



Sunshine Oilsands Ltd. and Total E&P Canada Ltd.

Applications for Interim Shut-in of Gas
Liege Field
Athabasca Oil Sands Area

October 15, 2009

ENERGY RESOURCES CONSERVATION BOARD

Decision 2009-061: Sunshine Oilsands Ltd. and Total E&P Canada Ltd., Applications for Interim Shut-in of Gas, Liege Field, Athabasca Oil Sands Area

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ENERGY RESOURCES CONSERVATION BOARD

Calgary Alberta

**SUNSHINE OILSANDS LTD.
TOTAL E&P CANADA LTD.
APPLICATIONS FOR INTERIM SHUT-IN OF GAS
LIEGE FIELD
ATHABASCA OIL SANDS AREA**

**Decision 2009-061
Applications No. 1613543 and 1616123**

1 INTERIM DECISION

Having considered the evidence submitted to the interim hearing, the Energy Resources Conservation Board (ERCB/Board) concludes that production of gas from 228 intervals in 158 wells may present a significant risk to future bitumen recovery, pending the outcome of the full hearing of the applications. Accordingly, the Board grants the applications by Sunshine Oilsands Ltd. (Sunshine) and Total E&P Canada Ltd. (Total) for the interim shut-in of gas production from the intervals specified by Sunshine and Total. The Board also decides to shut in gas on an interim basis from 51 additional intervals in the Liege Wabiskaw A Pool, 15 additional intervals in the Liege Leduc A Pool, 2 additional intervals in the Liege Wabiskaw O Pool, and 1 additional interval in the Liege Wabiskaw M Pool, as discussed in Section 5.5 of this report. Specifically, the Board will order the interim shut-in of gas production effective October 31, 2009, from the intervals listed in Appendix 1. Production from these intervals shall remain shut in pending the Board's final decision regarding Applications No. 1613543 and 1616123. An order requiring the interim shut-in of gas production will be issued shortly.

In overlapping gas pools where one pool is required to be shut in and another is not, there must be segregation between the pools in all wellbores or both pools must be shut in. Zonal segregation tests must be conducted and submitted to the ERCB in accordance with Section 11.150(1) and (2) of the *Oil and Gas Conservation Regulations* to confirm that segregation has been established between a pool that is required to be shut in and a pool that is not.

Because this is an interim proceeding, the Board did not have the benefit of the entirety of the evidence and argument that will ultimately be made available, nor was the Board in a position to assess the merits based on the totality of evidence. Accordingly, this interim decision should not be considered as conclusive or permanent with regard to the issues to be addressed at the full hearing.

2 INTRODUCTION

2.1 Applications and Interventions

On May 7, 2009, Sunshine applied for the permanent shut-in of natural gas production from specific intervals in 104 wells in the northern part of the Athabasca Oil Sands Area (main application). On the same date, Sunshine also applied for the interim shut-in of the same intervals because, in its view, ongoing gas production had resulted in the reservoir pressure declining at a rate that placed the bitumen at risk of sterilization prior to the Board's decision on

its main application. On September 25, 2009, Sunshine requested the interim and permanent shut-in of gas production from three additional intervals, of which two are in additional wells.

On May 21, 2009, Total applied to have the perforated interval in the well located in Legal Subdivision (LSD) 6, Section 4, Township 94, Range 17, West of the 4th Meridian (6-4 well) included within Sunshine's region of influence (ROI),¹ and it further applied for the interim shut-in of the 6-4 well.

Athabasca Oil Sands Corp. (AOSC) and Grizzly Oilsands ULC, owners of oil sands leases within Sunshine's ROI, filed submissions supporting Sunshine's application.

Canadian Natural Resources Limited (CNRL) and its working interest partner Japan Canada Oil Sands Limited, licensee of 25 of the affected gas wells, objected to Sunshine's application. Paramount Energy Operating Corp. (Paramount), licensee of 69 of the affected gas wells, objected to both Sunshine's and Total's applications. EnCana Oil and Gas Ltd. (EnCana), licensee of 13 of the gas wells affected by Sunshine's application, provided a letter stating that it did not have any submissions to make.

Considering the state of pressure depletion in the area and the ongoing gas production, the Board decided to hold a written hearing on the interim shut-in requests, followed by a full hearing.

2.2 Written Hearing

At a prehearing meeting conducted by the Board counsel, the parties agreed to have the interim shut-in applications considered at a written hearing. The written hearing was conducted by Board Member J. D. Dilay, P.Eng. (Presiding Member), Vice-Chairman B. T. McManus, Q.C., and Acting Board Member R. J. Willard, P.Eng. On July 20, 2009, the Board issued a notice of written hearing for the applications by Sunshine and Total. Those who participated in the written hearing are listed in Appendix 2.

3 TEST FOR INTERIM SHUT-IN OF GAS

The Board has previously dealt with requests for the interim shut-in of gas in the Athabasca Oil Sands Area. The Board addressed the matter of the appropriate test to be used for an interim shut-in application in *Decision 2001-063*.² The Board stated that while the tripartite test used in civil litigation may offer some general guidance for the Board, its strict application does not provide the appropriate basis upon which an interim shut-in application should be considered. The Board further stated that an interim shut-in application does not require the Board to conduct an analysis of the balance of convenience between the parties, nor does it require irreparable harm to be established conclusively. The Board's focus is on the potential for significant waste of bitumen resources during the period required to consider the main application.

In its submission, CNRL stated that while the Board has previously ruled that interim shut-ins are not the place for detailed debate, there must be sufficient evidence to conclude that there is

¹ Sunshine's ROI was defined by its interpretation of the zero edges of the gas accumulation isopachs and the zero edge of the lean bitumen zone isopach.

² *Decision 2001-063: Petro-Canada Oil and Gas Ltd., Interim Shut-in of Gas Production, Chard Area, August 2, 2001.*

commercially recoverable bitumen. In the Board's view, the appropriate consideration is whether the bitumen is potentially recoverable, not commercially recoverable. Paramount submitted that the Board should not use the broad power afforded by Section 3(5) of the *Oil Sands Conservation Regulation (OSCR)* in this case, since the Alberta Energy and Utilities Board (EUB; predecessor to the ERCB) Regional Geological Study³ (RGS) determined that Wabiskaw units in the northern study area do not contain potentially recoverable bitumen. The Board disagrees with this interpretation. In the Board's view, the RGS mapped bitumen deposits but it did not determine whether bitumen was potentially recoverable.

