Bulkley Valley
Community Resources Board
Box 577
Smithers BC V0J 2N0

December 13, 2008

Jeanien Carmody-Fallows
Ministry of Environment
Environmental Protection Division
Box 5000
Smithers BC V0J 2N0

Re: Blue Pearl Mining Inc. Davidson Project, *Waste Discharge Authorization Application*

Dear Mrs. Carmody-Fallows:

The Bulkley Valley Community Resources Board (BVCRB) wishes to offer the following comments regarding Blue Pearl Mining Inc.'s *Waste Discharge Authorization Application* for the Davidson Project, located in the Glacier Gulch area at the base of Hudson Bay Mountain.

The mandate of the BVCRB is to (1) advise government regarding ecologically responsible management of all resources to guarantee long-term resource sustainability and (2) to uphold the values and objectives set out in the Bulkley Valley Land and Resource Management Plan (LRMP) and Bulkley Valley Sustainable Management Plan (SRMP). The LRMP states that *maintaining water quality and fish habitat must be given special attention in watersheds with water licenses*. Since there are existing water licenses for the Bulkley River and, since the Bulkley River is classified as 'critical' salmon habitat, several concerns were identified by the BVCRB in reviewing the proponent's application that may impact water quality and fish habitat. These concerns are:

1. The accuracy of the low flow analysis presented by the proponent is questionable. As this is a key aspect to ensuring adequate dilution of the discharge materials it is very important that it not be overestimated. (see Addendums 1, 2)

2. The proposed discharge levels of several elements when compared to accepted water quality guidelines are considered excessive. Some proposed levels clearly exceed certain guidelines. (see Addendum 3)

3. The lack of analysis in the application regarding cumulative concentration impacts to the Bulkley River is a concern. The proponents discharge will be added to the discharge from other users (e.g. The Town of Smithers) so an analysis of the cumulative impacts is critical for ensuring the aquatic health of the Bulkley River is maintained. (see Addendum 4)

4. The discharge levels proposed under what the proponent defines as "upset conditions" are considered excessive. In addition the application is not clear on what constitutes "upset conditions" and the contingency measures that will be in place to minimize their impacts. (see Addendum 5)

5. The lack of analysis in the application regarding effluent loading in the receiving

environment is a concern. As the lifespan of the project could be as much as 30 years the cumulative impacts to the aquatic health of the Bulkley River could be significant making this type analysis critical. (see Addendum 6)

6. The effectiveness of the monitoring program proposed in the application is questionable. The proposed frequency of sampling does not appear adequate to ensure minimal impacts to the aquatic health of the Bulkley River. (see Addendum 7)

The attached addendums outline the technical aspects of the concerns raised above along with some suggestions the BVCRB believes would enhance this application. It was compiled by members of the BVCRB through discussions with various water quality experts and information from various publications.

The BVCRB cannot support approval of Blue Pearl Mining Inc.'s *Waste Discharge Authorization Application* as it is our opinion that the application, as presented, is not consistent with the values and objectives identified in the Bulkley Valley LRMP and the Bulkley Valley SRMP.

Yours truly,

Greg Storie
Chair, Bulkley Valley Community Resources Board

Addendum

(1) The proponent identified that 100-year low-flow conditions were 14.1 m^3s^{-1}. This was based on a seven-day average low-flow at the Bulkley River gauge at Quick, and scaled up by 20 % to account for the input of the Telkwa River. This approach raised two issues: first, the Bulkley River is known to be a losing environment between Quick and Smithers[1] which suggests this may not be an appropriate approach to characterize actual low-flow at the sewage outflow in Smithers. Second, this affects the predicted water quality levels downstream of the diffuser as the zone of dilution was based on flow that was over-estimated by as much as 150 percent (14.1 m^3s^{-1} minus the added 20% minus the loss between Quick and Smithers). It is therefore suggested that the proponent revisit this analysis and characterize low-flow to reflect actual Bulkley River conditions at the proposed discharge location.

(2) The application gives no consideration of hydro-climactic drivers to low-flow conditions in the Bulkley River. For example, research performed through the Ministry of Forests' Climate Change Branch indicated that low-flows in the Bulkley River were the result of both negative Pacific Decadal Oscillation (PDO) as well as La Nina conditions[2]. To validate this work statistics from the Water Survey of Canada for the Bulkley River at Quick were reviewed by the BVCRB for this application, in order to cross check antecedent climate conditions with every reported daily and monthly extreme low-flow event in the Bulkley River.

