7-36-1W5. The Christians noted that the aquifer was hydraulically connected to the Red Deer and the Medicine Rivers and that flow was from the Red Deer River, across the aquifer, to the Medicine River. Thus any contaminants entering the shallow aquifer could discharge into the Medicine River. Mrs. Christian argued that source water protection meant the protection of a river and the sum of the parts that make up the aquifer. With respect to this area, Mrs. Christian argued that this would include the banks, beds, and shores of the Red Deer and Medicine Rivers, associated riparian areas, overflow channels above and below ground, and the large shallow sand and gravel aquifer.

The Christians noted that this aquifer cleaned and stored enough water to fill the downstream needs of the City of Red Deer residents for almost a year and was the only fresh water available to the area residents' local water wells. The Christians argued that the placement of gas wells, infrastructure, and pipelines created a significant elevated risk that residents should not have to face. The Christians further argued that this aquifer must be protected from activities that would adversely affect drinking water quality.

The Christians noted that they retained Komex International Ltd. in 1999 to prepare a report (Komex, 2000) on the aquifer. The report indicated that the estimated groundwater flow velocity beneath the Medicine Flats area was 100 to 500 m per year. The Christians identified that their water wells were located down gradient from the proposed well sites in 13-18 and 5-18. The Christians further submitted that Komex, 2000, concluded that with the high velocity of the groundwater flow, any release of petroleum hydrocarbons could significantly impact groundwater quality.

The Christians expressed concern about the potential for contamination of the aquifer during drilling and production of the proposed wells from substances such as diesel fuel, motor oils, hydraulic oil, antifreeze, and varsol. The Christians also expressed concerns about the potential for releases and spills during production and regular access by oilfield trucks.

Specifically, the Christians noted concern about the potential for lost circulation during cementing procedures. They noted that Intrepid had drilled 31 gas wells in the area and had experienced circulation loss on two occasions, resulting in a failure rate of 6.5 per cent. The Christians argued that this failure rate indicated that loss of circulation did not appear to be a rare event. The Christians were concerned that loss of circulation could occur in the 13-18 or 5-18 wells, resulting in negative impacts on the aquifer.

In addition, the Christians also expressed concern about the potential for gas migration outside of the casing of the proposed 5-18 and 13-18 wells, resulting in negative impacts on the aquifer and the land surface.

The Christians also stated concern about the potential for methanol and/or produced water to spill at the proposed 5-18 and 13-18 locations, resulting in impacts on the shallow aquifer. The Christians indicated that during production of the proposed wells, the facilities would include a methanol tank and a 27-barrel produced water tank. The Christians noted that the proposed methanol tanks would have no clay or protective liner underneath them to collect spills and that the produced water tanks would not be equipped with shutoff valves and could potentially overflow.

With respect to the auguring of a conductor hole, Mr. Christian noted that he had direct experience drilling a piezometer in the aquifer, which was extremely difficult due to sloughing in of the gravels. He said that a backhoe was eventually used to install the casing, which ended in a surface excavation probably 40 feet (12 m) wide for a well 16 inches (40 cm) in diameter. Mr. Christian further noted that the depth of the piezometer was shallower than the depth of Intrepid's proposed conductor barrel.

The Christians submitted that in a previous decision,¹ the EUB had expressed reservations about drilling wells in shallow aquifers.

Mr. Clissold, of HCL, prepared three reports with respect to Intrepid's proposed development on Section 18, including *Intrepid Energy Corporation Proposed 13-18-36-1W5M Hydrocarbon Well Groundwater Issues, Medicine River Flats Aquifer Northwest 18-36-1W5M*, October 2006 (specific to 13-18) and subsequent reports specific to the proposed 5-18 and 8-18 wells dated June 2007.

Mr. Clissold noted that the Christians' concerns included the potential loss and contamination of their groundwater supply as a result of Intrepid's proposed development on 5-18 and 13-18. Mr. Clissold's 8-18 report noted that the development proposed for 8-18 would be located outside of the boundary of the aquifer and that the concerns related to the groundwater issues at the proposed 5-18 and 13-18 locations did not exist for the proposed 8-18 location.

Mr. Clissold noted that this aquifer was unique and local. He considered how to handle risk management to generate a comfort level with respect to any kind of development. Mr. Clissold agreed that under normal conditions there would be no problem, but noted that he was also trying to anticipate abnormal conditions.

