

ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

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*Amended

**Board Memorandum Respecting
 Examiner Report E 96-3
 Application No. 950490**

**CABRE EXPLORATION LTD.
 GAS INJECTION/RATEABLE TAKE
 COMMON CARRIER/COMMON PROCESSOR
 KAKWA A CARDIUM A POOL**

The Board has considered the examiners' recommendations as set out in the attached report. In light of this consideration, it is the Board's preference to initiate a review of Approval No. 6175. The Board will proceed to initiate the review on 1 May 1996 by issuing a Notice of Hearing setting out

- the date of the hearing when the approval will be reviewed, and
- the date by which specified information must be filed by affected parties to assist the Board in the review.

The Board requests that it be advised by interested parties of any developments or agreements made with respect to this matter in the interim.

The final disposition of Application No. 950490 will be considered in the context of the review of Approval No. 6175 and any agreements that are brought to the Board's attention.

DATED at Calgary, Alberta on 25 March 1996.

ALBERTA ENERGY AND UTILITIES BOARD

Céline Bélanger
 Chair

* This Memorandum was amended to add the date of the Board's decision on this matter.

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

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1 INTRODUCTION

1.1 Application, Intervention, and Hearing

Cabre Exploration Ltd. (Cabre) applied

- under section 37 of the Oil and Gas Conservation Act (the Act), for an order declaring Unocal Canada Resources (Unocal) as a common carrier of production from the Kakwa A Cardium A Pool (the A Pool) through the following pipelines:
 - either the effluent pipeline from a location in Legal Subdivision 6 of Section 27, Township 63, Range 6, West of the 6th Meridian (Lsd 6-27-63-6 W6M) (the 6-27 location/facilities) to the Unocal-operated processing facilities in Lsd 10-7-63-5 W6M (the Unocal plant), or the effluent pipeline from Lsd 11-32-63-6 W6M to the Unocal plant, to allow the applicant's production to be transported from the 6-27 location to the Unocal plant, with the choice of pipeline depending on transportation fees and operational constraints,
 - the pipeline from Lsd 11-3-64-7 W6M (the 11-3 location) to the 6-27 facilities, to allow dry makeup gas to be transported from NOVA Gas Transmission Ltd. (NOVA) facilities to the 6-27 location for injection into the A Pool, and
 - the pipeline from the Unocal plant to the 6-27 location, to allow Cabre's gas to be transported from the plant to the 6-27 location for reinjection into the A Pool;
- under section 42 of the Act for an order declaring Unocal as a common processor of gas produced from the A Pool, through the Unocal plant;
- under section 23 of the Act for an order distributing production among wells in a part of the A Pool; and
- under section 26 of the Act for an amendment to Approval No. 6175, respecting a scheme for gas cycling of the gas cap and for enhanced recovery of oil by gas injection in a part of the A Pool.

At the hearing, Cabre also applied under sections 7 and 45 of the Act for the aforementioned orders to be effective as of 27 June 1995.

Unocal, on behalf of the Kakwa Cardium A Unit (the Unit), filed a submission opposing the application.

The application was considered at a public hearing in Calgary, Alberta, on 21 and 22 November 1995, and 5 December 1995, by Board-appointed examiners K. G. Sharp, P.Eng., F. Rahnama, Ph.D., and G. W. Dilay, P.Eng.

Those who appeared at the hearing, and abbreviations used in the report, are shown on Table 1.

1.2 Background

The A Pool is an oil pool with an associated gas cap which is presently defined by the Board as shown on Figure 1. The northern portion of the pool is included in the Unit, operated by Unocal. The southern portion of the pool, which is not directly involved in the application, is in the Kakwa South Cardium A Pool Unit, operated by Enerplus Resources Corporation (Enerplus). There are two Cardium sands which currently comprise the A Pool. Locally, these sands are known as the A sand and the Alpha sand. The A sand, the lower sand, is a really extensive and defines the pool, while the Alpha sand, the upper sand, is restricted to the northern flank area of the pool in Townships 63 and 64, Ranges 5, 6, and 7, W6M.

Because the A Pool is an oil pool with an associated gas cap, gas cap production may not proceed without approval by the Board, pursuant to sections 26 and 29 of the Act. It is considered necessary to regulate gas cap production in oil pools because unrestricted flow would reduce the pressure of the pool, and could result in less recovery of oil than if a higher pressure were maintained to provide the reservoir energy for oil recovery. In addition, the gas cap portion of the A Pool contains retrograde gas. This terminology refers to wet gas in the reservoir which condenses into liquid when the reservoir pressure drops below a particular value. The optimum recovery mechanism, generally, is to maintain the pressure in the gas cap above the pressure where the liquids form. If this is not done, liquid which condenses insitu in the reservoir may not be recoverable.

Since 1984, the northern part of the A Pool has been subject to a scheme for cycling to obtain maximum recovery of liquids from the gas cap, and for enhanced recovery of oil by gas injection. The current scheme is set out in Approval No. 6175 and involves the area shown on Figure 1. Production within the area of the pool subject to Approval No. 6175 is presently occurring from 23 oil wells and 2 gas wells. Wet gas and oil are produced from the reservoir and the wet gas is processed at Unit facilities to remove gas liquids. The residue gas volumes are insufficient to maintain full voidage replacement and thus pool pressure, for the cycling and gas injection scheme; therefore, additional makeup volumes of dry gas are purchased from elsewhere and delivered to the scheme through NOVA and Unit facilities for injection into the A Pool. Four wells are used for injection of gas into the pool within the scheme area.

Cabre, which is not a participant in the Unit, commenced drilling a well in Lsd 9-16-63-6 W6M (the 9-16 well) as an oil prospect in August 1993. The well encountered the A Pool. Although the productive interval of the well is below the accepted original gas/oil contact of the pool, the well encountered liquids-rich gas (also referred to as wet gas or natural gas liquids elsewhere in the report), rather than oil. There was a loss of control at the well, and in October 1993, a relief well (the 9A-16 well) was drilled in the same section some 10 metres (m) from the 9-16 well. The 9A-16 well produced from the A Pool during a 4-month period, with gas being flared and some liquids being recovered at the wellsite. Control was subsequently established at the 9-16 well. However, because of problems in the wellbore, the 9-16 well has not been abandoned in the standard manner; the wellbore remains open below a depth of 665.0 m, Kelly Bushing (mKB), to a total depth of 1758.0 mKB. The 9A-16 well does not have Board approval to produce from the gas cap associated with the oil pool in accordance with sections 26 and 29 of the Act, and hence remains shut in. At the time of the hearing, the well was not tied in to any gathering system.

The applicant proposes to participate in the scheme set out by Approval No. 6175. Under the proposal, Cabre's 9A-16 well would be tied into separation facilities at the 6-27 location (see Figure 2). The unstabilized natural gas liquids would be transported from these facilities to the Unocal plant for stabilization. Residue gas obtained from the facilities at the 6-27 location, and volumes obtained from the Unocal plant, would be reinjected into the A Pool through facilities at the 6-27 location. Similar to the existing Unit operations, Cabre would obtain additional volumes of dry gas through NOVA facilities in the area for injection at the 6-27 location.

1.3 Preliminary Matters

At the opening of the hearing, the Unit requested a ruling on whether the Board has the jurisdiction, short of perhaps going to the Lieutenant Governor in Council, to order the Unit to inject Cabre's gas. It submitted that arguments on the rateable take application are premature until the jurisdictional question is addressed. Further, it argued that such a ruling would guide the parties in making a settlement, and would assist the Unit in making appropriate submissions at the hearing.

