MINISTRY OF ENVIRONMENT

ENVIRONMENTAL MANAGEMENT & ENVIRONMENTAL QUALITY SECTION COMMENTS

WITH RESPECT TO

BLUE PEARL MINING
DAVIDSON PROJECT

ENVIRONMENTAL MANAGEMENT ACT AUTHORIZATION APPLICATION

November 17, 2008

DOCUMENT HEADING	***COMMENT***
1. INTRODUCTION	
1.1 Background Information and Application Summary	
1.2 Overview of Blue Pearl Mining Ltd.	
2. PROJECT DESCRIPTION	
2.1 Property Description	
2.2 Project History	
2.3 Overview of the Molybdenum Market	
2.4 Project Scope	
2.4.1 Underground Mine	
2.4.2 Mine site and Loadout	*Due to the sensitivity of the downstream environment and the close proximity of user groups (drinking water), all active areas of the mine site should be considered as "operational". Passive run-off collection for the parking lot and area does not provide a sufficient mitigation strategy for potential contaminant release. Note that the design of the facility could result in the storage of materials, dumping, etc. within the "non-operational" areas during certain time periods.* ***(C. Stewart, P. Hudson) Include the "non-operational" area within the "operational area" and design the treatment system to include this effluent volume continuously instead of only during upset conditions.*** *Details regarding construction of the DRSPs and collection of runoff and conveyance to WTP are not included in the assessment and are required as collection and conveyance works are authorized as part of the effluent permit.* ***(J. Carmody-Fallows) Submit engineering details for all water collection and conveyance structures as part of a site water management plan.*** *What is the hydrogeology in the area of the DRSPs? If there is leakage through the DRSPs, or overtopping of the collection works, where will the flow go, how will monitoring for seepages from the structures be done?* ***(J. Carmody-Fallows)*** *How will the ore storage be constructed – is there a lined pad or will it be on ground? Is there groundwater monitoring planned? How will runoff be collected in this area* ***(J. Carmody-Fallows)*** *What are the erosion and sediment control measures that will be used at the site? Need completion of sediment and erosion control plan to be submitted for review* ***(J. Carmody-Fallows)***

2.4.3 Ore Hauling	*Comment: There is no mention of covering the vehicles for highway transport either here or in the certificate application. To prevent dusting along the highway, trucks will require covers.* ***(C. Stewart)*** *How will leakage from the transport trucks be controlled? What is the long term risk of impacts to water quality from spillage along the transportation corridors?* ***(J. Love)***
2.4.4 Utilities	
2.5 Proposed Project Phases	
2.5.1 Construction	
2.5.1.1 Water Management Facilities and Utilities	*Design data for the water management facilities and utilities rely on results from the Groundwater Modeling and Baseline Hydrology documents provided by Blue Pearl Mining. These documents do not currently provide the technical detail that will be required for water management design. These documents will need to be updated to address the issues raised by the various reviewers before they will be accepted as inputs to the water management infrastructure design. Please see the MOE EA comments with respect to Baseline Hydrology and Groundwater Modeling reports.* ***(P. Hudson)*** *No details were given regarding the design of the collection works (locations, sizing, erosion control, and construction materials, etc.) This must be included in a site Water Management Plan which needs to be submitted in support of the application.* ***(J. Carmody-Fallows)*** *The 700 m. loadout facility footprint may not provide sufficient room for settling ponds and other water management infrastructure. Were any alternative siting options investigated? Please provide details of any alternatives that were investigated. (**P.Hudson**)*
2.5.1.2 Ancillary Facilities	
2.5.1.3 Underground Mine Construction	*Where will the explosives storage magazines be located? How will it be constructed?* ***(J. Carmody-Fallows)***
2.5.1.4 New Haul Road and Power Line	
2.5.2 Operation	
2.5.3 Closure, Decommissioning and Reclaimation	
3. Pipeline and Diffuser Design	*The design reports for both pipeline and diffuser need to be submitted in support of the application, signed and stamped by the qualified professionals**. (J. Carmody-Fallows)***
3.1 Pipeline Design	*It is stated in paragraph 2, that the nominal (read normal) design flow is 60 L/s, and the pipeline is designed to accommodate 63L/s (a*

