Comments by Members of the CoalWatch Technical Experts Group on the Draft Application Information Requirements, Version 7.0 Of Raven Underground Coal Project

June 27, 2011

Forwarded by

John Snyder, President Cam Connor, Vice President

CoalWatch Comox Valley Society

COMMENTS BY:

Andrew Fyson PhD
I am a biologist with a BA in Botany from Oxford University, a PhD in Plant Physiology, several post docs in soil microbiology and 17 years working in Canada and Germany cleaning up mine sites using natural processes. I am currently Lands Manager for the Denman Conservancy Association. I am also on the technical committee of the Comox Valley Coalwatch.

Please publish my name and location along with my comments.

Andrew Fyson PhD
4174 Wren Rd
Denman Island BC V0R 1T0

June 26, 2011

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Re: The Raven Coal Mine proposal draft AIR

I am concerned by the inadequacy of proposed baseline studies both for aquatic (Section 5.5.2.1, 5.6.2.1) and terrestrial (Sections 5.7.3.1, 5.8.2.1) ecosystems and individual species. In particular, I am concerned for the many rare, threatened and endangered species known (and not yet known) to occur in the region around the proposed mine. For terrestrial ecosystems, the proposed RSA ends at the inner island highway (Figure 5.7.1). Such studies should extend to all areas potentially affected by water and air pollution including Baynes Sound, Denman Island and Hornby Island.

Denman Island has the only known breeding colonies of the Taylor's Checkerspot (*Euphydryas editha taylori*). Ths butterfly needs a particular combination of open grasslands and seasonal wetlands where particular foodplants occur. On Denman, clearcuts from the 1990s provide the habitat this insect needs. Since its discovery on Denman 5 years ago, it has been well studied by local and government biologists. An individual adult of this species has been seen in Buckley Bay, and since much suitable habitat is present in the region between the proposed mine site and

Baynes Sound, it likely breeds there too. Intense scientific studies are necessary at appropriate times of year to determine the presence of larvae and adults, their number, distribution and breeding status. It is essential to assess the status of rare species and monitor their populations before, during and following mine operation to ascertain what effects the mine is having and to mitigate mine effects through development of species and habitat-specific management strategies. The mine proponent must post a bond sufficient to pay for such studies.

Another concern is the lack of information on baseline studies already carried out and those proposed for terrestrial ecosystems (Section 5.7.3.1). These studies must be adequate to map ecosystems throughout the region potentially affected by the mine (including areas subject to air pollution such as Denman and Hornby Islands). Plans must be included in the mine proposal to mitigate for ecosystem damage and habitat lost through the building and operation of the mine.

Cumulative effects of the proposed mine on terrestrial ecosystems and individual species must be adequately studied. There is a lack of information on this in the draft AIR

The present draft AIR does the public and the environment a disservice. Only a Joint Federal/Provincial Independent Expert Environmental Review Panel with full public hearings can determine whether this proposed mine should go beyond this pre-planning stage.

Yours sincerely

Andrew Fyson PhD

I am a biologist with a BA in Botany from Oxford University, a PhD in Plant Physiology, several post docs in soil microbiology and 17 years working in Canada and Germany cleaning up mine sites using natural processes. I am currently Lands Manager for the Denman Conservancy Association. I am also on the technical committee of the Comox Valley Coalwatch.

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Re: The Raven Coal Mine proposal draft AIR

Like many others, I have spent many hours pouring through the various versions of the draft AIR and other available information on the proposed Raven Coalmine. Now is one of those rare moments when the public can have its say. Most of the public neither has the time nor the background to make any meaningful commentary on this tome. It is basically a listing of what the proponent believes it needs to do to get the government stamp to go ahead with this project. The public consultation on this may serve to show the proponent some of the inadequacies in the proposal so that he/she may fill in the holes or cover them over. There is nothing in terms of detail to comment on except for the most technical of people. We, the public, are not privvy to a mountain of background information that is not in the document. Therefore, specific, detailed comments are very difficult at best. It is possible to discern general areas which are ignored or inadequately covered.

I therefore call for a Joint Federal/Provincial Independent Expert Environmental Review Panel with full public hearings to determine whether this proposed mine should go beyond this pre-planning stage. A basic prerequisite must be a complete regional aquifer mapping and modelling.

Yours sincerely,

Andrew Fyson PhD

Please publish my name and location along with my comments.

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Re: The Raven Coal Mine proposal draft AIR

Denman Island is across the water from the proposed mine site and would be affected in many ways:

- A highly variable rain of coal dust and other particulates from the mine and associated transportation. The coal dust will affect the health of people and all other organisms on Denman and Baynes Sound between Denman and the proposed mine. Effects may be direct on an organism's health, or more indirect due to long-term accumulation of dust or through subtle changes in the balance of food webs in our ecosystems. The draft AIR does include Denman Island in the RSA (Figure 5.2.1) as lands potentially affected by air pollution so clearly the proponent recognises that there is a potential problem here. Baseline studies must be carried out on Denman Island and other potentially affected areas as models do not adequately account for topography, tree cover and local climates.
- There will be noise from blasting, other mine operations and mine traffic. These sounds will reach all of Denman Island (We here blasts from Texada Island which is much further away). However, Denman Island is not included within the RSA of lands potentially affected by noise (Figure 5.2.3).
- Negative impacts on the shellfish industry will have negative economic effects on Denman Island and change the ecosystems along Baynes Sound. All of Baynes Sound should be included in baseline studies and not the limited area shown in Figure 5.6.1.
- Tourism will be negatively affected by the propsed mine. The pristine reputation of the region would be in tatters. Many jobs would be lost. Such negative economic impacts on Denman and elsewhwere in the Comox Valley are not considered in the draft AIR.

