ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

CANADIAN 88 ENERGY CORP.
APPLICATION TO CONSTRUCT AND OPERATE
SOUR NATURAL GAS PIPELINES AND WELL PRODUCTION FACILITY, BURMIS AREA

Addendum to Decision 97-16
Application Nos. 1004834 and 1010138

1 THE APPLICATIONS AND HEARING

APPLICATION NO. 1004834

Canadian 88 Energy Corp. (Cdn 88) applied, pursuant to Part 4 of the Pipeline Act, for a permit to construct and operate two 168.3-millimetre (mm) outside diameter (OD) pipelines for a length of 13.9 kilometres (km). The proposed pipelines would run in the same ditch, from a well at Legal Subdivision 16, Section 7, Township 7, Range 2, West of the 5th Meridian, to connect to the Shell Carbondale system at Junction J in Lsd 1-7-6-2 W5M. These pipelines would transport sour natural gas containing up to 380 moles of hydrogen sulphide (H_2S) per kilomole of natural gas. Specific portions of the pipelines on the west side of Lees Lake would be designed as a Level 1 facility, while other segments would be designed as a Level 2 facility.

The proposed system is capable of delivering up to 704 $10^3 m^3/d$ of natural gas. Additionally, the applicant applied to construct and operate a line heater to be located at Lsd 15-29-6-2 W5M.

APPLICATION NO. 1010138

Cdn 88 also applied, pursuant to section 7.001 of the Oil and Gas Conservation Regulations, to construct and operate a production facility for the well at Lsd 16-7-7-2 W5M. The facility would include a 400-litre oil soluble corrosion inhibitor tank, 400-litre methanol tank, 750-litre hot oil heater, well site line heater and metering skid, pipeline pig sender, and a 12.2-metre (m) flare stack.

The applications were considered at a public hearing in Pincher Creek, Alberta, from 12 to 14 November 1997, before Board Members F. J. Mink, P.Eng., J. D. Dilay, P.Eng., and Acting Board Member E. A. Shirley, P.Geol. Those who appeared at the hearing are listed on the following table.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Canadian 88 Energy Corp. (Cdn 88)	
A. L. McLarty	C.W. Chapman, P.Eng. of Chapman Petroleum Engineering Ltd. B. Sheppard G. T. Dowling G. R. Gill, P.Eng. I. J. S. Banszky, P.Eng. of Banyan Engineering Ltd. T. R. Eccles, P.Biol. of AXYS Environmental Consulting Ltd. D. M. Leahey, Ph.D. of Jacques Whitford Environment Limited D. Richardson, P.Eng. of NeoCorr Engineering Ltd.
Rigel Oil and Gas Ltd. (Rigel)	
K. F. Miller G. V. Collins, P.Eng.	
Diamond Hitch Outfitters (Mr. Judd)	M. Judd
N. C. Conrad M. D. Sawyer	
Federation of Alberta Naturalists (FAN)	M. H. Posey
M. H. Posey	
The Lees Lake Objectors (Lees Lake)	B. F. Littlewood, C.E.T. Dr. D. H. Sheppard J. A. Sheppard J. Willis S. Dawson, R.E.T. of Elite Petroleum Consulting Ltd.
G. S. Fitch	

THOSE WHO APPEARED AT THE HEARING (cont'd)

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Lees Lake (cont'd)	W.H. Wolff, P.Eng. of Bissett Resource Consultants Ltd. I. Dowsett, R.E.T. of Conor Pacific Environmental Technologies Inc. I. Morris, P.Eng. of Project Plus Inc.
Alberta Energy and Utilities Board staff P. R. Forbes, C.E.T. R. S. King M. E. Connelly, P.Geol. S. C. Lee, P.Eng. D. A. Larder, Board Counsel	

Mr. C. Singleton registered as a participant at the hearing but did not present evidence, conduct cross-examination, or present closing arguments.

Having carefully considered all of the evidence at the hearing, the Board, in Decision 97-16 (attached), denied Application Nos. 1004834 and 1010138 without prejudice to any future applications by Cdn 88. This addendum amplifies the reasons for the Board's decision.

The existing pipeline corridor and the proposed and alternative routes presented at the hearing by all parties are shown on the attached Figure.

2 ISSUES

The Board considers the issues to be:

- need for the proposed pipelines,
- pipeline routing,
- impacts of the pipelines and ability to mitigate the impacts, and
- notification and public consultation by the applicant.

3 NEED FOR THE PROPOSED PIPELINES

3.1 Views of Cdn 88

Cdn 88 stated that the pipelines were required for the transportation of gas produced by the Lsd 4-18-7-2 W5M well (4-18 well), surface location at Lsd 16-7-7-2 W5M, and the recently completed Lsd 4-5-7-2 W5M well (4-5 well). It submitted single-point deliverability test reports for the Devonian, Rundle, and Mount Head zones of the 4-18 well. Additionally, Cdn 88 submitted a report on the preliminary test results for the 4-5 well.

Cdn 88 performed a single-point deliverability test for the Devonian zone in the 4-18 well over 19 days from 11 to 29 December 1996. Utilizing a Horner pressure buildup plot, Cdn 88 interpreted that the average reservoir pressure was about 419 kilopascals (kPa) less than the initial extrapolated pressure of 43 672 kPa. On the basis of this pressure depletion and cumulative test production, Cdn 88 calculated an original gas in place of 90 10^6 m^3 and a reservoir radius of 195 m. Cdn 88 believed these results to be pessimistic and expected that a pressure survey in the near term would better define any boundary effects that might exist in the reservoir which might be affecting the results. From pressure build up data, it determined an average reservoir permeability of only 0.17 millidarcies (mD), but an apparent negative skin factor of -5.1 at 132 10^3 m^3/d suggested that the permeability in the vicinity of the wellbore had improved from that which would be expected upon initial drilling of the well. On the basis of the final production rate of 132 10^3 m^3/d, however, it calculated a wellhead absolute open flow (AOF) potential of 281 10^3 m^3/d.

Cdn 88 also performed a single-point deliverability test over the Rundle zone in the 4-18 well for approximately 16 days from 8 to 23 January 1997. The actual cumulative flow time of the test, however, was only 24.4 hours and occurred only during clean-up of the well. Cdn 88 did not obtain sustained flows, as the well had reached its flaring permit maximum volume during clean-up and no further gas production was permitted. Although it was unable to determine a sandface AOF because of a malfunctioning bottom hole recorder and uncertainty of the phase behaviour in the wellbore during the test, it was able to calculate a wellhead AOF potential of 606 10^3 m^3/d. This was based on the final production rate of 87 10^3 m^3/d against a tubing head pressure of 17 340 kPa.

