September 26, 2007

Leanne Campbell  
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Subject: EnCana Shallow Gas Infill Development Project - Additional Information Request

Dear Ms. Campbell,

The Joint Review Panel (the Panel) has completed its review of EnCana’s Environmental Impact Statement, the information requests made by the public and government departments, and EnCana’s response to those requests and has determined that additional information is required from EnCana.

The additional information requested by the Panel is attached to this letter. A response is required from EnCana in order for the Panel to complete its review of the adequacy of the environmental impact statement. EnCana’s response will be made available to the public for review and comment. After reviewing the response and any comments from the public, the Panel will then reach its conclusion on the adequacy of the environmental impact statement.

The Panel would like to thank those who have contributed information requests and EnCana for the responses it has provided to date.

Yours truly,

Original signed by

Robert Connelly  
Chair, Joint Panel Review

c.c. Shawn Denstedt, Osler, Hoskins & Harcourt LLP
Project Description and Alternatives

The oil and gas resource potential of the strata underlying the Suffield National Wildlife Area (NWA) for which EnCana currently holds the mineral rights (to the base of Second White Specks) relates directly to the potential producing life of all existing and proposed future wells in this area. It also relates to the potential for re-completion of any wells located in the NWA, including additional fracing, and the potential for additional wells. In this context please provide the answers to the following resource questions.

**Shale Gas**

1. Are the strata that exist between the proposed producing intervals of the Second White Speckled Shale, the Medicine Hat and the Milk River Formations considered to be a shale gas resource?
   a. If so, what is the thickness and gas content of these strata?
   b. Has any of the gas production from the existing wells been attributed to the shale, given the relatively flat decline rates experience by the existing wells?
   c. What would be the development strategy to capture these shale gas reserves?

2. Is the Pakowki formation a shale unit and if so can it be considered to be a shale gas resource?
   a. What is the thickness and gas content of the Pakowki formation?
   b. Has any gas production been recorded from the formation?
   c. What will be the development strategy required to capture this shale gas reserve?

With respect to the above-mentioned questions:

3. What is the potential for encountering H₂S in any of the referenced strata?

4. What would be the effect on the producing life of the existing and proposed wells of recovering the shale gas resources in these strata?
5. As the original producing life of wells was estimated to be twenty years and many of the existing wells have produced for more than thirty years, with ongoing resource recovery still requiring additional wells, is the remaining well life of twenty to thirty years reasonable? If so, explain why.

Coal Bed Methane (CBM)

6. The information provided to date provides only passing reference to CBM potential for the NWA with respect to the Taber and McKay coals. Please provide the following information on the above-mentioned coal units:
   - Thickness
   - Gas content
   - $\text{H}_2\text{S}$ content
   - Gas production
   - Potential development strategy

Recovery

7. Provide additional details on EnCana’s “D6/D8” 16 well/section pilot in the NWA.
   a. Describe, with supporting information, the evaluation performed on the pilot results to confirm that the additional gas recovered at a well density of 16 wells per section is incremental recovery over a well density of 8 wells per section.
   b. Are the reservoir properties and characteristics in the pilot comparable to those in the rest of the NWA?

8. Provide full details on the reservoir modeling and simulation performed to support the conclusions reached from the “D6/D8” pilot and to support the possible recovery scenarios evaluated, including the following:
   a. Description of the type of model used;
   b. Input parameters and assumptions [reservoir (including original gas in place), facilities, economic criteria, etc.];
   c. Model runs results for the different cases analyzed;
   d. The expected recovery factors for the specified scenarios.

The information required above should be provided for at least the following scenarios:
   a. Producing the reservoirs with the existing wells only;
   b. Producing the reservoirs with the full development at 16 wps (vertical);
c. Producing the reservoirs with all new wells drilled from the existing locations (16 wps).

9. Are the formations being produced of different reservoir quality, especially with respect to permeability?
   a. How much variation is there?
   b. Does the recovery from the different formations vary?
   c. Do all of the formations targeted require the full 16 wells per section?
   d. How were differences in reservoir quality incorporated in projections/simulations?

10. Describe the gas production mechanisms at work from the targeted formations.
    a. Are only the perforated intervals contributing to production?
    b. Comment on the contribution to overall recovery of the shale package in these wells.

11. Is any of the incremental future recovery due to increased compression or facility enhancements?
    a. Were the increased compression and facility enhancements evaluated for the development scenario utilizing only the existing wells? If so, provide the results for this case.

12. Is all of the recovery from the additional wells incremental (i.e., there is no interference between wells at all)?
    a. If all recovery is incremental, then the drainage radii of the existing wells do not hit the drainage radii of the new wells until at least abandonment of all wells in the area. Is that correct? Is that reasonable?
    b. Is there any evidence from the 16 well/section pilot(s), such as confirmation that all infill wells were at initial pressure, to support the incremental recovery claim?
    c. What is the drainage radius of a well targeting these zones at abandonment?