Mr. Clissold made four recommendations based on a risk assessment of impacts on the aquifer:

- Test water wells completed in the shallow aquifer down gradient from the proposed 13-18 and 5-18 wells before lease construction and then three months, one year, and three years after completion of the wells.
- Drill and complete a recovery water well and two piezometers in the shallow aquifer down gradient from the proposed wells.
- Conduct a noise log and implement a full groundwater program before well completion and take all remedial action necessary to prevent drainage of the shallow aquifer.
- Recover liquid and water-soluble solids spilled on the access road, lease, or pipeline rights-of-way immediately.

Mr. Clissold noted that additional groundwater quality and water-level monitoring through his recommendations would mean that the interveners would not have to worry about what the company was doing, since evidence from the groundwater monitoring could be collected.

¹ *Decision 2003-014: Petrovera Resources Limited Applications for a Primary Recovery Scheme and Well Licences, Lindbergh Sector, Cold Lake Oil Sands Area.*

With respect to Intrepid setting conductor barrels, Mr. Clissold agreed that a conductor pipe set through the shallow gravel would protect the aquifer.

Mr. Clissold suggested that after cementing was conducted, a noise survey could be conducted to identify any leakage behind the pipe. He noted that a noise log would be the best way of finding out if there were any water running behind the casing. Mr. Clissold pointed out that on rare occasions cement could actually not fill the entire annulus and that if this were to happen in the wrong location, the result could be a hydraulic connection and inter-aquifer exchange.

With respect to fracturing, Mr. Clissold agreed that hydraulic fracturing had little or no influence on water wells and was unlikely to pose a risk.

With respect to gas migration, Mr. Clissold agreed with Mr. Armstrong, Intrepid's hydrogeologist, that the gas would likely come to surface at the first opportunity if gas migration were to occur. Mr. Clissold also noted that the risk of contamination through gas migration would be greater in a well in a confined aquifer as opposed to an unconfined aquifer, as a result of the gas not being able to escape to the atmosphere.

Mr. Clissold noted that Dr. Mortensen's report stated that numerous wells had been drilled through this aquifer; however, Mr. Clissold concluded that geologic evidence proved that only one hydrocarbon well had been drilled through this specific aquifer.

Mr. Clissold noted that it may be prudent to maintain material safety data sheets and mass balance for every material brought onto the proposed sites; this would provide a means to keep track of what would be on site and its potential risk.

Mrs. Telford agreed that it may be true that oil and gas development activity would not generally affect groundwater under normal conditions and may not necessarily affect this aquifer. She stressed, though, that because this aquifer was unusually susceptible to accidental damage, the risk of damage was too great to permit drilling through it.

The Christians argued that water level measurements taken at the Telford water well indicated the water level was 1.28 m below the top of the casing and that the casing was 0.7 m above the ground surface; therefore, the water level would be about 0.6 m below ground surface.

6.1.3 Views of the Board

The Board concludes that Intrepid has not established that the proposed well locations are the most appropriate in the circumstances and therefore its applications as proposed must be denied. Given the Board's determination to deny Intrepid's application for the reasons cited in Section 5.3, it is not necessary for the Board to decide on the appropriateness of the measures proposed by Intrepid to mitigate the risks associated with drilling in an unconfined aquifer and floodplain. However, the Board does believe some comment is necessary based on some inadequacies of Intrepid's proposal.

Intrepid explained the additional measures it intends to take when drilling through the unconfined aquifer. Those measures included setting a liner, placing a conductor barrel within the lining, and then cementing the conductor barrel, the surface casing, and the production string. The Board accepts that if these measures are successfully implemented, the risks to the aquifer

associated with drilling the two wells could be effectively mitigated. However, the Board is unsure whether the steps proposed by Intrepid could reasonably be implemented at the proposed sites.

The Board notes Mr. Christian's evidence that it was necessary to use a backhoe to install a small piezometer in a similar environment. Mr. Christian stated that this operation resulted in considerable surface disturbance and an eventual surface hole with an approximate diameter of 12 m. While Mr. Christian did not indicate that his experience with significant disturbance resulted in any impacts on the aquifer, the Board notes that should Intrepid's efforts to install the liner and conductor barrel result in a larger surface hole, the potential mitigation could increase, rather than decrease, the environmental effects associated with drilling the well. The Board finds that Intrepid failed to demonstrate that it fully comprehended the nature of the proposed drilling environment.