Cdn 88 performed several on-site analyses of the H_2S content during the test and computed an average H_2S content of 26.33 per cent which it believed was representative for the subject well and reservoir. Cdn 88 believed that, due to the short duration of this test, the zone should be retested into the proposed pipeline in order to confirm the test results.

Cdn 88 indicated that the test performed in the Mount Head zone for the 4-18 well was a single-point AOF potential test conducted for approximately 52 days, from 16 February to 8 April 1997. Its interpretation of the Horner pressure buildup plot indicated that the well should build up to an average reservoir pressure of 37 583 kPa. On the basis of the final production rate of 38 10^3 m^3/d against a tubing head pressure of 600 kPa, it also calculated a wellhead AOF potential of
38 10^3 m^3/d. Analysis of the pressure build up data indicated an average reservoir permeability of

0.03 mD, but Cdn 88 believed that the negative apparent skin factor of -4.48 at 38 10^3 m^3/d again suggested that the permeability in the vicinity of the wellbore had improved from that which would be expected upon initial drilling of the well. A small amount of water was reported during clean-up and testing, which Cdn 88 believed to be completion fluid.

The preliminary test results from the Rundle zone in the 4-5 well identified the flow rates, pressures and the corresponding H_2S content measured at the surface during a 59 hour flow test in October 1997. No subsurface pressure data was available at the time of the hearing as the pressure recorders had not yet been retrieved from the well. Cdn 88 said that the data indicated very uniform rates and pressures throughout the test. The well flowed at 113 10^3 m^3/d against a flowing tubing head pressure of 21 750 kPa. The H_2S content measured at surface varied from 10 to 35 per cent and averaged 23 per cent from about 20 samples. Additionally, two high-pressure gas samples were taken near the end of the test which showed an average H_2S content of 23 per cent.

Cdn 88 indicated that, in addition to having had completed and tested the 4-18 and 4-5 wells which would provide a potential production of 704 10^3 m^3/d of gas, it was currently drilling the Lsd 4-19-7-2 W5M well, surface location of 12-19-7-2 W5M. Also, it had recently applied for a licence to drill the Lsd 16-13-7-3 W5M well, surface location of Lsd 2-24-7-3 W5M. Furthermore, it was considering two additional wells, an Lsd 3-7-7-2 W5M well with a surface location of Lsd 9-7-7-2 W5M, and an Lsd 12-32-6-2 W5M well with a surface location of Lsd 5-32-6-2 W5M. Although Cdn 88 indicated that this would total six wells in the area that would contribute to Cdn 88's future area development, it stated there may be potential for a seventh well. This total development potential could provide an additional 2817 10^3 m^3/d of production.

Its proposal would allow Cdn 88 to tie-in the two initial wells into the Shell Canada Limited (Shell) pipeline system at Junction J, to be delivered to the Shell Waterton Gas Plant (the Waterton Plant) and recover some of its initial investment. Cdn 88 submitted that Junction J is capable of handling up to approximately 704 10^3 m^3/d. Since the Shell pipeline system at Junction J was limited in the capacity it could take, should the additional area wells prove successful, Cdn 88 would propose to construct a separate 273.1-mm OD pipeline from a point east of Junction J, called Waterton Junction, routed east to Sorge Junction, and south to the Waterton Plant. This would accommodate the additional potential 2817 10^3 m^3/d. Cdn 88 indicated that its future development plan would provide for initial production utilizing existing pipeline systems and allow for future production, including capacity from other investors, developers, and producers in the area.

In all cases, Cdn 88 believed that the potential from existing wells was sufficient to sustain flow rates and justify the initial need for the two proposed 168.3-mm OD pipelines to Junction J, with future provisions for a 273.1-mm OD pipeline from the Waterton Junction to accommodate production of future wells in the Burmis area. Cdn 88 concluded that, on the basis of its understanding of flaring permit constraints, it would be necessary to retest the wells by allowing them to flow for a longer duration once the pipelines were constructed.

Cdn 88 also indicated that it required the production facility for the 4-18 well to measure the

produced gas to the Waterton Plant and to process and heat the gas before sending it down the pipeline. It required the pigging facility to effectively maintain and clean the pipeline, and would use the flare stack to flare the gas during the anticipated monthly pigging operations. Cdn 88 noted that none of the interveners challenged the need for the proposed production facility.

3.2 Views of the Interveners

Rigel indicated that, although Cdn 88 had not adequately proven its reservoir capacity, it believed that there were sufficient gas reserves to justify a new pipeline system in the Burmis area. Rigel also believed that Cdn 88 should consider the needs of the entire area, not only its own needs, in determining the size of pipeline system required.

Rigel noted that, if its own drilling program in the Burmis area proved successful, it may want its production to be tied into the proposed pipelines, assuming acceptable terms could be negotiated. Rigel believed that this would be consistent with the economic, orderly, and efficient development of pipeline capacity in the Burmis area. However, Rigel stated that, if total productive capacity in this region ultimately exceeded the capacity of Cdn 88's proposed pipelines, or firm service arrangements with Cdn 88 could not be made under reasonable terms and conditions, additional pipeline facilities would then be required. Once the results of Rigel's recently spudded well in the Burmis area were known, it would be in a position to discuss its pipeline capacity requirements with Cdn 88 and determine whether sufficient spare capacity could be made available to Rigel under satisfactory arrangements.

Mr. Judd believed that Cdn 88's determination of need was premature and sketchy. He believed that Cdn 88 should not determine the need based on anticipation of capacity, but should understand the entire area development potential and, based on the concepts of Information Letter (IL) 93-9[1], determine the most appropriate course of action. Mr. Judd did not believe that there was enough information at this time to determine an overall development plan. He doubted that Cdn 88's overall development plan had been conveyed to-or understood by-the public. He believed that the first step should be to have an adequate understanding of a well, its geology, production characteristics, and productivity. The next step would be to develop a full and reasonable plan for the development of the field.

Lees Lake stated that the application for the pipelines was fundamentally deficient. It believed there was a lack of knowledge of the deliverability from the existing wells and that none of the well test reports were relevant. Lees Lake stated that the Devonian test at 4-18 was too short and that the pressures showed a 419 kPa depletion, suggesting that this zone is extremely limited and the well would not be of long-term consequence in this field. Lees Lake was also concerned that Cdn 88 gave no consideration to the low permeability of the formation to establish a stabilized AOF. With respect to the Rundle test at 4-18, Lees Lake was concerned with the very short duration of the test, the decreasing flow rates, the lack of bottomhole pressure data and the lack of knowledge of the reservoir permeability. In addition, Lees Lake was concerned with the applicants use of an N value of 1.0 in calculating the AOF. Lees Lake believed that Cdn 88

[1] IL 93-9 , *Oil & Gas Developments, Eastern Slopes (Southern Portion)*

should have assumed turbulent flow conditions that would have resulted in a lower AOF. Regarding the Mount Head test at 4-18, Lees Lake was concerned that Cdn 88 had not taken into consideration the extremely poor calculated permeability of 0.03 mD in determining the AOF. Lees Lake also indicated that Cdn 88 either did not sample or poorly tested the samples of the fluid recoveries to determine whether or not they were completion fluids. Finally, as only preliminary results were available from the 4-5 Rundle test, Lees Lake believed that it was inappropriate to make any comments regarding reservoir characteristics and potential flow.

