

March 8, 2004

Mackenzie Valley Environmental Impact Review Board  
Box 938  
5102 – 50 Avenue  
Yellowknife, NT  
X1A 2N7

**Attention: Kimberley Cliffe-Phillips**

Dear Ms. Cliffe-Phillips:

**Re: Environmental Assessment EA03-005  
Response to Technical Report Issued by Environment Canada**

With reference to the subject environmental assessment, we are pleased to be given the opportunity to respond to the Technical Report issued by Environment Canada. In the sections following, we have reiterated the recommendations of Environment Canada and provided the response from Paramount Resources Ltd.

#### **ISSUE #1: MITIGATION OF SO<sub>2</sub> AIR EMISSIONS**

##### **Recommendation:**

Environment Canada recommends that Paramount mitigate SO<sub>2</sub> emissions from the Cameron Hills facility. Accelerating the installation of the amine sweetening unit, proposed by the Proponent in the Planned Development Case, and using the sweetened fuel in all combustible engines and heaters, would eliminate all SO<sub>2</sub> air quality concerns.

##### **Response:**

The evidence presented in the DAR, in the responses to the IRs and during the public hearing does not support the recommendation from Environment Canada that the installation of an amine sweetening unit at Cameron Hills needs to be accelerated and the sweetened gas used to fuel all of the combustion engines and heaters. Even with all of the conservative assumptions included in the emissions modelling, the maximum SO<sub>2</sub> concentrations comply with the respective NWT air standards, even under worst case meteorological conditions. These standards

were acknowledged to be protective of health and the environment by GNWT, and certainly include built-in margins of safety.

During the questioning by Environment Canada personnel of the Paramount witnesses, it became clear that there was a misunderstanding regarding the scope of the applied-for development and how this fit into the Developers Assessment Report (DAR) submitted by Paramount. The DAR was prepared in response to MVEIRB Terms of Reference (ToR) regarding possible future cumulative effects in the region. The project ToR indicated that the MVEIRB had “...*already established that the individual components of the development under assessment (i.e., drilling, testing and tie in of oil and gas wells) generally are not likely to have a significant adverse effect, if considered in isolation.*”

However, the Board had concerns regarding possible cumulative effects, which it defines as “...*the effects of the proposed development in combination with effects from past, present or reasonably foreseeable developments.*” The DAR included a Planned Development Case, which evaluated the cumulative effects of the current and approved activities, the applied for development (specifically five new gas wells) and an additional 48 wells that might be considered as part of the development in the area over the next 10 to 20 years. Prior to applying for any of the additional wells or activities, Paramount would have to apply for additional land use permits. This was clearly confirmed by Mr. Lloyd Doyle of Paramount Resources when he provided the following response to a question from Environment Canada:

*“...every year that we put forth a project, we model it to ensure that we are within the guidelines and regulations of the area that we're working in, and we will continue to do so. The Planned Development Case is -- is not before the Board as a -- for a land use application, it is there purely to assess the cumulative effects and is very speculative, and certainly will not, in all likelihood, come down as presented. There will no doubt be changes and we will assess the affects to the air emissions for those changes by modelling it on a continual basis. [MVEIRB Transcripts, February 18, page 79, lines 5-15]”*

The misunderstanding regarding the scope of the project being applied for by Paramount appears to be basis for the recommendation by Environment Canada regarding the acceleration of the installation of an amine sweetening unit, included in the speculative Planned Development Case.

Environment Canada also appear to have misinterpreted the need and proposed use of the sweet fuel system. The sweet fuel system was included in the Planned Development Case for the project to address a number of operating requirements. Mr. Neil Kelly of Allnorth Consultants indicated when responding to Environment Canada questions that “...*there are other factors that go into the need for sweet fuel. And I think if you look at the equipment list associated with*

*the far development case, the population of equipment at the -- at the site might require sweet fuel. The nature of the equipment at this point in time does not require sweet fuel.* [MVEIRB Transcripts, February 18, page 76, lines 2-5]” In addition, the sweet fuel system included in the Planned Development Case would only supply fuel to the equipment at the central battery. Since sweet fuel would not be supplied to all of the wells within the SDL, implementing the sweet fuel system immediately would not eliminate SO<sub>2</sub> emissions from the development as suggested by Environment Canada.