4 ISSUES

The Board considers the issues for the two interim shut-in applications to be

- communication between the gas and bitumen intervals,
- potential recoverability of the bitumen,
- effect of gas production on bitumen recovery by steam-assisted gravity drainage (SAGD),
- urgency for interim shut-in of gas, and
- need to shut in additional intervals.

5 VIEWS OF THE BOARD

Because of the interim nature of the applications and the need to issue a timely decision, this report contains only the views of the Board and not the views of the hearing participants, as is the Board's normal practice.

In addition to reviewing the evidence provided by the parties, the Board has considered the RGS in developing its views. The subject wells are located in the northern area that the RGS dealt with. The Board notes that Sunshine, AOSC, CNRL, and Paramount cited the RGS and that Sunshine and CNRL indicated they had updated the RGS mapping with data from wells that had been drilled after the RGS was completed.

5.1 Communication Between the Gas and Bitumen Intervals

According to the stratigraphic model for the northern study area in the RGS, the sand units consist of, from bottom to top, the McMurray, Wabiskaw D, Wabiskaw C, and Wabiskaw A, while the shale units consist of the Wabiskaw D, Wabiskaw C, and Wabiskaw A. Of the gas intervals requested for shut-in, 126 are within the ERCB's Liege Wabiskaw O Pool (O Pool), 13 are within the Liege Wabiskaw A Pool (Wabiskaw A Pool), 3 are within the Liege Leduc A Pool (Leduc A Pool), and the remaining 17 are within the following smaller pools: Liege Wabiskaw M, P, S, T, Z, AA, Liege McMurray V, W, Liege Undefined 051 and 059, and six wells that have not yet been designated as pools by the ERCB.

With respect to the gas intervals within the O Pool that were requested to be shut in, the Board notes that while there were some differences in the mapping of the gas, bitumen, and shales by

³ EUB Report 2003-A: Athabasca Wabiskaw-McMurray Regional Geological Study, December 31, 2003.

Sunshine, CNRL, and the RGS, all the mapping indicates the gas is in communication with bitumen. Hence, the Board concludes that there is communication between the gas in the O Pool and the underlying bitumen.

With respect to the gas intervals within the Wabiskaw A Pool that were requested to be shut in, Sunshine and AOSC submitted that the gas in the Wabiskaw A Sand is in communication with the bitumen in the Wabiskaw A Sand. The Board notes that this is consistent with the RGS. While CNRL indicated that the gas in the Wabiskaw A Sand is not in communication with the bitumen in the Wabiskaw C and D sands, it appears to the Board that CNRL did not address the issue of whether the gas in the Wabiskaw A Sand is in communication with the bitumen in the Wabiskaw A Sand. Since the gas and bitumen are in the same stratigraphic sand unit, the Board concludes that there is communication between the gas in the Wabiskaw A Pool and the bitumen in the Wabiskaw A Sand.

With respect to the gas intervals within the Leduc A Pool that were requested to be shut in, the Board notes that little information was provided in the submissions. However, Figure 37 of the RGS shows that there is a Paleozoic high and Figure 45 indicates that there is no McMurray deposition in the area of the Leduc A Pool. This is consistent with the mapping by Sunshine and CNRL. The lack of McMurray sands and shales and the lack of Wabiskaw C and D shales result in the Wabiskaw sands of the O Pool being deposited directly on the carbonates of the Leduc A Pool. The Board therefore concludes that there is communication between the gas in the Leduc A Pool and the gas in the overlying O Pool, which is in communication with Wabiskaw bitumen.

With respect to the gas intervals in the smaller gas pools that were requested to be shut in, the Board notes the following:

- For the Liege Wabiskaw M, P, S, AA, undefined 051, and undesignated pools in LSD 10-20-93-17W4M, 6-26-95-17W4M, and 6-35-95-17W4M, the mapping by Sunshine, CNRL, and the RGS indicates that there are no Wabiskaw shales separating the gas from the bitumen. Therefore, the Board concludes that there is communication between the gas and bitumen.
- For the Liege Wabiskaw T Pool, there are differences in the mapping of the gas and shales by Sunshine, CNRL, and the RGS. The Board's review of the well log indicates that it is questionable whether the shale separating the gas and bitumen satisfies the typical log characteristics of the Wabiskaw A Shale as indicated in the RGS. Therefore, the Board considers that the gas is in communication with the bitumen for the purpose of the interim decision.
- For the Liege Wabiskaw Z Pool, while the parties have different interpretations whether the Wabiskaw C Shale is present, none of the parties interprets the Wabiskaw A Shale to be present. Therefore, the Board concludes that the gas is in communication with the bitumen above the Wabiskaw C Shale.
- For the Liege McMurray V and W pools, CNRL and the RGS interpret that there are no Wabiskaw C or D shales, while Sunshine interprets there to be a Basal Wabiskaw mudstone. However, the logs indicate that it is questionable whether the mudstone satisfies the typical log characteristics of a Wabiskaw shale as indicated in the RGS. As a result, the Board considers that the gas is in communication with bitumen.

- For the Liege Wabiskaw undefined 059 Pool, Sunshine interprets there to be no Wabiskaw A Shale, while CNRL interprets a Wabiskaw A Shale to be present in the well. However, the well is not within CNRL's zero edge for the Wabiskaw A Shale. For the interim decision, the Board considers the gas to be associated with bitumen.
- For the undesignated pool in LSD 6-14-95-18W4M, the mapping by Sunshine, CNRL, and the RGS indicates that the pool should be part of the O Pool. For the undesignated pool in LSD 6-11-93-18W4M, Sunshine's mapping indicates that the pool should be part of the O Pool, but CNRL and the RGS did not pool the gas. The Board's review of the well log indicates that Sunshine's mapping is reasonable. The Board concludes that these two pools should be pooled with the O Pool, which, as discussed above, the Board concludes is in communication with bitumen.

The Board notes that there was disagreement among the parties on whether solution gas has been and continues to be produced by the gas wells. While this would be another factor to consider in determining whether there is communication between the gas and bitumen intervals, the Board's view is that determining whether solution gas has been produced by the gas wells is a complicated matter, because there are several gas pools involved and there has been commingled production from the pools. The Board believes this matter should be considered further at the full hearing.