Lees Lake also expressed concern that the flow rates suggested by the tests would not maintain the velocities needed to reduce corrosion potential in the pipeline.

Lees Lake concluded that the need for the pipelines was an application by analogy, that Cdn 88 simply believed that these wells were as good as existing producing wells in the area, and therefore, that it would produce these wells. Lees Lake believed that this approach was not adequate for the Board to make a decision on the need for the pipeline.

None of the interveners commented on the need for the production facility for the 4-18 well.

3.3 Views of the Board

The Board notes Cdn 88's indication that there is potential for the drilling of a total of six wells in the area, with provision for a possible seventh. However, while the Board accepts that the 4-18 and 4-5 wells may have sufficient gas volumes to warrant minimal supply to the Waterton Plant, it is not convinced that the single-point deliverability tests conveyed sufficient information to fully assess the flow rates and reserves of either well.

The Board recognizes the high level of activity by Cdn 88 and others in the Burmis area. The Board accepts that the area offers significant new prospects for reserve additions and believes pipelines should be designed to recognize future needs. However, the Board believes that proponents should consider overall development plans and strategies in order to provide better estimates of all gas well volumes and industry developments in a development area. The Board believes that this approach would provide proponents with an opportunity to reflect upon long-term plans in order to consider more appropriate area development plans, instead of piecemeal approaches, such as the proposed interim routing approach by Cdn 88 into Junction J.

While none of the interveners commented on the issue of need for the facility proposed for the 4-18 well, the Board accepts that the production facility would be required in order to measure and send the produced gas adequately and safely down the pipeline. The Board believes that the need for the production facility is largely dependent on the need for the proposed pipelines.

Therefore, until an adequately proposed development plan is in place to determine the overall pipeline needs, it believes that the need to construct the pipeline facility depends on the pipelines going ahead.

4 PIPELINE ROUTING

4.1 Views of Cdn 88

Cdn 88 stated that, although the proposed pipelines were only 14 km long, it recognized that they were located in an area well known for its ecological value and potential residential and recreational land use. It prepared an environmental assessment of the project to assist in route selection and carried out a comprehensive assessment to develop environmental mitigation measures.

Cdn 88 stated that it considered potential implications of environmental disturbance in assessing the merits of various routes. It argued that the route it had chosen was one in which a significant portion would be within an existing Nova Gas Transmission Ltd. (Nova) right of way (ROW). Alternatively, following the route suggested by many of the interveners would require developing a new corridor in environmentally sensitive areas.

Along the portion of the proposed pipeline that would be located in close proximity to the recreational properties around Lees Lake, Cdn 88 proposed the installation of more emergency shutdown valves (ESDs) than are required for a Level 2 facility. The additional ESDs would reduce the pipeline from a Level 2 facility, requiring a minimum setback of 100 m to individual permanent dwellings, to a Level 1 facility with no minimum setback distance, except that associated with the ROW. Cdn 88 believed that this would meet the requirements of Interim Directive (ID) 81-3[2].

Cdn 88 noted that it worked with Shell in an effort to maximize use of existing facilities in the area and it concluded that the only reasonable tie-in point was at the Shell facility known as Junction J. Cdn 88 maintained that the gas must be transported to Junction J where there is capacity to take the gas, or an entirely new pipeline must be built directly to the Waterton Plant. However, Cdn 88 believed that it would not be technically feasible to build such a pipeline with enough flexibility to accommodate the initial deliverability scenarios given the volume of gas proven up so far. Cdn 88 was concerned about the ability of such a proposal to ensure minimum flows, or alternatively, to provide for unknown increases from further drilling in the area. Further, of issue to Cdn 88 was the capital cost for such a facility given the lack of definitive information on total reserves. Cdn 88 stated that moving away from the trend of its future well development to the south of the 4-18 discovery well and to the east of Lees Lake would require lengthy laterals resulting in incremental costs to tie into a pipeline system.

Cdn 88 stated that an alternative to the route applied for would be to build a line from the 4-18 well taking an easterly route around Lees Lake, turn south (near Highway 507), and loop back to rejoin the proposed route near the 4-5 well. Although none of the interveners had expressed a preference for such a route over the one applied for, Cdn 88 indicated that it would be prepared to build the pipeline along the most sensible route.

In evaluating alternative routes to the east side of Lees Lake, Cdn 88 believed that the easterly alternatives were less desirable for reasons including; ease of construction, use of existing access

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[2] ID 81-3, *Minimum Distance Requirements.*

corridors, impact on wildlife habitat and fragmentation, impact on vegetative communities and weed control, poorer economics, operational and maintenance considerations, and landowner concerns.

Cdn 88 stated that it was anxious to settle on a routing that would meet the concerns, the desires, and the objectives of the greater public interest in this area. It believed that it had worked hard to that end, and noted that regardless of the effort put forth, all of the concerns were probably not reconcilable. Given this, Cdn 88 believed that, all factors considered, its proposed route was one of balance and the most appropriate route. Further, it stated that it was confident that the route it selected was acceptable as it met all regulatory requirements.

4.2 Views of the Interveners

Rigel stated that it believed the pipelines could be constructed with minimal environmental disturbance, having regard for total production capabilities in the area. Rigel also stated that, to the extent reasonably possible, utilizing available capacity by all developers would also be consistent with the objectives of minimizing environmental disturbance.

Mr. Judd believed that, once Cdn 88 had an adequate understanding of the amount of gas it had, it would be in a better position to determine the most appropriate routing. Mr. Judd argued that Junction J is a weak link in the Shell pipeline system, and therefore, did not support adding the proposed pipelines into the already congested Junction J. Mr. Judd stated that, since Cdn 88 was proposing to transport its produced gas to the Waterton Plant in the future, construction of a separate pipeline system directly to the Waterton Plant, avoiding Junction J, would be most appropriate.

FAN stated that, based on the information it had, the applied-for route was the most desirable route having sole regard for environmental issues. FAN believed that reclamation and rehabilitation of environmental disturbances for any of the routes east of Lees Lake would be very difficult, and in certain cases, impossible to return to an equivalent state.

Lees Lake stated that the most important factor in selection of a route for the proposed pipeline should be public safety, not environmental protection. Further, Lees Lake submitted that the applicant's focus on choosing the most environmentally friendly route was a guise, and that the bottom line to the applicant's route selection criteria was one of economics.