6.2 Operation of the Wells in a Floodplain

6.2.1 Views of the Applicant

Specific to its applications, Intrepid noted that flooding would not be a major concern and that in a flood situation there would be no impact on any of the equipment on site. Intrepid also noted that high velocities of water running past its leases could result in movement of a meter skid off of its foundation, but would not impact the wellbore. Intrepid indicated that if a flood warning were issued for the Medicine River, it would likely shut in its wells and would not return until after the flood conditions had subsided.

Intrepid noted that AENV's Web-based map (Telus Geomatics) of the Medicine River floodplain indicated that all of the proposed well site locations would be outside of the flood area. Intrepid responded to the interveners' concerns regarding development on the floodplain by noting that in the unlikely event that the river overflowed its banks onto the well sites, there would be minimal impact on the surface facilities and no impact on the environment.

Intrepid noted that it could and would be willing to put concrete barriers around all the equipment and the wellheads. Further, to avoid impacts on the ground surface, Intrepid stated that it could develop minimal disturbance leases and noted that it would consider drilling when the ground was frozen or under dry conditions. Intrepid noted that it would not commit to drilling wells only when the ground was frozen but noted that if the ground were dry, there would be no risk of mixing or breaking through the surface. Intrepid stated that it would consider providing matting for the drill rig to sit on, but it would determine if mats were required based on the soil conditions at the time.

6.2.2 Views of the Interveners

The Christians expressed concerns that Intrepid proposed to drill the 13-18 and 5-18 wells within the Medicine Flats area, which was prone to flooding. The Christians pointed out that the Medicine Flats area was at the confluence of the Medicine River and Red Deer Rivers, was low in elevation, and was prone to flood events. The Christians stated that this floodplain area was not a suitable location for oil and gas development.

The Christians presented pictures of a flood event that occurred on May 8, 2007. They noted that the pictures showed the proposed 13-18 well site location with water surrounding it. In addition, the Christians presented pictures of Highway 54 under water. The highway runs east-west, south of the Christians' properties. The Christians identified that on May 8, 2007, Mr. Christian met with Intrepid on the Telford property to look at the floodwater levels. Mr. Christian noted that although the proposed well site location was not under water, the floodwater was noticeable both north and south of the proposed 13-18 location.

The Christians further submitted that the proposed 13-18 and 5-18 well sites had been under water or under flow of water at least twice in the last ten years and had been under "ponding" annually. The Christians stated that flood events in this area were becoming more frequent.

In addition to the flood events of 2007, the Christians identified flooding in the Medicine Flats area in 2005, which resulted in trenches cut through properties to a depth of 8 to 10 feet (2.4 to 3.0 m) and widths of 20, 30, and 40 feet (6, 9.1, and 12.2 m). Mr. Christian commented on the power of water, noting that he had picked spruce trees up off of his fields after they had moved across farm yards as though they were going down the river. In June 2005, the Christian families received flood evacuation notices and were ordered out of their homes.

Mrs. Christian indicated that the Christian family was on a disaster emergency list of the Red Deer County for high water and flood watches and noted that the Christians receive evacuation notices for Section 18 about every two years. She noted that they move their machinery and cattle to high land during evacuation events. Mrs. Christian also noted that J. Christian's property consisted of about 38 acres in the high land and that in a flood event this was where the Christians would go. Mrs. Christian stated that the Dickson Dam was built and operated to maintain adequate downstream flows, and although the operators recognize the immediate downstream flooding dangers and issue notices, they could do very little to stop severe floods. Mrs. Christian stated that flood events of great magnitude were not unusual in this floodplain.

Mrs. Christian pointed out that AENV was of the position that it would not compensate for flood-damaged development in these areas. Therefore, Mrs. Christian felt it was prudent for area residents to avoid adding more dangers, including those of oil and gas development.