13. Provide the reservoir pressure data that was used in the modeling that was carried out?
    a. What was the confidence level in analysis performed based on the pressure data that was available for the NWA?
14. Provide the cost benefit analysis (input, assumptions, model or methodology used, and detailed results) of development using:
   a. existing wells only;
   b. proposed development scenario (16 vertical wps);
   c. development scenario (16 wps) but utilizing directional wells drilled from existing well locations only.

15. Provide full details of all pros and cons (technical, economic, surface disturbance, etc.) of full vertical well development versus the use of directional wells from existing surface locations.

16. Could the need for looping of existing pipelines be reduced by increasing the compression on the gathering system? If not, why not? If yes, indicate the magnitude of the possible reduction in the number of looplines required to support the new wells?

**Determination of the Significance of Effects**

17. The environmental impact statement (EIS) Guidelines (page 6) require the proponent to “indicate how the significance of effects was assessed and justify the selected criteria”. In Section 3.5.4 (Vol. 2), the EIS describes what features were taken into consideration, but does not describe how they were considered. This same omission was repeated in answers to the many information requests on this question.

   a. Indicate how the significance was determined and specify how the rating criteria (direction, geographic extent, duration, frequency, reversibility and recoverability, and magnitude), existing information from past development activities, specific mitigation strategies and professional judgment were used to determine the significance of the residual effects.

   b. Provide the overarching principles used by assessors and cite four to five specific examples to illustrate how this was done.

18. Section 3.5.4 (Vol. 2) of the EIS indicates that “Negligible residual effects are those that are predicted to result in no measurable or detectable effect (i.e., no change in the environment beyond the normal range of ecological or socio-economic variability) …” This suggests that the only determinant of such effects is the magnitude of the (predicted) effect, only one of the rating criteria. Were other matters considered when determining negligible residual effects?
19. EnCana’s response to information request (IR) No. AWA 045 mentions that “established and scientifically accepted natural ranges of variability are not available for many VECs in the Dry Mixedgrass Subregion of Alberta” and “EnCana has not determined the range of natural variability for wildlife VECs”. This seems to contradict the approach described to determine the significance of effects which states that “Negligible residual effects are those that are predicted to result in no measurable or detectable effect (i.e., no change in the environment beyond the normal range of ecological or socio-economic variability) …” Clarify how the significance of effects was determined for valued environmental components (VECs) for which EnCana did not have information on the normal range of ecological or socio-economic variability?

20. As an example, the comparison of Tables 3-1 and 3-2 (Vol. 4, p 3 – 26 and 3 – 29) shows identical values for direction, geographic extent, duration, magnitude, reversibility, recovery, and frequency. Yet the resulting significance in Table 3-1 (decommissioning) is insignificant, while that in Table 3-2 is negligible. This probably means other factors than the rating criteria were used. Clarify.

Cumulative Effects

21. In response to IR No. Terr. 142, EnCana has indicated that a broader cumulative effects assessment would likely have shown population declines if a larger study area had been used for some species, but that such an assessment, while potentially useful for regional planning, is outside the scope of a project-specific cumulative effects assessment. Generally a species being endangered is an a priori indication of it having been exposed to a significant adverse cumulative effect. EnCana’s own assessment indicates that, for most wildlife species, the residual cumulative effect is adverse but insignificant.

a. When combined with a regionally-based cumulative effects assessment, could the Project contribute to a significant adverse cumulative effect? In order to improve the situation, are there offset opportunities that could make the residual effect either zero or positive? Such offsets might be guided by the recovery plans for species at risk.

b. Similarly, would an examination of habitat, in particular native prairie grasslands which are important for some listed species, show that such habitat has been reduced significantly? Are there offset opportunities that would reduce the residual effects to either zero or positive? In this regard, it is noted that the response to IR No. Terr. 121 where EnCana states: “reclaiming land back to a degraded landscape would be irresponsible if there is an opportunity to improve landscape functionality.”
22. In the description of the Ord’s Kangaroo Rats, it is indicated that they “require open, sparsely vegetated sandy habitats … associated with sand dune habitats and arid grasslands…” In Section 5.8.3.34 (page 5-99), it is indicated that stabilization of sand areas has contributed to the decline of Ord’s Kangaroo Rats.

a. Has this happened in the last 35 years, the period of time for which the cumulative effects assessment was carried out, in the NWA?

b. Has there been a notable decrease in this important habitat for Ord’s Kangaroo Rats? If there has been a noticeable decrease in habitat, could this be an indicator of a significant cumulative impact on this endangered species?