	minimal increase from nominal flow). Elsewhere in the document, the 60L/s is considered as the upset condition. The pipeline is to operate 50% full (therefore 30- L/s? So is this really the nominal flow?) but there seems to be confusion as to what values are being used where. In addition, the non-operational pond is to be pumped into the treatment system if water quality does not meet discharge requirements. Given the limited excess capacity in the pipeline, there appears to be limited capacity for receiving sediment pond overflows, which would then result in by-pass conditions. Several considerations regarding the operation of the pipeline are made in the certificate and effluent applications, but the mitigation strategies for problems encountered rely on limited storage capacity for a short duration. As bypasses of the treatment works are undesirable, the proponent must evaluate and put into place works and strategies to preclude bypass situations. For example, increased upstream storage capacity or twinning the effluent pipeline would provide a more robust contingency plan as it would enable increased storage and treated discharge capacity. A twinned line also would serve as a back-up in the event of the discharge line breakage or blockage, thus decreasing the potential need for an unregulated by-pass of the treatment system. ***(C. Stewart)*** *Evaluate and implement various options to address and mitigate potential by-pass conditions.* *What is the maximum capacity of the pipeline? Does modeling of water quality in the Bulkley River account for the maximum capacity of the pipeline? What design considerations were given to preventing occurrence of bypass to the pipeline?* ***(J. Carmody-Fallows)*** *The assessment indicates that it is impractical to design a system to withstand the full hydrostatic pressure in case of blockage at the lowest elevation – the design selected can withstand a continuous pressure of 70 m of water –what are the normal operating pressures in the pipe expected to be, under what conditions are the pressures likely to exceed the 70 m of water pressure, what are the contingency measures that will be undertaken at the manhole should back-ups occur? What are the risks of effluent running out of the manhole (is there an overflow pipe and where will it discharge to?) How long will it take to correct a backup, are there alarms?* ***(J. Carmody-Fallows)*** *How effective is the insulation expected to be to prevent freezing of the lines in winter? Is there a temperature where freezing may occur? What were the limitations preventing a deeper burial depth of the pipeline? How will blockages from freezing be removed? How will the pipeline be monitored for leaks?* ***(J. Carmody-Fallows)*** *Design discharge data for the pipeline rely on results from the Groundwater Modeling and Baseline Hydrology documents provided*

	by Blue Pearl Mining. These documents do not currently provide the technical certainty that will be required for water management design. The documents will need to be updated to address the issues raised by the various reviewers before they will be accepted as inputs to the water management infrastructure design. Please see the MOE EA comments with respect to Baseline Hydrology and Groundwater Modeling reports. ***(P. Hudson)*** *Para 6: Is the treatment system continuous or batch? If it is batch, are there low spots in the pipeline where water could pool, stagnate and freeze in-between effluent releases irrespective of the selected insulation locations?* ***(C. Stewart)*** *There is minimal discussion on the following three subjects, and additional information must be provided on:* • *Risk of breakage/leak/collapse/freeze* • *Monitoring for Leakage* • *Contingency plan to eliminate hazards associated with leakage. (**J.Love)*** *What is the risk of freezing during periods where there may be no flow due to operational breakdowns? The pipeline is buried at 1.8 m but the frost depth is 2.2m. Is this depth sufficient to protect from freezing? (**J.Love)***
3.2 Diffuser Design	*The last paragraph indicates storage of material on the exposed river bank. Based on the proposed diffuser site, it looks like there is no exposed river bank at this location. (**J.Love)*** *Provide details around construction environmental monitoring: roles and responsibilities, authorities and qualifications. (**J.Love)*** *What will be the expected water quality, and quantity of the water returning to the Bulkley River from the exfiltration pond? (**J.Love)*** *Are there any contingencies in place if water from the exfiltration pond does not meet suitable maximum contaminant concentrations for discharge into the Bulkley River and the trench continues to infill during diffuser installation? (**J.Love)*** *More detail is required specifically on construction sequencing and materials. For example: what type of sand bags are proposed for use in isolating the trench – how will they be installed? (**J.Love)*** *Section 3.2 - What is the expected vertical variation in Bulkley River bed elevations (scour and fill) at the location of the diffuser? What*

	contingencies are included in the diffuser design to clear it in the event it gets buried in sediment or is scoured leaving the diffuser exposed? What monitoring is proposed to ensure that the diffuser ports are free of obstructions? Have the necessary hydraulic and geomorphic studies been undertaken to assess the suitability of the proposed diffuser location? (P.Hudson) *MOE policy allows for no more than 25% width of a stream for a 1:2year, 7 day low flow to be included in the Initial Dilution Zone. The diffuser appears to be approximately 30 metres in length, where the width of the river is 85 m,(not sure under what flow conditions the 85 m width occurs and may be greater than 25% of the width). Have other diffuser configurations been considered, what are the results of the water quality modeling?* ***(J. Carmody-Fallows)*** *What is the scour depth at the chosen diffuser location? How variable is the bedload at the diffuser location through different seasons and how does the design take into account the bedload changes?* *Are there mechanisms to clear bedload from the diffuser, should some of the ports become blocked?****(J. Carmody-Fallows)***
3.3 Permits/Authorizations for the Pipline and Diffuser	*Were alternative pipeline and diffuser locations evaluated? Were these sites included in the baseline studies?* ***(J. Carmody-Fallows)***
3.4 Environmental Risks and Contingencies	*What pipeline monitoring measures will be put in place to detect pipe leakage? Refer to 3.1 above regarding the effluent pipeline.* ***(C. Stewart)*** *Will the pipeline be checked for leaks prior to burying? Details should be provided. (****J.Love)*** *The report mentions that concerns have been raised regarding contingency measures, but it does not address this issue beyond recognizing that it has been a concern in the past. (****J.Love)***
4. DISCHARGES	*Provide an alternatives assessment for locating the water treatment facilities including plant, sedimentation ponds etc. The current site provides very limited space and there does not appear to be any standby areas to allow for construction of larger retention facilities and for any additional polishing ponds that may be required?* ***(P. Hudson, J. Carmody-Fallows)***
4.1 Points of Discharge	*As noted previously, the proposed points of discharges should be reduced ultimately to 1; via diffuser to the river. The discharges would incorporate the waste rock disposal sites, both portal discharges and the 700 level facility with no distinction between op/non-op areas. This would improve on the protection of the immediate downstream resources****. (C. Stewart)***