In fact, Environment Canada’s recommendations seem to run contrary to much of the evidence from the GNWT regarding boreal caribou. Mr. Gavin More of the Government of the Northwest Territories gave evidence regarding the need for protection of critical habitat for boreal caribou, and went on to discuss possible concerns regarding the species avoiding human disturbances. Yet Environment Canada appears to recommend that additional disturbances be placed in the region to send sweet fuel to existing and approved wells that were not predicted to result in ground-level SO<sub>2</sub> concentrations in excess of the Northwest Territories Ambient Air Standards, even under worst case conditions. When questioned regarding whether GNWT had considered other possible environmental effects associated with running sweet fuel lines to all combustion sources within the SDL, Mr. Graham Veale of the R WED indicated that “...*No, my expertise is solely in terms of air quality and -- and those types of mitigation measures. I'm not an expert on habitat or anything like that, so no, that was not considered.* [MVEIRB Transcripts, February 18, page 208, lines 5-8]” It would seem likely that Environment Canada may have overlooked these potential effects when making their recommendations.

It would appear that some of the “SO<sub>2</sub> concerns” raised by Environment Canada in their technical report are based on a partial understanding of the project and the applied for development. For example, Environment Canada indicates in its technical report that:

*“...Tables III-8 and -10 (the Baseline Case) indicate that potential exceedances of the NWT SO<sub>2</sub> standards could be occurring now under the current stack configurations for the existing line heaters and pump jack. Clearly there is a sulphur issue that needs to be addressed.”*

The tables referred to by Environment Canada describe the respective heights for the line heater and pumpjack stacks that were used in the Baseline Case modelling presented in the DAR. The Baseline Case included an assessment of the air quality impacts from the existing and approved emission sources within the Cameron Hills development. While all of the Baseline Case sources have been approved, not all of them have been built as some of the approved wells may not produce. Evidence given by Mr. Martin Rawlings during the hearing confirmed that the Tables III-8 and III-10 provided highly conservative estimates of the current emissions in the Cameron Hills since “...*In the base line case, which*

*represents the existing and approved operations, it was assumed that all of the oil and all of the gas wells that are currently approved are operating. All of those wells would be equipped with the maximum amount of equipment possible, and would be emitting at the maximum rate on a continuous basis. In fact, that's quite an overstatement of what's really occurring. Of the fourteen (14) approved gas wells, only five (5) of those wells are currently in operation. Mr. Doyle in his opening remarks commented to why not all of the wells are currently operating. One of those wells, N-28 is equipped with a line heater, one of the sources of SO<sub>2</sub>. But that line heater is not used. A second well A-05 does not have a line heater at all, thereby eliminating the SO<sub>2</sub> emissions that could have come from that source. In the case of the oil wells only four (4) of the eighteen (18) approved wells are currently operating. Two (2) of those wells, F-73 and H-03, are equipped with electric pumps as opposed to fuelled pump jacks. [MVEIRB Transcripts, February 18, page 60, lines 24 & 25, page 61, lines 1-17]"* Therefore, the Baseline Case modelling presented in the DAR — which showed no predicted concentrations in excess of the NWT SO<sub>2</sub> standards — is an overstatement of the SO<sub>2</sub> concentrations that are currently possible in the Cameron Hills.

The other source of Environment Canada's "SO<sub>2</sub> concerns" is the H<sub>2</sub>S content used to calculate the SO<sub>2</sub> emissions presented in the DAR. In responding to IR 1.2.131, Paramount indicated that the H<sub>2</sub>S contents used as the basis of the emissions modelling presented in the DAR came from stable gas samples collected at the site. The response indicated that early readings, prior to the well stabilizing, would be misleading and tend to underestimate the quantities of H<sub>2</sub>S present. For example, the well bore tubes and surface production equipment contain molecular iron that reacts with the H<sub>2</sub>S in the gas to form a film of iron sulfide. This reaction will decrease the amount of H<sub>2</sub>S that appears to be present in the gas. Once the film of iron sulfide has formed, the reaction consuming H<sub>2</sub>S from the gas is arrested. In addition, evidence was presented during the hearing how the dispersion modelling presented in the DAR used conservative overestimates of the H<sub>2</sub>S contents present at Cameron Hills. Mr. Martin Rawlings confirmed that:

