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March 21, 2005

Alberta Energy and Utilities Board  
640-5<sup>th</sup> Avenue SW  
Calgary, Alberta T2P 3G4

**Attention: Ernie Smith, Resources Applications**

Dear Sir:

**Re: Proceeding No. 1347905, Bitumen Conservation Requirements,  
Athabasca, Wabiskaw-McMurray Phase 3 Final Hearing**

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Enclosed please find the Information Requests of Petro-Canada to Canadian Natural Resources Limited, the Staff Submission Group, and Paramount Energy Operating Corp. in respect of the above proceeding.

Should the Board have any questions or concerns regarding the foregoing, please do not hesitate to contact the undersigned.

Yours sincerely,

**PETRO-CANADA**

*Original signed by R. Kolber*

**Rachel Kolber  
Legal Counsel**

cc: Interested Parties

**In the Matter of Alberta Energy and Utilities Board  
Proceeding No. 1347905, Bitumen Conservation Requirements  
Athabasca, Wabiskaw-McMurray Phase 3 Final Hearing**

**Petro-Canada Information Request #1 to Canadian Natural Resources Limited (CNRL)**

<b>1.1</b>	<b>Reference:</b>	Recent pressure survey data or scheduled field gas well pressure surveys within the Chard area may not be on the public record.
	<b>Request:</b>	Provide any recent Wabiskaw-McMurray pressure survey data within a three mile extension from the Chard lease boundaries or submission study areas that may have been acquired through 2004 and 2005 that is not on the public record as of March 21, 2005. This should include the full electronic dataset for surface dead weight pressures and associated fluid levels, static gradient, flow and buildup testing and piezometer measurements. Applicable piezometer data should include the full historical dataset.

**In the Matter of Alberta Energy and Utilities Board  
 Proceeding No. 1347905, Bitumen Conservation Requirements  
 Athabasca, Wabiskaw-McMurray Phase 3 Final Hearing**

**Petro-Canada Information Request #1 to Paramount Energy Operating Corp (PEOC)**

<b>1.1</b>	<b>Reference:</b>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC identifies the following seven (7) facies types for geological and thermal flow simulation studies:</p> <ol style="list-style-type: none"> <li>1. Marine Sand</li> <li>2. Marine Mud</li> <li>3. Sand</li> <li>4. Interbedded Sand</li> <li>5. Interbedded Mud</li> <li>6. Mud Breccia</li> <li>7. Mud Plug</li> </ol> <p>PEOC provides brief definitions of these facies types, the average properties of the facies types, the variogram parameters for each facies type, and a 3-D realization of the facies types. These facies types also form the basis of Appendices 6 (Facies Profiles from Discriminant Analysis) and are referenced in Appendices 8 (Geological Modeling Report).</p>
	<b>Request:</b>	<p>Please provide a quantitative definition of reservoir parameters for each facies type. Specifically, how is “Sand” differentiated from “Interbedded Sand” and how is “Mud” differentiated from “Interbedded Mud”?</p>
<b>1.2</b>	<b>Reference:</b>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC references the 3-D Geological Model (Sections 5 and Appendices 8).</p>
	<b>Request:</b>	<p>Please provide the following:</p> <ol style="list-style-type: none"> <li>(a) All data files for the geological models for each submission (4 in total).</li> <li>(b) Cross-sections from the geostatistical model for facies, volume of shale (Vsh), porosity, horizontal permeability and vertical permeability for each submission (20 cross-sections in total),</li> </ol>

		including all the input wells.
<b>1.3</b>	<b>Reference:</b>	In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC deals with the facies modeling (Appendices 8, Section 4.3, Simulation Results and Discussion). PEOC describes the process of generating five facies realizations and then selects one as representative. Figures 23 to 26 in Appendices 8 illustrate a series of 2-D and 3-D representations of the selected facies model.
	<b>Request:</b>	(a) Please provide the same information as illustrated in Figures 23 to 26 for all five (5) facies realizations for each of the submissions.  (b) Please explain what PEOC has done to confirm that the five (5) realizations cover the range of possibilities?
<b>1.4</b>	<b>Reference:</b>	In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC presents histograms of horizontal permeability for all cells in the selected geologic model. This is presented in the Geological Modeling Reports (Appendices 8). Summarized below is the location of the histogram in each Geological Modeling Report.  Hangingstone McMurray X Pool      Figure 109    Page 72 Hangingstone McMurray KKK Pool    Figure 67     Page 55 Corner McMurray C Pool                Figure 130    Page 82 Corner McMurray G Pool                Figure 98     Page 68  These histograms are presented with the horizontal permeability on a Log scale.
	<b>Request:</b>	Please provide the following:  (a) The same histograms (4 in total) modified to present calculated horizontal permeability on a normal scale instead of a log scale.  (b) A separate histogram of the calculated horizontal permeability for each facies presented on a normal scale. This is requested for the selected geological model for each submission.  (c) A separate cross-plot of the calculated horizontal permeability versus the volume of shale (Vsh) for all cells in the geological