The Christians submitted copies of flood maps obtained from Telus Geomatics that identify areas along the Medicine River as floodway, flood fringe, and flood overland. Mrs. Christian defined "floodway" as the area of the highest velocity flow of the river outside of its normal channel, "flood fringe" as an area outside of the normal river banks having less flow velocity but still having water movement, and "flood overland" as the overland rising of water without significant flow velocity. Mrs. Christian agreed that these terms may not be appropriate to apply to general floods but could be applied to specific flood events, as each flood event was different. She commented that these maps were not consistent with the events the Christian family was used to and had chronicled.

The Christians identified an ephemeral draw located on T. Christian's property in close proximity to the proposed 5-18 well site that was subject to water flow from the Medicine and Red Deer Rivers in time of flooding.

The Christians submitted a copy of an AENV memorandum dated August 21, 2002, which described a 1-in-100 year flood event and the potential for flooding of the Medicine Flats area.

The Christians noted that the memorandum clearly identified the Medicine Flats area as a floodplain and described that when the 1-in-100-year flood had subsided, the Medicine Flats area would look like a wasteland consisting of gravel channels, some timber debris, large gravel mounds, and large holes where gravel pits used to be.

The Christians argued that the EUB could ensure that Intrepid's proposed operations would not be interrupted by flooding in the future by requiring Intrepid to locate its wells outside of the low-lying aquifer and floodplain areas in Section 18. The Christians further noted that with reduced spacing, Intrepid would not need to drill the 5-18 and 13-18 wells in a shallow, unconfined aquifer within a flood area and could access its resources by directional or slant drilling from the safety of higher ground.

Mrs. Telford stated that she did not know how bad the flooding in the area had been. She noted that flooding had occurred in spring 2007 and described that water came up across the driveway and into their basement. Mrs. Telford stated that they now have a flood evacuation plan in place.

When asked if the proposed 13-18 well site location was under water during the flooding this year, Mrs. Telford stated that to her understanding the location was not under water, but she could not be sure. Mrs. Telford did note that water came up all around the Telford property, enough so that the Telfords could not access their driveway and that parts of the Telford field were under water.

Mrs. Telford noted that the flooding in 2005 was a result of the Red Deer River flooding, with water coming across the field. She said the 2007 flood was a result of the Medicine River flooding.

6.2.3 Views of the Board

The Board notes the interveners' concerns that the 13-18 and 5-18 well site locations are proposed within an area prone to frequent, regular flood events. This situation is exacerbated as these sites are near the confluence of the Red Deer and Medicine Rivers. The Board also recognizes the interveners' concerns regarding the frequency of flooding in the Medicine Flats area and agrees that Intrepid's proposed operations would likely be interrupted by flood events of varying intensity at the proposed locations.

The Board is specifically concerned with the potential for Section 18 to be impacted by a 1-in-100-year flood event. The Board recognizes AENV's description of a 1-in-100 year flood event in the Medicine River Flats area and notes that it is likely that flood discharges would pond north of Highway 54 and in many places the water depth would exceed 1 m. The Board recognizes the potential for flow of the Red Deer River to escape and augment the discharges of the Medicine River, which would increase its erosive ability. AENV notes that this change in discharge would erode and enlarge the lower 6.1 km portion of the Medicine River. The Board is of the view that the confluence of the Medicine River and the Red Deer River in this area increases the potential for impacts on the Medicine River Flats area.

Intrepid testified that its response to flooding in the area would be to shut in the wells and that it would consider constructing concrete barriers around the wells to protect them from flood-borne objects, such as trees. In the Board's view, Intrepid failed to appreciate the scope and extent of flooding that regularly occurs at the two sites. The Board is not convinced that Intrepid has taken

any steps to verify that the mitigation measures proposed would be effective in addressing the risks identified. The Board is further concerned that Intrepid has not identified how it would keep itself informed of flood conditions or specified the conditions under which the wells would be shut in. It is the Board's understanding, based upon the evidence of the Christians, that flooding in the area develops quickly, oftentimes with very little advance notice.

The Board also notes that Intrepid appeared to have little appreciation for the surface environment in which the proposed well would be drilled. For example, Intrepid proposed to use minimal disturbance leases for the three wells in Section 18. However, the interveners' evidence was that the area of the proposed 13-18 location is often under standing water due to its location over the unconfined aquifer and proximity to the Medicine and Red Deer Rivers. In the Board's view, a minimal disturbance lease is simply inappropriate in such an environment due to concerns regarding access and surface disturbance.