- Population loss and house prices. With pollution from the mine, and perceptions of environmental degradation, and a net loss of jobs (through impacts on tourism, shelfish industry etc.) it is inevitable that people will leave the area

I am disappointed by the lack of consultation with Denman Islanders in this process. The attendance of Denman Islanders at the recent public meetings attests to the concern among the people here. I therefore call for a Joint Federal/Provincial Independent Expert Environmental Review Panel with full public hearings (including on Denman Island) to determine whether this proposed mine should go beyond this pre-planning stage. A basic prerequisite must be a complete regional aquifer mapping and modelling.

Please publish my name and location along with my comments

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June 26, 2011

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Re: The Raven Coal Mine proposal draft AIR

I am particularly concerned by the lack of information on mine-waste storage and management contained in the proponents published plans and the draft AIR (Section 2.2). The coal rejects and other unwanted materials from the mining processes contain sulphur and sulphide which have the potential to oxidise and generate acid rock drainage (ARD). The following information and actions are inadequately described in the draft AIR and must be addressed in the proposal.

- Data must be made available to the public to assess the quantity and ARD generating potential of this material. The draft AIR refers to use of standard BC procedures without further discussion or detail. Whatever procedure is followed e.g. careful mixing of materials, addition of lime etc., there will inevitably be ARD generation. This may occur in small foci and spread and it may start during mining operations or many years later.
- A clear procedure must be described to adequately monitor wastes for generation of ARD both during mine operation and following decommissioning. Such monitoring may be needed for hundreds of years.
- The mine and wastes management impoundments must be designed such that any ARD generated be confined to and treated on the mine site. The potential for ARD generation will continue for hundreds or thousands of years and treatments must be in place to cover all potential eventualities.
- Monitoring of receiving groundwater aquifers and surface waters in the potentially affected catchments must be continued through the mine operation and thereafter as long as potential for ARD generation continues.
- Who pays for monitoring and treatment? It should be the mine owner, not the tax payer.

Prior to giving the go ahead for a mine, the owner/operator must post a bond to monitor the wastes for many years and to pay for any treatment and clean up of pollution.

- There will be a major earthquake in the region. Will the waste management system be able to absorb the shock with no release of materials or changes which lead to pollution leaving the site?
- The present climate has very heavy rain events in winter and prolonged droughts in summer. Extremes which are rarely found in other mining regions. The former increases the likelyhood of wastes and contaminated waters overflowing the impoundments. The latter could increase potential infiltration of air (and ARD generating potential) into the wastes. Are standard procedures adequate for this climate? This is not adequately addressed in the draft AIR.
- With climate change, it is predicted that winters will get wetter, summers drier and extreme weather events in the region more frequent. Will the design and management of mine wastes be able to cope with such changes? This is not adequately addressed in the draft AIR.
- The aquifers in the region must be adequately mapped in order to assess where and how fast contaminants would spread in the groundwater.
- How would contaminated groundwater be treated? This is inadequately addressed in the AIR.

There are many other questions which are inadequately addressed in the draft AIR. I therefore call for a Joint Federal/Provincial Independent Expert Environmental Review Panel with full public hearings to determine whether this proposed mine should go beyond this pre-planning stage. A basic prerequisite must be a complete regional aquifer mapping and modelling.

Yours sincerely,

Andrew Fyson PhD

David Hughes MSc (Geology)

David Hughes is a geoscientist who has studied the energy resources of Canada for nearly four decades, including 32 years with the Geological Survey of Canada as a scientist and research manager. He developed the National Coal Inventory to determine the availability and environmental constraints associated with Canada's coal resources. As Team Leader for Unconventional Gas on the Canadian Gas Potential Committee, he coordinated the recent publication of a comprehensive assessment of Canada's unconventional natural gas potential. Over the past decade, he has researched, published and lectured widely on global energy and sustainability issues in North America and internationally. He is a board member of the Association for the Study of Peak Oil and Gas – Canada and is a Fellow of the Post Carbon Institute. He recently contributed to "Carbon Shift", an anthology edited by Thomas Homer-Dixon on the twin issues of peak energy and climate change, and his work has been featured in Canadian Business, Walrus and other magazines, as well as through the popular press, radio, television and the internet. He is currently president of Global Sustainability Research Inc., a consultancy dedicated to research on energy and sustainability issues.

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June 26, 2011

British Columbia Environmental Assessment Office

Dear Sirs and Madams,

RE: RAVEN UNDERGROUND COAL MINE

Further to your request for input into the Draft Application Information Requirements, my concerns are related to the economic viability of the project should it encounter issues with depressed coal prices, unplanned for geological complexity interfering with the ability to meet contracted product flows and quality, and the economic burden of mitigating acid drainage from the wash plant rejects, which will constitute 56% of the mined coal, and which is likely to be considerable given the sulphur content of the coal, as well as final remediation when the project is completed. So my recommendation would be:

> **Include a comprehensive risk assessment of the economic viability of the project given the potential for depressed coal prices, unanticipated geological complexities affecting the ability to deliver contracted coal volumes and coal quality, the effect on economic viability of the liabilities of mitigating acid mine drainage from the rejects of the wash plant, and the ability of the project to provide adequate funding for a complete remediation of the area at the cessation of mining given the risks.**

As background to my recommendation, I submitted some concerns earlier to the CEAA process which I have attached below. I have also reviewed the "Technical Report", posted June 8, 2011,

by Compliance prepared by its consultants Pincock, Allen and Holt (PAH). This report is not a "feasibility report" as requested in my earlier comments and which is needed in any review about the future of this project, rather it is yet another interim report with qualifying statements such as:

- "Geological and coal quality data on the Raven coal property are sufficient to support resource and reserve estimations at a feasibility level for the Raven project area." (Page 20.1) – ***Suggesting a feasibility study has not yet been completed.***

- "Mining studies are largely complete to bankable feasibility level; however, work in some areas is still ongoing." (Page 20.1) - ***Suggesting a feasibility study has not yet been completed.***

- "PAH has included assumptions based on current knowledge of the areas still under evaluation. While the final outcomes are likely to result in some change to the project economics, current economics including assumptions related to these issues are sufficiently robust that PAH does not expect the changes would be material. Areas of uncertainty in engineering design that must be resolved to finalize the bankable feasibility include the following (pages 20.1 and 20.1) - ***Suggesting a feasibility study has not yet been completed.***:

    - reject geochemistry to determine if reject material is potentially acid-generating ***[acid drainage is highly likely given the sulphur levels documented in the ROM coal]***,

    - groundwater inflows and geochemistry to determine underground water management,

    - water treatment requirements, if necessary."