		model presented on a normal scale. This is requested for the selected geological model for each submission.
<b>1.5</b>	<b>Reference:</b>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC presents histograms of vertical permeability for all cells in the selected geologic model. This is presented in the Geological Modeling Reports (Appendices 8). Summarized below is the location of the histogram in each Geological Modeling Report.</p> <p>Hangingstone McMurray X Pool      Figure 110    Page 75</p> <p>Hangingstone McMurray KKK Pool    Figure 68      Page 57</p> <p>Corner McMurray C Pool                Figure 131    Page 84</p> <p>Corner McMurray G Pool                Figure 100    Page 70</p> <p>These histograms are presented with the vertical permeability on a Log scale.</p>
	<b>Request:</b>	<p>Please provide the following:</p> <p>(a) The same histograms (4 in total) modified to present calculated vertical permeability on a normal scale instead of a log scale</p> <p>(b) A separate histogram of the calculated vertical permeability for each facies presented on a normal scale. This is requested for the selected geological model for each submission.</p> <p>(c) A separate cross-plot of the calculated vertical permeability versus the volume of shale (Vsh) for all cells in the geologic model presented on a normal scale. This is requested for the selected geological model for each submission.</p>
<b>1.6</b>	<b>Reference:</b>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, PEOC presents histograms of horizontal permeability for all cells in the whole field upscaled simulation model. This is presented in the Geological Modeling Reports (Appendices 8). Summarized below is the location of the histogram in each Geological Modeling Report.</p> <p>Hangingstone McMurray X Pool      Top Figure on Page 83</p> <p>Corner McMurray C Pool                Bottom Figure on Page 93</p>





		<p>the geological model covering the same volume as the well specific models. This is requested for the six well specific grids identified and should be on a normal scale.</p> <p>(c) A separate histogram of the calculated horizontal permeability from the well specific grids for each facies presented on a normal scale. This is requested for the six well specific grids identified.</p> <p>(d) A separate histogram of the calculated horizontal permeability from the geological model covering the same volume as the well specific models for each facies. This is requested for the six well specific grids identified and should be on a normal scale.</p> <p>(e) A separate cross-plot of the calculated horizontal permeability versus the volume of shale (Vsh) for all cells in the well specific grids presented on a normal scale. This is requested for the six well specific grids identified.</p> <p>(f) A separate cross-plot of the calculated horizontal permeability versus the volume of shale (Vsh) from the geological model covering the same volume as the well specific grids. This is requested for the six well specific grids identified and should be on a log scale.</p>												
<p><b>1.9</b></p>	<p><b>Reference:</b></p>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC presents histograms of vertical permeability for all cells in the well specific simulation grids. This is presented in the Geological Modeling Reports (Appendices 8). The well specific grids associated with each submission include (not a full list):</p> <table data-bbox="500 1352 1187 1730"> <tr> <td>Hangingstone McMurray X Pool</td> <td>11-19-081-09</td> </tr> <tr> <td>Hangingstone McMurray KKK Pool</td> <td>12-28-081-10</td> </tr> <tr> <td>Corner McMurray C Pool</td> <td>03-34-080-10</td> </tr> <tr> <td>Corner McMurray G Pool</td> <td>04-15-081-09</td> </tr> <tr> <td></td> <td>06-27-081-09</td> </tr> <tr> <td></td> <td>10-23-081-09</td> </tr> </table> <p>Summarized below is the location of the histogram in each Geological Modeling Report.</p>	Hangingstone McMurray X Pool	11-19-081-09	Hangingstone McMurray KKK Pool	12-28-081-10	Corner McMurray C Pool	03-34-080-10	Corner McMurray G Pool	04-15-081-09		06-27-081-09		10-23-081-09
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		<p>11-19-081-09 (X Pool)      Top Figure on Page 87</p> <p>12-28-081-10 (KKK Pool)    Top Figure on Page 65</p> <p>03-34-080-10 (C Pool)      Bottom Figure on Page 102</p> <p>04-15-081-09 (G Pool)      Bottom Figure on Page 92</p> <p>06-27-081-09 (G Pool)      Bottom Figure on Page 112</p> <p>10-23-081-09 (G Pool)      Bottom Figure on Page 108</p> <p>These histograms are presented with the vertical permeability on a log scale.</p>
	<b>Request:</b>	<p>Please provide the following:</p> <p>(a) The same histograms (6 in total) modified to present the upscaled simulation vertical permeability on a normal scale instead of a log scale.</p> <p>(b) Histograms presenting the calculated vertical permeability from the geological model covering the same volume as the well specific models. This is requested for the six well specific grids identified and should be on a normal scale.</p> <p>(c) A separate histogram of the calculated vertical permeability from the well specific grids for each facies presented on a normal scale. This is requested for the six well specific grids identified.</p> <p>(d) A separate histogram of the calculated vertical permeability from the geological model covering the same volume as the well specific models for each facies. This is requested for the six well specific grids identified and should be on a normal scale.</p> <p>(e) A separate cross-plot of the calculated vertical permeability versus the volume of shale (Vsh) for all cells in the well specific grids presented on a normal scale. This is requested for the six well specific grids identified.</p> <p>(f) A separate cross-plot of the calculated vertical permeability versus the volume of shale (Vsh) from the geological model covering the same volume as the well specific grids. This is requested for the six well specific grids identified and should be on a log scale.</p>
<b>1.10</b>	<b>Reference:</b>	In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February