After reviewing statistics for the entire 77 year record we can conclude that the eight most severe low-flow conditions in the Bulkley River occurred during La Nina episodes and also during negative PDO phases. More specifically, the winter of 1931 produced three extreme low-flow conditions immediately after eight months of negative PDO conditions. In 1969, an extreme low-flow event was recorded following three years of negative PDO conditions. Similarly, an extreme low-flow event in 1974 was preceded by ten consecutive La Nina months. Following this three extreme low-flow events, during the winter of 1980, were preceded by thirty-six consecutive months of La Nina conditions also during a negative PDO phase. Considering the uniformity of these findings and given previous work mentioned[2] this suggests that both negative PDO and La Nina conditions contribute to low-flows in the Bulkley River. Thereby making the case that the proponent should model low-flow using accepted hydro-climatic methods.

To round out these findings the BVCRB contacted three Canadian experts [Professors Dr. Daniel Peters, University of Victoria; Dr. Dan Moore, University of British Columbia; Dr. Barrie Bonsal, Environment Canada] to discuss hydro-climactic drivers in this region, historic drought periods beyond the instrument record and, the 2002 shift from positive PDO to negative PDO conditions. There was unanimous opinion among these experts that the PDO and La Nina are drivers of the water balance in Pacific Northwest watersheds.

A coherent pattern of past climate in this region was further evidenced through recent tree ring work in the Kispiox Valley, British Columbia which suggested that over the past four hundred years there were five drought cycles, each varying in strength and each coinciding with negative PDO phases[3]. The two most recent drought periods were 1797 to 1839 and 1946 to 1977. As such, only one of these five drought cycles occurred within the instrument record and the three most severe drought cycles occurred prior to the instrument record.

It stands to reason then that since negative PDO cycles and La Nina events appear to produce low-flows in the Bulkley River and since the most severe drought cycles occurred before the instrument record then low-flows recorded within the instrument likely underestimate the true severity of low-flow conditions that the Bulkley River. This further brings into question the accuracy of the low-flow calculations performed by the proponent.

There has been indication that the ocean-atmosphere state shifted back to a negative PDO phase in 2002[4]. As such, since past cycles of negative PDO phases have consistently produced drought cycles and historic evidence exists of more severe drought conditions in this region[5] then, at the very least, it is felt that the proponent should apply a factor of safety to low-flow conditions. The BVCRB would like to see the proponent consider climate change as a real entity in the water balance for this *Waste Water Discharge Authorization Application* by applying hydro-climate analysis to account for both the drivers of low-flow in the Bulkley River [climate change] as well as the historic magnitude attained. This will, in essence, lower the low-flow estimate and decrease the quantity of effluent the Bulkley River can receive per unit time.

(3) Table 6.3-1 in the *Water Discharge Authorization Application – Technical Assessment* outlined predicted water quality at the end of pipe (EOP) as well as three locations down stream in the receiving environment. Reviewing this table has identified that under low-flow estimates of $14.1 m^3 s^{-1}$ there were five parameters that exceeded MoE Pollution Control Objectives[6] (PCO) and 15 parameters that exceeded either Canadian Council of Environment (CCME) or BC instantaneous water quality guidelines for the EOP discharge (EOPD) (Table 1 below). Pertinent directly to the consideration of permitting *Waste Water Discharge* in the Bulkley River is that the Bulkley River currently has levels of Aluminum and Iron that exceed MoE PCO, as indicated through baseline conditions in this application; thus, consideration must be given to antecedent conditions of the Bulkley River when considering permitting applications.

Of the predicted EOP WQ parameters that exceeded PCO Ammonia was 1000% beyond MoE PCO, as were Nitrate at 156%, Aluminum at 340% and Iron at 600% (Table 1 below). Similarly, Ammonia was 43,478 % beyond Bulkley River baseline conditions, as were Nitrate at 105,405% and Nitrite at 116,842% (Table 1 below). Aluminum was proposed to exceed CCME guidelines by 34,000% while Iron was proposed to exceed these guidelines by 600%. Ten of these predicted WQ parameters were shown to exceed guideline limits at all three sample locations downstream of the diffuser; suggesting a limited ability of the dilution zone to efficiently dilute concentrations that exceed guidelines, in this case by several orders of magnitude.