	*General Question: Are the discharge volume estimates and calculations based on expected precipitation rates/events at the mine site, or at the Smithers airport, or in Town? Precipitation values at the site are likely greater than in the valley bottom. Also, is snowmelt considered in the runoff calculations, or are the volumes all based on storm events? (**J.Love)** *This section relies on data from the Hydrology Baseline and Groundwater Modeling documents provided by Blue Pearl Mining. These documents do not currently provide the technical certainty that will be required for water management design. The documents will need to be updated to address the issues raised by the various reviewers before they will be accepted as inputs to the water management infrastructure design. Please see the MOE EA comments with respect to Baseline Hydrology and Groundwater Modeling reports.* ***(P. Hudson)***
4.1.1 Existing 1066 Adit Discharge	*No details were given regarding the collection works at the 1066? How will flow be collected at the 1066? Will there be a sump/pump or continuous flow? Sizing of pipe, material for construction? Location of the pipeline? Collection works will be authorized as part of the effluent permit.* ***(J. Carmody-Fallows)*** Please *provide design details of the collection and conveyance works at the 1066 adit.*
4.1.2 Non-Operational Water to Kath Trib A3a	*As previously noted, the decant from this pond would be more appropriately passed through the treatment plant following oil/water separation, to ensure a good quality, controlled discharge.* ***(C. Stewart, P. Hudson)*** *What alternatives were considered to this discharge?* *The proximity of drinking water users downstream makes this a high-risk discharge due to human health concerns. Alternatives should be seriously considered.* ***(J.Love)*** *Section 4.1.2 notes that this discharge will represent 1 percent of the flow for drinking water users 1.2 km downstream. This still may pose a significant chronic health risk. At what time of year is the 1 percent of flow for the downstream drinking water user calculated – is this an average value, or a worst-case scenario?* ***(J.Love)*** *This section needs to provide a discussion around water retention times under normal and extreme event operating conditions.* ***(J.Love)*** *Table 4.2.2 - Provide hardness levels, total dissolved solids, and define "lower bound" and "upper bound".* ***(J.Love)***
4.1.3 Treated Operational	*Were other locations for a discharge to the Bulkley River explored?*

Mine Water to the Bulkley River	*Results of baseline? Advantages/disadvantages of alternative sites?* ***(J. Carmody-Fallows)***
4.1.3.1 Underground Mine Water (1066 Adit and 700 Adit)	*This section relies on data from the Groundwater Modeling document provided by Blue Pearl Mining. This document does not currently provide the technical certainty that will be required for water management design. The document will need to be updated to address the issues raised by various reviewers before they will be accepted as inputs to the water management infrastructure design. Please see the MOE EA comments with respect to Groundwater Modeling report.* ***(P. Hudson)*** *Plant was based on a predicted average discharge from the underground based on hydrogeological modeling (signed report needs to be sent in to accompany technical assessment). What was the range of flows predicted and how were the ranges in flow considered in designing the water treatment plant and in preparing contingencies?* ***(J. Carmody-Fallows)***
4.1.3.2 1066 DRSP Runoff	*An HDPE liner is proposed however there are no details as to the liner construction, specifics, etc. These are required.* ***(C. Stewart)*** *Provide details on the HDPE liner design, construction and operation.* *The preliminary location of the 1066 adit appears very close to Glacier Gulch. What is the hydrogeology in this location? If seeps were to occur, what is the risk of the seepage entering the glacier gulch watershed? What are the risks from seepage to the Kathlyn Creek watershed?* ***(J. Carmody-Fallows)***
4.1.3.3 700 m Elevation Runoff	*As above, no details regarding the design of the 700 DRSP were given and are required. (* ***J. Carmody-Fallows)***
4.1.3.4 Sewage Treatment	*No details were given regarding the sewage treatment and are required. What type of package treatment plant, what is the effluent quality expected from the specific plant selected, is disinfection planned, what sludge handling procedures are required, what is the reliability category, what type of contingencies will be required, operator certification level? An operating plan is required for the plant as well.* ***(J. Carmody-Fallows)*** *This section needs to define the terms for an Operating Plan for the treatment plant. The plan needs to be prepared by a qualified professional who is familiar with the design and operation of the proposed facility and needs to contain the following information:* *1) Details on the proper operation and maintenance of the facility;* *2) Emergency procedures and contingency plans;* *3) Facility monitoring, leak detection etc.;*