*"...In modelling the emissions from the central battery facility, H<sub>2</sub>S contents from the stable sample collected at the H-03 satellite was used. These H<sub>2</sub>S contents were increased by 22 percent, to allow for possible fluctuations. For the line heaters where we had existing measurements, we used the data that was available for those wells, thus using a representative stable sample for the wells where we had data. For the line heaters on the planned gas wells, we took the highest H<sub>2</sub>S content from the existing samples and increased it by 33 percent, to allow for possible fluctuations, that's what was used in the modelling for all of the future and planned wells. For the pump jacks, we took the H<sub>2</sub>S content measured at the H-03 battery, and we increased it conservatively by 25 percent, and used that when modelling the SO<sub>2</sub> emissions from all of the oilwells and pump jacks associated with those oil wells. [MVEIRB*

Transcripts, February 18, page 68, lines 19-15 and page 69, lines 1-12.]”

Environment Canada also highlighted that an H<sub>2</sub>S content of 3% was included in the Emergency Response Plan (ERP) filed by Paramount in July 2003. Paramount has identified that protecting the safety of workers and the public is important to the company. The ERP included an inflated estimate of the potential H<sub>2</sub>S contents present at the Cameron Hills to ensure that workers responding in an emergency will have more than the minimum level of protection. The 3% value listed in the ERP is not reflective of the H<sub>2</sub>S values likely or possible in the fuel gas at Cameron Hills.

To summarize, the evidence presented in the DAR, in the responses to the IRs and during the public hearing support Paramount’s position that a fuel sweetening system is not currently required at Cameron Hills, nor is it required to support the current application before the Board. The conservative dispersion modelling shows that, even under worst case meteorological conditions, the maximum SO<sub>2</sub> concentrations comply with the NWT air standards, which were acknowledged to be protective of health and the environment.

## **ISSUE #2: AMBIENT AIR QUALITY MONITORING**

### **Recommendation:**

EC recommends that Paramount develop an air quality monitoring program through consultation with air quality experts at EC and GNWT.

### **Response:**

As confirmed in the response to IR 1.2.135, and in evidence presented during the hearing, Paramount Resources currently has an air quality monitoring program at the Cameron Hills. One part of this program is comprised of a pair of total sulfation stations that record long-term air quality trends. A second component of the monitoring program is associated with worker health and safety issues. This monitoring is comprised of a series of continuous sensors sited at strategic locations to provide warning regarding elevated H<sub>2</sub>S in the area.

There did not appear to be any evidence presented in the DAR, the IRs, in evidence presented during the hearing or in the technical reports that would indicate the need for any additional monitoring beyond what is currently being done at the site. The dispersion modelling completed to support the DAR indicated that the design of the project ensures that there would be no exceedances of the NWT ambient air quality standards, even under worst case conditions meteorological conditions. This finding was recently confirmed by Environment Canada. The sensitivity modelling results filed by Environment Canada clearly show that the maximum SO<sub>2</sub> concentrations associated with the proposed project design and configuration were below the NWT standards for

every one of the 43,824 meteorological conditions evaluated. In fact, we heard evidence from Mr. Graham Veale of RWED during the hearings that “...I would certainly agree that the use of five (5) years of meteorological data would give you adequate coverage of all potential meteorological scenarios. [MVEIRB Transcripts, February 18, page 203, lines 16-19]” Therefore, the maximum SO<sub>2</sub> concentrations associated with the project design proposed by Paramount will comply with the NWT standards under what RWED has described as “all potential meteorological scenarios”.

### **ISSUE #3: WASTE MANAGEMENT– DRILLING FLUID AND WASTE DISPOSAL**

#### **Recommendation:**

The Board should ensure that a comprehensive monitoring program is established so that the information gathered is useful in assessing the performance of in-ground waste disposal facilities.