	<p>15, 2005, PEOC discusses numerical simulation (Sections 6 and 7, and Appendices 10).</p> <p>Section 6.1 of each submission (with the exception of the Hangingstone McMurray KKK pool submission) states: “A sensitivity analysis in which the calibrated reservoir description was partially replaced with uniform, high quality clean sand dramatically improved the forecast parameters”.</p> <p>Section 8 of each submission states that the question of bitumen exploitability can be addressed for each of the pools by comparing results of the simulation to the status of the applicable recovery technologies.</p> <p>Section 9 of each submission states: “When the results of the simulation studies presented in this report are compared to the literature, applications to the AEUB for pilot or commercial SAGD approvals, and data from existing SAGD projects, the question posed by ID 99-1 regarding whether or not the bitumen resource can be exploited with reasonably foreseeable technology and economic conditions can be addressed”.</p>
<p><b>Request:</b></p>	<p>Please provide the following:</p> <ul style="list-style-type: none"> <li>(a) A summary list of all simulations run, including all sensitivities (both 2-D and 3-D), for all submissions.</li> <li>(b) Simulation input data files for all sensitivities.</li> <li>(c) For the 2-D models, the effective wellbore length.</li> <li>(d) Relative permeability curves for all phases.</li> <li>(e) A copy of the study or studies which form the basis of the relative permeability curves.</li> <li>(f) Gas solubility tables and an explanation regarding how they were determined.</li> <li>(g) If gas solubilities were determined through lab work, a copy of the study or studies on which they are based.</li> <li>(h) Operating conditions including bottomhole temperature and pressure profiles (versus time) for all SAGD simulations.</li> <li>(i) Tabulated SAGD production forecasts (oil, gas, water, steam) for all simulations.</li> </ul>

		<p>(j) Cross-sections from all simulation models.</p> <p>(k) Field data used to calibrate the SAGD model at 1200 and 200 kPa.</p>
<b>1.11</b>	<b>Reference:</b>	Figure 28 (Hangingstone X Pool History Match Plot) of the Hangingstone McMurray X pool submission dated February 14, 2005 is missing symbols representing the observed/field data.
	<b>Request:</b>	Please reproduce Figure 28, including symbols for observed/field data.
<b>1.12</b>	<b>Reference:</b>	In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, PEOC discusses a “hybrid operating program” and its implementation in the revised generic 2-D models (Sections 7.2 of the Hangingstone McMurray X and KKK pools and the Corner McMurray C pool submission; Section 7.3 of the Corner McMurray G pool submission).
	<b>Request:</b>	Please explain this “hybrid operating program” and how it was implemented in the revised generic 2-D models.
<b>1.13</b>	<b>Reference:</b>	<p>In its submissions for the Hangingstone McMurray X pool and the Corner McMurray C and G pools, dated February 14, 2005, and its submission for the Hangingstone McMurray KKK pool, dated February 15, 2005, section 5.3 discusses the quantitative log analysis. This discussion includes the approach to determining volume of shale, porosity and permeability.</p> <p>Figure 17 in each submission is a core porosity-core permeability cross-plot. The figure identifies 156 data points but the text of the submissions state that only 16 data points were available.</p>
	<b>Request:</b>	<p>Please provide the following information:</p> <p>(a) What is the laboratory methodology used to obtain core fluid volumes and core porosity?</p> <p>(b) What is the correlation between the log derived fluid volumes and the core fluid volumes? Please provide cross-plots of log versus core saturations for all cored intervals used.</p> <p>(c) What is the correlation between the log derived porosity and the core porosity? Please provide cross-plots of log versus core porosities for all cored intervals used.</p> <p>(d) How were the core permeability data obtained? Please describe the</p>