	4) A waste stream water balance model including best available estimates of potential inflows to the plant and a flow routing model of those inflows through the system to the receiving environment; *5) Staff education;* *6) Staff certification;* *7) A letter from the qualified professional whom designed the plant that certifies the accuracy of the operating plan.* *(P.Hudson)*
4.1.3.5 Discharge to Bulkley River	*Design characteristics state that 5,184 m^3/d of effluent will be treated per day. This assumes a constant rate of treatment for 24 hrs. If the plant is a batch process, can this volume of effluent be treated in one day?* ***(C. Stewart)*** *Provide details as to the actual operations, the volume of effluent which may be successfully treated and discharged under a wide variety of conditions, and the impacts that these conditions have on the storage of untreated effluent.* *Average flow values are being used but are these appropriate for design purposes as it is generally the peak flows which result in system overload and rapid loss of retention, treatment ability and overflow.* ***(C. Stewart)*** *The original retention pond volume is 6000 m^3, however this does not speak to volume loss due to retained water, dead zones, sediment build-up, snow/ice build-up etc. during operations. What mitigation strategies are being provided to ensure that storage capacity is consistently available?* ***(C. Stewart)*** *What is the predicted upper range of flows for the site? Can the treatment plant be quickly modified to adjust to flows that are higher than predicted? Is partial treatment an option during higher flows? Was a duplicate treatment line considered, that could double the capacity during initial construction and unexpected high volume, and allow for continuous treatment during periods of maintenance/shutdown?* *Design details are required for the retention pond.* *If precipitation is occurring on site and the plant is shutdown, less than 48 hours of retention are available? What is the expected maintenance time required to replace components?* ***(J. Carmody-Fallows)***
4.2 Influent Water Quality Characterization	*Table 4.2-2 discusses the water quality predictions during construction. The values used do not consider acidic conditions observed in various parts of the 1066 adit, but more importantly the expected conditions for the 700 adit. The 700 DRSP input may be more significant and as such the values for the acidic conditions should be used in the predictive work. Section 9.6.4 of the certificate*

	application (appendix C4, table 9-6) illustrates the ranges for neutral and acidic pH. The acidic pH concentrations do need to be considered for predictive purposes as it will impact treatment and possibly retention/storage times. ***(C. Stewart)*** *Re-model the water quality predictions and treatment considerations based on acidic inputs from the 700 DRSP.* *Why was KC3 used for calculating baseline water quality for site runoff? (**J.Love)*** *The link between site runoff and this site is not clear and there are no linkages on the maps. (**J.Love)*** *How will diverting water away from KC16 into KC3 affect water quantity for downstream drinking water users?* ***(J.Love)***
4.3 Water Treatment	*Were there assumptions made in the predicted water quality for the construction and operational phases specifically for the 700m adit?* ***(J.Love)*** *Was the water quality from the water samples collected at the attempted 700m drill hole considered? If not, why?* ***(J.Love)***
4.3.1 Sediment Pond	*As per previous comments, discharges from the sediment pond should be continually routed through the treatment system and not allowed to by-pass.* ***(C. Stewart)*** *This section indicates that turbidity will be monitored prior to discharge from the sediment pond. What will be the complete list of parameters monitored here? Will hydrocarbons be included? The mitigation proposed to collect hydrocarbons is the deployment of absorbent booms which may only absorb a fraction of the total contamination. More details about effectiveness and operations of the absorbent booms are required.* ***(J.Love)*** *MOE Policy does not allow discharges to streams with less than 10:1 dilution ratio. Any discharges to KCA3a would have to be treated to meet drinking water standards and have an appropriate level of monitoring and contingencies to ensure drinking water is protected.* ***(J. Carmody-Fallows)***
4.3.2 Mine Water Treatment Facility	*How robust is the treatment facility for changing flow conditions? What is the minimum treatment time necessary to achieve acceptable effluent discharge quality?* ***(C. Stewart)*** *If 20 minutes is the retention time in the agitation reactor, is this the time limiting step for the treatment system? If so, what volume could be treated in a 24 hr period? Max of 72 batches per day if everything*

	ran perfectly. ***(C. Stewart)*** *Determine the probable volume of effluent which may be treated and discharged pursuant to permit requirements per day, and evaluate this volume relative to inflows and storage capacity.* *Note that the plant flow sheet does not include the 700 DRSP or the influent from the sediment pond (section 4.2.2).* ***(C.Stewart)*** *Update the treatment plant flow sheet to include all inputs.* *What was the criteria used to select D-Mo and D-As as key parameters?****(J.Love)*** *Ammonia was identified as a key parameter because of the potential for elevated levels due to blasting. However, no permit limit was proposed. Paragraph 5 in this section also makes reference to the permit limit for ammonia in table 4.4.3; this error requires clarification.* ***(J.Love)*** *The treatment proposed is the same as that used at the Brenda Mines. At Brenda Mines, several technologies were evaluated prior to selecting the adsorption process. Additionally, several rounds of bench and pilot scale testing were undertaken prior to design and construction of the plant. For this project - batch testing included in the EA documentation only reported results from three flasks.* *There was no discussion included in the technical assessment comparing the ores and expected discharges from Davidson to Brenda Mine. – How are the two ore bodies the same, what are the major differences (it is my understanding that arsenic was not a significant parameter at Brenda?) What additional testing was undertaken to modify the Brenda process to the Davidson Mine?* *At Brenda Mine, the molybdenum was found to be weakly sorbed to the precipitates? Is that the experience with the Davidson discharge? In what forms does the arsenic precipitate out? How likely is the arsenic to remobilize with changing pH? What is the arsenic speciation in the influent and the effluent??* *Brenda Mine has a 6 day retention polishing pond – however, no polishing pond is included here – Why?* *What is the range for operating pH at each stage and how sensitive is the treatment to variations of pH changes and chemical additions? How is efficiency changed?* *What is the specific chemical required at each stage and the approximate dosages for each given average operating conditions? How much of each will be stored at site and how long does it take to get adequate supplies?* *What is the sludge quality and quantity expected to be? A sludge management plan will need to be submitted.* ***(J. Carmody-Fallows)*** *Provide additional engineering detail*