Notwithstanding the above statements to the contrary, PAH in its Executive Summary states that

> *"PAH has completed a feasibility study on the project. This report presents a summary of the feasibility findings in Section 22-Additional Requirements for Technical Reports on Development Properties and Production Properties."*

Furthermore, this mine is being proposed on the basis of reserves that are not proven, as 51% of the coal that is expected to be extracted falls into the "probable", not "proven" category as evidenced by Table 17-4 on page 17.12. Hence my concerns about the need for a risk assessment on the effect of running into unanticipated geological complexities that will be detrimental to the project's economics and its ability to fulfill commitments on mitigating environmental impacts.

Coal price assumptions have been increased substantially from last year's pre-feasibility study to justify the economics of this mine, based on recent increases in coal price that are now assumed to be permanent by the proponents. Hence my concerns about the need for a risk assessment on

the potential for depressed coal prices, given the commodity's historic price volatility, and the effect of a collapsed coal price on the project's economics and its ability to fulfill commitments on mitigating environmental impacts.

The liabilities imposed upon taxpayers for the unfunded obligations of mine operators in the past, due to the non-viability of their ventures, begs a careful consideration of this proposal on economic grounds, for which my recommendation considered in a proper feasibility study is essential. The environmental concerns imposed by this proposal, which are considerable, I believe have been well stated by others, and certainly by the sheer number of concerned citizen responses to you on environmental issues justifies an independent review of this project.

Sincerely,

J. David Hughes
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MY RESPONSE TO THE ORIGINAL CEAA CALL FOR COMMENTS:

September 14, 2010

Mr. Andrew Rollo
Canadian Environmental Assessment Agency
805 - 1550 Alberni Street
Vancouver B.C.
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Dear Mr. Rollo,

RE: Comments on the proposed Raven Mine by Compliance Energy Corporation

I have reviewed the letter sent to you and Minister Prentice by the Environmental Law Centre (ELC) at the University of Victoria requesting a full public inquiry by an independent expert review panel into the Raven Coal Mine application and am aware of the many concerns about this project by people of the Comox Valley, most of which were addressed in the letter.

By way of introduction I am a coal geologist and also the senior author of GSC Paper 88-21 which is the principal document forming the basis of calculating 43-101 compliant coal resources used for the in situ resource assessment of the Raven Mine. Although I believe that there are environmental issues and a level of public concern that certainly meet the threshold of Federal and Provincial Ministers for calling for Public Hearings before an Independent Expert Review Panel, as outlined in the ELC letter, I would like to provide my perspectives as a long time coal geologist on the likelihood of this mine succeeding in meeting its stated production objectives over its proposed 20-year life.

The principal document outlining the resource base which the Raven Mine hopes to extract is the Technical Report prepared by Denver-based consultants Pincock, Allen and Holt (PAH) dated June 4, 2010, which incorporates all previous geological studies. This report correctly implies that this project is a long way from demonstrated “feasibility”. There is a great deal of additional study that will be required to demonstrate the portion of the in situ resource they have calculated that could actually be recovered by current mining methods. Some basic points:

- At 2.2 million tonnes per year the proposed mine is a very large mine by Canadian standards for underground operations.

- The 3,100 hectare footprint is correspondingly large.

- The quality of this coal is very high ash High Volatile Bituminous A, meaning that to clean it to an acceptable ash content for a metallurgical product, recovery is only 40%,

and even with an additional higher ash- and sulphur-thermal product total recovery will be less than 60% overall. This leaves a very large volume of rejects from the washing operation for surface disposal, hence public concerns about groundwater contamination and acid drainage.

- The coal seams are highly variable in thickness and bordering on "complex" in terms of structural configuration. This will complicate and restrict the recovery of these seams in actual mining operations. Of the seams present, the Denver-consultants focus on seams 150 and 360 stating:

  - *"Coal zone 1 is composed of many thin coals, bony coals, coaly mudstones, carbonaceous mudstones, mudstones, and siltstones. Despite the variability in thickness and composition, Seam 150 conforms to the thickness and coal-to-rock ratio defining resources over much of the property."*

  - *"Coal zone 3 is just as persistent as zone 1, but is much more variable in thickness and coal-to-rock ratio, and therefore will probably be considered less attractive to mine."*

This raises the issue of the recoverability of the "in situ resources" defined in the Technical Report. The inferred resources should be discounted completely from consideration of recoverable resources at this point. Seams 340L and 150L should also be discounted completely as they are based on only three and four boreholes respectively. Similarly, seam 340 should be discounted completely as it is unlikely to be feasible for mining, given its small resource content. This leaves the remaining measured and indicated in situ resources in seams 150 and 360 of **63 million tonnes**. The proportion of this in situ resource that could potentially be recovered will certainly be restricted by the aforementioned variability in thickness, included rock partings and structural complexity.

Four factors combine to question the recoverable resources on which the mining proposal is based and the potential ultimate viability of the mine over its proposed life:

1. **Structural Complexity** – The classification of the deposit as borderline "complex" means that a portion of the area for which in situ resources are calculated will likely be unmineable due to these complexities. It is my experience in coal deposits such as this that the more data you have, the more complex the interpretation of the deposit becomes. A generous assumption would be that 75% of the area included in the in situ resource calculation will prove to be mineable. This reduces the in situ "recoverable" resource to **47 million tonnes**.