Respecting routing of the gas from Cdn 88's wells to Junction J, Lees Lake stated that, given the environmental impacts and the impacts that the current operations have already had on the Sheppards' quality of life, any additional gas taken to Junction J would significantly compound the existing problems, such as increased frequency and duration of flaring, noise, and maintenance activity.

Lees Lake questioned the applicant's analysis of options. It stated that the only complete environmental assessment conducted was for the proposed route and that only a minimal assessment was conducted for the east Lees Lake loop. It noted that Cdn 88's consultant report indicated that there were hardly any impacts involved in the east Lees Lake loop, and whatever

there were could be mitigated.

Lees Lake acknowledged that other routes may have greater environmental impacts. However, it believed that the applicant had not adequately assessed alternative routes. It noted that, although the application is for two 168.3-mm OD pipelines from the 4-18 well to Junction J, the applicant had contemplated that another pipeline would be needed once volumes increased. This line would take gas south from 4-18, along the existing ROW, to a location along Screwdriver Creek and on to the Waterton Plant along the Sorge ROW. Given these plans, Lees Lake indicated that the applicant was taking a piecemeal approach in the area, an approach which is not in compliance with IL 93-9.

Lees Lake argued that it was not its responsibility to provide a fully developed alternative route, although it did provide evidence regarding potential routes to the east of Lees Lake. Two of Lees Lake's experts provided independent proposals for "easterly" routes. These "easterly" alternatives were not identical nor were they prescriptive. However, in general they proposed that the pipeline travel in an easterly direction, north of Highway 507, then turning southeast in the area of Section 18-6-1 W5M ending up at Sorge Junction. From there, the proposed Cdn 88 pipeline could parallel the existing Sorge ROW to its terminus at the Waterton Plant. Lees Lake recognized that such a proposal may require small variations; however, it stated that virtually any alternative route would be safer than the one proposed by Cdn 88.

Having consideration for the future incremental costs of the anticipated line from Waterton Junction to Sorge then to the Waterton Plant, Lees Lake believed that Cdn 88's argument for the economics of the applied-for pipeline versus the intervener's proposal of taking an easterly route directly to the Waterton Plant would be significantly tempered.

4.3 Views of the Board

Having considered all factors regarding the application, the Board finds the proximity of the northern portion of the proposed pipeline to people in the vicinity of Lees Lake to be unacceptable. The Board recognizes that Cdn 88 proposed to install additional ESDs in the vicinity of the Lees Lake area that would theoretically reduce land use setbacks to that associated with the ROW. However, the Board notes that the proposed pipeline would run parallel to a significant number of residences on the west side of Lees Lake and would pass less than 60 m from the nearest residence. Compounding the Board's concern is the amount of year round recreational activity in the areas west of Lees Lake that would make it unlikely that a reasonable emergency response plan could be developed, given the nature of the activity and the proximity of the proposed pipeline. The Board believes that routing of the proposed pipeline near the west end of Lees Lake is neither prudent nor in keeping with the spirit or intent of the setback distances prescribed by the Board in ID 81-3. While the risks of the proposed alignment are minimal, they are unnecessary given the likelihood that alternative routes could reduce them significantly.

The Board recognizes the attempts made by Cdn 88 to minimize environmental impact by following existing land disturbances and utilizing existing facilities. The Board accepts that alternative routes may result in greater environmental disturbances than the proposed route.

However, the Board believes that, as stated by Cdn 88's expert witnesses, these environmental impacts could be mitigated. The Board also considers cost to be a factor in determining the appropriate route. However, as alternative routes were not adequately assessed, the Board is unable to compare the economics of the proposed route with other alternative routes. The Board agrees that it is necessary to consider many factors, but notes that for sour gas pipelines in environmentally sensitive areas, public safety, environmental impact, and economics do not have equal weighting.

5 IMPACTS OF THE PIPELINES AND ABILITY TO MITIGATE THE IMPACTS

5.1 Views of Cdn 88

Subsequent to submitting its application to the Board on 7 January 1997, Cdn 88 indicated that it had received three separate letters outlining concerns regarding the routing of the pipeline around the west side of Lees Lake and the tie-in location at Junction J. As a result of these submissions, Cdn 88 evaluated all other feasible options respecting the proposed pipeline system. This included discussions with Shell on alternative tie-in points and rerouting portions of the pipeline at Junction J and to the east of Lees Lake. Cdn 88 indicated that it preferred to resolve these issues outside of a hearing and that it would continue to evaluate other options that may satisfy all affected parties. However, in subsequent investigations, Cdn 88 was unable to find a viable alternative to that which it proposed. Therefore, it believed that it had made every reasonable attempt to resolve these concerns.

Cdn 88 stated that the major causes for sour gas pipeline failures are third party damage and corrosion. It stated that it had developed a detailed risk-based maintenance plan to deal with these problems, and to make these pipelines safer. Furthermore, Cdn 88 indicated that it would be prepared to construct the pipeline around Lees Lake with steel casings so that, should a leak occur, the gas would be captured within the casing and diverted to a flare system, well away from the Lees Lake residents. Cdn 88 acknowledged that residents believed that the pipelines represented a significant hazard to the Lees Lake residents because of the risk of a gas release. However, Cdn 88 argued that the same level of risk already existed when the area residents voluntarily accepted the Nova pipeline and when they established their properties and their recreational dwellings in that area. Additionally, Cdn 88 argued that sour gas has acquired an ill-deserved reputation as an automatic and absolute hazard when in a pipeline. It noted that the escape of sweet gas from a pipeline could pose as significant a risk as sour gas. With regard to the potential risks associated with the release from the proposed pipeline, Cdn 88 believed that the levels of risk are very low. It stated that the calculated level of risk is 0.4 in a million, which is a level commonly considered to be within accepted societal standards, and in many jurisdictions, it is considered insignificant.

In order to alleviate the perception of risk, Cdn 88 proposed to modify the pipeline construction and install additional ESDs in order to build a Level 1 pipeline facility through the Lees Lake area, in accordance with the requirements of ID 81-3. This would result in lower H_2S release volumes than Level 2, 3, or 4 pipelines in the event of a rupture.

Cdn 88 stated that it based its release rate calculations on instantaneous ESD valve closure as

provided for in ID 81-3. However, Cdn 88 used the GASCON2 model[3] and additionally, incorporated a slightly higher H_2S concentration and used a 10 second time period for ESD valves to close, to determine the risks associated with an accidental release of H_2S from a pinhole leak or pipeline rupture. Cdn 88 believed that the use of the GASCON2 model was more appropriate in this case given the nature of the gas under pipeline pinhole leak conditions and argued that the interveners use of the SLAB model[4] was inappropriate. Cdn 88 concluded that the risks associated with an accidental release would be minimal in the area of Lees Lake. It further concluded that the setbacks as proposed would be adequate in terms of its contribution to public safety.

