



# **Bernum Petroleum Ltd.**

**Application for a Well Licence  
Cochrane Area**

**November 16, 2011**

**ENERGY RESOURCES CONSERVATION BOARD**

Decision 2011 ABERCB 033: Bernum Petroleum Ltd., Application for a Well Licence, Cochrane Area

November 16, 2011

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# ENERGY RESOURCES CONSERVATION BOARD

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Calgary Alberta

**BERNUM PETROLEUM LTD.  
APPLICATION FOR A WELL LICENCE  
COCHRANE AREA**

**2011 ABERCB 033  
Application No. 1674911**

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## DECISION

[1] Having carefully considered all of the evidence, the Energy Resources Conservation Board (ERCB/Board) hereby denies Application No. 1674911 without prejudice to future applications.

## INTRODUCTION

### Application

[2] Bernum Petroleum Ltd. (Bernum) applied in accordance with Section 2.020 of the *Oil and Gas Conservation Regulations* for a licence to drill a well from a surface location in Legal Subdivision (LSD) 1, Section 4, Township 26, Range 3, West of the 5th Meridian (1-4), to a projected bottomhole location in LSD 6-33-25-3W5M (6-33). The purpose of the well would be to obtain oil production from the Cardium Formation. The proposed well would be located about 4.5 kilometres (km) east of Cochrane. Figure 1 shows the proposed 1-4 surface location, alternative surface locations, mineral and surface rights ownership, and major features of the area.

### Interventions

[3] Timothy Bancroft and Frances Bancroft (Bancrofts), owners of the southeast quarter of Section 4-26-3W5M from which the surface location of the proposed well would be drilled, objected to the application. The Bancrofts also own the north half and southeast quarter of Section 34-25-3W5M (see Figure 1).

[4] The Board also heard concerns from the Meskanaw Road-Glendale Court Neighbourhood Residents Association (Meskanaw Group). The Board determined that the Meskanaw Group members were not people who may be directly and adversely affected by the Board's decision on the application. Notwithstanding, in accordance with its usual practice where a hearing will be held, the Board allowed this group to participate in the hearing in a limited fashion. Each family was given an opportunity to make a brief statement but not the option of cross-examining other parties, providing sworn testimony, or making final argument. The Meskanaw Group expressed concerns about noise, inadequate consultation, and effects both visually and on the environment, including those on wildlife.

### Hearing

[5] The Board held a public hearing in Calgary, Alberta, on August 30 and 31, 2011, before Board Members J. D. Dilay, P.Eng. (Presiding Member), R. C. McManus, M.E.Des., and A. H. Bolton, P.Geol. The Board considers the close of the record to be August 31, 2011. The Board

and staff travelled to the proposed 1-4 surface location on August 15, 2011, and the alternative proposed surface locations on August 24 and 29, 2011.

[6] Those who appeared at the hearing are listed in [Appendix 1](#).

## **ISSUES**

[7] The Board considers the issue respecting the application to be the surface location of the well.

[8] Regarding the need for the well, the Board notes that the interveners did not take a position. The Board notes that Bernum has the necessary mineral rights to access and develop oil and gas resources. The Board finds that a well is needed to confirm the presence of commercial hydrocarbons and potentially produce oil and gas. However, the Board must be satisfied that the well is in the public interest and that drilling and the effects of drilling from the proposed surface location are acceptable.

[9] In reaching the determinations contained in 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 to indicate that the Board did not consider all relevant portions of the record with respect to that matter.

## **EVIDENCE AND SUBMISSIONS REGARDING THE WELL LOCATION**

### **Background**

[10] Bernum stated that it first became involved in the proposed 6-33 well in November 2009 through discussions with Frac Energy Inc. (Frac). In 1987, Canadian Hunter Exploration Ltd. had drilled, logged, and tested a vertical well at LSD 6-33-25-3W5M (the existing abandoned 6-33 well) that tested oil from the Cardium Formation.

[11] Frac advised Bernum that it wanted to obtain the Freehold mineral rights for the west half and southeast quarter of Section 33-25-3W5M and that Enar Securities Ltd. (Enar) (the Freehold mineral owner) was prepared to grant a lease to those rights. Furthermore, the surface owner of LSD 8-33-25-3W5M (8-33) was willing to grant a surface lease at 8-33 for a well location.