The Board notes that the interveners and the applicant recognize that surface spills will directly enter the shallow aquifer. The Board is of the view that double wall containment for methanol storage and the minimal potential for extensive amounts of produced water production indicate that Intrepid would be able to operate its proposed facilities safely in most circumstances. However, for a site situated over an unconfined shallow aquifer in an area where wet conditions occur frequently and flooding is a concern, the Board would expect applicants to consider additional mitigation in design of the well sites, such as a clay base, to ensure that spills do not reach the aquifer.

Given these two factors, the Board finds that there is significant risk associated with the drilling and operation of these two wells at the proposed locations. While the Board agrees with Intrepid and Mr. Clissold that practices and processes may be implemented to mitigate this risk, it finds that such steps should be contemplated only if no reasonable alternative location outside of the area of risk is available.

6.3 Noise and Visual Impacts

6.3.1 Views of the Applicant

With respect to the interveners' concerns about noise, Intrepid stated that noise levels during production operations at the proposed well sites would not be greater than the noise associated with farmers working their fields. Intrepid stated that it would comply with all EUB requirements regarding noise in *Directive 038: Noise Control*. It argued that its proposed booster compressors would be equipped with sound attenuation packages and designed to meet all regulatory requirements. Intrepid argued that with respect to the Christian and Telford residences, existing tree buffers near the homes would help to mitigate any sound.

Intrepid explained that if it received a noise complaint, noise measurements would be taken and Intrepid would determine what kind of rectification was required. Intrepid acknowledged that concerns had been expressed regarding noise levels at the 16-18 well site.

With respect to the Telfords' concerns regarding the potential for noise to affect their kennel operation, Intrepid stated that the current noise occurring throughout the area appeared to have had no adverse effects on the dogs. Intrepid noted that the Telfords mitigated the potential noise impacts of T. Christian's farming activities near the kennels by keeping the dogs inside or

providing additional attendant care to keep them calm. Intrepid further noted that its proposed construction operations would be short in duration and would not be located adjacent to the kennels.

Intrepid acknowledged that it had not consulted any experts or provided any information that would suggest that dogs were not bothered by compressor noise. Intrepid argued that no special noise abatement measures were required when it installed and started up compression at its existing 16-18 well site and that special measures may not be required at the proposed 13-18 well site. Intrepid committed to reimburse the Telfords for reasonable additional expenses they may incur and committed to providing additional attendant care for the dogs during drilling, completion, and tie-in operations at the proposed 13-18 well. Intrepid noted that it had provided additional attendant care for the dogs without incident during the time of its second survey of the proposed 13-18 location. It stated that it would do its best to minimize any disruption to the dogs' normal routine.

Intrepid acknowledged that the construction of the proposed well sites, access roads, and associated pipelines would involve heavy equipment and traffic. Intrepid noted that the construction equipment required for the proposed 13-18 and 5-18 well sites would travel on the Telfords' access road. With respect to the proposed 5-18 well site location, the traffic would travel onto the Telfords' driveway.

Intrepid stated that during drilling operations, motors would be running 24 hours a day for a period of 3 to 5 days. Specifically with respect to the proposed 13-18 well site, Intrepid stated that under normal conditions, it would be perforating the wellbore over a period of a single day and fracture stimulating the target formations the following day. This would be followed by flow for cleanup purposes and testing of the well, which could take 3 to 5 days.

Intrepid stated that in order to produce its 13-18 well, it would require two weeks' use of large cranes, bobcats, a flatbed truck, a tractor trailer, welding trucks, and crew vehicles; this equipment would also have to be moved to various locations along the proposed pipeline routes. Intrepid stated that it would attempt to minimize traffic and post speed limit signs on the access roads. Intrepid noted that to reduce traffic, it could use one crew vehicle instead of having crew members driving to the proposed sites individually.

Intrepid stated that once construction was complete, it would expect an operator to visit the sites once a day and agreed that the operator could park a distance from the proposed 13-18 well site and walk to the well to minimize visual disturbance for the dogs.

6.3.2 Views of the Interveners

The Christians noted that the residences of T. Christian and Mrs. and Mr. Christian were in low-lying areas in the south half of Section 18. The Christians stated that given the topography of the area, they were concerned that they would be bothered by noise from the compressors proposed for the 8-18 and 5-18 well sites.