Cabre argued that the Board has broad powers to effect the purposes of the Act, including the purposes of providing for economic and orderly development, and of affording each owner the opportunity of obtaining its share of production. It submitted that section 7 of the Act, section 15 of the Energy Resources Conservation Act, and section 10(3)(f) of the Alberta Energy and Utilities Board Act, provide the jurisdiction for the Board to grant the orders requested.

The examiners agreed that there is a question as to whether the Board has jurisdiction to order injection on behalf of others, as there is no specific provision in the Act covering that situation. The examiners required evidence that there are no alternatives to the applicant's proposals regarding injection, before deciding if a recommendation to use the general powers afforded the Board by section 7 of the Act to order injection would be appropriate. Thus, the examiners decided to proceed with the hearing to consider the evidence of both parties.

2 ISSUES

The examiners consider the issues to be

- the need for an order requiring the Unit to inject gas on Cabre's behalf, and if one is to be issued, the details of the order,
- the need for common carrier and common processor orders, and if such orders are issued, the details of the orders, and
- the need for a rateable take order, and if one is to be issued, the details of the order.

3 NEED FOR A GAS INJECTION ORDER, AND IF ISSUED, THE DETAILS OF THE ORDER

3.1 Views of Cabre

Cabre is unable to produce the 9A-16 well, as it is not a participant in the existing enhanced recovery scheme which requires cycling and gas injection to maintain reservoir voidage at 100 per cent, and does not have an injection well of its own in the A Pool. The applicant indicated that it would be prepared to produce without voidage replacement or cycling if so directed by the Board, but it had no intention of producing in this manner, as it did not consider such a scenario to be the optimum way of producing the pool. However, the applicant indicated that it had not specifically investigated to any degree the effect of producing the 9A-16 well without voidage replacement on pool recovery. Cabre submitted that a considerable volume of the oil underlying Section 16-63-6 W6M (Section 16) had migrated to down-dip Unit oil producers, and it acknowledged that wet gas underlying the section would be swept from the section in the same manner as the original oil had been, by the residue gas injected by the Unit at the 6-27 location and at the well in Lsd 11-14-63-16 W6M (the 11-14 well).

In the case where voidage replacement for production from the 9A-16 well is required, Cabre submitted that it has no reasonable alternative to using the Unit's facilities for gas reinjection. It rejected the alternative suggested by the Unit of establishing its own cycling scheme by drilling and producing a well in Section 9-63-6 W6M (Section 9) where it holds the Cardium petroleum and natural gas rights, while using the 9A-16 well for injection. It noted that there is a geological risk associated with drilling in Section 9. Further, even if a well drilled in Section 9 encountered the A Pool and could be produced, injecting into the 9A-16 well would be a safety risk because such injection could cause a loss of control at the 9-16 well, which is only some 10 metres from the 9A-16 well. In any event, Cabre considered that such a cycling scheme would be economically unattractive. There would be a risk of rapid breakthrough of injected gas at the producing well. In addition, the scheme would be uneconomic unless Cabre could use the Unit pipeline which extends from the NOVA metre station at the 11-3 location to the 6-27 location to obtain additional dry makeup gas for voidage replacement.

In response to questioning on other possible locations where Cabre could drill its own injection well, the applicant indicated that it could not locate any currently-unleased lands around the A Pool for such purposes. It said that drilling an injection well on the fringe of the pool would have even greater geological risk than drilling in Section 9, and have worse economics. Cabre also said that it did not pursue a Unocal suggestion of investigating possible injection into a well in Lsd 7-12-64-7 W6M (the 7-12 well), but it noted that this well is in communication with a different gas cap than the 9A-16 well.

Cabre has been unable to negotiate a mutually satisfactory commercial agreement for use of the Unit's injection facilities. It found the Unit's offer to inject gas on Cabre's behalf for voidage replacement for production from the 9A-16 well of up to 13 thousand cubic metres per day ($10^3 \text{ m}^3/\text{d}$) of gas to be unacceptable. As indicated in section 5.1 of the report, the applicant proposed to produce a minimum of $81.3 \times 10^3 \text{ m}^3/\text{d}$ from the 9A-16 well in order to obtain its share of pool reserves.

In view of the foregoing, the applicant requested that the Board order the Unit to inject gas for voidage replacement on Cabre's behalf. The applicant requested that Approval No. 6175 be amended to include Section 16, containing the 9A-16 well, and those Unit lands not currently subject to the approval that are between Section 16 and the current area subject to the approval. If the Board considered a separate approval to be preferable to amending the existing approval, Cabre would concur with that decision.

3.2 Views of the Unit

The Unit submitted that, if the 9A-16 well is placed on production, gas should be injected into the A Pool to maintain voidage replacement at 100 per cent. The Unit did not propose production without voidage replacement as a solution that would allow Cabre to produce its well, because of pool conservation issues. It considered that the effect on pool recovery of producing the 9A-16 well without voidage replacement, while the Unit continued to replace voidage for Unit production, would be dependent on the rate of production from the Cabre well. The Unit also said that its simulation studies indicated that at blowdown there would be retrograde losses in outlying areas of the pool, including Section 16, that had not been fully swept by the cycling scheme. The studies assumed no production from Section 16 had occurred before blowdown. However, if Cabre is allowed to produce the 9A-16 well without voidage replacement, the Unit maintained that it should also be allowed to produce in the same manner.

The intervener estimated that the voidage decrease in the gas cap would be about 3.5 per cent per year, if it did not obtain makeup gas from elsewhere to inject into the A Pool to maintain voidage replacement.

The Unit strongly argued that the Board should not issue any order requiring the Unit to inject gas on Cabre's behalf. The Unit is prepared to inject gas for voidage replacement on Cabre's behalf for production from the 9A-16 well of up to $13 \times 10^3 \text{ m}^3/\text{d}$, which it calculated to be the applicant's approximate share of production from the A Pool (as discussed in section 5.2 of the report). Further, the Unit argued that Cabre has other alternatives to using the Unit's injection

facilities. The Unit maintained that it was economic for Cabre to drill its own injection well. It would be unacceptable to the Unit for Cabre to twin any Unit injection well on Unit lands. However, the Unit suggested that the applicant should drill a well in the southeast quarter of Section 9 for production, and use the 9A-16 well for injection. The 9A-16 well could be whipstocked further away from the 9-16 well, and injection rates could be limited, to mitigate possible safety concerns. The Unit considered that injection into the 9A-16 well would result in a pressure fence between that well and existing Unit injectors which would alleviate drainage of hydrocarbons from the Unit to Cabre lands. The Unit also noted that Cabre had not pursued the possible alternative of using the 7-12 well for injection; the Unit considered that there was good pressure communication between this well and the Unit area of the pool.

3.3 Views of the Majority

The views expressed below are those of examiners K. G. Sharp and F. Rahnama (the majority).

The majority considered the issue of the need for a gas injection order in the context of the following purposes of the Act:

- to effect the conservation of, and prevent the waste of, the oil and gas resources of Alberta,
- to provide for the economic, orderly, and efficient development in the public interest of the oil and gas resources of Alberta, and
- to afford each owner the opportunity of obtaining its share of production of oil or gas from any pool.

For the circumstances surrounding the application, the majority considered:

- whether gas injection is required to replace voidage from production from the Unit area of the pool and from the 9A-16 well for conservation reasons, and
- whether Cabre has any reasonable alternatives at this time to using the Unit injection facilities.

The majority note that normally an operator who wishes to produce from the gas cap of an oil pool requires approval for concurrent production before such production occurs, in order to control the reservoir energy needed to deplete the oil pool and ensure optimum recovery (i.e. for conservation reasons). Furthermore, an operator producing a well from a retrograde condensate reservoir would be required to ensure that maximum recovery of liquids occurred through a cycling scheme. As Cabre does not have Board approval to produce the 9A-16 well from the gas cap of the A Pool, nor is it part of the area subject to Approval No. 6175, it is currently unable to produce its well. Board approval would therefore be required to allow Cabre to produce its well.