[12] Bernum noted that there was some commonality in the ownership of the surface and the minerals and stated that the Harvey and Raymond families owned both mineral and surface rights.

[13] In mid-December 2009, Bernum and Frac reached a final partnership agreement, one in which Bernum would assume operational control of the proposed development. Bernum stated that on December 23, 2009, the surface owner of the 8-33 location advised Bernum that it was no longer willing to grant a surface lease for a well at 8-33 as it was concerned with potential future surface development opportunities that had been set out in the Bearspaw Community

Development Strategy (BCDS) draft land-use plan of October 2009. This plan envisioned that lands in the vicinity of Sections 33 and 34 would be developed as a “country crossroads” mixed-use centre for future, medium-density commercial and residential development.

[14] Enar communicated to Bernum that it was willing to grant Freehold mineral leases to Bernum on the condition that Bernum only drill its well from lands north of Highway 1A. Bernum indicated that during that period of negotiations, it continued to investigate potential alternative surface well site locations.

[15] On April 30, 2010, Bernum and Enar signed the Freehold mineral leases for the west half and southeast quarter of Section 33. Schedule A from Clause 2 (Clause 2A) of the leases states:

**RESTRICTIONS TO SURFACE DEVELOPMENT**

The Lessee [Bernum] agrees that, for the purposes of development of the said lands only, no surface development shall take place on lands located south of the surveyed right of ways of Provincial Highway 1A and north of the boundaries of the Bow River waterway, such lands which are owned by the following parties and their respective successors and assigns as of the date of this agreement:

Jenlin Holdings 2004 Ltd.  
Redtail Holdings 2004 Ltd.  
Glenbow Ranching 2004 Ltd.  
Timothy and/or Fran Bancroft  
Ralph Spanier and/or the estate of Walter Spanier

The Lessee also agrees that, for the purposes of development of the said lands only, no surface development shall take place within the established boundaries of the area known as Glenbow Ranch Provincial Park.

For all other surface landowners located within the restricted lands, the Lessee shall notify the Lessor of its intent to develop the said lands from a proposed location on the Restricted Lands and request consent from the Lessor, which may be unreasonably withheld, to proceed with obtaining the right to the surface development...

[16] Bernum stated that when the Freehold mineral leases were signed, the BCDS was an active planning document outlining future development for the area, including Section 33.<sup>1</sup>

**Alternative Location**

[17] The Bancrofts submitted that they were not aware of or involved in the Freehold mineral lease negotiations between Bernum and Enar, including discussions related to Clause 2A. The Bancrofts noted that if Bernum wished to seek a surface location on restricted lands south of Highway 1A (including lands owned by the Bancrofts), Clause 2A required that it seek Enar’s approval beforehand. The Bancrofts further submitted that Clause 2A effectively prevented Bernum from completing a thorough review of all potential surface locations south of Highway 1A.

[18] Bernum stated that before signing the mineral lease, it had already determined that it wanted to drill from north to south and that the 8-33 surface location proposed by Frac was not its preferred location.

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<sup>1</sup> This matter is addressed further in Section D7 of the BCDS on Land Use Planning.

[19] Bernum stated that its preference to drill from north to south and its desire to use the existing abandoned 6-33 well as a control point for the end of its well were the primary criteria for selecting what it believed to be the best technical location for the well north of Highway 1A.

[20] Bernum indicated that before acquiring mineral rights for the west half and southeast quarter of Section 33 on April 30, it was considering surface locations both south and north of Highway 1A to access minerals from Section 33 and, hopefully, acquire Crown mineral rights for Sections 29, 32, and 34. Bernum stated that it was looking at every surface option that would enable it to develop the various drilling spacing units (DSUs) from a surface location to minimize surface impact.

[21] Bernum indicated that in wanting to drill the DSUs in the west half of Section 33 from north to south and to enable the proposed well to access portions of the Cardium Formation south of the existing abandoned 6-33 well location, it considered two other possible surface locations: LSD 14-28-25-3W5M (14-28) directly south and LSD 3-4-26-3W5M (3-4) directly north. The 14-28 location was unacceptable to Bernum because it was within the Glenbow Ranch Provincial Park. The 3-4 location was unacceptable because it was located within the Meskanaw/Glendale acreage development.