Considering the Bulkley River is classified as 'critical' salmon habitat it is fair to suggest that EOPD's exceeding guidelines and PCO are unacceptable in the eyes of the LRMP and SRMP, as they propose risks to water quality and aquatic health. Therefore the BVCRB does not support any EOPD that exceeds CCME and BC WQ Guidelines; in addition to this the BVCRB is fundamentally opposed to any EOPD that are near MoE PCO limits.

(4) Table 6.3-1 in the *Water Discharge Authorization Application – Technical Assessment* outlines predicted water quality for EOPD from the Blue Pearl Mine as well as the Town of Smithers (TOS) sewage outflow. Of particular interest was (1) that several total and dissolved metals reported for the TOS sewage outflow were demonstrated to exceed EOP guidelines and (2) that the EOPD for Blue Pearl was proposed to discharge total and dissolved metals beyond guidelines and beyond PCO. Common to both discharge sources (TOS and Blue Pearl EOP) were five parameters that exceeded MoE PCO's: Ammonia, Nitrate, Aluminum, Iron and Manganese. Given the contiguous nature to these two effluent sources EOP cumulative concentrations must be considered together for this location in order to demonstrate that water quality and fish habitat will not be compromised.

The BVCRB suggests the proponent employ cumulative concentration analysis that considers both TOS and Blue Pearl EOPD's. Two important factors require discussion: first, is why guidelines exists; and second, is the dilution zone and subsequent dilution capacity of the receiving environment.

(5) Table 6.3-3 in the *Water Discharge Authorization Application – Technical Assessment* identified 'upset conditions' for the Davidson Project. During upset conditions 12 parameters were indicated to exceed MoE PCO with an additional 12 parameters exceeding CCME and BC WQ guidelines (Table 2 below). As such, upset conditions propose to introduce an additional seven pollutants into the Bulkley River. These are: pH (8.7), TSS, Arsenic, Cadmium, Copper, Molybdenum and Zinc (Table 2 below). It is important to consider that each parameter identified in the MoE PCO has previously been identified as toxic in aquatic ecosystems.

The BVCRB does not support permitting of effluent at or near toxic levels (up to 24, 000% MoE PCO limits – Table 2 below) into 'critical' salmon habitat. Nor does the BVCRB support permitting the additional 12 parameters to exceed CCME and BC WQ guidelines.

To properly assess this application the BVCRB would like to know what constitutes upset conditions, how long they can be expected to last and what contingencies will be in place to ensure prompt correction. Without this there is no way to understand (1) what additional upset condition will contribute towards biological effects and, then again (2) how much additional effluent loading will the receiving environment endure.

(6) The current application does not discuss effluent loading in the receiving environment. Therefore, to discuss loading in the receiving environment each WQ parameter was converted from mg/L to kg/day and then forecasted across several temporal periods (Table 2 below). of the Bulkley River be compromised. For example, an estimated 1.5 million kg of solid waste are proposed to be discharged into the Bulkley River each year, with a ten-year mine life producing 15.5 million kg of solid waste, and a 30-year mine life producing 46.6 million kg of solid waste.

Given the level of solid waste proposed, the BVCRB would like to see modeled impacts of each WQ parameter. These modeled impacts should be representative of the EOPD levels proposed for both normal conditions and upset conditions. For example, Sulphate impacts would be modeled using 729 mg/L not 100 mg/L. This will ensure that aquatic stresses associated with proposed EOPD levels accurately depict what is proposed. In addition the It is suggested that the proponent investigate impact pathways in order to provide evidence that metal loading will not impact sediment quality, water quality or benthic communities in the receiving environment.

(7) In a review of the *Sediment Quality (7.1-4)* and *Benthic Invertebrates* (7.1-5) sections of the *Water Discharge Authorization – Technical Analysis* the BVCRB questions the proponents monitoring approach. We are not convinced this monitoring plan will detect environmental effects and aid in protecting the sustained aquatic health of the Bulkley River. Sampling sediment and benthic invertebrates once a year in an erosional system does not seem adequate to characterize the environmental effects, including sediment quality and benthic communities. To that end, suggesting collecting three samples over three years before assessing the need for further sampling was also unacceptable. Given the potential metal loading identified in the analysis in the previous Addendum, the need for a well-thought, thorough, biological effects monitoring program is critical. The BVCRB would encourage the proponent to employ a rigorous sampling program to demonstrate that under no circumstances, upset or otherwise, will the aquatic health of the Bulkley River be compromised.