2. **Mining Method** – Typical recoveries by the proposed "room and pillar" mining method are in the order of 50% of the in situ resource. Assuming that this can be

increased to 70% by the practice of "pulling pillars" on retreat, that leaves **recoverable coal of 33 million tonnes**, which is **insufficient to meet the 44 million tonne requirement of the proposed mining operation**.

3. **Higher Waste Volumes than indicated will have to be handled and disposed of** – The recoveries after washing in the PAH report are low (40% for metallurgical and less than 60% for a combined metallurgical/thermal product) yet still understate the amount of material that will have to be removed from the mine and disposed of which will adversely affect economic viability. The PAH report indicates on page 12.1 that "partings greater than 0.3 m were not sampled". Given the variability of seams as described above in the PAH report there will certainly be partings thicker than this that will have to be removed to surface during the mining process as it will not be possible to selectively remove them underground. This is likely to substantially increase the volume of waste that will have to be handled and disposed of on the surface compared to the estimates in the mining proposal. This will adversely affect economic viability and increase the environmental impacts of surface disposal.

4. **The Lack of Corporate Experience in Underground Coal Mining of Compliance Energy Corporation (CEC)** – CEC as a corporate entity has been around for ten years. A review of the experience of Management and Directors of CEC shows that although some have extensive mining expertise in metals and surface mining of coal in the Alberta Plains and in the Alberta and BC mountains, none have expertise in underground coal mining let alone an underground operation of the proposed size of the Raven Mine. CEC as a corporate entity has no experience in underground coal mining.

In summary, there are many questions concerning the economic and environmental viability of the Raven Mine based on the factors outlined above that can only be answered with a proper feasibility study and the acquisition of a lot more data.

It is important to assess the potential economic viability of the mine through its lifetime in order to assess the ability to deliver on claims for employment and other social benefits as well as the ability to mitigate and reclaim environmental impacts.

In my involvement with the coal industry over nearly four decades I have observed instances of mines enthusiastically promoted by corporate entities which subsequently collapsed for both geological and economic reasons, most notably the Westray mine in Nova Scotia, which tragically killed 26 miners in 1992. These factors plus the environmental concerns outlined in the ELC letter and by the very extensive comments provided to you already by the people of the Comox Valley more than justify the fullest independent review of the Raven Mine proposal, as I hope you will agree.

Sincerely,

David Hughes
Box 237
Whaletown, B.C., V0P 1Z0

Dr. A. M. Martell
Courtenay BC

Issues Regarding Birds

Marine Environment

The most notable omission in the dAIR regarding birds is the omission of any reference to birds in Baynes Sound. Baynes Sound is recognised in the dAIR as a Marine RSA (Figure 5.6-1), but no bird species are listed as VCs in that area (Table 5.6-1). Baynes Sound is recognised as an Important Bird Area (IBA) based on international criteria (www.ibacanada.ca) and supports internationally important populations of waterbirds. In addition, several species of Provincial conservation concern (Blue-listed) are found in Baynes Sound. The Detailed Marine Baseline (5.6.2.1) needs to be expanded to include both the international important waterbirds and the blue-listed species as VCs and a plan developed to identify potential direct and indirect effects on them from the proposed development. To do this effectively, the Baynes Sound RSA (5.6.1.1) needs to be extended to reflect the normal movements of the populations of waterbirds. The temporal boundaries (5.6.1.2) should also be extended to cover a reasonable period after decommissioning the proposed development site.

Terrestrial Environment

Although the dAIR states that it includes “rare and listed species” (5.8.2.1), several species of birds so listed are omitted as VCs (Table 5.8-1) although they are found within the Terrestrial RSA. Those species should be included as VCs. The temporal boundaries (5.8.1.2) should also be extended to cover a reasonable period after decommissioning the proposed development site; 1-2 years is insufficient to evaluate the response of birds to decommissioning and revegetation (Table 2.2-1).

Dr. A. M. Martell

Robert McDonald MASc Electrical Engineering

BASc Electrical Engineering, UBC, 1968
MASc Electrical Engineering, UBC, 1970

35 years experience in Engineering, and Engineering Management.

2000 – 2006: Manager, Mission Systems Engineering at MDA Space Systems, Brampton ON. Responsible for 50-75 engineers working on Canadarm systems support contract with the NASA Space Shuttle program, and the Canadian Space Agency Space Station robotics systems support contract.

2000 – 2002: a Corporate Director of a publicly traded technology company on the TSX Venture Exchange.

2006: Retired

Mine Dewatering

Raven proposes to use the water seeping into the mine workings as feed water for their coal processing plant. However, the amount of water coming into the mine is unknown, due to the extensive mine workings (extending over 8.5 km, and running under 5 local creeks and the Tsable River). Geologic faulting is extensive over the Raven mine area, and mine dewatering was an issue for the old Tsable Mine and for the Quinsam Mine. In addition, mine water is expected to be saline.

Section 4.2.1 of the AMEC Project Description mentions all of the above issues, and proposes three solutions: treatment within the wash plant, storage and release (possibly with treatment), and deep well injection. There need to be environmental surveillance mechanisms in place to ensure that mine dewatering treatment is centralized, and treated to the same standard as other waste water from the mine.

Since the volume and pollutants of the mine water are unknown, monitoring as the mine evolves is critical. Deep well injection would just make the issue unable to be monitored, and the mine could always say “Any downstream environmental impact is not our fault”. Full treatment on the surface at a central site would allow for monitoring of the pollution control process.

Coal Gas Methane

Raven proposes to vent methane from their mine into the environment. The May 2011 AMEC Project Description document (p85) says methane volumes will be 127,500 cubic meters per day, or 87,000 Kg per day. At 260 production days per year, this amounts to over 22,000 metric tons of methane per year.

Obviously, keeping methane under control within the mine is mandatory to protect workers from coal gas explosions.

However, the global warming effect of methane is estimated to be from 25 to 80 times higher than carbon dioxide, which leads to the conclusion that the methane released in the Comox Valley by the Raven Mine will cause a similar amount of global warming as the Raven coal that will be burned in the Far East.