Mrs. Telford stated that they specifically purchased the northwest quarter of Section 18 because it was an ideal location to operate dog kennels. She described her property as isolated, at the end of a dead-end road where potential external stressors to dogs could be controlled. Mrs. Telford argued that the location was chosen so that her kennel dogs would not be upset by continuous

traffic or passing disturbances and any noise made by the dogs would be unlikely to bother neighbours.

The Telfords noted that they had invested about \$75 000 to setting up their kennel business since purchasing the property. The Telfords stated that in order to operate the kennels, they had to obtain a permit from the County of Red Deer and had to get consent from neighbours who might be affected by noise from the dogs. Mrs. Telford expressed concerns regarding the potential of their neighbours being disturbed by noise from the dogs as a result of Intrepid's development creating stress. Mrs. Telford stated that her neighbours could withdraw their consent or complain, which could cause the County of Red Deer not to renew the Telfords' permit to operate the kennels.

Mrs. Telford said that the Telford kennels included a breeding operation. Mrs. Telford noted that they were also legally responsible for the well-being of dogs boarding at the kennels.

Mrs. Telford stated that when someone unknown would come to their property and they were not near the kennels, the dogs became distressed and overexcited. She further described that the dogs barked incessantly, jumped at the fences, and ran in and out of the kennel building. Mrs. Telford noted that noise from the dogs in this state could be deafening and that there was a significant potential for injury to the dogs or puppies. Mrs. Telford stated that the potential damage from this type of commotion was exemplified by what had occurred when Intrepid surveyed the proposed 13-18 location, when a puppy was killed and another dog injured.

The Telfords' expert witness, Dr. Heide, noted that dogs thrived on routine and stated that the proposed development could lead to increased stress on the dogs as a result of increased human activity, noise, traffic, and proximity of the proposed well and pipeline. Dr. Heide noted that dogs did not become accustomed to external stressors, which had the potential to lead to a number of serious outcomes. Dr. Heide stated that these impacts could significantly hinder the Telfords' ability to breed dogs successfully and could increase the risk that newborn puppies would be injured or killed, resulting in a marked loss of income for the Telfords.

Dr. Heide rated the potential stresses on the Telfords' dogs throughout Intrepid's proposed development, indicating that on a scale of 1 to 10 during construction phases, the stress level for high-stress dogs could be 8 to 9 and for lower-stress dogs 6 to 7. Dr. Heide identified the potential stress level during operations as 5 to 6, based on the commotion he had observed when he visited the Telfords' kennels.

With respect to impacts on dogs boarded at the kennels, Dr. Heide noted that Intrepid's operations would create added stress on dogs already under stress as a result of being left in the kennels. Dr. Heide stated that owners might be reluctant to leave their dogs at the kennels if the dogs were likely to be unduly stressed. Mrs. Telford further expressed concern that her clients may not wish to leave their pets at the kennels, which would result in a loss of income.

Mrs. Telford noted that Intrepid intended to use their road to access the proposed 5-18 well site. She stated that construction traffic on the Telfords' road would pass near the kennels.

Mrs. Telford stated that all of Intrepid's proposed construction and operational activities would be in direct visual, olfactory, and auditory range of the kennelled dogs.

The Telfords were of the view that it would not be effective for Intrepid to provide additional attendants for their dogs throughout the lengthy construction period. The Telfords noted that it would be entirely different for the dogs to tolerate a few individuals walking around the property for a few hours to conduct a survey than it would be for them to tolerate ongoing traffic and heavy construction noise continuously for a number of weeks. Both Dr. Heide and the Telfords expressed doubt that the presence of additional staff would minimize the impact of ongoing external stressors.

Dr. Heide stated that moving the proposed well sites farther from the Telfords' kennel operations could decrease the level of stress on the dogs during the initial phases. Mrs. Telford agreed that the farther away the wells could be located, the better the situation would be for the dogs.

The Telfords acknowledged that Intrepid had undertaken to be responsible for any damages that may result from its activities; however, Mrs. Telford stated that not all potential damage was quantifiable or financially compensable. Mrs. Telford further noted that Intrepid had not undertaken to be responsible in the event of the complete loss of their kennel business.