5.2 Potential Recoverability of the Bitumen

Sunshine provided an isopach map of continuous Wabiskaw bitumen. Based on a comparison of bitumen pay values shown on the isopach map with pay values indicated on several well logs, it appears that Sunshine's isopach map does not include the bitumen in the Wabiskaw A Sand. CNRL provided separate net bitumen isopach maps for the Wabiskaw C and D sands, but its isopach map for the Wabiskaw C Shale indicates that within Sunshine's ROI there are no laterally continuous shales separating the bitumen in the Wabiskaw C and D sands. AOSC provided a map showing the area that it interprets to have bitumen in the Wabiskaw A Sand with a net pay greater than 10 metres (m).

CNRL pointed out that in *Decision 2005-122*,⁴ the Board allowed gas production in the Tar-Ells area (in RGS's northern study area) where the average thickness of Wabiskaw bitumen pay is less than 15 m and a regionally correlatable mudstone separates the Wabiskaw from the underlying McMurray. Sunshine and AOSC used a 10 m bitumen thickness when they referred to recoverable bitumen. Furthermore, AOSC stated that subsequent to the EUB Staff Submission Group (SSG) report⁵ issued in January 2004, oil sands companies are currently including recoverable resources in bitumen accumulations of 10 m and in some cases less than 10 m because of improved technology. This statement by AOSC is consistent with the Board's conclusion in *Decision 2005-122* that the expanded definition of potentially recoverable bitumen proposed by the SSG should be part of the Board's consideration in determining potentially recoverable bitumen. The expanded definition is:

⁴ *Decision 2005-122 Addendum: Phase 3 Final Proceeding Under Bitumen Conservation Requirements in the Athabasca Wabiskaw-McMurray*, December 21, 2005.

⁵ *Staff Submission Group Recommendations for Production Status of Gas Wells, Athabasca Wabiskaw-McMurray*, January 26, 2004. The SSG was a group of EUB staff members who participated in the bitumen conservation hearings as a party to those proceedings.

The EUB's conservation mandate inherently requires consideration of the long-term development of bitumen resources. Current commercial in situ technologies in the Athabasca Wabiskaw McMurray are new and developing; therefore, these schemes do not define potentially recoverable bitumen. The EUB must also consider the bitumen resource that is exploitable with reasonably foreseeable technology and economic conditions. For example, the EUB expects that existing projects will develop lesser quality resources as they expand.

Although AOSC did not provide any specific example of where thinner bitumen intervals have been pursued, the Board notes that in a previous hearing regarding gas production in the Cold Lake Oil Sands Area (*Decision 2007-056*⁶), CNRL submitted that it had been producing Clearwater bitumen by cyclic steam stimulation from an area where it interpreted the average bitumen thickness to be 7 m. While the specific nature of the bitumen resource and the specific production technology to be used have to be considered, the Board accepts that the thickness criterion for determining potentially recoverable bitumen could be reduced with advances in technology.

With respect to the O Pool, the mapping by Sunshine, CNRL, and the RGS indicates that the gas is associated with some bitumen that has a thickness of 15 m or more. Although CNRL argued that the complex geology makes it extremely doubtful that SAGD is viable in the subject area, for the interim decision the Board considers the bitumen to be potentially recoverable, since there is some bitumen with a thickness of 15 m or more. As discussed in Section 5.1 of this report, since the Leduc A Pool is in communication with the O Pool, the Board considers the Leduc A Pool to be associated with potentially recoverable bitumen.

With respect to the Wabiskaw A Pool, the available evidence indicates that the bitumen that the gas is associated with does not have a thickness of 15 m. While there are limited data in the area to assess the bitumen resource, the logs for the wells in LSD 11-4-93-18W4M, 11-7-93-18W4M, and 7-12-93-19W4M indicate that the bitumen in the Wabiskaw A Sand has a thickness of 10 to 12 m. Considering the presence of some bitumen with a thickness of 10 to 12 m and mindful of the possibility that the thickness criterion could be reduced with advances in technology, for the interim decision the Board considers the bitumen associated with the Wabiskaw A Pool to be potentially recoverable.

With respect to the smaller gas pools, the mapping by Sunshine, CNRL, and the RGS indicates that most of the pools are in communication with bitumen that has a thickness of 10 m or more. The thickness of the bitumen directly associated with the gas in the Liege Wabiskaw S Pool and the Liege McMurray V and W pools is less than 10 m, but there is bitumen in the vicinity of these pools with a thickness of 10 m or more. For the interim decision, the Board considers the bitumen associated with the smaller gas pools to be potentially recoverable.

5.3 Effect of Gas Production on SAGD Bitumen Recovery

The Board notes the conflicting results predicted by the reservoir model runs conducted by Sunshine and CNRL regarding the effect of reduced gas pool pressure on SAGD bitumen recovery. When Sunshine ran its model with the pressure in the steam chamber balanced with the pressure in the gas zone once the steam chamber reached the gas zone, the model runs predicted

⁶ *Decision 2007-056: Applications for the Production and Shut-in of Gas from the Clearwater Formation, Fisher and Moore Fields, Cold Lake Oil Sands Area, July 24, 2007.*

reduced bitumen recovery and increased cumulative steam-oil ratio (CSOR) when the pressure in the gas zone was reduced. The initial concern raised by CNRL was that the model was too simplistic, since it did not consider several factors, such as reservoir heterogeneity, specifically reservoir compartmentalization in the vertical and areal directions. Subsequently, when CNRL ran Sunshine's model with overbalanced steam injection where the pressure in the steam chamber was higher than the gas zone pressure even once the steam chamber reached the gas zone, the model runs predicted no detrimental effect on bitumen recovery or CSOR when the pressure in the gas zone was reduced. Sunshine's concern was that CNRL's model runs were a misuse of Sunshine's model because overbalanced steam injection required a larger three-dimensional model to approximate the steam loss to the aerially extensive gas cap, but the model was only two-dimensional.

The Board believes that there needs to be further review of the modelling work at the full hearing to resolve these conflicting model results. For the purpose of the interim decision, the Board continues to rely on its previous conclusion that producing associated gas and thereby reducing the reservoir pressure presents an unacceptable risk to SAGD bitumen recovery.