The majority note that both the Unit and Cabre agreed that it would not be appropriate at this time to allow unrestricted gas production from the A Pool in the general area involved in the application without voidage replacement, for conservation reasons. However, neither party presented evidence regarding the impact on overall recovery of liquids from the gas cap, or oil from the downdip portion of the pool, if the 9A-16 well produced without voidage replacement while the Unit continued to inject gas to replace voidage for only Unit production.

The majority are of the opinion that, as the productive interval of the 9A-16 well is below the accepted original gas/oil contact of the A Pool, there was originally oil underlying Section 16. The fact that the 9A-16 well encountered liquids-rich gas rather than oil leads the majority to conclude that at least a portion of the oil has been replaced by wet gas swept into the section by gas injected by the Unit at the 6-27 and 11-14 wells. Similarly, a portion of the wet gas and retrograde liquids should be swept from the section by the continuing injection of gas through Unit facilities. However, as indicated by the Unit simulation studies, if the 9A-16 well remains shut in during cycling of the pool, a certain amount of the retrograde liquids and wet gas are likely to be left in Section 16 at the commencement of blowdown. Some of these reserves are likely to remain in the reservoir. If the 9A-16 well produces during cycling, additional volumes of wet gas are likely to be produced and less retrograde liquids are likely to be left behind. Therefore, it appears likely that more liquids would be recovered from Section 16 if the 9A-16 well goes on production during cycling than if it remained shut in. In addition, if the Unit continued to inject gas to replace voidage only for Unit production, while the 9A-16 well produced at equitable rates without voidage replacement, the resulting effect on the pressure in the overall gas cap and on oil recovery should not be significant, because the volume of production from the 9A-16 well would be a fairly small proportion of the total amount of production taken from the pool.

In summary, the majority conclude that:

- no evidence was submitted to suggest that it would be appropriate to produce without voidage replacement in the major portion of the gas cap of the A Pool at this time,
- the preferred option would be for the 9A-16 well to produce with full voidage replacement, thus promoting optimum recovery,
- where full voidage replacement for production from the 9A-16 well is not a workable alternative, it would be preferable for the 9A-16 well to produce without voidage replacement rather than remain shut in, to minimize the loss of wet gas and retrograde liquids as previously noted, and
- the possible loss of reservoir energy resulting from production of only the 9A-16 well at some equitable rate without voidage replacement, while the Unit replaces voidage for Unit production, should not be of such magnitude as to cause the majority to conclude that it should not be allowed, for the reason noted above.

Although overall pool recovery may not be a major issue if the 9A-16 well is produced without voidage replacement, such production is not an ideal solution to the matters in question, because

the Unit and Cabre would not be producing under the same conditions. For this reason, the majority believe it is appropriate to consider whether Cabre has any reasonable alternatives to this approach.

The majority note the Unit's offer to inject gas to replace voidage for production up to $13 \times 10^3 \text{ m}^3/\text{d}$ of gas from the 9A-16 well. As discussed in section 5.3 of the report, the majority consider that this volume of gas would not allow Cabre to obtain its share of reserves, and conclude that this is not a reasonable alternative for Cabre from an equity point of view.

The majority believe that consideration of Cabre's alternatives for gas injection in wells which are not yet drilled, whether in Section 9 or elsewhere on the fringes of the A Pool, is premature and speculative at best, since there is no certainty such wells would encounter the A Pool or be suitable injectors for a cycling scheme. Such speculations cannot therefore be considered reasonable alternatives for Cabre because of the uncertainties involved. The majority are doubtful that any injection into the 9A-16 well would be acceptable from a safety perspective, considering the past problems with the 9-16 well. The 7-12 well appears to be the only existing non-Unit well that Cabre could potentially use in a cycling scheme. The majority are of the view that the 7-12 well is in communication with a different gas cap than the 9A-16 well. The majority recognize a perched oil zone exists between the gas cap that contains the 7-12 well and the gas cap that contains the 9A-16 well. Using the 7-12 well as an injector may result in the movement of the perched oil to the southeast into the adjacent gas cap, resulting in oil losses, and thus in the view of the majority, the well is not an acceptable alternative. The majority conclude that using the Unit's injection facilities represents the most practical, orderly, and efficient alternative for developing Cabre's reserves. The matter of obtaining commercial arrangements for such a scheme remains an issue.

In the circumstances described above, the majority believe that, without some action by the Board, Cabre is unlikely to be afforded a reasonable opportunity to obtain its share of liquids. The majority believe that there are two possible recommendations which arise from the foregoing: to allow the 9A-16 well to produce without voidage replacement while the Unit continues to replace voidage for Unit production, or to seek an order under section 7 of the Act to require the Unit to inject on Cabre's behalf. An order under section 7 would be a very significant action by the Board, and is a major step towards forced unitization. Such an order should in the majority opinion be undertaken only where there is no workable alternative to allow the applicant to obtain its fair share of reserves. In this case, the majority believe there is an alternative, and therefore the majority do not believe it to be appropriate to recommend the issuance of an order requiring the Unit to inject on Cabre's behalf.

After weighing conservation and equity issues and the evidence presented, the majority are persuaded by the unique circumstances surrounding the application and the subject pool to recommend that an approval be issued to allow Cabre to produce the 9A-16 well without voidage replacement. Although this alternative does not provide for ideal operation of this pool in that Cabre and the Unit would not appear to be producing under the same conditions, it does provide an opportunity for Cabre to produce its reserves with some minor impact on overall pool recovery, and without the significant action by the Board of ordering the Unit to inject gas on

Cabre's behalf. The majority still believe that the optimum scenario for operation of the pool would involve a voluntary settlement between the parties which would allow production with full voidage replacement to conserve all reservoir energy. The compromise option that the majority are prepared to recommend has resulted because the parties have failed to come to a mutually satisfactory voluntary agreement.

3.4 Views of the Minority Examiner

The views expressed in this section of the report are the views of examiner G. W. Dilay (the minority examiner).

The minority examiner believes that there should be a "level playing field" for both operators; that is, both operators should be subject to the same rules of operation. In the part of the pool under consideration in this case, the common rule is that, until partial or full blowdown of the gas cap is approved, only liquids are allowed to be produced and the reservoir voidage created by the liquid production must be replaced by gas injection. There would not be a "level playing field" if the Unit was required to replace its voidage and Cabre was not. Therefore, the minority examiner does not believe it would be fair, at this time, to allow Cabre to produce its well without replacing voidage. The minority examiner notes that Cabre did not propose to produce its well without replacing voidage and that the Unit was opposed to this type of operation if it was required to replace its voidage. The minority examiner also notes that since there are no Unit producers between its two injectors in the gas cap and Cabre's 9A-16 well, some of the Unit's reserves would be swept towards Cabre's well if it were allowed to produce while the Unit was required to continue to inject.

With respect to the effect on hydrocarbon recovery of allowing Cabre's well to produce without voidage replacement, the minority examiner notes that only a qualitative assessment of this issue is possible. Since Cabre did not apply for approval to produce its well without voidage replacement, neither Cabre nor the Unit provided a quantitative assessment of the effect this would have on hydrocarbon recovery. Allowing Cabre to produce its well without voidage replacement would result in the approval of partial blowdown of the gas cap. The minority examiner does not believe this should be done without a proper assessment of the effect it would have on hydrocarbon recovery.