[22] Bernum noted that it had originally proposed a surface location at LSD 2-4-26-3W5M (2-4). It subsequently proposed a different surface location at 1-4, the current surface location in its application, in response to concerns from the residents of the Meskanaw/Glendale acreage development.

[23] The Bancrofts retained Bissett Resource Consultants Ltd. (Bissett) to assess potential alternative surface locations from which a well could be successfully drilled and produced. Bissett examined a number of sites and identified two alternative locations south of Highway 1A, which Bissett submitted would meet Bernum's drilling requirements. Bissett proposed Alternative Location No. 1 at LSD 16-28-25-3W5M (16-28) and Alternative Location No. 2 at LSD 3-33-25-3W5M (3-33) (see Figure 1).

[24] Bernum stated that it preferred the proposed 1-4 surface location over the alternative surface locations identified by Bissett from a technical, economic, and environmental perspective. According to Bernum, the 1-4 surface location would allow it to drill from north to south to the desired subsurface bottomhole location at the existing abandoned 6-33 well, enable access to other DSUs, minimize environmental risks, and reduce development costs due to its proximity to existing and proposed infrastructure (i.e., roads, pipeline tie-in).

### **North-South Orientation**

[25] Bernum stated that it wanted to use the Cardium A in the existing abandoned 6-33 well as its end point for the drilling of the proposed 6-33 well from the 1-4 surface location because it was a known, identifiable target that had been logged and had produced oil on a drillstem test.

[26] Bernum said that it preferred drilling from north to south from a structural and completion standpoint to orient the wellbore and the fracture stimulation to optimize production.



[27] Bernum interpreted that the principal stress in the Lochend area was compressional and oriented from west to east. As a result, fractures induced by multistage fracture completions would open up in a west to east orientation perpendicular to the well path. This would maximize the volume of rock exposed to the higher permeability fracture and result in the best flow rate and production from the well. Bernum also provided evidence that the majority of commercially successful Cardium horizontal wells recently drilled in the Lochend area had been drilled from north to south.

[28] Bernum indicated that drilling directly from the north or the south would also allow it to drill a longer horizontal leg within the Section 33 Cardium DSUs.

[29] The Bancrofts agreed with the need to orient the wellbore from north to south but did not agree with the need to drill it from north to south.

### **North-South Drill Plan**

[30] Bernum stated that it wanted to drill north to south as the existing abandoned 6-33 well, acting as a known control point, would enable it to determine which direction to drill in if it lost contact with the Cardium Formation from faulting or other factors during drilling of the horizontal leg of the proposed 6-33 well.

[31] Bernum indicated that it was aware that Petrobakken Energy Ltd. had drilled a similar well about 6.5 to 8 km northeast of the 6-33 well that intersected a fault and lost the target zone.

[32] Bernum submitted that drilling from the north would also allow it to drill past the 6-33 bottomhole location if drilling were successful, resulting in a longer horizontal leg within the Cardium Formation, something that it could not do from the 16-28 or 3-33 surface locations.

[33] The Bancrofts acknowledged Bernum's preference to drill from north to south but argued that drilling from south to north was also suitable for drilling to the desired bottomhole target. The Bancrofts suggested that by drilling from the south, Bernum could use the existing abandoned 6-33 well as a known starting point from which to begin its horizontal section (heel point). The Bancrofts agreed, however, that there might be differing opinions among experts as to whether or not a solid control should be at the heel or end point of the horizontal section of the well and considered Bernum's preference to drill north to south to be a valid engineering point of view.

### **Access to Other DSUs**

[34] Bernum indicated that if the proposed 6-33 well were successful, it intended to drill additional wells into the east half of Section 33 and the west half of Section 34, for which it holds mineral rights. Bernum indicated that all of these potential wells could be drilled from the 1-4 surface location, thereby minimizing overall surface impact.

[35] According to Bernum, the 1-4 surface location would also be suitable for the development of Section 4-26-3W5 should it acquire the Crown mineral rights to this section.

[36] The Bancrofts suggested that the alternative surface locations evaluated by Bissett at 16-28

and 3-33 could also be used to access the east half of Section 33 and the west half of Section 34.