In response to the Lees Lake argument that the setback guidelines are wrong and need to be changed to reflect actual ESD closure release volumes, Cdn 88 stated that the guidelines are quite specific and direct, and that it would be prepared to accept changes to the guidelines should the Board choose to make them. Cdn 88 believed that the pipeline was safe based on its risk assessment as well as its compliance with technical standards and setback and other regulatory requirements.

Although Cdn 88 believed that the risks of a release were minimal, it also contended that, should a release occur, Cdn 88 would activate its emergency response plan. It believed that, although the first line of defense would be sheltering until the problem subsided, the access and egress to the west Lees Lake area would be suitable in case of evacuation. Therefore, it contended that this would further minimize risk impacts to this area.

With regard to safety and nuisance concerns put forth by Mr. Judd and the Sheppards in the area of Junction J, Cdn 88 acknowledged that Shell has had some difficulties with parts of its Carbondale system. However, Cdn 88 believed that, with respect to the portion of the system that the Cdn 88 gas would be tied into, there had been only one leak, and that had been repaired, and there had been no other problems. It stated that the introduction of the Cdn 88 gas to the Shell pipeline system at Junction J would actually improve the integrity of that pipeline system by adding velocity to the gas flow.

With regard to the Sheppards' concerns, Cdn 88 acknowledged that it is difficult not to be sympathetic with the Sheppards since they obviously did not expect to encounter this kind of industrial activity when they moved into this rural area. However, Cdn 88 indicated that it was most anxious to work with them and Shell in an effort to minimize the potential impact to them from the existing facilities, as well as the proposed facilities in that area. In that respect, Cdn 88 believed that it had done everything that it could reasonably do to try to accommodate the Sheppards, including the selection of a new corridor on land away from the Sheppards' property.

5.2 Views of the Interveners

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[3] GASCON2 is a model to estimate ground-level H_2S/SO_2 concentrations and consequences from uncontrolled sour gas releases. It is designed for neutrally buoyant releases.

[4] SLAB is a dense gas dispersion model. The name refers to the control volumes used in solving the equations.

Mr. Judd stated that Junction J is only 500 m from his residence, and in terms of risk of release, he is unquestionably at the highest risk location along the proposed pipelines.

Mr. Judd indicated that Junction J has four pipelines going into it, three of which are presently in operation. He believed that, with the addition of the two Cdn 88 proposed pipelines, it would become a virtual beehive of activity, particularly when the consequences of the need for nearly continuous monitoring are taken into account.

With regard to risk, Mr. Judd argued that one pipeline being parallel to another is considered as adding to the risk arithmetically. He believed that, when a number of lines with different activities were joined together at one location, the risk would increase exponentially. Additionally, each time a human interaction exists, there is another risk.

Mr. Judd noted that there was little information presented relative to the operation of the Shell Carbondale pipeline. Mr. Judd recalled that Shell had also stated at the time it applied for the Carbondale system that its proposed pipeline would be constructed and operated in a safe manner and that safety was a top priority when it designed pipeline facilities. Shell testified at the time that it had a history of safe facility operations and was confident that it could maintain its record in that regard. However, shortly after the Carbondale pipeline was constructed and put into service on 26 September 1995, a rupture was discovered. No information was available on when the rupture actually occurred. Mr. Judd believed that, during that period of time, corrosion was running rampant. He did not believe that the new corrosion monitoring techniques and technologies planned by Cdn 88 would solve all of the potential problems associated with its proposed pipeline as well as the existing problems with the Carbondale system. Mr. Judd indicated that the original failure was approximately 200 m from his residence, and he was therefore, not convinced that adding additional lines would not cause additional problems. Mr. Judd believed therefore, that the Carbondale system pipeline may be so fundamentally flawed that it may not be capable of any future usage. He did not believe that increasing the flow would help solve the Carbondale system problem, but rather because of increased H_2S content, it may exacerbate the corrosion. Further, Mr. Judd believed that there is a scarcity of knowledge about the relationship of H_2S, pipelines and corrosion, and that a thorough investigation of the Carbondale system is necessary.

Mr. Judd indicated that there have been two actual failures and there is an additional larger systemic decay that has not been addressed. He stated that, although there have been two pipeline failures, it was disturbing to him that they occurred despite Shell's monitoring and safety programs. One leak was discovered by a Shell employee because of the evidence of leaked product in the snow. The other was discovered following investigation into the death of two cows. None of the emergency devices, the monitoring devices or the ESDs were triggered by the failures. Additionally, he believed that there has been a third failure, the failure of the Board to hold Shell accountable to explain the problem with the Carbondale system and ensure that the public and the Board are satisfied with the technologies Shell is using and the safety measures Shell is taking. Therefore, Mr. Judd's position was that no more sour gas pipelines should be tied into Junction J and that the Board should conduct an inquiry into the operation of the Carbondale system.

Lees Lake did not believe that there was sufficient evidence to prove that Cdn 88 could meet its minimum flow velocity targets necessary to mitigate corrosion. It was concerned that corrosion would cause serious damage to these pipelines.

Lees Lake submitted that there was credible and compelling evidence that the portion of the pipeline opposite Lees Lake would not be a Level 1 facility and believed that it would be a Level 2 facility requiring greater setbacks than proposed. Its expert evidence included sophisticated release volume calculations that showed that actual release volumes could be five, ten or almost fifteen times greater than those predicted by Cdn 88. It believed that Cdn 88 assumed only instantaneous closures of ESDs in keeping with ID 81-3. It did not agree with evidence submitted by Cdn 88 which suggested that, even with the extra gas admitted into these segments and with a ten-second delay in ESD valve closure, the risk level was still acceptable because it was comparable to the risk of being struck by lightning. Lees Lake submitted that this kind of analogy was not appropriate.

Lees Lake vigorously disagreed with Cdn 88's view that the SLAB model should not be applied in this application. It believed in fact that the SLAB model was more appropriate in this case, given the potential density of this gas. On the basis of the gas specific gravity and the fact that gas cools rapidly in a blowdown situation, it believed that the gas produced by Cdn 88's well would become heavier than air.

Lees Lake noted that Cdn 88 admitted during cross-examination that, in the case of a partial rupture, higher volumes of gas would be released. The interveners pointed out that, in the worst case scenario, a partial rupture of the line would occur and the valves would take longer to close. Lees Lake submitted that, given the conflicting evidence on risk and release volumes, the Board must err on the side of public safety. Further, Lees Lake believed that the Board should consider its evidence that although the close spacing of ESD valves decreases the release volume, it does not proportionately reduce the risks.