	regarding the design and operation of the water treatment plant. *Design details on retention pond are required – what is the median particle size for settling, what is the sediment storage capacity for the retention pond – drawing shows two ponds – are they in series or parallel, how will they be normally operated?* *Ammonia stripping will be used to remove ammonia as required. Need operational details regarding how ammonia will be monitored, how ammonia stripping can be brought on line, what the resulting effluent is with and without stripping, rates of NH3 off-gassing?* *Design details on sizing of all components, where process controls are, rates and type of chemical added at each step, sludge generated, precision required for metering chemicals?* *Needs an operating plan, manual to be completed. What is the training required for the operator? Training program will need to be designed/signed off by a qualified professional knowledgeable with the operations of the plant.* ***(J. Carmody-Fallows)***
4.3.3 Sewage Treatment Facility	*The assessment report indicates that the STP will be designed to meet MSR limits for BOD and TSS. There should be monitoring at STP or the diffuser discharge site to demonstrate this (The proposed permit limits at the diffuser include TSS but not BOD). There is no discussion around monitoring fecal coliforms to protect recreational (and possibly drinking water?) users on the Bulkley River. Provide clarification.* ***(J.Love)*** *Will there be inline PH, temp, conductivity monitoring? Will turbidity be monitored to measure filtering success and filter integrity? If not, why? If yes, provide details.* ***(J.Love)*** *What type of package treatment? What is the reliability category? Are there any synergistic effects that might occur from adding STP effluent to the water treatment plant effluent? Additional detail regarding sewage treatment is required.* ***(J. Carmody-Fallows)***
4.4 Effluent Water Quality Characterization and Proposed Permit Levels	
4.4.1 Existing 1066 Adit Discharge	*Proposed limits in the Notice of Work Environmental Management Plan are not permitted levels and several levels are not based on samples collected at A1, rather they are based on BC Pollution Control Objectives. MoE requested the NOW EMP identify threshold levels based on the water quality at A1, B.P.M rejected that request.* ***(J.Love)***
4.4.1.1 Proposed Permit Levels	*Table 4.4.1 has a flow rate of 13.9 L/s as a proposed limit? The tech assessment refers to current flows from 2-6 L/s? Why the difference?*

	(J. Carmody-Fallows)
4.4.2 Non-operational Water to Kath Trib A3a	*Storm water runoff from parking lots is likely to contain many more potential contaminants than TSS.* ***(J.Love)*** *This is a human health issue as the water is planned to be pumped into the headwaters of a drinking water source. The monitoring must include an array of contaminants expected in typical urban runoff.* ***(J.Love)*** *Table 4.4.2 needs to include hardness and a complete list of dissolved-metals.* ***(J.Love)***
4.4.2.1 Proposed Permit Levels	*Please note that permit limits set in authorizations under the* ***Environmental Management Act*** *are based on site-specific requirements, including best available technology, background or baseline water quality, risks of cumulative impacts to a water body, and resources at risk which are all used to determine end of pipe permit limits. The use of provincial objectives for mining and limits set at other mines may sometimes aid in the determination of appropriate limits.* ***(J. Carmody-Fallows)***
4.4.3 Treated Operational Mine Water to the Bulkley River	*Please note that in table 4.4-3, the values indicated for Equity Silver do not reflect the current authorization which requires specific dilution ratios, lower discharge concentrations and a program of acute and chronic toxicity test work using Ceriodaphnia dubia during discharge periods.* ***(C. Stewart)***
4.4.3.1 Proposed Permit Levels	*This section indicates permit limits were based on contents of rock units, precedent at other mines and water quality modelling.* *A review of the limits suggests only a precedence at other mines was used. If water quality modelling or rock type were used, provide details how they were used.* ***(J.Love)*** *Why were Se, Pb, Hg, Cd, Cr, Zn, Cu not identified as parameters of interest? See earlier comments on ammonia (section 4.3.2).* ***(J.Love)*** *Speciation of metals, in particular, Arsenic needs to be completed. Given the known health effects of arsenic at extremely low concentrations and the potential for synergistic effects, the use of the criteria needs to be augmented. Blue Pearl needs to engage an acceptable qualified professional who specializes in arsenic toxicity to evaluate the human health and aquatic effects that may result from the proposed discharge.* ***(J. Carmody-Fallows)***
5. Receiving Environment	*Table 5.2-1 should highlight exceedances and the factor of exceedance of the most sensitive guideline.* *This table should not state that a guideline depends on hardness, but rather calculate an appropriate guideline.* *Studies should look at interactions among toxic chemicals, not just impacts of individual chemicals. We have to assess this discharge and contaminant levels within the context of total cumulative*