6.3.3 Views of the Board

The Board notes Intrepid's commitment to comply with *Directive 038* and appropriately respond to noise concerns. The Board observes that the proposed compressors are of relatively low horsepower and finds that with the measures proposed by Intrepid, it would be unlikely that noise associated with its compressors would be problematic at the Christians' residences.

The Board notes that the only evidence provided at the hearing with respect to the potential impact of Intrepid's proposed developments on the Telfords' kennel operation was presented by the interveners, who believed that several serious impacts could result. Therefore, given the evidence provided, the Board agrees that Intrepid's proposed development could result in serious impacts on the kennel and boarding operations.

Recognizing the Telfords' concern that there would be increased traffic and noise levels at their residence, the Board believes that steps could be taken to minimize the impacts through a careful examination of the best well site locations, pipeline and road routing, and timing of truck traffic.

Regarding the initial construction traffic and noise proposed for the 13-18 and 5-18 well site locations, the Board agrees that the Telfords' kennel operations would be impacted by construction noise and increased volumes of traffic passing their residence. The Board agrees with the Telfords that alternative sites may reduce the impacts of construction noise levels at the Telford kennels.

The Board notes that daily operational visits by Intrepid personnel, particularly if by walking to the proposed well sites, would not result in significant impacts on the kennels.

Given the concerns of the interveners regarding the impacts of traffic and noise, the Board expects Intrepid to work with the community in determining appropriate well site locations and mitigative measures. These measures could include methods for trucks accessing well sites to minimize truck noise and related impacts on area residents. However, the Board recognizes that traffic results not only from oil and gas industry activities, but also from other activities. In this

situation the Board notes that the Telford property is located on a dead-end road, which is currently subject to minimal unexpected traffic.

The Board is not convinced by Intrepid's evidence that it can effectively mitigate the impacts on the Telfords. It appears that Intrepid either did not fully understand the Telfords' concerns and its potential impacts on the Telfords' operations, or Intrepid did not take these concerns seriously.

7 CONCLUSIONS

The Board denies Applications No. 1491537, 1491541, 1493237, without prejudice to future applications to develop natural gas reserves under Section 18, Township, 36, Range 1, West of the 5th Meridian (Section 18). The Board also denies Applications No. 1462172, 1486686, 1486688, 1500670, 1507656, 1507707, and 1507722, as there is no need for these facilities without the gas well licences.

Should Intrepid consider wells, pipelines, or facilities with surface locations within Section 18, it should thoroughly investigate a range of potential locations, assess the relative impacts of alternatives, and develop appropriate measures to minimize environmental and landowner impacts, including on their business operations. Intrepid is also expected to implement an effective participant involvement program with landowners and should strongly consider initiating discussions with local landowner groups.

Dated in Calgary, Alberta, on October 30, 2007.

ALBERTA ENERGY AND UTILITIES BOARD

J. D. Dilay, P.Eng.
Presiding Member

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

W. G. Remmer, P.Eng.
Acting Board Member

APPENDIX 1 HEARING PARTICIPANTS

Principals and Representatives
 (Abbreviations used in report)

Witnesses

Intrepid Energy Corporation (Intrepid)
 H. R. Ward

J. D. Kay, P.Land
 B. W. Goruk, P.Eng.
 J. E. Armstrong, P.Eng., of
 Worley Parsons Komex
 F. Farkas, of
 Farkas Oil & Gas Ltd.