[37] Bernum agreed that Section 34 could be accessed from the alternative 16-28 surface location. As well, it indicated that with a longer reach and shorter horizontal leg, the oil targets in Section 33 could be accessed from surface locations at 16-28, 1-4, or 3-33. However, Bernum stated that it would not be able to access the minerals in Section 4-26-3W5M from either 16-28 or 3-33.

### **Access to the Surface Location**

[38] Bernum argued that the 1-4 surface location had good surface access as there was an existing high-grade gravel road east of the site. An undeveloped road allowance from the gravel road could be used for the remaining 250 metres. Furthermore, it had already received approval from the County of Rocky View to develop this access.

[39] The Bancrofts stated that existing gravel roads located on the Freehold mineral owners' surface lands could be used to provide access to 16-28 and 3-33. They asserted that using these roads would minimize the need to develop additional access to these alternative locations.

[40] Bernum stated that the surface owner was unlikely to grant Bernum permission to use the existing private roads to access Bissett's alternative locations. Bernum argued that the amount of road development required to access 16-28 and 3-33 would be significant. Bernum stated that the estimated cost to construct the access road to 16-28 would be about \$355 000. It was unsure of the costs to reach 3-33.

### **Pipeline Connection**

[41] Bernum stated that it preferred the 1-4 surface location because of its proximity to existing and planned oil and gas infrastructure north of Highway 1A. Bernum stated that NAL Energy Corporation (NAL) was a partner in the 6-33 well and that NAL proposed to construct a central battery and gathering system at Section 20-27-3W5M. Bernum indicated that to tie in a successful well located at the 1-4 surface location, it would need an 11 km pipeline from the 1-4 surface location to NAL's proposed central battery and gathering system, which would cost \$2.2 million.

[42] Bernum claimed that the surface owner was unlikely to give permission to develop a pipeline across its lands for 16-28 and 3-33. Furthermore, Bernum argued that if it could obtain approval to develop the pipeline across these lands to 16-28 or 3-33, it would increase the length of the pipeline by about 2 km. Bernum indicated that the additional length and the need to bore under Highway 1A would increase the construction cost of the pipeline tie-in by about \$575 000.

[43] The Bancrofts questioned whether a well at the 1-4 surface location would ever be tied into a pipeline system due to the cost of the pipeline and the difficulty of routing the pipeline through a country residential area.

### **Environmental Risks and Constraints**

[44] Bernum argued that it preferred the 1-4 surface location over the 16-28 and 3-33 surface locations because it was farther away from the steep slopes and draws along the Bow River and

that this distance would virtually eliminate the potential effects on the Bow River in the event of a release from the well. Bernum stated that the alternative locations would require additional safeguards such as berms and that this would affect the economics of the project.

[45] Bernum stated that 16-28 and 3-33 were closer to the Bow River and the escarpment which made them more environmentally sensitive than the 1-4 surface location. Bernum indicated that the Bow River valley was inhabited by ungulates and raptors and that the County of Rocky View had specific areas of concerns outlined in its land-use bylaws.

[46] Bernum stated that the alternative locations were also close to Glenbow Ranch Provincial Park and this might result in potential restrictions on Bernum's ability to access and produce from the locations. Bernum also suggested that it might be required to provide additional studies and complete more comprehensive environmental assessments on these locations.

[47] Bernum stated that if it were to use either of the alternative sites, its insurance provider would consider this a high-risk environmental site. Bernum indicated that the cost of the insurance premiums would increase by \$10 000 and that the deductible would increase from \$50 000 to \$250 000, making the alternative sites less desirable.

[48] The Bancrofts argued that well sites are often constructed near bodies of water or steep slopes and that the alternative 16-28 and 3-33 surface locations meet ERCB setback requirements. They stated that well site berming and other precautions such as measures to block existing culvert drainage along the railway could effectively address the risk of spilled oil reaching the Bow River. The Bancrofts also questioned if the additional costs of the berms, other safeguards, and insurance were significant when compared to the overall costs of the project.

### **Land-Use Planning**

[49] Bernum stated that when the Freehold mineral lease was signed in April 2010, the BCDS was an active planning document being developed by the MD of Rockview to guide future development in the area. The BCDS proposed the development of a medium-density commercial and residential area south of Highway 1A. Bernum stated that the BCDS was "in play" when it was negotiating the minerals agreement with Enar and that Bernum had relied upon the BCDS document in making its decision to look for potential surface locations north of Highway 1A. Bernum acknowledged that the BCDS planning process was suspended indefinitely in spring 2011.