5.4 Urgency for Interim Shut-in of Gas

Based on the available pressure data, Sunshine estimated that the reservoir pressure within its ROI had dropped from an initial pressure of 925 kilopascals absolute (kPaa) to about 290 kPaa. Sunshine estimated that it could take about one year for a decision to be made on its main shut-in application and that continued gas production would result in the reservoir pressure dropping to 222 kPaa over the one-year interim period. CNRL estimated that the reservoir pressure would drop to 265 kPaa over the one-year interim period. Although the absolute value of the estimated pressure reduction over the one-year interim period is modest, at 25 to 68 kPa, the Board considers this pressure reduction to be significant because the current reservoir pressure is very low. The estimated one-year interim pressure drop would be 8.6 to 23.4 per cent of the current pressure and, as pointed out by Sunshine, as gas production continues, the technical limitations of artificial lift will be exceeded. Hence, the Board believes there is sufficient urgency to justify interim shut-in of gas production.

CNRL pointed out that in the SSG's submission to the Phase 3 Interim Proceeding regarding the bitumen conservation requirements, the SSG recommended that the O Pool be allowed to produce. The Board notes that the SSG's recommendation was not contested by any party, so the appropriateness of gas production from the O Pool was not reviewed at the interim or final proceedings.

5.5 Need to Shut in Additional Intervals

Thirteen of the intervals that Sunshine requested be shut in are within the northern part of the Wabiskaw A Pool. The ERCB maps the Wabiskaw A Pool as a very large gas pool, as shown by Pool Order 0538 306001 (see Appendix 3). Based on its pool order, the Board has identified 51 additional wells that are producing gas from the A Pool; 41 of these wells are licensed to CNRL and 10 to Paramount. Sunshine's gas pool mapping only dealt with the northern part of the Wabiskaw A Pool; it showed the Wabiskaw A Pool extending farther to the south, but the full extent of the pool was not identified. CNRL's gas pool mapping showed the northern part of the Wabiskaw A Pool to be separate from the rest of the pool. The Board does not believe there is

sufficient information in the submissions to warrant a change to the Wabiskaw A Pool Order at this time.

Three of the intervals that Sunshine requested be shut in are within the Leduc A Pool. The ERCB maps the Leduc A Pool as a large gas pool, as shown by Pool Order 0538 720001 (see Appendix 4). Based on its pool order, the Board has identified 15 additional wells that could be producing gas from the Leduc A Pool, all of which are licensed to Paramount. None of the parties provided mapping of the Leduc A Pool.

In addition, the Board has identified one well in the M Pool and two wells in the O Pool that are producing gas from these pools but were not requested to be shut in by Sunshine. Two of these wells are licensed to CNRL and one to EnCana.

The Board has determined that immediate action is required to mitigate potential future risk to bitumen recovery. The Board's conservation approach requires gas production to be dealt with on a pool basis. Accordingly, the Board considers it necessary to shut in Wabiskaw gas in all 64 wells that are producing from the Wabiskaw A Pool, Leduc gas in all 18 wells that could be producing from the Leduc A Pool, and Wabiskaw gas in the 3 additional wells producing gas from the M and O pools. The Board notes that the 18 wells that could be producing gas from the Leduc A Pool are also producing gas from the Wabiskaw, which would also have to be shut in. The Board recognizes that CNRL, EnCana, and Paramount were not advised of the potential for interim shut-in of the additional intervals. The Board considers it unfortunate that these intervals were not identified earlier by the parties. However, considering the Board's conservation mandate and the authority provided in Section 3(5) of the *OSCR*, the Board believes that it is in the public interest to shut in these intervals on an interim basis. Section 3(5) states:

(5) Where it appears to the Board that the ultimate recovery of crude bitumen in the oil sands strata may be affected by gas production, the Board may, on its own initiative or on application by an affected party, make any order or directive it considers necessary to effect the conservation of the crude bitumen in any particular case.

6 CONCLUSION

Based on its review of the evidence and recognizing the interim nature of this decision, the Board finds that

- the gas in the pools is in communication with bitumen;
- the bitumen is potentially recoverable;
- the continued production of gas from these pools presents an unacceptable risk to bitumen recovery;
- there is sufficient urgency to justify interim shut-in of gas; and
- all producing intervals in the Wabiskaw A, M, and O and Leduc A pools need to be shut in.

Dated in Calgary, Alberta, on October 15, 2009.

ENERGY RESOURCES CONSERVATION BOARD

<original signed by>

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

<original signed by>

B. T. McManus, Q.C.
Vice-Chairman

<original signed by>

R. J. Willard, P.Eng.
Acting Board Member

APPENDIX 1 SHUT-IN INTERVALS

Note that intervals not requested for shut-in by Sunshine but shut in by the Board because they are in the same pools as the intervals requested for shut-in by Sunshine are indicated by *.