Section 5.2.2.2 of the dAIR document discusses the impact of coal gas methane, but at the same level as diesel emissions from mine equipment. Given the large volumes of methane to be released, this item deserves separate consideration as a major industrial pollutant from the Raven Mine.

When considering the proposed mine design, capture and sale or disposal of the methane should be proposed as an alternate way of executing the mining project. Even the burning off of the methane would dramatically reduce the global warming effect from the methane, reducing it from 25 to 80 times, to that of carbon dioxide.

Mike Morrell MSc

Mike Morrell is a Fishery Biologist (MSc UBC 1973). He has been doing fisheries work since his undergraduate days in the early 1960s. During the 1980s he was staff fishery biologist with the Gitxsan-Wet'suwet'en Tribal Council, based in Hazelton, BC. Since 1987 he has lived on Denman Island and has made his living as an independent fisheries consultant for First Nations, NGOs and citizens' groups in BC and Yukon. He is also a bird-watcher and naturalist.

SOME DEFICIENCIES IN THE DRAFT APPLICATION INFORMATION REQUIREMENTS FOR RAVEN UNDERGROUND COAL PROJECT, VERSION 7, MAY 2011

Submitted by Mike Morrell, MSc, Fishery Biologist.
Member, CoalWatch Comox Valley Technical Group.
6003 Denman Rd, Denman Island, BC V0R1T0
26 June 2011 (As submitted in PDF)
Please publish my name and location along with my comments.

SUMMARY OF RECOMMENDATIONS

Recommendation 1: that the BCEAO and federal CEAA ("the Agencies") require that the impact assessment for the Raven Project be expanded to include assessment of possible impacts of development of the Bear and Anderson Lake properties, as well as any other reasonably foreseeable developments within the regional holdings of the proponent.

Recommendation 2: that the Agencies require the proponent to provide more details of planned baseline studies and modelling of hydrogeology and groundwater quality and to make this information available for public review prior to approval of the AIR. In particular, the additional information should include locations and descriptions of new groundwater monitoring stations and a conceptual description of the hydrogeological model.

Recommendation 3: that the Aquatic Spatial Boundaries be expanded to encompass all surface freshwater systems of the Raven Project Land Tenure as well as the wetlands and creeks of the Baynes Sound shoreline—i.e. the same spatial boundaries now applied to groundwater and hydrogeology studies (Fig 5.3-1). If the geographical scope of the assessment is expanded per my Recommendation 1, then these Aquatic Spatial Boundaries should be correspondingly expanded.

Recommendation 4: that the proponent provide credible population estimates of all salmonid populations of the Raven Project Land Tenure as benchmarks against which to measure possible project impacts. For anadromous populations (Coho, Pink and Chum Salmon; Steelhead and Cutthroat Trout), such population estimates should include estimates of both outmigrant smolts and adult spawners. Population enumerations should be conducted for several years prior to project construction and ongoingly for the life of the mine and after decommissioning should the project proceed.

Recommendation 5: that the list of marine Valued Components include at least the following:

- Plankton—phytoplankton and zooplankton communities, including seasonal timing of blooms
- Marine Plants—Eelgrass and attached macroalgae
- Shellfish—(in addition to Pacific Oyster already on the list) Manila, Littleneck, Butter and Geoduck Clams; Scallops (native and cultured); Prawns and Crabs (*Cancer* and *Pugettia*)
- Finfish—marine salmonids (Coho, Pink, Chum and Chinook Salmon; Steelhead and Sea-run Cutthroat Trout), Pacific Herring, Pacific Sand Lance, and groundfish (Lingcod, Rockfish spp., Staghorn and other Sculpins, Plainfin Midshipman, flatfish including Starry Flounder, and Pacific Hake)
- Seabirds—year-round residents (Pelagic Cormorant, Great Blue Heron, Glaucous-winged Gull); winter residents (Trumpeter Swan, American Wigeon, Surf and White-winged Scoters, Pacific Loon, Black Turnstone, Mew Gull); spring migrants (Brant)
- Marine Mammals—Harbor Seal, California and Steller Sea Lions.

Recommendation 6: that the Baynes Sound Marine LSA be expanded to include the full width of Baynes Sound adjacent to the Raven Project Land Tenure. And that the corresponding RSA include all of Baynes Sound from approximately Mapleguard Point-Boyle Point in the south to Comox Harbour and the Courtenay Estuary in the north.

Recommendation 7: that marine baseline sampling of water quality, sediment quality and characterization of benthic infauna as currently proposed be carried out over a more extensive marine area, including more offshore areas, deeper sediments and sampling stations throughout Baynes Sound. In addition, the proponent should carry out baseline studies of tissue concentrations of metals and other contaminants that may be introduced into the food web by mine effluent; such studies should document tissue loads in a number of indicator species from phytoplankton and zooplankton through higher trophic levels at all seasons of the year.

SPATIAL SCOPE OF REVIEW

In my comments below I provisionally accept the proponent's definition of the project area as the Raven Project Land Tenure as shown in Fig 2.2-2 of the draft Application Information Requirements, version 7 ("dAIRv7"). However, given that the proponent owns coal rights to a

much larger area contiguous with the Raven Project and that there are at least two commercially promising prospects nearby (Bear and Anderson Lake), I recommend as follows:

Recommendation 1: that the BCEAO and federal CEAA ("the Agencies") require that the impact assessment for the Raven Project be expanded to include assessment of possible impacts of development of the Bear and Anderson Lake properties, as well as any other reasonably foreseeable developments within the regional holdings of the proponent.

If the Agencies decide to expand the spatial scope of the review, then my comments below regarding spatial scope should be expanded accordingly.