The BVCRB would also like to see the proponent and Provincial Government discuss the application of the Reference Condition Approach (RCA) towards biological monitoring of Bulkley River aquatic health; and would further like to ask the Provincial Government also require a more rigorous sediment and benthic monitoring program to accompany RCA; one that will provide confidence in its estimates

References

[1] - Personal communication with Patrick Hudson, BC MoE Regional Hydrologist, Skeena Region. October 2008.

[2] - Anderson, J.L. 2005 – Understanding the Linkages Between Groundwater Supply and Climate Variation in the Bulkley Valley. Internal paper. Climate Change Branch, Ministry of Forest and Range. Paper available through Dave Tamblyn, Regional Hydrogeologist, Ministry of Environment, Water Stewardship Division, Skeena – Omineca - Peace

[3] - Anderson et al., 2008 - Linking *Dothistroma septospora* to Climate Variability through Establishment of Regional Paleoclimate Baseline: Skeena Stikine Climate Network. Technical Report For Forest Science Program Project Y08 1269

[4] - Personal communication with Barrie Bonsal, Research Scientist – Climate Impacts on Hydrology and Ecology, National Hydrology Research Centre (Saskatoon, SK), Environment Canada.

[5] - Turner, B.T. 2008. Climate change reforestation strategies: policy barriers and opportunities. Director of Tree Improvement Branch, Ministry of Forest and Range. Presentation held on November 27, 2008 in Victoria, BC.

[6] - Ministry of Environment - Pollution Control Objectives for The Mining, Smelting and Related Industries of British Columbia, 1979

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Table 1. Proposed water quality (WQ) for 'End of Pipe Discharge' (EOPD) into the Bulkley River (BR), under normal operating conditions, from the Blue Pearl Mine *Waste Water Discharge Application*. Flow rate was indicated in the application to be 60 L/s or 5,184,000 L/day. Based on this total and dissolved metal effluents were scaled up to kg/day for additional consideration of heavy metal loading in the receiving environment. Accompanying each guideline and regulation, in this table, is the 'EOPD above' guideline or regulation limits; this is the percent that each proposed WQ parameter exceeds guidelines, regulations or baseline conditions in the BR. All values are in mg/L unless otherwise specified. Bold-red values indicate proposed WQ is beyond pollution limits and bold-black indicated proposed WQ exceeds Federal and Provincial guidelines.