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
LIEGE	WABISKAW A	00/14-32-090-17W4/0*	182.7	185.7	Wabiskaw #1	CNRL
		00/14-03-091-17W4/0*	185.5	189.9	Wabiskaw #1	CNRL
		00/14-04-091-17W4/2*	188.2	194	Wabiskaw A	CNRL
		00/15-05-091-17W4/3*	185.7	193.1	Wabiskaw	CNRL
		00/02-08-091-17W4/0*	185.0	193.4	Wabiskaw	CNRL
		00/07-09-091-17W4/0*	200.2	211.6	Wabiskaw #1	CNRL
		00/06-10-091-17W4/0*	205.2	216.7	Wabiskaw #1	CNRL
		00/11-10-091-17W4/2*	183.3	190	Wabiskaw #1	CNRL
		00/12-11-091-17W4/2*	182.4	186	Wabiskaw A	CNRL
		00/11-15-091-17W4/0*	184.2	189	Wabiskaw #1	CNRL
		00/03-16-091-17W4/3*	185.8	192.2	Wabiskaw	CNRL
		00/07-16-091-17W4/2*	186	192	Wabiskaw #1	CNRL
		00/08-18-091-17W4/0*	185.3	190.4	Wabiskaw #1	CNRL
		00/05-20-091-17W4/0*	190.9	195.5	Wabiskaw #1	CNRL
		00/11-22-091-17W4/0*	183.4	187.5	Wabiskaw #1	CNRL
		00/14-28-091-17W4/0*	190.5	194.3	Wabiskaw #1	CNRL
		00/10-29-091-17W4/2*	194	198	Wabiskaw	CNRL
		00/11-30-091-17W4/0*	196.1	199.2	Wabiskaw #1	CNRL
		00/05-32-091-17W4/0*	196	200	Wabiskaw	CNRL
		00/06-33-091-17W4/0*	194	197.7	Wabiskaw #1	CNRL
		00/10-01-091-18W4/0*	186	190	Wabiskaw #1	CNRL
		00/15-12-091-18W4/0*	191	194.3	Wabiskaw #1	CNRL
		00/13-14-091-18W4/0*	198.8	201	Wabiskaw #1	CNRL
		00/16-22-091-18W4/2*	196	200	Wabiskaw A	CNRL
		00/12-23-091-18W4/0*	287	677	Wabiskaw #1	CNRL
		00/12-24-091-18W4/0*	286	668	Wabiskaw #1	CNRL
		02/10-34-091-18W4/2*	203.5	208	Wabiskaw A	CNRL
		00/13-05-092-17W4/2*	199	202	Wabiskaw #1	PARAMOUNT
		00/03-09-092-17W4/2*	194	196.5	Wabiskaw #1	PARAMOUNT
		00/02-23-092-17W4/0*	195.2	196.8	Wabiskaw A	PARAMOUNT
		00/03-29-092-17W4/0*	201.1	203	Wabiskaw A	PARAMOUNT
		00/06-03-092-18W4/2*	204	209	Wabiskaw A	CNRL
		00/07-04-092-18W4/0*	204	210	Wabiskaw #1	CNRL
		00/11-04-092-18W4/2*	205	210.3	Wabiskaw #1	CNRL
		02/10-05-092-18W4/3*	208	213	Wabiskaw #1	CNRL
		00/10-08-092-18W4/2*	205.8	211.3	Wabiskaw #1	CNRL
		02/06-10-092-18W4/0*	203.4	208.8	Wabiskaw #1	CNRL
		00/04-16-092-18W4/0*	204	210	Wabiskaw	CNRL
		00/05-16-092-18W4/3*	205	210.3	Wabiskaw	CNRL
		00/06-17-092-18W4/0*	207.3	212	Wabiskaw #1	CNRL
		00/06-20-092-18W4/0*	207.5	211	Wabiskaw #1	CNRL
		00/06-06-093-17W4/0*	197.3	203.1	Wabiskaw #1	CNRL

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
	WABISKAW A (cont.)	00/06-01-093-18W4/3	202	210.7	Wabiskaw A	CNRL
		00/11-02-093-18W4/2	205	211.2	Wabiskaw A	CNRL
		00/11-04-093-18W4/0	207.8	210	Wabiskaw A	CNRL
		00/11-07-093-18W4/0	207.7	210	Wabiskaw A	CNRL
		00/15-08-093-18W4/0*	243.7	251.1	Wabiskaw #1	CNRL
		00/07-09-093-18W4/2	208.9	212	Wabiskaw A	CNRL
		00/15-09-093-18W4/2*	320	676	Wabiskaw A	CNRL
		00/11-10-093-18W4/0	208	212.3	Wabiskaw A	CNRL
		00/06-11-093-18W4/2	206	212	Wabiskaw A	CNRL
		00/04-12-093-18W4/0	201.5	208.8	Wabiskaw A	CNRL
		00/07-12-093-18W4/0	199.5	206	Wabiskaw A	CNRL
		00/07-16-093-18W4/2	207	213	Wabiskaw A	CNRL
		00/11-17-093-18W4/2	208	214.2	Wabiskaw A	CNRL
		00/14-18-093-18W4/2	207	214.5	Wabiskaw A	CNRL
		00/06-19-093-18W4/0	209.3	213.6	Wabiskaw A	CNRL
		00/07-20-093-18W4/2*	212.44	215.2	Wabiskaw A	CNRL
		00/07-12-093-19W4/0*	207.1	211	Wabiskaw #1	PARAMOUNT
		02/10-13-093-19W4/0*	278.96	463	Wabiskaw A	PARAMOUNT
		00/11-14-093-19W4/0*	208.2	213	Wabiskaw #1	PARAMOUNT
		00/07-22-093-19W4/2*	210.9	215.8	Wabiskaw #1	PARAMOUNT
		00/11-23-093-19W4/0*	208.2	213	Wabiskaw #1	PARAMOUNT
		02/10-24-093-19W4/0*	209.3	213	Wabiskaw A	PARAMOUNT
	WABISKAW M	00/07-20-095-17W4/0	304	307	Wabiskaw D	PARAMOUNT
		00/02-21-095-17W4/0*	270	272	Wabiskaw D	ENCANA
	WABISKAW O	00/12-19-093-17W4/2	282.5	541	Wabiskaw C	PARAMOUNT
		00/12-30-093-17W4/0	285.11	552	Wabiskaw C	PARAMOUNT
		00/06-01-093-18W4/0	217.8	226	Wabiskaw C	CNRL
		00/11-02-093-18W4/0	222.2	230.8	Wabiskaw C	CNRL
		00/11-04-093-18W4/0	225	229	Wabiskaw C	CNRL
		00/11-07-093-18W4/0	225.4	228	Wabiskaw C	CNRL
		00/15-08-093-18W4/0	283.2	717	Wabiskaw C	CNRL
		00/07-09-093-18W4/0	224.4	231.8	Wabiskaw C	CNRL
		02/15-09-093-18W4/0*	289.51	790	Wabiskaw C	CNRL
		00/11-10-093-18W4/0	222	229.5	Wabiskaw C	CNRL
		00/11-10-093-18W4/0	232	234	Wabiskaw D	CNRL
		00/06-11-093-18W4/0	219.2	228	Wabiskaw C	CNRL
		00/04-12-093-18W4/0	216.4	224	Wabiskaw C	CNRL
		00/07-12-093-18W4/0	212.5	217	Wabiskaw C	CNRL
		00/01-14-093-18W4/0	282.98	791	Wabiskaw C	CNRL
		00/11-14-093-18W4/0	223.8	227	Wabiskaw C	CNRL
		00/03-15-093-18W4/2	319	773	Wabiskaw C	CNRL
		00/07-16-093-18W4/0	222	228.5	Wabiskaw C	CNRL
		00/11-16-093-18W4/0	301.62	1002	Wabiskaw C	CNRL
		00/10-17-093-18W4/0	291.3	810	Wabiskaw C	CNRL
		00/11-17-093-18W4/0	221	226.5	Wabiskaw C	CNRL
		00/14-18-093-18W4/0	222	229	Wabiskaw C	CNRL