Regarding Cabre's request for the Board to require the Unit to inject gas on behalf of Cabre, the minority examiner recognizes that the Board has broad powers under section 7 of the Act. However, there is no specific provision in the Act that deals with this matter as there is with respect to common carrier, common processor, and rateable take. The minority examiner believes that the matter of requiring one operator to inject on behalf of another operator would most properly be dealt with under forced unitization. Although there is a provision in the Act (sections 76.1 to 76.9) that would allow the Board to have a pool or part of a pool operated as a unit, these sections have not been proclaimed. Therefore, the minority examiner does not believe it would be appropriate for the Board to require the Unit to inject on behalf of Cabre.

The minority examiner recognizes that by not allowing Cabre to produce its well without voidage replacement and not requiring the Unit to inject on behalf of Cabre, Cabre's options to

produce its well are limited and drainage of the hydrocarbons underlying Section 16 by the Unit could continue. However, under the Act, the Board is only required to afford each owner the opportunity of obtaining its share of the production of oil or gas from any pool. The minority examiner believes that this opportunity is provided by the Board establishing a "level playing field" where both operators are subject to the same established rules of operation. Once a "level playing field" has been set, any drainage that occurs is allowed under the rule of capture. The minority examiner believes that when an operator is considering drilling a well near the edge of a pressure maintained pool, the operator must take into consideration that its ability to produce its well will depend on the rules of operation.

Until Cabre is in a position to have the voidage created by any liquid production from its well replaced by gas injection or blowdown of the gas cap is approved, the minority examiner does not see a need for the Board to issue common carrier, common processor, or rateable take orders. Therefore, the minority examiner recommends that Cabre's application be denied.

4 NEED FOR COMMON CARRIER AND COMMON PROCESSOR ORDERS, AND IF ISSUED, THE DETAILS OF THE ORDERS

4.1 Views of Cabre

Cabre submitted that it required common carrier and common processor orders to provide access to all facilities used by the Unit to transport and process gas and liquids from the A Pool, including gas injection facilities. Such access would allow production from the 9A-16 well to alleviate ongoing drainage of Cabre's A Pool reserves by Unit operations.

The applicant said that, although the productive interval of the 9A-16 well is below the original gas/oil contact of the A Pool, the well encountered liquids-rich gas rather than oil. The oil originally underlying Section 16 had been swept from the section by the gas injection scheme operated by the Unit, and since gas continues to be injected into the pool, the liquids underlying Section 16 continue to be drained. Cabre submitted that pressure tests conducted at the 9A-16 well also showed that drainage of its reserves was occurring, with the pressure of the A Pool at the well declining from 20 100 kilopascals, gauge (kPag) in February 1994 to 19 442 kPag in November 1995.

Cabre submitted that it has producible reserves available for transportation and that processing facilities are required for the gas involved. The applicant estimated remaining gas-in-place reserves underlying Section 16 to be 60.3 million (10^6) m³ as calculated from its mapping, or 114.0×10^6 m³ as calculated using wellbore parameters over the whole of the section. Cabre would also be able to purchase additional volumes of dry make-up gas needed for voidage replacement which would be transported in the proposed common carrier operation. The applicant indicated that it has a ready market for the liquids that would be recovered through the 9A-16 well.

The applicant argued that using the Unit facilities offered the only option that is feasible or practical. This alternative offered the best economics, avoids unnecessary duplication of

facilities, and minimizes environmental impact associated with building new facilities. Cabre considered the following other alternatives:

- building its own gas plant and injection scheme, and using the Unit pipeline extending from the 11-3 to the 6-27 location for transporting makeup gas,
- installing its own injection scheme, with processing at an Alberta Natural Gas Company Ltd. plant located in Lsd 7-16-62-8 W6M (the Cutbank plant), and using the Unit pipeline extending from the 11-3 to the 6-27 location for transporting makeup gas,
- using the Unit injection facilities, with processing at the Cutbank plant, and using the Unit pipeline extending from the 11-3 to the 6-27 location for transporting makeup gas, and
- installing its own injection scheme, with processing at the Unocal plant, and using the Unit pipeline extending from the 11-3 to the 6-27 location for transporting makeup gas.

Cabre found these alternatives unacceptable for one or more of the following reasons:

- installing its own injection scheme is not practical (as discussed in section 3.1 of the report),
- the Unit would not allow Cabre access to Unit injection facilities for reasonable volumes of production (as discussed in sections 3.1 and 5.1 of the report),
- Cabre has no assurance it would have reasonable access to the Unit pipeline extending from the 11-3 to the 6-27 location, and
- there is sufficient capacity in the Unit facilities for production from the 9A-16 well, and hence the construction of new facilities is unnecessary.

Cabre indicated that if it were allowed to produce the 9A-16 well without voidage replacement, it could have the option of processing its gas at the Cutbank plant. However, in this situation, it would prefer to use the Unit's processing facilities to minimize capital costs and environmental impact.

The applicant said that, although numerous discussions had taken place between the parties, it has not been able to negotiate a satisfactory arrangement for using the Unit facilities. It argued that the Unit's statements that the Unit would transport and process Cabre's gas are meaningless unless Cabre has been afforded reasonable and firm fees and rates. In view of the foregoing, Cabre concluded that it had no reasonable alternative but to request common carrier and common processor orders.

Cabre requested that the common carrier and common processor orders be effective as of 27 June 1995, the date its application was complete. It considered this effective date to be justified by the delays in resolving the issues between Cabre and the Unit. These delays have

had a considerable negative economic impact on Cabre, since it has not been able to produce its well and consequently drainage of its reserves has occurred over a long period of time.

4.2 Views of the Unit

The Unit indicated that Cabre is entitled to recover the reserves underlying Section 16. However, it calculated the initial gas in place for the A Pool for the section, on the basis of its mapping, to be only $24 \times 10^6 \text{ m}^3$, and it questioned whether Cabre had not already produced much of its gas during the loss of control and flaring that had occurred at the 9-16 and 9A-16 wells. The Unit did not dispute that the gas producible from the 9A-16 well would require processing, or that Cabre would have a market for the liquids produced from the well.

The Unit questioned Cabre's assertion that common carrier and common processor orders are required to mitigate drainage. In the Unit's opinion, it is not clear that Cabre's reserves are being drained. The Unit speculated that Section 16 could be in a transitional area of the gas/oil interface, and hence in this situation the 9A-16 well could encounter liquids-rich gas rather than oil under initial reservoir conditions. Further, the sweep of the enhanced recovery scheme in Section 16 would be minimal, because the section is on the edge of the pool. In support of this view, the Unit noted that the liquids content of gas from a Unit well in Lsd 6-29-63-6 W6M in 1988 was similar to that from the 9A-16 well in 1994. The Unit also argued that the pressure depletion at the 9A-16 well noted by Cabre may be explained by the loss of control and flaring that occurred at the 9-16 and 9A-16 wells, by the flow of gas into a coal seam at a depth of 353 m in the 9-16 well before the zone was plugged, by possible ongoing flow of A Pool gas into an upper zone in the 9-16 wellbore which remains open below 665.0 mKB, and by production without voidage replacement by Enerplus in the south part of the pool. In any event, any drainage of Cabre's reserves was not inequitable, because the Unit is maintaining 100 per cent voidage replacement in the Unit area of the pool subject to Approval No. 6175, and any drainage is not due to Unit operations.

The Unit was opposed to the issuance of common carrier and common processor orders. It also argued that the definitions of a pipeline and a processing plant in the Act indicate that these orders would not in any event apply to the gas injection facilities.

The Unit submitted that common carrier and processor orders are not required because the Unit is prepared to carry and process up to $13 \times 10^3 \text{ m}^3/\text{d}$ of Cabre's gas, with injection at Unit facilities. If Cabre wishes to produce at a greater rate, as long as it implemented its own cycling scheme, the Unit is prepared to carry and process up to $60 \times 10^3 \text{ m}^3/\text{d}$ of Cabre's gas as measured at the top of the separator, or about $70 \times 10^3 \text{ m}^3/\text{d}$ as measured at the wellhead. Furthermore, the Unit would carry and process such gas without discrimination, at reasonable fees determined using the Jumping Pound 90 guide.