[50] The Bancrofts stated that the County of Rocky View was no longer pursuing or considering the BCDS and that the BCDS was of no consequence. The Bancrofts stated that the Bearspaw Area Structure Plan (BASP) was the existing planning document in effect. The Bancrofts noted that the BASP designated areas north of Highway 1A, including the area of the proposed 1-4 surface location, as country residential and areas south of Highway 1A as agricultural. As such, the Bancrofts submitted that the County of Rocky View deemed the lands in the vicinity of the 1-4 surface location as having higher development potential than the alternative locations.

[51] Bernum acknowledged that although the BASP designates the southeast quarter of Section 4-26-3W5M as country residential, these lands fall within development priority area 3,

suggesting a lower priority for development than lands that fall within development priority areas 1 or 2.

[52] Bernum indicated that it had considered the proposed developments laid out in the BCDS and had chosen a location that it judged was consistent with future development plans while still respecting its needs to drill from north to south.

[53] The Bancrofts indicated that they had no immediate plans to develop the southeast quarter of Section 4-26-3W5M and planned to continue farming it. However, they did note that the zoning of the lands allowed for future development and that they did not want to hinder their children from developing the lands in future.

[54] Bernum argued that with respect to the social aspects of the proposal, the Bancrofts did not live near the 1-4 surface location or farm the land. It also noted that the 1-4 surface location was farther from existing residences than either of the 16-28 or 3-33 surface locations.

### **Property Values**

[55] The Bancrofts argued that the 1-4 surface location would impede future residential development and therefore reduce the value of their property.

[56] Bernum noted that studies on the effect of oil and gas development on property values have been inconclusive.

### **Freehold Mineral Leases and Surface Rights**

[57] The Bancrofts noted that a group of related persons or companies owned both the mineral and surface rights in the west half and southeast quarter of Section 33 and that this situation is not very common. In Alberta, the Freehold mineral and surface owners are usually different, with the Crown owning the mineral rights in most cases.

[58] The Bancrofts stated that they did not participate in or were informed of negotiations between Enar and Bernum to establish conditions in Clause 2A of the Freehold mineral lease. The Bancrofts objected to Enar dictating that the facilities be placed on its neighbours' lands rather than on its own lands.

[59] The Bancrofts' view was that it was unfair that they would bear the burden of mineral production while the party owning both the mineral and surface rights would receive all of the benefit. The Bancrofts argued that the Board must address this inequity as required by its public interest mandate.

[60] The Bancrofts submitted that in exercising its public interest mandate, the Board must consider all of the social, economic, and environmental considerations of the proposal with fairness. The Bancrofts contended that while they were not a party to the agreement between Enar and Bernum, this agreement resulted in their bearing the burden of the effects of the surface location on their lands.

## FINDINGS

[61] The Board accepts that there is some common ownership of the minerals rights and the surface in the west half and southeast quarter of Section 33.

[62] The Board notes that Enar was initially prepared to lease its mineral rights and that the surface owner was prepared to allow a surface location at 8-33. However, upon learning about the possibility of surface development related to the BCDS, including a potential commercial development node (Glenbow Crossroads) near the base of Lochend Road, it was no longer willing to allow wells and related development on the surface of its land and other nearby land.

[63] The Board also notes that Bernum and the Bancrofts agreed that the BCDS was a draft planning document that was never put into effect.

[64] The Board accepts that a well accessing the oil DSUs in the west half of Section 33 must be drilled horizontally through the Cardium Formation and that drilling north to south is required to achieve optimal, economic recovery.

[65] The Board accepts Bernum's preference to drill from north to south with the 6-33 control point at the end of the well and that this may reduce the technical risks associated with the well. The Board also acknowledges that drilling from north to south gives Bernum the option of continuing the well to the southern boundary of Section 33. However, the Board is not convinced that the well cannot also be drilled from south to north. The Board notes that it did not receive detailed technical evidence on this matter. The Board is not convinced that the evidence presented to support Bernum's preference to drill from north to south sufficiently overrides other considerations in assessing alternative locations from which the well could be drilled.