**Wildlife and Habitat**

23. In IR No. AWA 076 EnCana was asked to provide more detail by vegetation unit for the existing disturbance footprint. EnCana summarized the number of units affected and the percentage area of the total units disturbed. The summary information was presented in Vol. 3 Table 3-2: Footprint Distribution by Canadian Wildlife Service Vegetation Cover type and in Table 3-3: Footprint Distribution to Ecological Range Site Units. For the proposed disturbance footprint EnCana identified the names of specific vegetation units or ecological range units and calculated areas of disturbance (see Vol. 3, Appendix L, Table 3L-1 on page 3L-4 and Table 3L-2 on page 3L-5).

a. To compare changes between existing and proposed disturbance footprints, EnCana is asked to create Tables 3-2 and 3-3 using names of “land/vegetation cover types” and “ecological range site unit” names. See Appendix 3L, Tables 3L-1 and 3L-2.

b. Include mapping of the disturbance footprint with land/vegetation cover types and ecological range sites used to compile the statistics of the referenced table above. Recommended map scale is 1: 40 000 to 1:50 000.

24. In its response to IR No. AWA 077, the Tables referenced by EnCana summarized five disturbances by the project but did not indicate the incremental change from baseline.

a. In reference to Volume 3 Table 3L-1 and 3L-2, EnCana summarized the percent disturbance caused by the proposed disturbance footprint. Compared to the baseline disturbance, what is the incremental percent increase to each land/vegetation cover type and to ecological range site unit caused by the project?
25. EnCana is asked to provide an assessment of sensory disturbance, during the life of the project, and describe the effects to wildlife and changes to their habitat suitability. This assessment should include noise, human presence, etc.

26. In Volume 3, Section 5.6.5 and Table 5-1, page 5-7, Table 5-1 indicates that burrowing and short-eared owls were selected as VECs. However it appears that no surveys were conducted by EnCana to locate nests.

   a. Describe any such surveys and results, or indicate why no surveys were undertaken.

   b. Describe under what circumstances raptor surveys will be conducted as part of the pre-disturbance assessment (PDA) process.

27. In Volume 3, Section 1.2.1, page 1-2 and other sections of the EIS refer to the inclusion of the Koomati area in order to compare the effects of different well densities. Explain the results of these studies and their applicability to the NWA for which proposed wells will be above ground.

28. EnCana has modeled wildlife habitat supply as a means of assessing impacts to wildlife. Data from various Canadian Wildlife Service (CWS) sources such as vegetation cover, ecosites and ecological range sites were converted into habitat units and ranked for their habitat suitability for VEC species. Those habitat units with high to moderate suitability ratings were then mapped for their distribution and areal extent. It is not clear how the habitat ratings of low, moderate and high of Section 5.7.1.1 made use of species specific biological information (e.g., life cycles) to determine habitat requirements necessary to rank suitability.

   a. Provide for each VEC the methods, quantitative inputs, professional judgments, uncertainties and assumptions used in rating habitat and thereby modeling habitat supplies.

   b. Provide a description of the models used for each VEC evaluated in the EIS. Discuss the sources of information used in each model and the suitability of this input relative to the species being assessed (i.e., mapping scale, ability to identify critical habitat characteristics).

   c. Describe limiting factors in the NWA for each VEC and how these factors were incorporated into identification of moderate and high quality habitats or critical habitats.

   d. Explain how the suitability and supply models considered and assessed site-specific critical and important habitat requirements of the VECs, including breeding locations, leks, dens, and burrows.
e. How will identification of geographically small features be incorporated into the PDA process and route selection for roads and pipelines?

f. Presuming that EnCana’s modeling of habitat suitability incorporates various sources of literature information, how does EnCana intend to validate or confirm wildlife use of predicted habitats?

g. Resolution of the EnCana habitat supply mapping is apparently based on the mapping resolution of CWS data. For Appendix 5H what is the smallest sized mapable habitat unit (e.g., in hectares)? What is the ability of EnCana’s habitat supply mapping to identify uncommon, limited extent habitats of high importance to a VEC? How has this ability been used in the assessment to influence routing or siting of the development, avoidance through constraint mapping or other mitigation?

h. In its responses to the initial IRs EnCana states that NWA cover types are still valid as there has been little fire and grazing pressure remains constant. Describe cover types that are successionally pre-climax as a result of previous disturbances, changes to these communities that would be expected over the intervening 10 years, and how these cover types were validated and updated.

29. Volume 3, section 5.4, page 5-4: EnCana did not identify Alberta Sustainable Resource Development (ASRD) maps of critical winter range for ungulates within the NWA. Provide this map information and specify applicable timing constraints of ASRD for wildlife management purposes. Identify how ASRD’s winter timing constraints for ungulates may or may not be compatible with EnCana’s proposed mitigation of winter drilling.

30. Volume 3, Section 5.6.5.5, page 5-20 and Table 5-1: Using EnCana or ASRD data, what is the extent of winter use by pronghorn antelope or other ungulates within the NWA for winter range?