GROUNDWATER

Spatial Boundaries (Fig 5.3-1)

I note that the LSA and RSA for hydrogeology and groundwater quality studies have been expanded from the boundaries shown in the original Project Description (2009) and Addendum (2010) to coincide approximately with the boundaries of the Raven Project Land Tenure. Subject to my recommendation above about the need for consideration of other potential coal developments in the area, I think this expansion is appropriate and helpful.

Groundwater Baseline Data and Modelling (Sec 5.3.2.1)

The current dAIRv7 provides insufficient detail on the proponent's plan for data collection and modelling of hydrogeology and groundwater quality. The eight test wells described in Section 5.3.2.1 do not appear adequate to provide data for the expanded study area shown in Fig 5.3-1. In the Working Group Issues Tracking Tables ("Tracking Tables") the proponent states an intention to provide additional information regarding the hydrogeological model and additional groundwater monitoring sites (Tracking Tables, Provincial and Local Agency Issues, p19 at DILTC-II-04). However, this information is not scheduled to be provided until the next version of the dAIR is released; at the Courtenay Public Meeting of 30 May 2011, the proponent stated that the next version of the dAIR would not be available until after the present Public Comment Period had ended.

Recommendation 2: that the Agencies require the proponent to provide more details of planned baseline studies and modelling of hydrogeology and groundwater quality and to make this information available for public review prior to approval of the AIR. In particular, the additional information should include locations and descriptions of new groundwater monitoring stations and a conceptual description of the hydrogeological model.

HYDROLOGY

Spatial Boundaries (Fig 5.4-1)

The proposed Aquatic Spatial Boundaries encompass only the watershed of Cowie and Cougar Smith Creeks plus two small tributaries of the adjacent Tsable River system. These boundaries apply to all surface water studies, including Hydrology, Surface Water and Sediment Quality, and Freshwater Fisheries and Aquatic Resources. (The dAIR states that these boundaries also apply to studies of Hydrogeology and Groundwater Quality [dAIRv7, Sec 5.4.1.1, p87], but I assume this is an error persisting from earlier versions of the dAIR.)

The proponent's rationale for these boundaries is that "… the proposed Raven Project is confined to Cowie Creek and some of its tributaries. The possible proposed Raven Project influence on water quality and stream flows is therefore limited to the watershed in which it is located." (dAIRv7, Sec 5.4.1.1, p87) In the absence of a detailed mine plan, water management plan, and detailed hydrogeological mapping to illustrate possible subsurface connections among surface and groundwater systems, there is no evidence that this statement is correct.

Recommendation 3: that the Aquatic Spatial Boundaries be expanded to encompass all surface freshwater systems of the Raven Project Land Tenure as well as the wetlands and creeks of the Baynes Sound shoreline—i.e. the same spatial boundaries now applied to groundwater and hydrogeology studies (Fig 5.3-1). If the geographical scope of the assessment is expanded per my Recommendation 1, then these Aquatic Spatial Boundaries should be correspondingly expanded.

FRESHWATER FISHERIES AND AQUATIC RESOURCES

Spatial Boundaries (Fig 5.4-1)

As noted above, the Aquatic Spatial Boundaries are too restrictive and should be expanded per my Recommendation 3. In dAIRv7, fisheries and aquatic biology studies would be restricted to the Cowie/Cougar Creek watershed and would ignore the much larger and more productive adjacent Tsable River and Wilfred (Coal) Creek systems, both of which are at risk if the Raven Project proceeds.

Freshwater Fisheries Baseline Studies (Sec 5.5.2.1)

The fisheries impact assessment envisioned in the dAIR is based primarily on estimation of freshwater fish habitat and projections of potential habitat loss due to mine impacts. The relation between fish populations and our measurements of the extent and quality of habitat is not precise.

The proposed baseline studies may provide credible estimates of populations of stream-resident salmonids (Rainbow and Cutthroat Trout). Likewise they will provide indices of the abundance of juveniles for stream-rearing species (Coho Salmon and anadromous Cutthroat and Rainbow Trout [Steelhead]); however, they will provide no information on numbers of smolts of these species that leave the rearing streams, nor will they estimate numbers of spawning adults. Finally, proposed baseline studies will provide no information at all on the present status of Pink and Chum Salmon that spawn in streams of the project area but rear and mature entirely in marine waters. Federal and provincial government agencies have no quantitative estimates of the anadromous salmonid populations of any of the streams of the project area since 2004.

Recommendation 4: that the proponent provide credible population estimates of all salmonid populations of the Raven Project Land Tenure as benchmarks against which to measure possible project impacts. For anadromous populations (Coho, Pink and Chum Salmon; Steelhead and Cutthroat Trout), such population estimates should include estimates of both outmigrant smolts and adult spawners. Population enumerations should be conducted for several years prior to project construction and ongoingly for the life of the mine and after decommissioning should the project proceed.

MARINE ENVIRONMENT

Valued Components (S 5.6.1 and Table 5.6-1)

The proponent acknowledges that the list of marine VCs is preliminary (dAIRv7:p108). In fact for Baynes Sound the list is practically nonexistent.

It is important to note that the environmental importance of Baynes Sound depends upon its integrity as a functioning ecosystem that provides many services to the human and non-human communities of the region. It is this function that must be protected, not simply a list of components. That said, it is reasonable and practical to list particular species and other components of particular importance to humans and to the ecosystem along with other species and ecological groupings that may act as indicators of overall ecosystem health. Once having made such a list, it is important to recognize that our present understanding of ecosystem structure and function is very limited and that any list of components may fail to include important elements of the system. Therefore, ongoing monitoring of the entire ecosystem is required in order to detect unforeseen impacts.