The Unit agreed that attempts had been made by the parties to negotiate a mutually satisfactory agreement for Cabre's use of Unit facilities. However, the Unit contended that, as it is prepared to carry and process Cabre's gas on reasonable terms, Cabre has failed to demonstrate that it cannot negotiate reasonable arrangements to use the Unit facilities. Hence, the application for the common carrier and common processor orders should be rejected. Further, Cabre has a

reasonable alternative for processing its gas at the Cutbank plant. The Unit also opposed the common carrier and common processor declarations because the orders would open the Unit's facilities not only to Cabre, but to other parties which are not Unit participants.

The Unit opposed the granting of the common carrier and common processor orders, but submitted that if such orders are issued, they should not be effective in a retroactive manner, because the 9A-16 well is not tied in.

4.3 Views of the Majority

The majority notes that the Board has indicated in previous reports that a successful applicant for a common carrier order would be required to satisfactorily demonstrate that

- producible reserves are available for transportation through an existing pipeline,
- there is a reasonable expectation of a market for the substance which is proposed to be transported by the common carrier operation,
- the applicant could not make reasonable arrangements to use the existing pipeline, and
- the proposed common carrier operation is either the only economically feasible way or clearly the most practical way to transport the substance in question, or is clearly superior environmentally.

A successful applicant for a common processor order would be required to satisfactorily demonstrate that

- producible gas reserves exist and gas processing facilities are needed,
- reasonable arrangements for the use of processing capacity in the existing plant could not be agreed on by the parties, and
- a common processor order is either the only economically feasible way or clearly the most practical way to process the gas in question, or is clearly environmentally superior.

The majority accept the evidence and statements that there are reserves producible from the 9A-16 well which require processing, and that the applicant has a market for the reserves producible from the well.

As indicated in section 3.3 of the report, the majority believe that the original oil reserves underlying Section 16 have been swept by the enhanced recovery scheme operated by the Unit. Further, it is highly probable that the operation of the scheme continues to affect the reserves underlying the section. The decline in pressure of the A Pool at the 9A-16 well noted by Cabre also indicates to the majority that Cabre's lands are being influenced by operations in the pool. Accordingly, the majority conclude that the applicant's reserves are being drained.

Having regard for the conclusion discussed in section 3.3 of the report, that it would be appropriate to recommend that Cabre be allowed to produce without voidage replacement, the majority consider the applicant's alternatives for developing its reserves are to

- build all its own facilities,
- use the Unit's facilities, or
- transport its gas to the Cutbank plant for processing.

The majority believe that the most practical, efficient, and orderly alternative would be one which involved the minimum installation of new facilities, and hence minimize duplication of existing facilities and environmental impact.

The majority believe the option of Cabre building its own processing plant and pipelines to get its gas to market to be an unnecessary duplication of facilities. Although the Cutbank alternative appears to be an economic option, it would involve building more new facilities, including a longer pipeline, than using the Unit facilities. These two options would also increase surface disturbance and cause some impact on the environment. The majority therefore conclude that utilization of the Unit facilities represents the most desirable option in this case.

The majority note that negotiations to allow Cabre access to Unit facilities on mutually acceptable terms have failed. Moreover, the Unit does not favour the production of the 9A-16 well without voidage replacement unless the Unit is allowed to produce in a similar manner, and its offers to Cabre for use of Unit facilities do not contemplate the scenario where Cabre would be allowed to produce without voidage replacement. The majority are of the opinion that under these circumstances, Cabre would not have unequivocal and equitable access to Unit facilities in the absence of common carrier and common processor orders. The majority are therefore prepared to recommend that these orders be granted, except with respect to the dry gas pipelines extending from the 11-3 to the 6-27 location, and from the Unocal plant to the 6-27 location. As Cabre would be allowed to produce without voidage replacement, it would not be necessary to have these particular pipelines included in the common carrier order. Further, the majority believe that it would be appropriate to limit the orders to apply only to gas produced from the A Pool through the 9A-16 well, to address the Unit's concerns regarding access to the facilities by others. The majority concur with the Unit that the common carrier and common processor orders would not apply to the gas injection facilities.

To establish the effective date of the orders, the majority considered drainage matters and whether the 9A-16 well is substantially ready to produce. The majority believe that drainage of Cabre's reserves has continued to occur during the processing of the application. However, no pipeline has yet been installed which would allow the production of the 9A-16 well. The majority believe that the pipeline could be installed in a relatively short period of time. Accordingly, the majority are prepared to recommend that the effective date of the common carrier and common processor orders be the date of the Board's decision with respect to the recommendations on the application.

4.4 Views of the Minority Examiner

For the reasons noted in section 3.4 of the report, the minority examiner believes that there is no need for common carrier and common processor orders, and recommends that the request for these orders be denied.

5 NEED FOR A RATEABLE TAKE ORDER, AND IF ISSUED, THE DETAILS OF THE ORDER

5.1 Views of Cabre

As summarized in previous sections of this report, Cabre submitted that using the Unit facilities to transport and process gas from the 9A-16 well is the most practical way in which to obtain its share of production. The applicant indicated that it has been unsuccessful in its attempts to negotiate what it considers to be an equitable rate of production from the well with the Unit, and its reserves continue to be drained. Cabre concluded that a rateable take order is needed to ensure that it obtains an equitable share of pool production.

The applicant proposed that gas from a portion of the A Pool should be distributed between the Unit and the 9A-16 well in proportion to the pore volume associated with specified areas validated by productive wells. Cabre argued that mapping should not be used as a basis for allocation, because contouring during mapping is highly interpretive. New wells and lands could be added to the rateable take area and order through consistent application of the formula adopted.

Cabre proposed that only the area in which the gas cycling scheme is operative, and which affects the reserves associated with the 9A-16 well, be used in an allocation formula. It excluded lands not within the current G Order defining the A Pool, any section not considered to be productive from the A Pool, and any section with a shut-in well not impacting on the reserves underlying Section 16. The area to be used in the formula conforms to the approximate area of the expanded gas cap of the A Pool, and includes those lands listed on Table 2 and shown as the "Application Area" on Figures 1 and 2 (hereinafter referred to as the application area).

Cabre proposed that the entire pore volume associated with each well within the application area be recognized whether the well was oil or gas bearing. The applicant recognized that this method would place it at a disadvantage as compared to the Unit, but it was prepared to use this method in order to keep the allocation formula simple. However, the applicant argued that the Alpha sand should not be included in the formula, because there is communication between the A sand and the low-permeability Alpha sand only where wells have been completed to allow commingling of production from the two sands in the wellbore. Further, in Cabre's opinion, the Alpha sand is not being swept by the enhanced recovery scheme. Cabre requested that if the Alpha sand is used in the allocation formula, the oil pay, validated area, and recovery from the sand should be significantly discounted. The applicant did not include water saturation in the allocation formula because it is consistent throughout the pool. The proposed net pay and porosity values presented by Cabre are shown on Table 2.

Cabre could find no foundation for a Unit suggestion that the rateable take order should account in some way for the reserves produced during the loss of control and flaring that occurred at the 9-16 and 9A-16 wells. The applicant did not propose to account for such volumes, but would do so if directed by the Board.

Using the approach noted above, the applicant calculated that 7.4 per cent of production from the application area should be allocated to Cabre, and 92.6 per cent to the Unit.