	Bulkley River Baseline WQ_{avg}	Bulkley River Baseline WQ_{max}	Blue Pearl EOPD	Blue Pearl EOPD above BR WQ_{max} (%)	MoE PCO	Blue Pearl EOPD above MoE PCO (%)	CCME WQ Guidelines	Blue Pearl EOPD above CCME WQ Guidelines (%)	BC WQ Guidelines	Blue Pearl EOPD above BC WQ Guidelines (%)	Effluent Loading (kg/day)	Effluent Loading (kg/week)	Effluent Loading (kg/year)	Effluent Loading total kg across 3 year monitoring program	Effluent Loading total kg across 10-year mine life	Effluent Loading total kg across 30-year mine life
pH	7.89	8.43	8	95	8.5	**94**										
TSS	19.1	155	15	10	25.0	60	104	none	84.00	none	78	544	28,305	84,914	283,046	849,139
Sulphate	4.38	5.45	**729**	**13,376**	**ng**				**50.00**	**1,458**	**3,779**	**26,454**	**1,375,606**	4,126,817	13,756,055	41,268,165
Chloride	0.43	3.13	**8.8**	**281**	**ng**				100.00	none	46	319	16,605	49,816	166,054	498,162
Ammonia	0.006	0.023	**10**	**43,478**	**1.00**	**1,000**	2.43	**412**	2.43	**412**	**52**	**363**	**18,870**	**56,609**	**188,698**	**566,093**
Nitrate	0.015	0.037	**39**	**105,405**	**25.0**	**156**	2.93	**1,331**	10.00	**390**	**202**	**1,415**	**73,592**	**220,776**	**735,921**	**2,207,762**
Nitrite	0.0006	0.0019	**2.22**	**116,842**	10.0	22	**0.06**	**3,700**	**0.02**	**11,100**	**12**	**81**	4,189	12,567	41,891	125,673
Total Metals																0
Aluminum	**0.51**	**4.74**	**1.7**	**36**	**0.50**	**340**	**0.01**	**34,000**			**9**	**62**	**3,208**	**9,624**	**32,079**	**96,236**
Antimony	0.00006	0.00022	**0.037**	**16,818**	**0.25**	**15**	**0.02**	**185**								0
***Arsenic**	0.0004	0.0023	**0.04**	**1,739**	**0.05**	**80**	**0.01**	**800**	**0.01**	**800**	**0**	**1**	**75**	**226**	**755**	**2,264**
Boron	0.005	0.005	**0.0818**	**1,636**	**ng**				1.20	none	0	3	154	463	1,544	4,631
Cadmium	0.00008	0.00025	**0.0074**	**2,960**	0.01	74	0.00	**43,529**	0.00	**56,923**	**0**	**0**	14	42	140	419
Chromium	0.0006	0.0048	0.0049	102	0.05	10	0.00	**490**	0.00	**490**	**0**	**0**	9	28	92	277
Cobalt	0.0003	0.00267	**0.0215**	**805**	0.50	**4**			0.00	**538**	**0**	**1**	41	122	406	1,217
Copper	0.0018	0.0095	**0.022**	**232**	0.05	**44**	0.00	**1,100**	0.00	**1,100**	**0**	**1**	42	125	415	1,245
Iron	**0.604**	**4.98**	**1.8**	36	**0.30**	**600**	**0.30**	**600**	**0.30**	**600**	**9**	**65**	**3,397**	**10,190**	**33,966**	**101,897**
Lead	0.00024	0.0018	0.001	56	0.05	2	0.00	none	0.05	none	0	0	2	6	19	57
Maganese	0.036	**0.227**	**15.69**	**6,912**	**0.10**	**15,690**			0.70	**2,241**	**81**	**569**	**29,607**	**88,820**	**296,067**	**888,200**
Mercury	0.00003	0.00008	**0.00011**	**134**	0.01	2	**0.00**	**412**	**0.00**	**535**	**0**	**0**	0	1	2	6
Molybdenum	0.0005	0.0013	**0.09**	**6,923**	0.50	18	**0.07**	**123**	**0.02**	**450**	**0**	3	170	509	1,698	5,095
Nickel	0.0007	0.0053	0.004	75	0.20	2	0.03	none	0.03	none	0	0	8	23	75	226
Phosphorus	0.02	0.162	**0.2**	**123**	2.00	10			**0.01**	**2,000**	**1**	**7**	377	1,132	3,774	11,322
Selenium	0.0005	0.0005	**0.001**	**200**	0.05	2	0.00	none	0.00	none	0	0	2	6	19	57
Silver	0.00001	0.00002	**0.00087**	**4,325**	0.05	2	**0.00**	**865**	**0.00**	**1,730**	**0**	**0**	2	5	16	49
Thallium	0.00005	0.00005	**0.00029**	**580**	ng		0.00	none								0
Titanium	0.018	0.161	0.054	34	ng				0.10	none	0	2	102	306	1,019	3,057
Zinc	0.003	0.02	0.012	60	0.20	6	**0.03**	**none**	**0.01**	**160**	**0**	**0**	23	68	226	679
Dissolved Metals																0
Aluminum	0.041	0.148	**0.63**	**426**	**ng**				**0.05**	**1,260**	**3**	**23**	1,189	3,566	11,888	35,664
										Sum	4,274	29,915	1,555,586	4,666,759	15,555,864	46,667,591

BR WQ_{avg} - Baseline Bulkley River Water Quality. Calculated by Rescan. N = 57

EOPD - End of Pipe Discharge

PCO - Polution Control Objectives for The Mining, Smelting and Related Industries of British Columbia, 1979