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
	WABISKAW O (cont.)	00/06-19-093-18W4/0	222.5	227.8	Wabiskaw C	CNRL
		00/06-19-093-18W4/0	230	233.2	Wabiskaw D	CNRL
		00/09-19-093-18W4/0	282.8	940	Wabiskaw C	CNRL
		00/07-20-093-18W4/2	294.63	783	Wabiskaw C	CNRL
		02/07-20-093-18W4/2*	303.9	305	Wabiskaw D	CNRL
		00/11-21-093-18W4/0	225	227.4	Wabiskaw C	CNRL
		02/10-23-093-18W4/0	237	239	Wabiskaw D	PARAMOUNT
		00/11-23-093-18W4/2	303.79	536	Wabiskaw C	PARAMOUNT
		00/10-25-093-18W4/2	304.12	492	Wabiskaw C	PARAMOUNT
		00/03-27-093-18W4/2	285.44	537	Wabiskaw C	PARAMOUNT
		02/14-30-093-18W4/0	224	229.8	Wabiskaw C	CNRL
		00/12-31-093-18W4/0	228.7	237	Wabiskaw C	CNRL
		00/12-32-093-18W4/0	227.5	235.2	Wabiskaw C	CNRL
		00/12-32-093-18W4/0	237	241	Wabiskaw D	CNRL
		00/02-36-093-18W4/2	295.68	506	Wabiskaw C	PARAMOUNT
		02/10-24-093-19W4/0	224	227	Wabiskaw C	PARAMOUNT
		00/10-25-093-19W4/0	224.8	236	Wabiskaw C	PARAMOUNT
		00/07-36-093-19W4/0	228	232.5	Wabiskaw C	PARAMOUNT
		00/09-20-094-17W4/2	352.5	540	Wabiskaw C	PARAMOUNT
		00/05-29-094-17W4/2	325.9	483.7	Wabiskaw C	PARAMOUNT
		00/03-31-094-17W4/0	247.4	251.1	Wabiskaw C	PARAMOUNT
		00/10-33-094-17W4/0	238.5	242	Wabiskaw C	ENCANA
		00/11-34-094-17W4/2	309.6	533	Wabiskaw C	ENCANA
		00/06-04-094-18W4/2	298.7	433	Wabiskaw C	PARAMOUNT
		00/07-05-094-18W4/0	229	238.5	Wabiskaw C	PARAMOUNT
		00/07-05-094-18W4/0	238.5	240.5	Wabiskaw D	PARAMOUNT
		00/07-06-094-18W4/0	234.4	240.2	Wabiskaw C	PARAMOUNT
		00/07-06-094-18W4/0	243	245	Wabiskaw D	PARAMOUNT
		00/05-07-094-18W4/0	239.8	245.5	Wabiskaw C	PARAMOUNT
		00/06-08-094-18W4/0	235.5	244.1	Wabiskaw C	PARAMOUNT
		00/08-09-094-18W4/0	232	241	Wabiskaw C	PARAMOUNT
		00/08-09-094-18W4/0	242.8	244.6	Wabiskaw D	PARAMOUNT
		00/13-10-094-18W4/2	295.34	461.8	Wabiskaw C	PARAMOUNT
		00/03-15-094-18W4/2	299.03	518	Wabiskaw C	PARAMOUNT
		00/08-16-094-18W4/0	244	252	Wabiskaw C	PARAMOUNT
		00/08-16-094-18W4/0	253	259	Wabiskaw D	PARAMOUNT
		00/09-17-094-18W4/2	312.81	687	Wabiskaw C	PARAMOUNT
		00/09-18-094-18W4/3	303.4	700	Wabiskaw C	PARAMOUNT
		00/08-19-094-18W4/2	312.04	610	Wabiskaw C	PARAMOUNT
		00/11-20-094-18W4/0	256	262.5	Wabiskaw C	PARAMOUNT
		00/11-20-094-18W4/0	263	269	Wabiskaw D	PARAMOUNT
		00/06-21-094-18W4/0	246.6	253.2	Wabiskaw C	PARAMOUNT
		00/06-21-094-18W4/0	254	264.5	Wabiskaw D	PARAMOUNT
		00/01-22-094-18W4/2	323.4	526	Wabiskaw C	PARAMOUNT
		00/04-23-094-18W4/0	315.4	531	Wabiskaw C	PARAMOUNT
		00/05-24-094-18W4/2	249	252	Wabiskaw C	PARAMOUNT