Cabre requested that a minimum rate be set in the rateable take order to allow each party to produce to that level even if the other operator had shut in production for any reason. It proposed that the minimum rate be its share of the system capability for the application area, which it estimated to be $1.1 \times 10^6 \text{ m}^3/\text{d}$ based on peak gas production in January 1994. On this basis, the applicant calculated that its minimum rate should be $81.3 \times 10^3 \text{ m}^3/\text{d}$, and the Unit's $1.018 \times 10^6 \text{ m}^3/\text{d}$. Cabre estimated the minimum economic rate for its well would be $42.5 \times 10^3 \text{ m}^3/\text{d}$, using information it had at the time it submitted the application. It said that later negotiations with the Unit indicated that a minimum economic rate would be greater than its initial calculation, but it did not provide an estimate of any higher value.

The applicant submitted that production under the rateable take order should be balanced on a calendar-year basis.

Cabre also requested that the effective date of the rateable take order should be 27 June 1995, the date its application was complete, the same effective date it requested for the common carrier and common processor orders, for the reasons summarized in section 4.1 of the report. It argued that the rateable take order could be made retroactive under section 7 of the Act. However, if the Board believes it is unable to make the effective date of the order retroactive, Cabre requested that the Board should make a recommendation on what it believes to be an equitable allocation for the period in question.

Finally, the applicant requested that the Board clarify whether the production afforded to Cabre should be the raw gas equivalent of the liquid stream when commingled with the gas stream after the separator as proposed by the Unit during negotiations, or the gas measured off the top of the separator, as proposed by Cabre. The applicant favoured the latter approach for ease of operation, and because the plant capacity estimates and therefore rateable take are also based on gas production and injection measured in a similar manner. Cabre also indicated that it would not have a problem measuring the raw gas flowing from the 9A-16 well.

5.2 Views of the Unit

The Unit acknowledged that the Unit and Cabre had been unable to agree on what volume of Cabre's gas the Unit would carry and process. However, the Unit maintained that there was no need for a rateable take order. As discussed in section 4.2 of the report, the Unit argued that there is no inequitable drainage of Cabre's reserves. Further, Cabre is not being deprived of an opportunity to produce its well. As indicated in previous sections of the report, the Unit is prepared to carry and process $13 \times 10^3 \text{ m}^3/\text{d}$ of Cabre's gas with injection at Unit facilities; if

Cabre wishes to produce at a greater rate, so long as Cabre implements its own gas cycling scheme, the Unit is prepared to carry and process up to $60 \times 10^3 \text{ m}^3/\text{d}$ as measured at the top of the separator, or about $70 \times 10^3 \text{ m}^3/\text{d}$ as measured at the wellhead. The Unit is prepared to carry and process such volumes of gas without discrimination at reasonable fees. The Unit also argued that, in addition to the Unit's offer, Cabre has other alternatives, as summarized in sections 3.2 and 4.2 of the report, to produce its reserves.

The Unit was also opposed to the rateable take order because the concept of such an order was never intended to be applied in a pool operating under a gas cycling scheme. It argued that as soon as the 9A-16 well begins producing, the Unit's reserves would be drained, as injected gas sweeps liquids-rich gas towards the 9A-16 well. The Unit indicated that there is no existing Unit well, or one that could be drilled economically, to capture the Unit liquids that are swept towards the 9A-16 well.

The Unit objected to the issuance of any rateable take order, but if one were issued, the Unit submitted that gas from the A Pool should be distributed between Cabre and the Unit in proportion to the reserves underlying appropriate portions of the pool, as determined by volumetric analysis of its hydrocarbon pore volume mapping of the pool. It acknowledged that mapping is interpretive, but argued that this is still the best means of determining hydrocarbon pore volumes in a pool. The Unit considered the A and Alpha Cardium sands comprising the pool to be in communication, and said that both sands should be accounted for in any allocation of production.

The Unit submitted that all of the Unit's A Pool lands being served by the Unocal plant, and non-Unit lands deemed productive which are expected to be served by the plant in future, should be accounted for in allocating production. On this basis, it considered that the entire Unit area, and sections 1 and 12-64-7 W6M, should be used. The Unit noted that using all of this portion of the A Pool in allocating production would be appropriate since the entire area is in pressure communication.

On the basis of its mapping for the area described above, the Unit calculated that 1.0 per cent of the reserves should be allocated to Cabre, and 99.0 per cent to the Unit. If Cabre's reserves were calculated using wellbore parameters applied over the area of Section 16, and divided by the total volume of gas in place calculated from the volumetric analysis of the Unit's mapping, Cabre's share of the pool would be 3.6 per cent, and the Unit's would be 96.4 per cent.

Applying the above allocation to the Unit's estimate of the appropriate system capacity of $1.380 \times 10^6 \text{ m}^3/\text{d}$ would result in a rate of $13.9 \times 10^3 \text{ m}^3/\text{d}$ for Cabre for a 1.0 per cent share, and $49.9 \times 10^3 \text{ m}^3/\text{d}$ for a 3.6 per cent share. The Unit indicated however that, if a rateable take order is issued, it would prefer that allocation be done on a percentage basis, rather than with actual rates. This would allow the processing plant throughput to be adjusted more readily to reflect other pools being served by the plant.

The Unit argued that distribution of production in the A Pool should not be based entirely on hydrocarbon pore volume analysis, but should also include a factor to account for the location of

injectors and producers and the sweep pattern of the liquids in the pool. It also contended that the Board should give consideration to the gas produced during the loss of control and flaring that occurred at the 9-16 and 9A-16 wells in allocating production. However, no calculations or analyses were presented to indicate how these two matters could be accounted for in the rateable take order.

The Unit requested that the term of any rateable take order be limited to the period before concurrent production of the gas and oil in the A Pool occurs (blowdown). Further, there should be a statement in the decision on the application indicating that the rateable take order is not setting any precedent for production allocation during blowdown of the pool.

Finally, the Unit argued that the provisions of section 45 of the Act, which allow for some measure of retroactivity respecting the effective date of common carrier and common processor orders, do not apply to rateable take orders. In any event, there is no need for any rateable take order issued to be made effective in a retroactive manner, since the 9A-16 well is not tied in.

5.3 Views of the Majority

In previous decisions on rateable take matters, the Board has indicated that an applicant requesting an order distributing production among wells in a pool would be required to demonstrate that it is being deprived of the opportunity to obtain its share of production from the pool. The Board would determine whether or not the applicant has and will continue to have a reasonable opportunity to produce reserves, more or less in proportion to the reserves associated with its well. The applicant must show that drainage is actually occurring or would occur as a result of the applicant not having an opportunity to produce its share of gas.

As indicated in section 4.3 of the report, the majority believe that the reserves underlying Section 16 are being drained, and would continue to be drained, because of the failure of the parties to come to a mutually satisfactory arrangement allowing production from the 9A-16 well. The majority are satisfied that the applicant has made reasonable attempts to resolve the issue of what rates should be produced from the 9A-16 well, and that it is being deprived of a reasonable opportunity to produce its well. Therefore, the majority are prepared to recommend that an order be issued to provide for equitable withdrawals from the pool.

The majority believe that production should be distributed among wells in the appropriate portion of the A Pool on the basis of reserves. The order should also take into account that production would be occurring from the 9A-16 well without voidage replacement, and that the primary goal for an operator in this pool at this time is the recovery of a maximum amount of liquids. The recovery of these liquids in Cabre's case without voidage replacement should not be allowed to take such reservoir energy as to significantly affect overall recovery from the pool. The rateable take order should also account only for production taken from the effective date of the order, and not for any previous production that occurred at the 9-16 and 9A-16 wells. With respect to reserves issues, the planimetering of a hydrocarbon pore volume map should not be used as a basis for allocation, because of the interpretive nature of producing the contours on such a map. Therefore, the majority believe it is appropriate to use an allocation formula which

incorporates wellbore parameters over specified areas that would account for reserves associated with both drilled sections and undrilled sections that could be drained by existing wells.