	exposure, some discussion on this topic are required. *Certain metal toxicities will vary greatly based on valences. A program to assess the speciation of Arsenic, Chromium and Molybdenum should be included in the assessment.* *Table 5.2-1 lumps all samples from each receiving environment. These samples should also be presented and assessed on a site-by-site basis. For example, Bulkley River sites upstream and downstream of the municipal STP should not be lumped together.* ***(J. Love)***
5.1 Water and Sediment Quality Guidelines	
5.1.1 Water Quality	*The water quality evaluation would benefit in terms of a population assessment, rather than just using average values. Median, minimum, std dev, etc. with seasonal evaluations would assist in understanding the data better. Is the majority of the contaminant loadings flush related? Are they consistent? Are there outliers skewing the data or is the range very limited?* ***(C.Stewart)*** *Re-evaluate the water quality database utilizing more population based statistics and seasonal influences.*
5.1.2 Sediment Quality	
5.2 Glacier Gultch Creek	
5.2.1 Physical Characteristics	
5.2.2 Chemical Characteristics	*MoE considers the silt and clay (<63 micron) fraction to be relevant in considering the potential effects of metals in sediments. Any analysis of these potential effects must also consider the relative amount of this fine fraction as compared to the other larger fractions, and the distribution of fines in the various stream habitats.* ***(J.Love)***
5.2.3 Biological Characteristics	
5.3 Kathlyn Creek	
5.3.1 Physical Characteristics	
5.3.2 Chemical Characteristics	
5.3.3 Biological Characteristics	
5.4 Bulkley River	*The second paragraph (page 5-12) suggests gravel is the dominant substrate at some of the sites but observations suggest the reach at the BR 4 and 5 are cobble-bolder dominated with small pockets of sand and gravels. It may be this substrate size data came from the sample collected for sediment chemistry. However, this does not indicate the dominant substrate as the text suggests.* ***(J.Love)*** *As previously suggested to Blue Pearl Mining and its consultants, MoE requires sediment chemistry be conducted in depositional areas*

	with a notable size fraction less than 63 microns. Sediment chemistry from gravel dominated sites (as the text suggests) is misleading. Analysis of this size fraction has minor biological significance and does not provide appropriate baseline data for detecting potential mine-related impacts from the discharge. ***(J.Love)*** *Substrate information presented in Sections 5.4.2 and 5.4.3 is contradictory. Paragraph 2 on pg 5-12 states "gravel was the dominant substrate" but paragraph four on the same page states a "lack of gravels substrate". Clarify discrepancy.* *Also be aware that not all fish species use gravels as preferred spawning substrate.* ***(J.Love)*** *Table 5.4.2 Where were the samples from Table 5.4-2 collected? Previously six sets of water quality data for the municipal sewage discharge were presented; why is the data set not complete? This table also needs the sample dates for each analysis. Some of the previous data suggested that the sewage discharge may be oxidizing in the summer and reducing the winter. This is relevant to the cumulative discharge assessment as toxicities and valencies change with the different environments. Provide trend analysis for the six samples and a cumulative/synergistic effects assessment for the combination of the proposed mine discharge and the municipal sewage discharge.* ***(J.Love)***
5.4.1 Physical Characteristics	
5.4.2 Chemical Characteristics	*Table 5.4-2 is incomplete as it is lacking the dissolved chemistry data.* ***(C. Stewart)*** *Are there any cumulative or synergistic effects from the mixing of the Smithers STP effluent with the effluent from the mine? What are the impacts from the additional nitrogen components from the mine? Are there risks of toxic effects? Can the combined STP effluent and Mine effluent pass an LC50?* ***(J. Carmody-Fallows)***
5.4.3 Biological Characteristics	
6. Assessment	*The "Assessment" section relies on data from the Hydrology Baseline and Groundwater Modeling documents provided by Blue Pearl Mining. These documents do not currently provide the technical certainty that will be required for water management design. The documents will need to be updated to address the issues raised by the various reviewers before they will be accepted as inputs to the water management infrastructure design. Please see the MOE EA comments with respect to Baseline Hydrology and Groundwater Modeling reports.* ***(P. Hudson)***