With regard to public safety, Lees Lake believed that, in the case of the residents at the west end of Lees Lake, emergency response planning is complex. It indicated that it has a very serious access and egress problem, particularly in the winter. Since the wind is predominantly from the west, the only egress would be towards the pipeline and into the release, which would be a very difficult evacuation scenario. Although Lees Lake acknowledged that the trend in emergency response planning now is to recommend sheltering over evacuation, it did not believe that there was any evidence that any real thought was given to whether sheltering was appropriate in this circumstance.

Lees Lake believed that the land use in the area was recreational. Lees Lake cited numerous examples about the high level of year-round outdoor activities, including boating, fishing, hiking, skiing, and picnicking. Lees Lake did not believe that Cdn 88 fully understood the way the residents use Lees Lake, or knew the number of people using the area throughout the year nor their many outdoor activities. For reasons of difficulty of evacuation and primarily the land use issue, Lees Lake submitted that this area should be designated a public facility for the purpose of the Board's setback guidelines. Further, according to Lees Lake, the Municipal

District of Pincher Creek had recently designated the Lees Lake area as residential recreational, a type of land use that is not significantly different in nature from a campground, which is often designated by the Board as a public facility.

Lees Lake acknowledged that Cdn 88's corrosion protection plan appeared to be a very good plan to address corrosion problems in this type of sour gas line. However, since Cdn 88 admitted that in the event of a pinhole leak, the 500 parts H_2S per million parts of air isopleth would extend
42 m, Lees Lake believed that anyone within 50 m of a pinhole leak would be in a highly dangerous situation. People would encounter serious eye irritation and health effects would be very serious. Lees Lake pointed out that there were 19 leaks on sour gas lines in Alberta in 1996, and that a pinhole leak would create a perilous situation because the proposed line, parallel to the Lees Lake road, was in such close proximity to the residences. The Cooke's residence was 47 m from the ROW. Additionally, Lees Lake indicated that the interveners in this case did not feel very comfortable with this application because, as Cdn 88 later admitted, there were two locations along the pipeline with severe water traps which have the potential to cause pinhole leaks; one at Lees Lake and the other in Screwdriver Creek Valley, near the Sheppards.

FAN and Rigel did not comment on the impacts of the proposed pipelines.

5.3 Views of the Board

A paramount concern for the Board when considering applications for sour natural gas facilities is to ensure public safety. The Board believes that, while sour gas facilities will inevitably represent some public risk, that risk can be limited to acceptable levels if all due diligence is applied. In the case of the Cdn 88 proposal, the Board notes that, having regard for the pipeline design, a comprehensive corrosion mitigation and monitoring program would be incorporated to minimize these risks. This program is unproven and the first implementation of such a program should not occur where a possible failure puts a number of people at risk.

Having regard for the evidence presented at the hearing with regards to ESD closure, the Board believes its policy as indicated in ID 81-3 is adequate to deal with the vast majority of circumstances. However, it accepts that under certain circumstances, when potential risks are uncertain given such measures as topography, nature of the gas compositions, and flow rates, it may be necessary to adjust safety measures to deal with the uncertainties. Such adjustments would be largely judgemental based on the circumstances. In this instance, the Board believes that there were insufficient test results and evidence to provide the Board with an adequate level of comfort necessary to accept that the risks associated with an accidental release in such close proximity to the Lees Lake area would be acceptable, regardless of the ESD closure rate and plume dispersion modelling. Given the evidence, the Board also believes other suitable routing options are available that would preclude the risks imposed on the community.

The Board notes that the level of current and anticipated recreational use of the Lees Lake area, much of which is outdoors, will result in significant numbers of people dispersed within the area throughout the year, such that it could be recognized as a public facility for regulatory purposes. Given the circumstances, the Board does not accept that a reasonable and effective emergency

response plan can be implemented for the applied-for routing that would also have the confidence of the public.

The Board notes that, subsequent to the 1995 failure on the Carbondale system, a proactive monitoring and repair program was implemented for the purpose of ensuring early detection of potential problems so appropriate actions could be taken. The Board believes that this is a positive response; however, the new monitoring program has resulted in an increase in activity, specifically in flaring and vehicular traffic at Junction J. It heard substantial evidence regarding the effects on the quality of life for Mr. Judd and the Sheppards from these increased activities.

Given the existing uncertainties with the Carbondale system and the concerns surrounding Junction J, the Board considers it inappropriate to introduce sour gas from new sources into that system at this time.

6 NOTIFICATION AND PUBLIC CONSULTATION BY THE APPLICANT

6.1 Views of Cdn 88

Cdn 88 stated that its notification and public consultation process consisted of making telephone calls and sending information packages to all potentially affected landowners and occupants within 500 m of the proposed pipeline. Cdn 88 indicated that it had telephoned potentially affected parties in December 1996 to discuss the proposed pipeline project and determine if any concerns existed. It sent an information letter to these parties on 2 January 1996.

Cdn 88 further indicated that it was uncertain as to how to notify the temporary occupants of the Lees Lake cottages. Therefore, it gave all temporary occupants written notification of the proposed pipeline by registered mail. It also attempted personal consultation with occupants of all 54 lots. Cdn 88 said that it was unable to personally consult with occupants of nine of the lots.

With regard to the production facility application for the 4-18 well, Cdn 88 indicated that it had held an open house in the area on 28 August 1997 to discuss the project, identify concerns and attempt to address these concerns. Cdn 88 indicated that it had also mailed out information packages to all landowners and occupants within 500 m of the proposed production facility. Some area residents expressed concerns about the project's effect on the value of their property, proximity of sour wells to residential areas, and flare stack height. Cdn 88 tried to meet with these individuals to address these concerns. However, it believed that the parties would not object.

It was Cdn 88's view that, while it provided proper notification of its plans to the public, its consultation with area residents failed to resolve outstanding issues. Cdn 88 believed that some interveners were intractably opposed to its pipeline project which no amount of consultation or discussion could overcome. Therefore, Cdn 88 considered that the notification and public disclosure that it undertook were not the important issues in the application and, although more extensive disclosure with the public may have assuaged some individual's concerns, it would not have resolved any of the safety, routing, and environment issues in this proceeding. Cdn 88 argued that the real test of public notification and consultation was the results that it produced

and that the vigorous public participation in the hearing was evidence of an appropriate public process.

6.2 Views of the Interveners

Lees Lake noted that, although Cdn 88 stated that it had not been able to personally consult nine people, Lees Lake believed that the company did not make contact with 16 landowners. For example, the public notification sheet indicated that Cdn 88 talked with landowners by telephone. However, Ms. Willis testified that when Cdn 88 contacted her by telephone, Cdn 88 only wanted to confirm her correct mailing address. Lees Lake stated that this telephone consultation took place over the Christmas holidays when residents were preoccupied with the season. It submitted that this type of telephone contact did not constitute proper public consultation.