Recommendation 5: that the list of marine Valued Components include at least the following:

- Plankton—phytoplankton and zooplankton communities, including seasonal timing of blooms
- Marine Plants—Eelgrass and attached macroalgae

- Shellfish—(in addition to Pacific Oyster already on the list) Manila, Littleneck, Butter and Geoduck Clams; Scallops (native and cultured); Prawns and Crabs (*Cancer* and *Pugettia*)
- Finfish—marine salmonids (Coho, Pink, Chum and Chinook Salmon; Steelhead and Sea-run Cutthroat Trout), Pacific Herring, Pacific Sand Lance, and groundfish (Lingcod, Rockfish spp., Staghorn and other sculpins, Plainfin Midshipman, flatfish including Starry Flounder, and Pacific Hake)
- Seabirds—year-round residents (Pelagic Cormorant, Great Blue Heron, Glaucous-winged Gull); winter residents (Trumpeter Swan, American Wigeon, Surf and White-winged Scoters, Pacific Loon, Black Turnstone, Mew Gull); spring migrants (Brant)
- Marine Mammals—Harbor Seal, California and Steller Sea Lions.

Spatial Boundaries (Fig 5.6-1)

The marine LSA for Baynes Sound proposed in dAIRv7 includes only the nearshore subtidal area near the mouth of Cowie Creek in Fanny Bay. The proposed RSA includes the full width of Baynes Sound from Buckley Bay north of the mouth of Tsable River to McNaughton Creek north of Deep Bay.

The proponent offers no rationale for these boundaries. Presumably the choice of LSA boundaries is based on the same logic that guided the restriction of the Aquatic Spatial Boundaries to the watershed in which the mine surface works are planned—i.e. that the mine will have no impact on other surface waters. I reject that thinking on the grounds detailed above. The RSA boundaries in dAIRv7 encompass the portion of Baynes Sound adjacent to the mouths of the major stream systems draining the Raven Project Land Tenure.

In my opinion, the LSA should include the full width of Baynes Sound adjacent to the entire Raven Project Land Tenure, from approximately the mouth of Hindoo Creek south to at least Mud Bay in order to monitor the effects of runoff and subsurface seepage from all proposed surface and underground mine works. The RSA should include all of Baynes Sound so as to establish baselines for the whole Baynes Sound ecosystem, including all shellfish aquaculture tenures and also known point sources of Acid Mine Drainage (Union Bay coal piles and Courtenay River, which receives effluent originating in the abandoned Mt Washington Mine on Tsolum River.

Recommendation 6: that the Baynes Sound Marine LSA be expanded to include the full width of Baynes Sound adjacent to the Raven Project Land Tenure. And that the corresponding RSA include all of Baynes Sound from approximately Mapleguard Point-Boyle Point in the south to Comox Harbour and the Courtenay Estuary in the north.

Detailed Marine Baseline Studies (Sec 5.6.2.1)

The baseline studies proposed in dAIRv7 include only water quality, sediment quality, and benthic infauna characterization in nearshore subtidal study areas. These data are worth collecting as a step toward monitoring how, where and in what form mine contaminants might enter Baynes Sound if the proposed project goes ahead.

In addition, it will be essential to be prepared to monitor how contaminants may disperse through the ecosystem after reaching Baynes Sound. Contaminants that precipitate into the nearshore sediments may disperse through passive transport by wind, waves, currents and gravity. Contaminants may also be incorporated into organisms and enter the food web. Accordingly it is appropriate to establish baseline levels not only in the water column, nearshore sediments and burrowing organisms, but also in deeper water and sediments and in selected indicator organisms at all levels in the food web. It is important that this baseline sampling of the ecosystem be carried out throughout Baynes Sound, since various contaminants, including those originating in Acid Mine Drainage, are already known to be present in the system, and it will be important to be able to determine incremental effects of the Raven Project if it proceeds. The deposits of coal washings known as the Union Bay coal piles at the mouth of Hart Creek provide an interesting opportunity to trace the historical and ongoing dispersal of coal waste leachate through the Baynes Sound system.

Recommendation 7: that marine baseline sampling of water quality, sediment quality and characterization of benthic infauna as currently proposed be carried out over a more extensive marine area, including more offshore areas, deeper sediments and sampling stations throughout Baynes Sound. In addition, the proponent should carry out baseline studies of tissue concentrations of metals and other contaminants that may be introduced into the food web by mine effluent; such studies should document tissue loads in a number of indicator species from phytoplankton and zooplankton through higher trophic levels at all seasons of the year.

J.R. Morris, P.Eng

RAVEN UNDERGROUND COAL PROJECT

COMMENTS ON dAIR v.7

Prepared by J.R. Morris, P.Eng

1. NEED FOR THE PROJECT

   The need for the project must balance the advantages to the proponent (Compliance Coal Corporation) with the potential damage to the local environment and properties of residents of the area. The costs of long term monitoring and mitigation must be quantified and bonding or other guarantee provisions put in place as part of any future EA certificate.

   There is no technical requirement for this project, as the projected annual production is a minuscule proportion of world production.

   There are moral objections to coal production at a time when carbon combustion threatens out world climate.

2. DATA SOURCES

   The dAIR document contains some description of the proposed activities, but is largely a copy of the EAO Table of Contents format. Two additional documents have been provided which appear to be intended as secondary sources of information: UPDATED PROJECT DESCRIPTION, Amec, May 2011: TECHNICAL REPORT ON THE RAVEN COAL PROJECT, Pincock, Allen and Holt (PAH), June 8, 2011.

   Documents intended to support the dAIR should be listed in the Appendices. All documents must be edited to remove any discrepancies.

3. HYDROGEOLOGY AND HYDROLOGY

   a. Modelling

      The documents implicitly acknowledged that vertical conduits, either from existing faults and fractures, or fracturing resulting from post-mining subsidence, will be major sources of mine water inflow. The field investigation must include sufficient test wells suitably located to test the hydraulic conductivity of existing geological faults. Long term modelling must include estimations of the effect of mine-induced fracturing. The model must consider linkage of the mine openings

to various overlying strata, including aquifers supplying. Local shellfishers have stated that freshwater springs in the tidal area are important for oyster production. This mine would be entered at an elevation above much of the settled area between mine portal and seashore. This raises the probability of mine water being forced upwards to springs and aquifers when and if the mine fills with water after closure.

b. Spatial Boundaries

The surface water hydrology boundaries have been defined as the Cowie Creek watershed. This does not take into account the linkages through horizontal mine openings and vertical fractures, which may link across surface watershed boundaries.