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
	WABISKAW O (cont.)	00/07-26-094-18W4/0	265.5	268	Wabiskaw C	PARAMOUNT
		00/07-26-094-18W4/0	285	286.8	Wabiskaw D	PARAMOUNT
		00/14-27-094-18W4/2	338.5	565	Wabiskaw C	PARAMOUNT
		00/16-28-094-18W4/0	319.8	470	Wabiskaw C	PARAMOUNT
		00/03-29-094-18W4/0	248.3	253	Wabiskaw C	PARAMOUNT
		00/03-29-094-18W4/0	254	258.8	Wabiskaw D	PARAMOUNT
		00/11-30-094-18W4/0	305	307.3	Wabiskaw C	PARAMOUNT
		00/11-30-094-18W4/0	310	310.9	Wabiskaw D	PARAMOUNT
		00/06-32-094-18W4/0	297	300.5	Wabiskaw C	PARAMOUNT
		00/11-33-094-18W4/0	297	304.2	Wabiskaw C	PARAMOUNT
		00/11-33-094-18W4/0	304.2	310	Wabiskaw D	PARAMOUNT
		00/09-35-094-18W4/0	264.9	267.2	Wabiskaw C	PARAMOUNT
		00/09-01-094-19W4/0	234.6	240	Wabiskaw C	PARAMOUNT
		00/09-01-094-19W4/0	243.1	247.1	Wabiskaw D	PARAMOUNT
		00/09-12-094-19W4/0	244	247	Wabiskaw C	PARAMOUNT
		00/09-13-094-19W4/0	249	251.5	Wabiskaw C	PARAMOUNT
		00/09-13-094-19W4/0	257	259	Wabiskaw D	PARAMOUNT
		00/07-24-094-19W4/0	268	271.1	Wabiskaw C	PARAMOUNT
		00/07-24-094-19W4/0	276	279.6	Wabiskaw D	PARAMOUNT
		00/14-04-095-17W4/0	267.2	267.7	Wabiskaw A	ENCANA
		00/14-04-095-17W4/0	269.3	275.8	Wabiskaw C	ENCANA
		00/04-05-095-17W4/0	262	264	Wabiskaw C	PARAMOUNT
		00/15-07-095-17W4/0	323.9	601	Wabiskaw C	PARAMOUNT
		00/09-09-095-17W4/0	266.2	267	Wabiskaw A	ENCANA
		00/09-09-095-17W4/0	268.5	272	Wabiskaw C	ENCANA
		00/05-10-095-17W4/0	275.5	277.5	Wabiskaw A	ENCANA
		00/05-10-095-17W4/0	277.5	280.5	Wabiskaw C	ENCANA
		06/07-13-095-17W4/0	273	276	Wabiskaw C	ENCANA
		00/14-14-095-17W4/0	265.6	269.9	Wabiskaw C	ENCANA
		00/15-15-095-17W4/2	329.46	555	Wabiskaw C	ENCANA
		00/06-16-095-17W4/2	335	542	Wabiskaw C	ENCANA
		00/01-17-095-17W4/0	327.57	558	Wabiskaw C	PARAMOUNT
		00/07-20-095-17W4/0	297.8	304	Wabiskaw C	PARAMOUNT
		00/02-21-095-17W4/0	265	269	Wabiskaw C	ENCANA
		00/10-24-095-17W4/0	292.2	295	Wabiskaw C	ENCANA
		00/04-29-095-17W4/0	439.61	755	Wabiskaw A	PARAMOUNT
		00/01-30-095-17W4/0	370.4	371	Wabiskaw A	PARAMOUNT
		00/01-30-095-17W4/0	371.4	374.6	Wabiskaw C	PARAMOUNT
		00/02-30-095-17W4/0	438.34	672	Wabiskaw C	PARAMOUNT
		00/10-03-095-18W4/0	297.2	302	Wabiskaw C	PARAMOUNT
		00/10-03-095-18W4/0	302.7	311.8	Wabiskaw D	PARAMOUNT
		00/07-04-095-18W4/0	315.4	321.5	Wabiskaw D	PARAMOUNT
		00/07-05-095-18W4/0	333	340.8	Wabiskaw C	PARAMOUNT
		00/10-08-095-18W4/0	347	350	Wabiskaw C	PARAMOUNT
		00/06-09-095-18W4/0	327.3	333.5	Wabiskaw C	PARAMOUNT
		00/06-09-095-18W4/0	333.5	336.8	Wabiskaw D	PARAMOUNT

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
	WABISKAW O (cont.)	00/11-11-095-18W4/0	310.5	314.4	Wabiskaw C	PARAMOUNT
		00/11-11-095-18W4/0	315.4	318.4	Wabiskaw D	PARAMOUNT
		00/06-12-095-18W4/0	349.98	622	Wabiskaw C	PARAMOUNT
		00/11-12-095-18W4/0	282.5	288	Wabiskaw C	PARAMOUNT
		00/11-12-095-18W4/0	288	292	Wabiskaw D	PARAMOUNT
		00/04-13-095-18W4/0	317.7	321.4	Wabiskaw C	PARAMOUNT
		00/04-13-095-18W4/0	321.8	330.2	Wabiskaw D	PARAMOUNT
		00/11-16-095-18W4/0	336	339.5	Wabiskaw C	PARAMOUNT
		00/11-16-095-18W4/0	340.5	346.8	Wabiskaw D	PARAMOUNT
		00/10-25-095-18W4/0	373.3	384.9	Wabiskaw C	PARAMOUNT
		00/06-27-095-18W4/0	430	432.3	Wabiskaw C	PARAMOUNT
		00/03-28-095-18W4/0	393	398.5	Wabiskaw C	PARAMOUNT
		00/10-34-095-18W4/0	455	462	Wabiskaw C	PARAMOUNT
		00/10-02-096-18W4/0	389.5	393	Wabiskaw C	PARAMOUNT
	WABISKAW P	06/07-13-095-17W4/0	270.3	271	Wabiskaw A	ENCANA
		00/14-14-095-17W4/0	264	264.8	Wabiskaw A	ENCANA
	WABISKAW S	00/10-02-096-18W4/0	387	387.8	Wabiskaw A	PARAMOUNT
	WABISKAW T	00/10-20-093-17W4/2	209.1	213.3	Wabiskaw	PARAMOUNT
	WABISKAW Z	00/06-04-094-17W4/2	227.2	228	Wabiskaw #1	PARAMOUNT
	WABISKAW AA	00/06-06-094-17W4/0	233.5	238	Wabiskaw C	PARAMOUNT
	MCMURRAY V	00/07-26-094-18W4/0	285	286.8	McMurray ch	PARAMOUNT
	MCMURRAY W	00/07-05-094-18W4/0	244	245.8	McMurray ch	PARAMOUNT
	UNDEFINED (051)	00/11-09-096-17W4/0	455	456	Wabiskaw C	PARAMOUNT
	UNDEFINED (059)	00/11-09-096-17W4/0	453.2	453.9	Wabiskaw A	PARAMOUNT
	LEDUC A	02/10-24-093-19W4/0*	239	260.2	Leduc	PARAMOUNT
		00/07-05-094-18W4/0*	251	265.8	Leduc	PARAMOUNT
		00/07-06-094-18W4/0*	252	271.1	Leduc	PARAMOUNT
		00/05-07-094-18W4/0*	252	275.9	Leduc	PARAMOUNT
		00/08-09-094-18W4/0*	259	270	Leduc	PARAMOUNT
		00/08-16-094-18W4/0*	267	281.3	Leduc	PARAMOUNT
		00/06-21-094-18W4/0*	265	283.4	Leduc	PARAMOUNT
		00/05-24-094-18W4/0*	278	283.4	Leduc	PARAMOUNT
		00/06-32-094-18W4/0*	306.7	329.6	Leduc	PARAMOUNT
		00/09-13-094-19W4/0*	261.6	281.7	Leduc	PARAMOUNT
		00/07-24-094-19W4/0*	280	300.8	Leduc	PARAMOUNT
		00/10-03-095-18W4/0*	312.7	331.5	Leduc	PARAMOUNT
		00/10-08-095-18W4/0*	355.3	375.8	Leduc	PARAMOUNT
		00/06-09-095-18W4/0*	337.8	342	Leduc	PARAMOUNT
		00/11-11-095-18W4/0	318.4	344.9	Leduc	PARAMOUNT
		00/04-13-095-18W4/0	339.8	354.4	Leduc	PARAMOUNT
		00/11-16-095-18W4/0*	346.8	366.6	Leduc	PARAMOUNT
		00/03-28-095-18W4/0	399.6	424.7	Leduc	PARAMOUNT
	Not designated	00/10-20-093-17W4/0	213.4	214.5	Wabiskaw C	PARAMOUNT
	Not designated	00/10-20-093-17W4/0	218	219	Wabiskaw D	PARAMOUNT
	Not designated	00/06-11-093-18W4/0	231.1	233.3	Wabiskaw D	CNRL
	Not designated	00/06-26-095-17W4/0	272.5	275.4	Wabiskaw C	ENCANA