31. Volume 3, Section 5.10, page 5-126: Describe EnCana’s operating policy regarding requirements for field staff and contractors to report all wildlife collisions and mortalities, in particular snake mortality, to EnCana. What species get reported and what are the results? How is the information used in environmental management plans?

32. Has EnCana noted daily patterns in snake mortality or conducted research to detect such patterns? Outline findings of any such studies.
33. In its response to IR No. NC 005, EnCana did not respond to the question of how the information collected in its literature search, including the recovery strategies and available plans, were used in the determination of the significance of effects and in the choice of mitigation measures. Clarify how this information was used to determine the significance of effects on listed species.

Soils, Vegetation and Reclamation

34. Since the actual physical disturbance is reported “negligible” for Spyder plowing and two metre wide disturbance for chain ditching, why is Spyder plowing not used for larger steel pipelines, or larger plastic pipelines, to reduce the physical disturbance even more?

35. In section 2.7.2 and Appendix 2A, the assessment focused on extreme and high risk ratings. It is unclear how the risk criteria were determined from the references provided. Outline the criteria and professional judgments and explicitly how they were used to rate soil landscape features and soil landscape models according to the five risk ratings for shallow gas activities.

36. In Volume 1, Section 2.2.2, page 2-16, it is stated that “To minimize disturbance to the prairie environment, no new roads (i.e., with built-up roadbeds) will be constructed, and all access routes will be marked in the field to ensure all traffic is restricted to specific routes.”
   a. What is the maximum frequency of use that EnCana predicts for prairie trails during drilling, construction, start-up and operation?
   b. Describe the impacts associated with repeated and increased use of existing trails to the sod layer and underlying soils (e.g., compaction, rutting, and erosion).

37. In Volume 1, Section 2.2.2.4, page 2-19, it is stated that “Disturbed ground will be recontoured, where necessary, and reseeded or left to recover naturally, depending on site conditions.” Discuss EnCana’s experience, challenges and success, based on site specific examples, with natural recovery reclamation practices in the Suffield area and preferably in the NWA.

38. In Volume 3, Section 2.8.3, page 2-38, with regard to rolling and/or inclined ridges, it is stated that “Landscapes in this Soil Landscape Feature are presently showing numerous reclamation problems caused by existing traffic use. Therefore, traffic must be minimized and controlled to prevent problems in this SLF. The residual environmental effects for the SLF are rated as insignificant.” Also EnCana describes similar reclamation problems associated with “Sloping Till with Channels” and “Steep Sloping Till with Gullies & Channels.”
a. Describe EnCana’s status and mitigation plans to date for rectifying reclamation issues associated with these Soil Landscape Features.

b. If remedial action has not occurred, what follow-up steps are being undertaken?

39. In Volume 1, page H-4, EnCana mentions “The Reclamation Plan has also been designed with recognition of multiple societal values including soil, water and air quality, biodiversity and aesthetics. The plan must comply with environmental regulations yet be cost-effective.” In terms of “cost-effective reclamation”, what are the costs and benefits that EnCana evaluates to make such a determination?

Miscellaneous

40. In Volume 5 Section 2.6.1.3, page 2-9, EnCana states “A final report detailing the HRIA and the new and revisited historical resources sites was submitted to the Alberta Government on October 25, 2006” (Ng 2006). Indicate whether Historical Resources Act clearance is required by the Alberta Government for the project within the NWA. What is the status of EnCana’s historical resources impact assessment? Has the Alberta Government provided a response? If so, what were the details of it?

41. Given the numerous requests regarding water usage, it would be useful if EnCana could provide a summarized water management plan. The information should include volumes of water supply, water use, recycled volumes, etc. over the expected life of the project.

42. For wells and pipelines that EnCana currently operates inside of the NWA:

   a. What “post approval” environmental management processes are used by EnCana (e.g., monitoring programs, auditing, supervision, compliance enforcement, follow-up or experimental programs)?

   b. What information is obtained through these processes?

   c. How might further monitoring and reclamation also address problem areas in the National Wildlife Area created by earlier gas development? Measures could include reseeding bare ground areas, removing any drilling wastes and reclamation if such wastes still remain, controlling of noxious weeds and erosion control on access trails?

   d. Would post-construction assessments be conducted to verify the accuracy of predicted effects and identify mitigation measures to correct any unanticipated effects?
Constraints mapping was a process used by EnCana to locate wells, pipelines and access. A sample area and generalized constraints have been illustrated in Volume 3, Appendix 3F, Figure 3F-2, page 3F-82. Identify the processes used for constraints analysis. This should include discussion of the different classes of environmental constraints, criteria for setback distances, comparative weightings given to environmental, geological, operational, resource extraction, economic constraints, selection of map scale and explicitly how these various considerations were used to create the constraints maps.