[66] The Board finds that in addition to accessing the 6-33 bottomhole location in the west half of Section 33, minerals in the east half of Section 33 and west half of Section 34 could potentially be accessed from a surface location south of Highway 1A.

[67] With respect to site access, the Board recognizes that Bernum has the required approval from the County of Rocky View to access the 1-4 surface location. This would allow Bernum to use the existing high-grade gravel road north of Highway 1A on the east side of Section 33 and construct a new access road west from the gravel road on the undeveloped road allowance to reach the 1-4 surface location.

[68] With respect to the possible surface development in the area south of Highway 1A, the Board notes that the BSDS has been dormant for some time and that the future status of the BSDS and any associated development are not certain. The Board agrees with Bernum and the Bancrofts that the BASP is the relevant municipal planning document guiding development for this area. Accordingly, the Board does not consider the BSDS to be a factor in locating a well south of Highway 1A. In addition, it is not clear from the evidence that the kind of development proposed in the dormant strategy and oil and gas activity are incompatible.

[69] The two alternative locations presented by the Bancrofts suggest that viable locations south of Highway 1A may exist. The Board agrees that because the 1-4 surface location is farther from the valley breaks and draws of the Bow River, the risk to the Bow River from a well release is

virtually eliminated. However, the Board believes that the valley breaks and presence of the Bow River south of Highway 1A are not insurmountable risks; they can be addressed by dikes and other mitigative measures. The Board notes that it is not uncommon for well sites to be located near steep slopes or water bodies and still meet ERCB requirements. In addition, there was evidence that locations to the south of Highway 1A could be set back farther from the valley breaks and the draws than the ERCB's 100-metre requirement.

[70] With respect to Bernum's concern that there might be additional requirements related to the proximity of the Glenbow Ranch Provincial Park, the Board notes that Bernum did not present any evidence indicating this.

[71] The Board was not presented with evidence showing that the proposed development would affect property values, regardless of whether it was north or south of Highway 1A. In addition, the Board notes that it was not presented with any evidence indicating that drilling would prevent future development of lands for commercial or residential purposes.

[72] The Board notes the unique nature of this situation where the surface and Freehold mineral rights in the west half and southeast quarter of Section 33 are owned by the same party.

[73] The Board notes that the economic benefits of the proposed development would accrue primarily to the Freehold mineral owners and to Bernum. In addition, the Board recognizes that the Freehold mineral owners may choose not to lease the rights to Bernum without restricting surface development south of Highway 1A.

[74] Further, the Board is unclear as to the extent Bernum considered alternative locations south of Highway 1A given the inclusion of Clause 2A in the mineral lease agreement. The Board believes that it is very important for the applicant to assess alternative locations and to present analyses of the social, economic, and environmental factors that led it to determine its preferred option, especially where there are objections to a proposed location. The Board is not satisfied with the level of analysis presented by the applicant in this case. The Board particularly notes the applicant's lack of evidence in assessing alternative locations, before receiving the Bissett report.

[75] The Board recognizes that there are some challenges to locating a well site south of Highway 1A. However, the Board is not satisfied, on the basis of the evidence provided, that there is not a viable location south of Highway 1A from which a well or wells could be drilled to access the Cardium Formation in the west half of Section 33.

[76] Accordingly, the Board is not prepared to grant the application having regard to the evidence. The Board denies the application without prejudice to future applications.

Dated in Calgary, Alberta, on November 16, 2011.

**ENERGY RESOURCES CONSERVATION BOARD**

*<original signed by>*

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

*<original signed by>*

R. C. McManus  
Board Member

*<original signed by>*

A. Bolton, P.Geol.  
Board Member

## APPENDIX 1 HEARING PARTICIPANTS

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### Principals and Representatives

Bernum Petroleum Ltd. (Bernum)  
M. B. Niven, Q.C.

T. and F. Bancroft  
J. Laycraft, Q.C.  
C. Simmons

Meskanaw Group  
S. R. Eaton, P.Geol., P.Geoph., of  
Apex Energy Consultants Inc.  
D. MacLellan, P.Eng., of  
Apex Energy Consultants Inc.