6.1 Glacier Gultch Creek	
6.2 Kathlyn Creek	*Refer to previous comments regarding the sedimentation pond discharge.* ***(C. Stewart)*** *This section identifies the discharge to Kathlyn Creek as non-operational; this area is associated with the works and is thus operational. Better terminology is required to differentiate these 2 areas, if they are truly different (ex. mine related versus other operations related). More details are required as to how the run-off from the 2.2 Ha area will be isolated from contaminated water originating underground and at the ore loading facilities. More information about potential contaminant transport at the site is needed, and consideration should be given to air borne particulates that will settle on the site, un-reported and reported spills, groundwater contamination and other sources of contamination including automobiles.* ***(J.Love)*** *Characterization of and risks associated with this discharge are not adequately addressed, and the potential for impacts to drinking water users downstream is not clearly defined. Without further information, it is unlikely that this discharge would be permitted due to the proximity of drinking water users and the potential for chronic human health effects.* ***(J.Love)*** *The permit limits for this discharge appear to include only Total Suspended Sediment (TSS). Additional permit limits for this discharge should be proposed, and those should be based on a review of all potential contaminants of concern, and an assessment of contaminant transport and impact pathways.* ***(J.Love)*** *What is the expected water quality in Kathlyn Creek downstream of this discharge site? Was any modelling done to predict this?* ***(J.Love)***
6.3 Bulkley River	*Results of water quality modeling needs to be submitted in support of the application – signed by qualified professional.* ***(J. Carmody-Fallows)*** *The model assigns 100 ppm for chemical constituents, what is the fate of sulphate which is predicted to be 729 ppm and at what point would the sulphate levels reach background levels found in the Bulkley River.* ***(J.Love)*** *Clarify what is meant by "fully mixed in half the width of the Bulkley River".* ***(J.Love)*** *Table 6.3-1*

	This table must clearly outline the effects of the proposed discharge on background concentrations of Bulkley River water, including which contaminants will increase in concentration and which contaminants will exceed the aquatic life guidelines. This table only includes dissolved aluminum. Where are the other dissolved metals? ***(J.Love)*** *The data from this exercise will be used in developing site specific water quality objectives for all contaminants that may have a negative effect on the receiving environment. This list would include contaminants that show a measurable increase from background and/or exceed British Columbia Aquatic Life Guidelines.* ***(J.Love)*** *This table uses the lowest threshold guideline. It becomes confusing when checking the calculated guidelines when a mixture of maximum, 30 day and different user criteria are mixed in a table. It is necessary to present the actual guidelines at reasonable hardness, pH and temperature for the most sensitive user.* ***(J.Love)***
6.3.1 Modeling and Mixing	*The WTP is designed to handle 60 L/s. Modeling included a discharge rate of 100 L/s, - what is the maximum discharge rate expected for the mine, including any emergency contingencies where excess flows bypass treatment and are discharged directly via the pipeline to the Bulkley River? Modeling should also include a worst-case effluent quality scenario and predictions. What are the results with a shorter diffuser (no more than 25% of the width of the river, and the maximum expected effluent discharge rate?* ***(J. Carmody-Fallows)***
6.3.2 Water Quality Effects	
6.3.2.1 Normal Treatment Plant Operation at 100 Year Low Flow	
6.3.2.2 Permit Levels	
6.3.3 Treatment Plant Upset at 100 Year Low Flow	*Given that acidic conditions will occur to some degree from the 700 portal waste rock, there needs to be an accounting of the loading in the event that no treatment is available.* ***(C. Stewart)*** *Acidic concentrations determined in Table 9-6, need to be incorporated into the model to evaluate its impact on the effluent quality.*
7. Proposed Monitoring	*Table 7.1-1 outlines the proposed monitoring program. The frequency of the monitoring may be insufficient given the sensitivity of the receiving environment; primarily for the discharge points in terms of chemistry and toxicity. Once a good database is obtained, monitoring could be relaxed in the future if warranted by the data.* ***(C. Stewart)*** *Recommend 2x/wk for effluent discharges, acute and chronic testing*

	monthly until there is an understanding of the project effects. *Groundwater monitoring program will be required for this site. EA documents suggest that a survey of seepages was conducted in 2008. Where are the results of the survey, and how will they be used to design a program to monitor the groundwater at the site? JCF*
7.1 Overview	*A groundwater and seepage monitoring program at the mine will be required to assess both changes in quality and quantity. EA documentation refers to a seepage survey conducted at the site, however, results of the survey were not included. The survey should be used to help form the basis of a groundwater monitoring program for the mine. Submit a groundwater and seepage monitoring plan.* ***(J. Carmody-Fallows)***
7.1.1 Hydrology	*The hydrologic monitoring program relies on data from the Hydrology Baseline and Groundwater Modeling documents provided by Blue Pearl Mining. These documents do not currently provide the technical certainty that will be required for water management monitoring design. The documents will need to be updated to address the issues raised by the various reviewers before they will be accepted as inputs to water management planning and design. Please see the MOE EA comments with respect to Baseline Hydrology and Groundwater Modeling reports.* ***(P. Hudson)***
7.1.2 Surface Water Quality	
7.1.3 Toxicity	
7.1.4 Sediment Quality	
7.1.5 Benthic Invertebrates	
7.1.6 Fish	
7.1.7 Reporting	

<u>Davidson Project Receiving Environment Review Summary</u>

The following section summarizes the review comments provided by Jack Love, Environmental Impact Assessment Biologist for the Ministry of Environment, Environmental Quality Section with respect to the Waste Discharge Authorization Application – Technical Assessment (September 2008).