CCME - Canadian Council Ministers of the Environment

Table 2. Proposed water quality (WQ) for 'End of Pipe Discharge' (EOPD) into the Bulkley River (BR), under upset operating conditions, from the Blue Pearl Mine *Waste Water Discharge Application*. Flow rate was indicated in the application to be 60 L/s or 5,184,000 L/day. Based on this total and dissolved metal effluents were scaled up to kg/day for additional consideration of heavy metal loading in the receiving environment. Accompanying each guideline and regulation in this table is the 'EOPD above' guideline or regulation values. This is the percent that each proposed WQ parameter exceeds guidelines, regulations and baseline conditions in the BR. All values are in mg/L unless otherwise specified. Bold-red values indicate proposed WQ is beyond pollution levels and bold-black indicated proposed WQ exceeds Federal and Provincial guidelines.

	Bulkley River Baseline WQ_{avg}	Bulkley River Baseline WQ_{max}	Blue Pearl EOPD	Blue Pearl EOPD above BR WQ_{max} (%)	MoE PCO	Blue Pearl EOPD above MoE PCO (%)	CCME WQ Guidelines	Blue Pearl EOPD above CCME WQ Guidelines (%)	BC WQ Guidelines	Blue Pearl EOPD above BC WQ Guidelines (%)	Effluent Loading (kg/day)	Effluent Loading (kg/week)
pH	7.89	8.43	8.7	103	8.5	102						
TSS	19.1	155	206	133	25.0	824	104	198	84	245	1,068	7,475
Sulphate	4.38	5.45	729	13,376	ng				50	1,458	3,779	26,454
Chloride	0.43	3.13	8.8	281	ng				100	none	46	319
Ammonia	0.006	0.023	35	152,174	1.00	3500	2.43	1,440	2.43	1,440	181	1,270
Nitrate	0.015	0.037	39	105,405	25.0	156	2.93	1,331	10	390	202	1,415
Nitrite	0.0006	0.0019	2.2	115,789	10.0	22	0.06	3,667	0.02	11,000	11	80
Total Metals												
Aluminum	0.51	4.74	15.8	333	0.50	3160	0.005	316,000			82	573
Antimony	0.00006	0.00022	0.046	20,909	0.25	18	0.02	230			0.2	2
Arsenic	0.0004	0.0023	0.5575	24,239	0.05	1115	0.005	11,150	0.005	11,150	3	20
Boron	0.005	0.005	0.465	9,300	ng				1.2	none	2	17
Cadmium	0.00008	0.00025	0.0109	4,360	0.01	109	0.00002	64,118	#####	83,846	0.1	0
Chromium	0.0006	0.0048	0.016	333	0.05	32	0.001	1,600	0.001	1,600	0.1	1
Cobalt	0.0003	0.00267	0.037	1,386	0.50	7			0.004	925	0.2	1
Copper	0.0018	0.0095	0.18	1,895	0.05	360	0.002	9,000	0.002	9,000	1	7
Iron	0.604	4.98	12.2	245	0.30	4067	0.30	4,067	0.30	4,067	63	443
Lead	0.00024	0.0018	0.009	500	0.05	18	0.001	900	0.05	none	0.05	0
Manganese	0.036	0.227	24.1	10,617	0.10	24100			0.7	3,443	125	875
Mercury	0.00003	0.00008	0.0002	250	0.01	4	#####	769	0.00002	1,000	0.001	0
Iolybdenum	0.0005	0.0013	4.5	346,154	0.50	900	0.073	6,164	0.02	22,500	23	163
Nickel	0.0007	0.0053	0.076	1,434	0.20	38	0.025	304	0.025	304	0.4	3
Phosphorus	0.02	0.162	0.28	173	2.00	14			0.01	2,800	1	10
Selenium	0.0005	0.0005	0.0045	900	0.05	9	0.001	450	0.002	225	0.02	0
Silver	0.00001	0.00002	0.0083	41,500	0.05	17	0.0001	8,300	0.00005	16,600	0.04	0
Thallium	0.00005	0.00005	0.0006	1,200	ng		0.0008	none			0.003	0
Titanium	0.018	0.161	0.62	385	ng				0.1	620	3	22
Zinc	0.003	0.02	0.229	1,145	0.20	115	0.03	763	0.0075	3,053	1	8
Dissolved Metals												
Aluminum	0.041	0.148	0.63	426	ng				0.05	1,260	3	23
										Sum -	5,598	39,183