#### **Response:**

Paramount has incorporated several mitigation strategies (Sections 3.6.2 and 3.6.8 in the DAR) related to the management of their in-ground waste disposal, including:

- selecting sites with impermeable soils;
- avoiding areas of permafrost;
- obtaining INAC inspector approval of the site;
- using non-toxic drilling muds;
- using the industry standard mix, bury and cover method for drilling waste disposal pits and camp sump;
- compaction of backfill in lifts to mitigate post-abandonment subsidence, and capping (1 to 1.5 m in height) to compensate for any settling and to divert surface water away from the site; and
- restoring the site in a manner that is suitable to INAC.

As stated in Section 3.6.10 of the DAR, Paramount’s objective is to abandon and reclaim each site so that ongoing monitoring of any condition is not required. However, Paramount accepts its obligation to monitor the effectiveness of abandonment and reclamation efforts for at least the one year after a site is reclaimed, and beyond the first year until satisfactory reclamation conditions prevail. If the site is stable, and revegetating satisfactorily, no further monitoring or activity will be undertaken. The site will be considered reclaimed. If, however, one year after a site is initially abandoned, evidence of the need for further restoration work is required, a remediation plan will be developed for

review and acceptance by the INAC Resource Management Officer. That remedial plan may be limited to seeding bare or erosion prone areas.

Paramount's operators conduct ongoing monitoring of the Cameron Hills project. With respect to ongoing monitoring, Paramount has provided training (summer 2003) to their operators, related to the recognition, appropriate response, and reporting of erosion, that have been incorporated into ongoing inspections. As such, Paramount submits that the project is undergoing adequate monitoring.

#### **Issue #4: Sensitivity of SO<sub>2</sub> Concentrations to Stack Height and Fuel Type**

##### **Recommendation:**

Through the model sensitivity test presented above, Environment Canada has shown that air quality model predictions are very sensitive to stack height and changes in fuel type used at the Cameron Hills facility. Decreasing the stack height and changing from sweetened fuel to well gas will increase ground-level SO<sub>2</sub> concentrations and may cause exceedances of the NWT ambient air quality standards.

Environment Canada recommends that the Proponent conduct a new air quality assessment including new air modelling if the stack heights or fuel type are changed from what was proposed in the DAR. This includes any development beyond the Application Case without the installation of the amine sweetening unit proposed in the Planned Development Case.

##### **Response:**

It should be reassuring to the Board that the sensitivity modelling completed by Environment Canada confirms that the maximum SO<sub>2</sub> concentrations associated with the proposed project design and configuration are predicted to meet the NWT standards, even under worst case meteorological conditions. In determining this, Environment Canada used the 43,824 meteorological conditions evaluated in the DAR, that we heard from Mr. Graham Veale of RWED during the hearings that *"...I would certainly agree that the use of five (5) years of meteorological data would give you adequate coverage of all potential meteorological scenarios."* Therefore, the maximum SO<sub>2</sub> concentrations associated with the project design proposed by Paramount is predicted to comply with the NWT standards under what RWED has described as *"all potential meteorological scenarios"*.

The recommendation by Environment Canada that additional air modelling evaluations be completed if stack heights or fuel types are changed from those proposed in the DAR, including development beyond the Application Case is consistent with evidence presented by Paramount at the hearings. This was clearly confirmed by Mr. Lloyd Doyle of Paramount Resources when he provided the following response to a question from Environment Canada:

*“...every year that we put forth a project, we model it to ensure that we are within the guidelines and regulations of the area that we're working in, and we will continue to do so. The Planned Development Case is -- is not before the Board as a -- for a land use application, it is there purely to assess the cumulative effects and is very speculative, and certainly will not, in all likelihood, come down as presented. There will no doubt be changes and we will assess the affects to the air emissions for those changes by modelling it on a continual basis.”*

Paramount is distributing copies of these Responses as outlined in the attached distribution list. Please contact Lloyd Doyle at (403) 290-3673 should you require further information.

Yours truly,

PARAMOUNT RESOURCES LTD.

Lloyd Doyle  
Corporate Operating Officer