The majority believe that it would be appropriate to limit the effect of the rateable take order as much as possible while still providing equity. Specifically, the order should deal with only those wells which affect the reserves underlying Section 16. On this basis, the majority are prepared to accept Cabre's assessment of the area which should be used in allocating production.

The majority are of the opinion that the wellbore net pay and porosity values presented by Cabre are generally more consistent than those presented by the Unit, and are prepared to use the Cabre values for these parameters in the allocation formula. The majority also agree with Cabre that water saturations do not vary significantly in the application area and therefore need not be used in the formula. However, the majority agree with the Unit's arguments respecting the Alpha Cardium sand and believe that this sand should be accounted for in the allocation. Finally, the majority note that for the sake of simplicity, Cabre is prepared to accept a methodology whereby the entire pore volume within a well would be recognized whether the well is oil or gas bearing, although this method places the applicant at a disadvantage. The majority consider this a practical approach and are prepared to adopt it in this instance. However, both the A and Alpha sands should be treated in the same manner.

On the basis of the wellbore net pay, porosity, and area values discussed above and set out in Table 2, and the allocation formula as noted in the same table, the majority conclude that, if the 9A-16 well were producing with full voidage replacement, it would be equitable to allocate 6.8 per cent of the total production of the application area to the 9A-16 well, and 93.2 per cent to the Unit wells. To account for the production scenario that would allow the 9A-16 well to produce without voidage replacement, production from the well should be further limited so that Cabre would receive no more from gas and liquids revenues combined than it would from liquids revenues alone if voidage for production from the 9A-16 well were being replaced. Using the method set out in Table 3, the proportion of production allocated to Cabre would be dependent on the liquid component of the raw gas stream flowing from the 9A-16 well, which would change with time. On the basis of the discovery liquid component, and the method noted on Table 3, the majority calculate that, where the 9A-16 well is producing without voidage replacement, it would be equitable to allocate 2.3 per cent of production from the application area to Cabre, and 97.7 per cent to the Unit. The majority believe that the composition of the raw gas stream at the 9A-16 well should be tested on a semi-annual basis, and the allocation and the minimum rate discussed below, adjusted accordingly to obtain an annual value.

The majority recognize that the allocation method as set out here may not be appropriate throughout the life of the A Pool. When circumstances or the recovery mechanism in the pool change sufficiently that the rateable take order no longer provides for equitable withdrawals from the pool, an affected party may apply to the Board for an amendment or if appropriate, a rescission, of the order. The majority also recognize that this methodology will be complex to administer, but see it as a workable alternative to either leaving the 9A-16 well shut in or the simpler allocation method that would likely have been used if the Unit had been ordered to inject on Cabre's behalf.

The majority agree with Cabre that it would be appropriate to set minimum production rates, to allow each operator to produce up to a particular volume, regardless of whether the other operator shut in production for any reason. The majority note the Unit's argument that if a rateable take order were issued, it would prefer only percentages of production to be set rather than rates, to allow for more convenient adjustments of plant throughput. The majority consider that the minimum rate should therefore be at some level below system capacity, and yet still be economic. The majority are prepared to use the minimum economic rate estimated by Cabre of $42.5 \times 10^3 \text{ m}^3/\text{d}$, assuming full voidage replacement for the 9A-16 well, as a basis on which to set minimum rates. Adjusting the minimum economic rate estimated by Cabre to account for production from the 9A-16 well without voidage replacement, for the discovery liquid component of the gas stream at the well, using the method shown on Table 3, and using the allocations noted above, the minimum rate for the 9A-16 well would be $14.2 \times 10^3 \text{ m}^3/\text{d}$, while the minimum rate for the Unit would be $603.2 \times 10^3 \text{ m}^3/\text{d}$. For production above the minimum rates, the established proportions would have to be maintained.

Finally, the majority believe that the allocation order should be effective at the same time as the common carrier and common processor orders, and that it would be appropriate to balance production under the allocation order on a calendar-year basis. The majority also believe that it would be appropriate to measure both raw gas volume and composition at the 9A-16 wellhead.

5.4 Views of the Minority Examiner

For the reasons noted in section 3.4 of the report, the minority examiner believes that there is no need for a rateable take order, and recommends that the request for such an order be denied.

6 RECOMMENDATIONS

For the reasons noted above, the minority examiner recommends Cabre's application be denied.

The majority recommend that

- the Board issue an order allowing production from the 9A-16 well without voidage replacement; and
- the Board, with the approval of the Lieutenant Governor in Council, issue an order declaring Unocal as a common carrier of production from the A Pool from the 9A-16 well, through
 - the effluent pipeline extending from the 6-27 location to the Unocal plant, and
 - the effluent pipeline extending from Lsd 11-32-63-6 W6M to the Unocal plant; and

- the Board, with the approval of the Lieutenant Governor in Council, issue an order declaring Unocal as a common processor of gas produced from the A Pool through the 9A-16 well, through the Unocal plant; and
- the Board issue an order distributing production among wells in a portion of the A Pool in the manner set out in section 5.3 of the report; and
- all of the aforementioned orders be effective on the date of the Board's decision with respect to these recommendations by the majority.

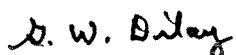
DATED at Calgary, Alberta on 13 March 1996.



K. G. Sharp, P.Eng.



F. Rahnama, Ph.D.



G. W. Dilay, P.Eng.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Cabre Exploration Ltd. (Cabre) H. R. Ward	W. C. Farquhar, P.Eng., MBA G. Bolter
Unocal Canada Resources (Unocal) B. K. O'Ferrall M. Decter	L. M. Doyle, P.Eng. P. A. Nenadov L. Rice-Naas, MSc.
Alberta Energy and Utilities Board staff K. Fisher H. L. Longworth, P.Eng. L. D. Martinuzzi, P.Eng. C.J.C. Page A.E.M. Wiechert, P.Geol.	

TABLE 2 ALLOCATION OF RESERVES FROM THE KAKWA A CARDIUM A POOL
(APPLICATION AREA - GAS CAP)

Section	Validated by Wells	Wellbore Parameters From Cabre				Porous Rock	Reserves Allocation ^b (%)
		Net Pay m (meters)	Porosity Phi (%)	Phi * h (%m)	Area ha (hectares)	Volume ^a Phi * m * ha (%mha)	
Unit Lands							
10-63-6W6	00/09-10-063-06W6/0	1.19	14.8	17.6	64.8	1140.5	
11-63-6W6	00/07-11-063-06W6/0	1.18	11.6	13.7	97.1	1330.3	
	00/11-11-063-06W6/0	1.23	14.8	18.2	97.1	1767.2	
12-63-6W6	00/07-12-063-06W6/0	1.21	16.6	20.1	129.5	2603.0	
	00/11-12-063-06W6/0	1.00	15.3	15.3	129.5	1981.4	
13-63-6W6	00/06-13-063-06W6/0	1.12	16.3	18.2	259.0	4713.8	
14-63-6W6	00/11-14-063-06W6/0	1.06	14.8	15.7	259.0	4066.3	
15-63-6W6	average Phi*h from 9-10, 11-14, & 02/09-16-063-6W6			18.0	259.0	4662.0	
21-63-6W6	average Phi*h from 02/09-16, 06-27, & 06-29-063-06W6			16.6	259.0	4299.4	
22-63-6W6	average Phi*h from 11-14, 02/09-16, & 06-27-063-6W6			19.8	259.0	5128.2	
23-63-6W6	Average Phi*h from 11-14, 10-24, & 06-27-063-6W6			19.4	259.0	5024.6	
24-63-6W6	09-24-63-6W6 (A sand)	1.07	18.3	19.6	129.5	2538.2	
	09-24-63-6W6 (Alpha sand)	1.14	7.3	8.3	129.5	1074.9	
	10-24-63-6W6 (A sand)	1.07	18.3	19.6	129.5	2538.2	
	10-24-63-6W6 (Alpha sand)	1.61	12.0	19.3	129.5	2499.4	
27-63-6W6	00/06-27-063-06W6/0	1.50	15.3	23.0	259.0	5957.0	
28-63-6W6	Average Phi*h from 6-27, & 06-29-063-06W6			14.5	259.0	3755.5	
29-63-6W6	00/06-29-063-06W6/0	0.39	15.4	6.0	259.0	1554.0	
31-63-6W6	00/06-31-063-06W6/0	1.00	15.3	15.3	259.0	3962.7	
32-63-6W6	11-32-63-6W6 (A sand)	1.55	17.0	26.3	259.0	6811.7	
	11-32-63-6W6 (Alpha sand)	1.4	6.0	8.1	259.0	2097.9	
6-64-6W6	04-6-64-6W6 (A sand)	0.88	15.9	14.0	259.0	3626.0	
	04-6-64-6W6 (Alpha sand)	0.6	6.1	3.7	259.0	958.3	
Total Unit						74090.3	93.2%
Cabre Lands							
16-63-6W6	02/09-16-063-06W6/0	1.53	13.6	20.8	259.0	5387.2	6.8%