Lees Lake stated that the registered letter sent on 2 January 1997 by Cdn 88 was the only formal notification that the residents received prior to the application being filed with the Board on 7 January 1997. It noted that the letter did not disclose the H_2S content of the gas which would be shipped through these pipelines. Lees Lake acknowledged that content levels were discussed with residents at various times with respect to individual wells but they argued that this information was never set out in the formal notification regarding the pipeline.

Lees Lake argued that Cdn 88 failed to comply with the provisions relating to public notification requirements set out in Guide 56. In particular, Lees Lake noted that prior to the filing of the application, Cdn 88 failed to:

- contact approximately one third of the owners of cabins at Lees Lake,
- make the project understandable to the public,
- take into account the Eastern Slopes Policy; and
- afford adequate time for the public to review pertinent information.

Lees Lake characterized Cdn 88's public notification as grossly inadequate and questioned the accuracy of Cdn 88's representations about public notification given to the Board in its filings.

Rigel, Mr. Judd, and FAN did not comment on the issues of notification and public consultation.

6.3 Views of the Board

An appropriate notification and public consultation process must be conducted well in advance of the submission of an application to the Board. It must be thorough enough to allow all parties who are or may be directly affected to be sufficiently aware of, and understand the implications of the proposed project. The Board believes that the public should have sufficient information to participate meaningfully in the decision-making process, to voice their concerns, have their concerns heard, be properly addressed, and if possible, resolved. The proponent's information must be extensive, consistent, factual, disclosed in a timely way, and if the proposal is part of a larger project, the proponent should be prepared to discuss the entire project and to explain how its component complements other energy development plans in the area. The Board believes that

Cdn 88 did not meet this level of public notification and consultation. In particular, the Board questions the process adopted by Cdn 88 to inform and engage those affected. The evidence suggests that the dialogue between the parties were less than meaningful and there is little evidence to suggest Cdn 88 was prepared to consider alternatives to resolve the issues.

7 DECISION

Having carefully considered all of the evidence, the Board denies Application Nos. 1004834 and 1010138 without prejudice to any future applications.

DATED at Calgary, Alberta, on 21 October 1998.

ALBERTA ENERGY AND UTILITIES BOARD

[Original signed by]

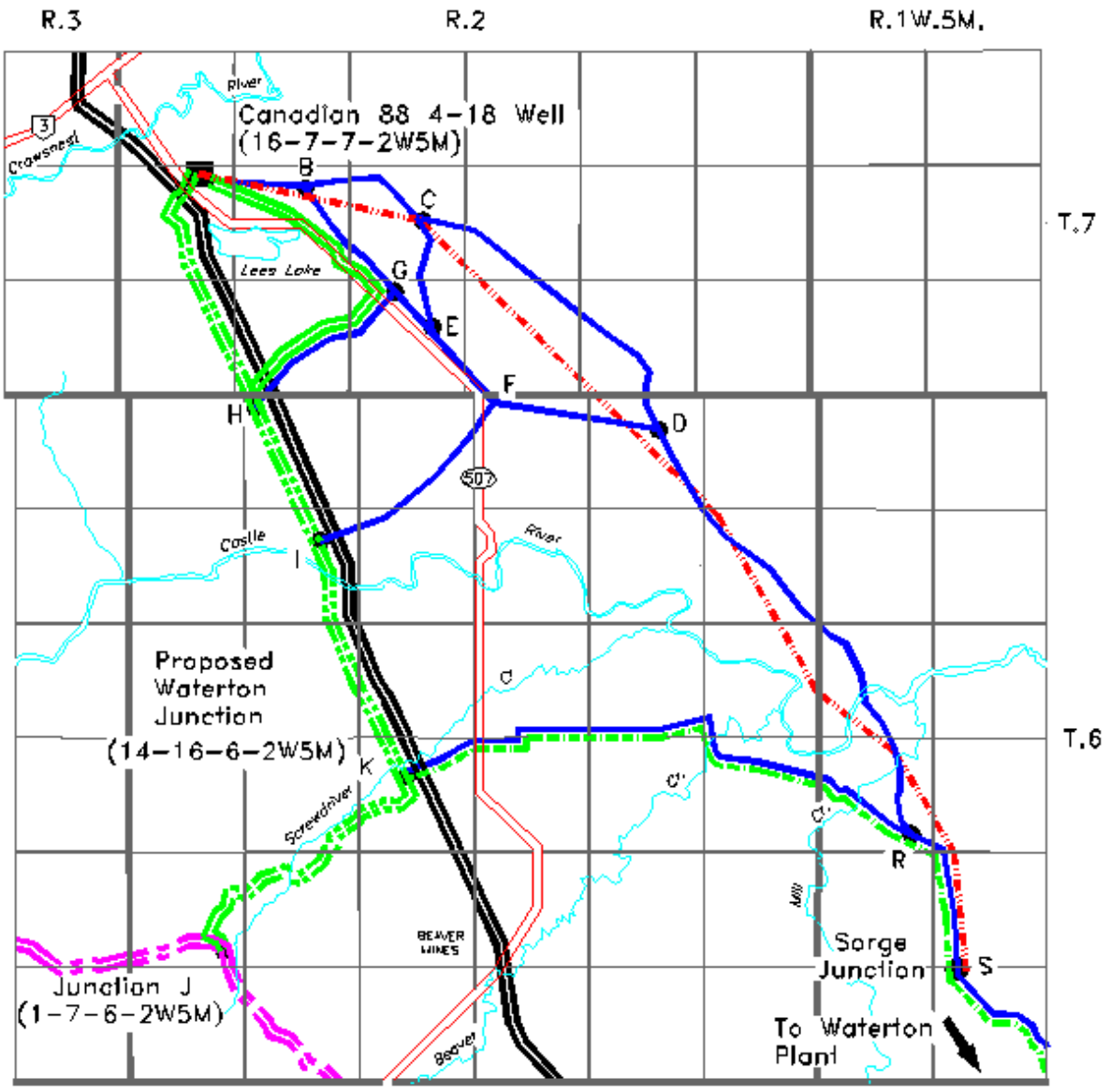
F. J. Mink, P.Eng.
Presiding Member

[Original signed by]

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

[Original signed by]

E. A. Shirley, P.Geol.
Acting Board Member



LEGEND

- Proposed Canadian 88 Pipelines
- Canadian 88 Alternative Pipeline Route
- Future Canadian 88 Pipeline Proposal to Sorge Junction
- Existing NGTL Pipeline Corridor
- Existing Shell Pipeline Routes
- Bissett Resources Consultants Ltd. Alternative Routes
- Project Plus Inc. Alternative Route

Proposed and Alternative Routes by Canadian 88 and Interveners

Applications No. 1004834 & 1010138

Canadian 88 Energy Corp.