Field Name	Pool Name	Well ID	Pay Top Depth (TVD)	Pay Base Depth (TVD)	Stratigraphic Interval	Licensee
	Not designated	00/06-35-095-17W4/0	324.2	326.2	Wabiskaw C	ENCANA
	Not designated	00/06-14-095-18W4/2	418.2	608	Undefined	PARAMOUNT

APPENDIX 2 HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in report)

Athabasca Oil Sands Corp. (AOSC)

R. W. Block
S. Svarte
I. Atkinson

Canadian Natural Resources Limited (CNRL)

P. J. McGovern
J. Urdaneta
K. O. Adegbesan, P.Eng.

Grizzly Oilsands ULC

J. Pearce

Japan Canada Oil Sands Limited

B. Rennie

Paramount Energy Operating Corp. (Paramount)

G. S. Fitch
D. J. Farmer

Sunshine Oilsands Ltd. (Sunshine)

R. W. Block
D. Brown, P.Eng.
P. M. Collins, P.Eng.
E. Zaghoul, P.Geol.
R. Bachman, P.Eng.

Total E&P Canada Ltd. (Total)

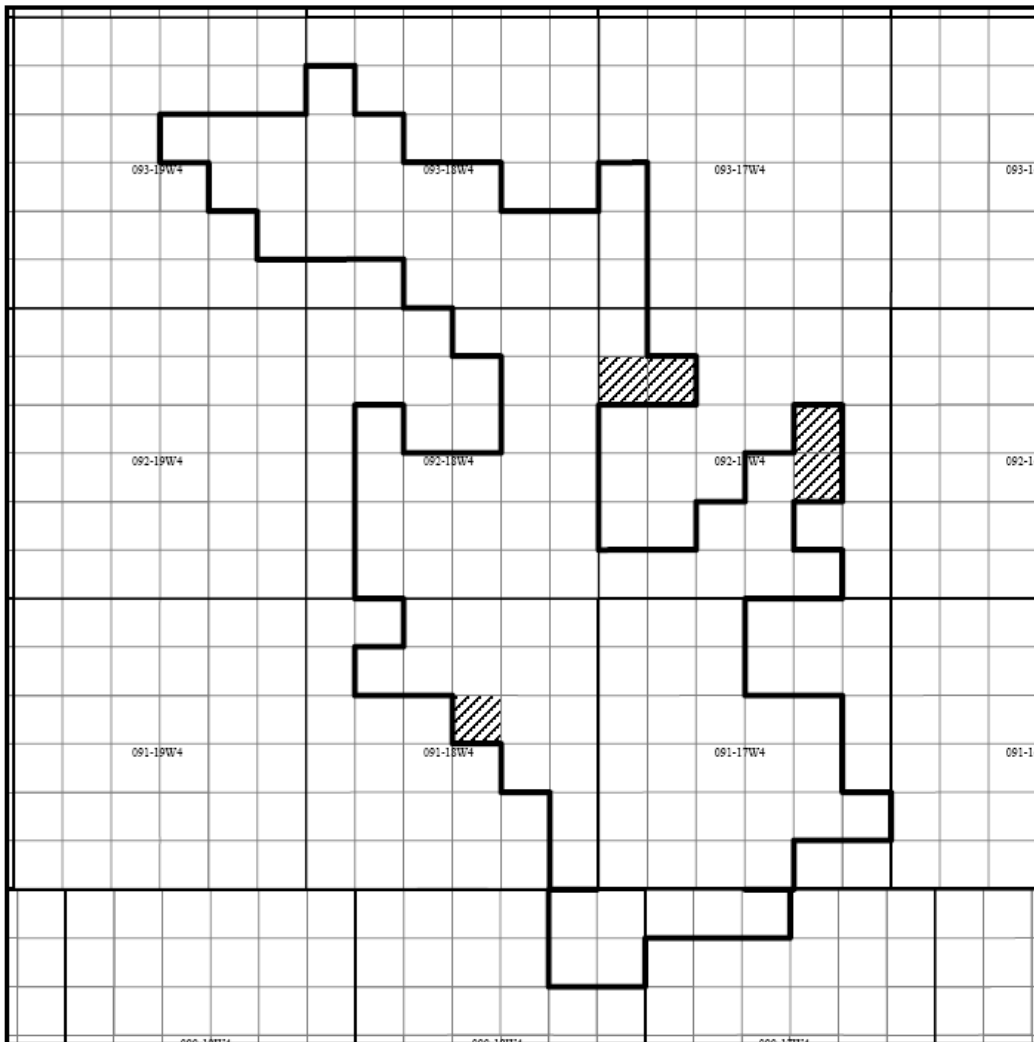
V. Giry
J-M. Feroul
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G. W. Dilay, P.Eng.
J. Du, P.Eng.
T. Hurst
B. Law, P.Eng.
E. Wo

APPENDIX 3 POOL ORDER FOR LIEGE WABISKAW A POOL

POOL ORDER: 0538 306001 2007-02-01




Field/Pool Code: 0538 306001 Effective Date: 2007-02-01

Field Name: LIEGE

Pool Name: WABISKAW A

Reference Well: 00/10-24-093-19W4/0

Depths: 207.80 - 212.00 metres

Area of Change: 

Pool Order 0538 306001 2007-01-01 is rescinded.



Alberta Energy and Utilities Board



Wayne Elsner
Section Coordinator
Reservoir Administration Section
Resource Appraisal Group