a Porous rock volume = net pay × porosity% × area

b Calculated reserves allocation is based on the following formula:

Per cent of application area reserves for Cabre = $\frac{\text{sum of porous rock volume of interest}}{\text{sum of porous rock volume for all sections}} \times 100$
or for Unit

TABLE 3 ADJUSTMENT FACTOR^a AND ALLOCATION OF PRODUCTION FROM THE KAKWA A CARDIUM A POOL (APPLICATION AREA - GAS CAP)

	Unadjusted ^b Reserves Allocation (%)	Adjustment Factor ^c (fraction)	Adjusted ^d Production Allocation (%)
Unit	93.2	N/A	97.7
Cabre	6.8	0.333	2.3

a Adjustment factor for voidage and liquid/gas ratio only apply when produced gas is not being returned to the production zone. In this instance the factor would only apply to Cabre's unadjusted reserves allocation, not the Unit's.

b From Table 2.

c This adjustment factor allows a reduced gas and gas liquids production that is equivalent in value to the larger volume of liquid production that would be allocated if all associated gas volumes were reinjected. It accounts for liquid and gas revenues and processing and injection costs based on Jumping Pound formula (JP 90 from Appendix A of Application No. 950490). The adjustment factor is calculated as follows:

$$\text{Adjustment factor} = 0.333 \times \frac{C_{5+}}{5.61} \quad \text{where: } C_{5+} = \text{current mole \% } C_{5+} \text{ in recombined raw gas stream for the subject well}$$

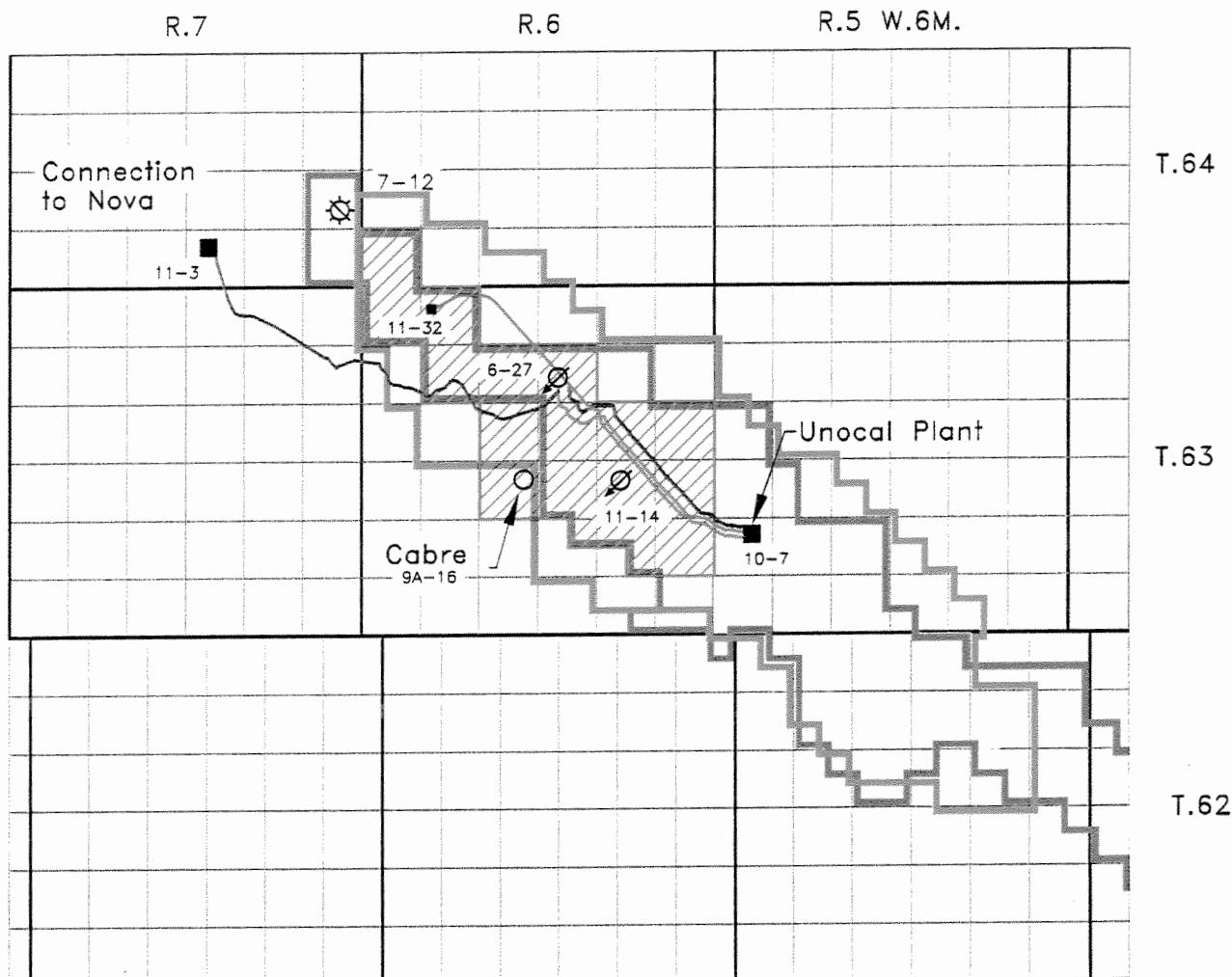
5.61 = discovery mole % C_{5+} in the recombined raw gas stream for the subject well

$$0.333 = \frac{\text{Raw Gas Production Rate (no injection)}}{\text{Raw Gas Production Rate (with injection)}}$$

such that: Net Revenue (no injection) = Net Revenue (with injection)

d Adjusted production allocation = unadjusted reserves allocation \times adjustment factor.

(Note: Once Cabre's adjusted production allocation is calculated then the Unit's reserves allocation must be adjusted so that the sum of their production allocations = 100%.)



- | | | | |
|--|-----------------------------------|--|--------------------|
| | Area Subject to Approval No. 6175 | | Standing well |
| | Application Area | | Gas injection well |
| | Kakwa A Cardium A Pool | | Suspended gas well |
| | Kakwa Cardium A Unit | | |
- Proposed Common Carrier Pipelines
- Makeup gas pipeline
 - Dry gas return pipeline
 - Effluent pipeline
 - Effluent pipeline

FIGURE 2 APPLICATION AREA DETAIL

E96-3