D. Christian
 G. Christian
 J. Christian
 T. Christian
 R. C. Secord

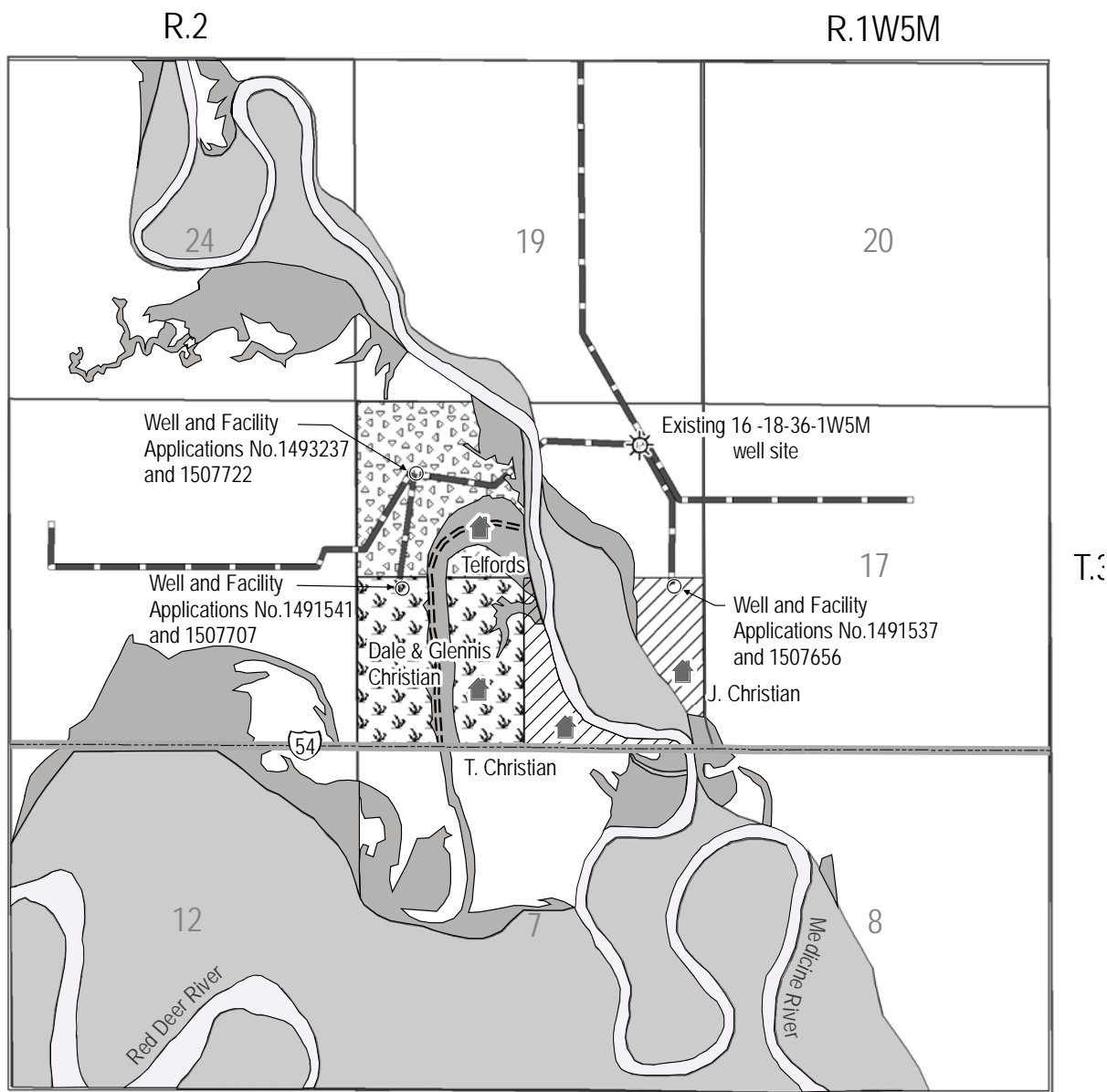
D. Christian
 G. Christian
 J. Christian
 T. Christian
 R. Clissold, P. Geol., of
 Hydrogeological Consultants Ltd.

J. Telford
 S. Telford
 D. H. Steblyk

J. R. Garden P.Eng., of
 Deadeye Engineering
 Dr. B. Heide, of
 Alberta Veterinary Centre
 S. Telford

J. Winter
 D. Rew

Alberta Energy and Utilities Board staff
 J. P. Mousseau, Board Counsel
 B. Austin, P.Geol.
 B. Curran
 M. Vandenberg
 D. Miles
 K. Clayton
 T. Novotny



Legend












- | | | | |
|---|----------------------|---|--------------------|
|  | J. Christian's lands |  | Proposed wells |
|  | T. Christian's lands |  | Existing well |
|  | Telfords' lands |  | Residences |
|  | Flood fringe |  | Ephemeral draw |
|  | Floodway |  | Proposed pipelines |
|  | River | | |

Figure 1. Map of proposed project and interveners' lands