Energy Resources Conservation Board staff  
R. J. Mueller, Board Counsel  
R. Reid  
M. Gonie  
E. Tom  
C. Tamblyn  
A. Mahmood  
J. Zwarich, P.Geol.  
P. Gigantelli, P.Geol.  
R. Lougheed

### Witnesses

M. Ponto  
D. Stewart, P.Geoph.  
B. Brausen, P.Eng.  
R. Telford  
R. Hall

T. Bancroft  
K. R. Bissett, of  
Bissett Resource Consultants Ltd.

B. Motoc  
R. Lucko  
O. Miskiwi  
D. MacLellan



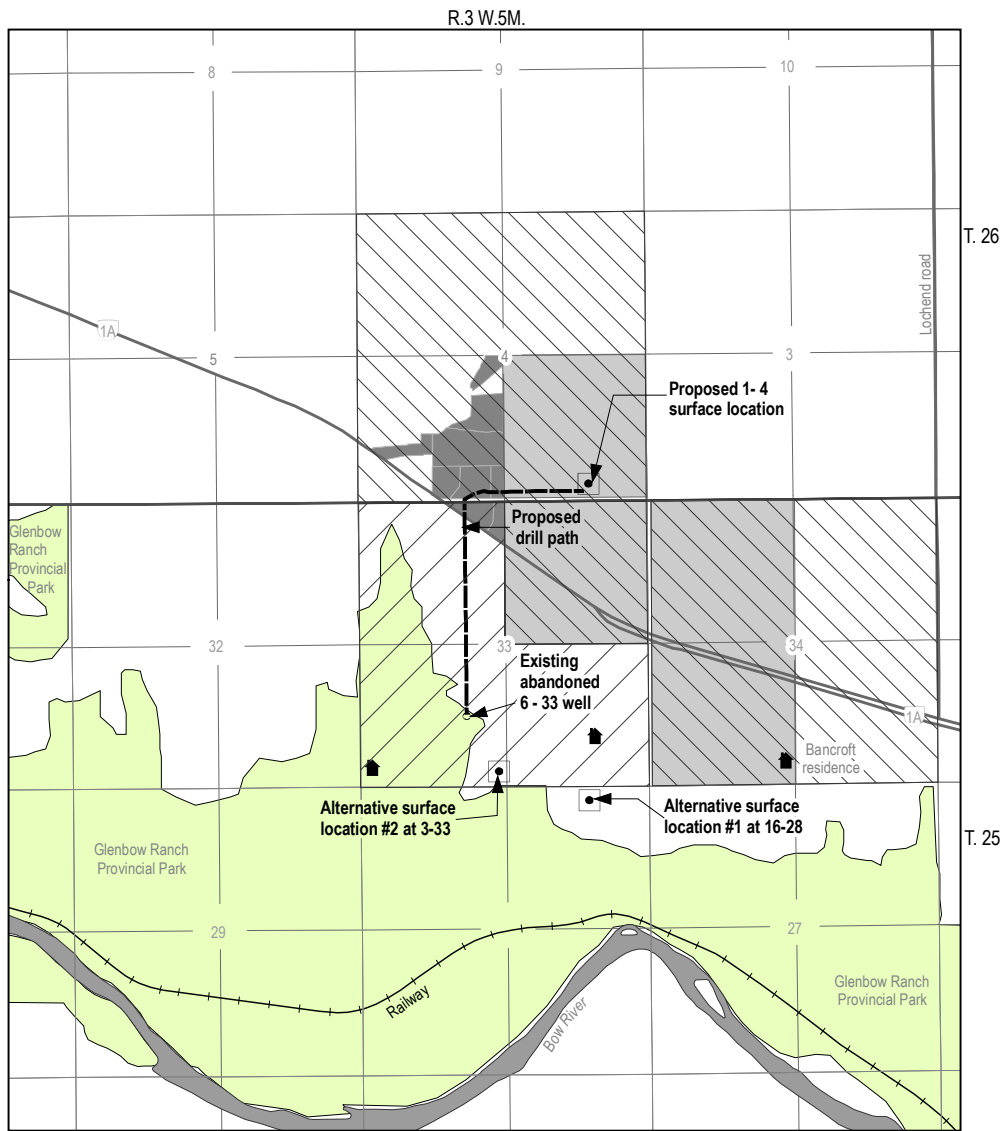


Figure 1. Location of proposed well site, alternative sites, and major features of the area.