It is our recommendation that Blue Pearl Mining hire a qualified environmental professional with experience in designing aquatic EEM programs for mining projects to review and update the proposed EEM program. Review and revisions to the program should address the following items:

1) **"Time Zero" Characterization**: To be useful in identifying potential impacts from the mine, the Environmental Effects Monitoring (EEM) Program must characterize time zero in an ongoing impact assessment. The EEM program as presented does not adequately

identify baseline conditions at the monitoring locations. Appropriate biological monitoring tools must be used, and sufficient data must be collected and presented to demonstrate that the EEM program will be able to detect significant change. If significant change is detected, decisions can then be made to take appropriate management actions.

2) **Critical Effects Thresholds**: The report does not identify critical effects thresholds, or what would be considered a biologically significant change. The report should identify thresholds or triggers for the various EEM components (water, sediment, benthic invertebrates, fish, etc.), and these should be identified prior to considerable data collection. These thresholds are flexible guidelines and are not compliance limits.

3) **Power Analysis**: The EEM program requires a power analysis be conducted and presented in order to confirm that sufficient data is being collect to measure possible mine related impacts. There may be different degrees of statistical power associated with each of the data sets (such as concentrations of the various metals of concern in the ambient waters of the Bulkley River).

4) **Receiving Environment Objectives**: When contaminants of concern in the receiving environment are expected to exceed provincial water quality guidelines in the absence of mine related discharges, site specific water quality objectives must be developed to take the place of the provincial water quality guidelines. The objectives should be established according to approved Ministry principles and methods (see: "Principles for preparing water quality objectives in British Columbia" and "Methods for deriving site-specific water quality objectives in British Columbia and Yukon"). Proposed objectives need to be presented in the Technical Assessment Report.

5) Impact Pathways: An impact pathway assessment needs to be conducted, including:
   a. Inventory of potential physical and chemical impact-causing pathways.
   b. Identifying the degree to which receiving environment receptors are exposed to the proposed discharges
   c. Cumulative/synergistic effects assessment

6) Characterization of and risks associated with the Kathlyn Creek discharge are not adequately addressed. Without further information, it is unlikely that this discharge would be permitted since this proposed discharge is in proximity of drinking water users, creating the potential for chronic human health effects.

7) An aquatic EEM program is required for Lake Kathlyn. The Technical Assessment Report indicates that very limited sampling is planned for one site in the lake, however, the report (and likely the program) lacks sufficient detail and data is not presented in the Technical Assessment Report.

The overall impact assessment focuses discussion on the risks associated with arsenic and molybdenum and does not discuss other potential contaminants of concern, nor does it consider upset conditions. The text identifies that some contaminants in the Bulkley River are already above the B.C. water quality guidelines and does no further analysis. The data below suggest contaminants such as: cadmium, chromium, selenium, mercury and possibly tin are also of potential concern. Cadmium for instance is four times above the guideline in the Bulkley River, and the proposed discharge is 370 times above the guideline.

The table below is an example of the type of table that must be used to present calculations to determine other contaminants of potential concern. A full list of potential contaminants of concern needs to be generated. A number of contaminants will likely need to have permit limits and/or site specific water quality objectives developed. A monitoring program must then be proposed to assess attainment of the water quality objectives and determine trends in water quality over time at appropriate locations.

	Aquatic Life Guideline (ALG) (mg/l)	Bulkley River Background (mg/l) factor above (ALG)		Modelled end of the pipe (mg/l) factor above (ALG		Bulkley 13 m downstream (mg/l) factor above (ALG)	
Ammonia	20.2(4)	0.006	0	10	0	0.1	0
Sulphate	100	4.38	0	729	7	11.6	0
Cadmium	0.00002(3)	0.00008	4	0.0074	370	0.000103	5
Chromium VI	0.001	0.0006	1	0.0049	5	0.0019	2
Copper	0.007(2)	0.0018	0	0.022	3	0.0046	1
Lead	0.034(2)	0.00024	0	0.001	0	0.0008	0
Mercury	0.00001(5)	0.00003	3	0.000107	11	0.000044	4
Nickel	0.025	0.0007	0	0.004	0	0.0022	0
Selenium	0.002	0.0005	0	0.001	1	0.0005	0
Tin Tributyl tin	0.000008	0.00005	6	no data		no data	
Zinc	0.033(6)	0.003	0	0.012	0	0.0097	0

(1) when pH is greater than 6.5
(2) when hardness is 50 mg/l CaCO3
(3) when hardness is 60 mg/l CaCO3
(4) for a pH of 7.0 and a summer temperature of 12 degrees Celsius
(5) 30 day average when MeHg = 1.0% of THg
(6) water hardness less than or equal to 90
Bulkey river data used average values from Table 5.2-1