		<p>lab procedure and provide the core analysis report(s) from which the data was taken.</p> <p>(e) Was this data corrected in any way prior to using it to derive the porosity-permeability transform?</p> <p>(f) Were 16 points or 156 points used for the core porosity-core permeability cross-plot?</p> <p>(g) Please provide a table identifying the facies type assigned to each core permeability sample.</p>
<b>1.14</b>	<b>Reference:</b>	Recent pressure survey data or scheduled field gas well pressure surveys within the Chard area may not be on the public record.
	<b>Request:</b>	Provide any recent Wabiskaw-McMurray pressure survey data within a three mile extension from the Chard lease boundaries or submission study areas that may have been acquired through 2004 and 2005 that is not on the public record as of March 21, 2005. This should include the full electronic dataset for surface dead weight pressures and associated fluid levels, static gradient, flow and buildup testing and piezometer measurements. Applicable piezometer data should include the full historical dataset.

**In the Matter of Alberta Energy and Utilities Board  
 Proceeding No. 1347905, Bitumen Conservation Requirements  
 Athabasca, Wabiskaw-McMurray Phase 3 Final Hearing**

**Petro-Canada Information Request #1 to the Staff Submission Group (SSG)**

<b>1.1</b>	<b>Reference:</b>	<p>In its submission dated February 14, 2005, the SSG refers to eleven (11) cored wells along the south border of the Surmont leases (page 16). The cored wells, as well as the well 00/10-11-080-07W4/0, are also referenced in Figure 6-2 (Areal Distribution of Core_8.5x11.pdf) and Table 6-1 (Wabiskaw D Shale Core Study Data). The cored wells and core intervals are:</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;"><b>Location</b></th> <th style="text-align: left;"><b>Interval</b></th> </tr> </thead> <tbody> <tr><td>00/10-30-80-6W4</td><td>240.2-324.9</td></tr> <tr><td>AA/11-30-80-6W4</td><td>247.0-319.0</td></tr> <tr><td>AA/10-3-80-7W4</td><td>315.7-387.3</td></tr> <tr><td>AA/10-10-80-7W4</td><td>312.5-393.3</td></tr> <tr><td>00/10-11-080-07W4</td><td>316.0-374.5</td></tr> <tr><td>AA/10-22-80-7W4</td><td>324.1-404.9</td></tr> <tr><td>02/9-24-80-7W4</td><td>268.0-356.8</td></tr> <tr><td>AA/10-26-80-7W4</td><td>314.0-392.5</td></tr> <tr><td>AA/10-29-80-7W4</td><td>342.0-418.0</td></tr> <tr><td>00/3-32-80-7W4</td><td>338.0-420.8</td></tr> <tr><td>AA/7-26-80-8W4</td><td>392.0-447.0</td></tr> <tr><td>00/3-34-80-8W4</td><td>394.0-444.5</td></tr> </tbody> </table>	<b>Location</b>	<b>Interval</b>	00/10-30-80-6W4	240.2-324.9	AA/11-30-80-6W4	247.0-319.0	AA/10-3-80-7W4	315.7-387.3	AA/10-10-80-7W4	312.5-393.3	00/10-11-080-07W4	316.0-374.5	AA/10-22-80-7W4	324.1-404.9	02/9-24-80-7W4	268.0-356.8	AA/10-26-80-7W4	314.0-392.5	AA/10-29-80-7W4	342.0-418.0	00/3-32-80-7W4	338.0-420.8	AA/7-26-80-8W4	392.0-447.0	00/3-34-80-8W4	394.0-444.5
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	<b>Request:</b>	<p>Please provide the complete Wabiskaw and McMurray core descriptions and relevant core photos prepared by the SSG for the twelve (12) foregoing wells. In addition, for those wells, please provide any core analyses or special core analyses undertaken, including weight % bitumen, porosity, permeability, or dean stark analysis.</p>																										