Decision 97-16

ALBERTA ENERGY AND UTILITIES BOARD
Calgary Alberta

CANADIAN 88 ENERGY CORP.
APPLICATION TO CONSTRUCT AND OPERATE
SOUR NATURAL GAS PIPELINES AND WELL **Decision 97-16**
PRODUCTION FACILITY, BURMIS AREA **Applications No. 1004834 & 1010138**

1 APPLICATIONS

APPLICATION NO. 1004834

Canadian 88 Energy Corp. (Cdn 88) applied pursuant to Part 4 of the Pipeline Act for a permit to construct and operate two 168.3-millimetre outside diameter pipelines for a length of 13.9 kilometres. The pipelines would run in parallel, in the same ditch, from a well with a surface location at Legal Subdivision 16, Section 7, Township 7, Range 2, West of the 5th Meridian, to connect to the Shell Waterton pipeline system at Junction J in Lsd 1-7-6-2 W5M. These pipelines would transport sour natural gas containing up to 380 moles of hydrogen sulphide per kilomole of natural gas. Specific portions of the pipelines would be maintained as a Level 1 facility at the west side of Lees Lake, while other portions would be maintained as a Level 2 facility. The applicant also applied to construct and operate a line heater to be located at Lsd 15-29-6-2 W5M.

APPLICATION NO. 1010138

Cdn 88 applied pursuant to section 7.001 of the Oil and Gas Conservation Regulations to construct and operate a production facility for the well located at Lsd 16-7-7-2 W5M. The facility would contain a 400-litre oil soluble corrosion inhibitor tank, 400-litre methanol tank, 750-litre hot oil tank, hot oil heater, well site line heater, pipeline pig sender, and 12.2-metre flare stack.

2 HEARING

The applications and interventions were considered at a hearing in Pincher Creek, Alberta, on 12 November 1997, before Board Members F. J. Mink, P.Eng., J. D. Dilay, P.Eng., and Acting Board Member E. A. Shirley, P.Geol. Those who appeared at the hearing are listed in the following table.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)	Witnesses
Canadian 88 Energy Corp. (Cdn 88) A. L. McLarty	C. W. Chapman, P.Eng. of Chapman Petroleum Engineering Ltd. B. Sheppard G. T. Dowling, C.R.S.P. G. R. Gill, P.Eng. I. J. S. Banszky, P.Eng. of Banyan Engineering Ltd. T. R. Eccles, P.Biol of AXYS Environmental Consulting Ltd. D. M. Leahey, Ph.D. of Jacques Whiteford Consulting Engineers D. Richardson, P.Eng. of NeoCorr Engineering Ltd.
Rigel Oil and Gas Ltd. K. F. Miller G. V. Collins, P.Eng.	
Diamond Hitch Outfitters N. C. Conrad M. D. Sawyer	M. Judd
Federation of Alberta Naturalists M. Posey	
The Lees Lake Objectors G. S. Fitch	B. F. Littlewood, C.E.T. D. H. Sheppard J. A. Sheppard J. Willis S. Dawson, R.E.T. of Elite Petroleum Consulting Ltd. W. H. Wolff, P.Eng. of Bissett Resource Consultants Ltd. I. Dowsett, R.E.T. of Conor Pacific Environmental Technologies Inc.

THOSE WHO APPEARED AT THE HEARING (cont'd)

Principals and Representatives (Abbreviations Used in Report)	Witnesses
The Lees Lake Objectors (cont'd)	I. Morris, P.Eng. of Project Plus, Inc.
Alberta Energy and Utilities Board staff P. R. Forbes, C.E.T. R. S. King M. E. Connelly, P.Geol. S. C. Lee, P.Eng. D. A. Larder, Board Counsel	

Mr. C. Singleton registered as a participant at the hearing but did not present evidence, conduct cross-examination, or present closing arguments.

3 DISCUSSION

Although there is presently limited definitive information on gas reserves in the general area, the Board is prepared to accept that there is a reasonable probability a significant trend exists near Burmis. Consequently, the Board believes that future gas development by a number of operators will require major expansion of the pipeline facilities in the Burmis-Waterton corridor.

Notwithstanding, the Board has reviewed all of the evidence and concludes that the subject applications should be denied. In addition, it believes that an early decision would allow Cdn 88 to plan its contingent activities.

While the Board's final report will outline all of the issues and the Board's conclusions related to the application in detail, the pivotal concerns of the Board that prompted the denial of this application relate to the proposed routing of the pipeline near Lees Lake and its alignment at Junction J.

The paramount concern for the Board in considering applications for sour natural gas facilities is to ensure public safety. The Board believes that, while sour gas facilities will inevitably represent some public risk, that risk can be limited to acceptable levels if all due diligence is applied. In this instance, the Board believes that routing of the proposed pipeline near the west end of Lees Lake is neither prudent nor in keeping with the spirit of the setback distances prescribed by the Board. The Board believes that the level of current and anticipated recreational use of the area, much of which is outdoors, will result in significant numbers of people throughout the area. Given that circumstance, the Board cannot accept that a reasonable and effective emergency response plan can be implemented for the applied-for routing that would also have the confidence of the public.
The Board also has reservations about expanding the use of Junction J at this time. It is evident

that fluids in the Shell Carbondale system have prompted extensive internal corrosion and a line failure in 1995. The Board notes that, although the 8-inch line downstream of Junction J was placed back in service and has operated without incident, it is subject to intense monitoring. Part of the section of line upstream of Junction J remains out of service. Given the existing uncertainties with the Carbondale system, the Board considers it unreasonable to introduce sour gas from new sources before it is established that the system can be operated without incidence and confidently for a significant period of time. The Board also recognizes that, in the long run, a new pipeline corridor distinct from the Carbondale system, will be necessary to accommodate the projected reserves in the area. At this point, it considers the use of Junction J as a hub for gathering sour gas in the area to be problematic.

While the Board recognizes that certain environmental tradeoffs may be necessary with a new pipeline route, it believes that the impacts can be minimized to maintain the spirit of Informational Letter IL 93-9, Oil and Gas Developments - Eastern Slopes (Southern Portion).

4 DECISION

Having carefully considered all of the evidence, the Board denies Applications No. 1004834 and 1010138 without prejudice to any future applications. A detailed report giving the reasons for the Board's decision will be issued in due course.

DATED at Calgary, Alberta, on 3 December 1997.

ALBERTA ENERGY AND UTILITIES BOARD

(Original signed by)

F. J. Mink, P.Eng.
Board Member

(Original signed by)

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

(Original signed by)

E. A. Shirley, P.Geol.
Acting Board Member