Monitoring and modelling must extend from the full length of western (upstream) boundary of the Raven property to the downstream limits of aquifers and surface drainage. This must include sampling of marine organisms in Baynes Sound, and may include well sampling on Denman and Hornby Islands.

c. Temporal Boundaries

Post-operational monitoring is mentioned in the text, but the rudimentary schedules provided show activity for only one year after completion of mining. No long term cost allowances are obvious in the estimates.

Monitoring will be needed at least until the hydraulic system stabilizes, primarily indicated by stabilization of mine water level (with seasonal variations). If the mine does not fill with water, this will indicate that outflow is occurring at depth, probably through fractures to aquifers or springs. Springs might commonly occur in stream beds, so they will not be visually obvious; chemical testing of water, sediments, and biota will be needed. This may impose long term water treatement.

d. Water Balance

Water balance calculations are mentioned, but facilities for balancing are not mentioned. Presumably the objective is to determine the quantity of water that must be supplied to operate the washing plant. It is quite conceivable that the mine drainage will exceed the plant requirements, and that the problem will be the treatment of water discharge to prevent harm to receiving surface waters.

Seasonal flows in these creeks may be very low, so that in summer the discharge water must be essentially at original stream quality to prevent damage to the biota.

Heavy rains can wash plant site materials into the creeks. The indicated size of the settling pond does not appear adequate for surge events.

Post closure water balance will be key to determining the long term monitoring and treatment requirements, as noted above.

4. OPEN PIT OPERATIONS

   The PAH technical report still contains a reference to open pit mining of the upper section of the coal seams, although this is contained in an excerpt from a previous report. Any EA issued must contain conditions that will limit operations to underground mining within the present Raven Project boundaries.

Maya Stano P.Eng., JD.

Maya Stano is a Professional Geological Engineer with experience working on environmental issues pertaining to mines both in BC and internationally. In addition, Maya recently completed a law degree with a specialization in environmental and natural resource law. Maya has also worked on various mining issues for numerous non-profit organizations - both at a provincial and national level.

Maya Stano [Tel: 250-891-4210] [Email: maya.stano@gmail.com]

June 27, 2011

Rachel Shaw
Project Assessment Manager
BC Environmental Assessment Office
PO Box 9426 Stn Prov Govt,
Victoria BC V8W 9V1

Dear Ms. Shaw:

I have reviewed the Raven Underground Coal Project Draft Application Information Requirements / Environmental Impact Statement Guidelines Version 7.0, May 2011 (the "Draft AIR") and offer the following comments on this document.

- Section 2.2.1: The Draft AIR states that the "*need for*" and "*purpose of*" the project will be established from the perspective of the proponent. However, this is an important point on which to take into account the public's comments – therefore, the public perspective, as provided in the public comments, should also be included in this discussion.

- Section 2.5: The section on alternatives assessment does not indicate how alternatives will be identified. Alternatives should be identified based on a technical analysis, but also based on comments submitted by the public. Although the Draft AIR states that "*The Application / EIS will describe how public and Aboriginal groups' feedback on alternatives was incorporated throughout the EA process and into the mine design process*" there is no mention on how the public's comments will be taken into account in actually identifying alternatives – not just commenting on those alternatives identified by the proponent. The public, through local knowledge, will likely be able to offer important alternatives that should be considered by the proponent in its Application/EIS.

- Section 2.7: Labour force requirements should also be identified for the decommissioning and closure stage. In addition, the breakdown of local, provincial, national and international hiring should also include a description of associated wage categories for each of these categories.

- Section 3.3: I would like to highlight the importance of adequate consultation with Aboriginal groups and First Nations, particularly on the determination of the "significance" of adverse effects. The "significance" of adverse effects must take into account the Aboriginal and local community's perspective.

- Section 4.2.2.2: The table mentioned in this section is important for the public to review – it should therefore be included in the Executive Summary of the Application / EIS, rather than only being buried deep in the Application / EIS document.

- Section 4.2.3: Same as above – the table mentioned in this section should be included in the Executive Summary for ease of public review.

- Section 4.2.4: What area around the proposed project will be considered in the cumulative effects assessment? There is mention of the "*same area*" – please define the distance from the proposed mine that this would include (i.e., 5 km radius, 10 km radius, etc.)

- Section 5.3.2.1: The number of groundwater wells installed to date for the hydrogeological characterization appears to be inadequate – it is recommended that a thorough groundwater well drilling and sampling program (with sufficient wells and data collected over 2 years to characterize baseline conditions) be carried out to adequately map the local aquifers. In addition, water quality surveys should be completed during low, medium and high flow periods – not only during low flow periods. All aquifer mapping data collected should promptly be made publicly available.

- Section 22.12: The discussion of significance of effects is perhaps one of the most important discussions in the Application / EIS. Rather than merely being discussed in different sections of this report, this discussion must be highlighted in adequate depth in the Executive Summary for ease of public review.

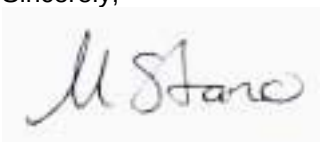
- Section 22.19: The results of the follow-up program must be made publicly available and the method of doing so must be included in the Application / EIS. In addition, adaptive management must be integral part of the follow-up program, and not merely be used "*where applicable*".

- Section 22.20: Renewable resources must also include surface and ground waters.

- Appendix B: Significance rating must take into account the local community's and Aboriginal people's perspectives.

In addition to the above-mentioned deficiencies, there is an inadequate discussion on the potential climate change impacts both on the project, and that would be caused by the proposed project. These must be adequately discussed and considered in the Application / EIS. The ML/ARD program is also not sufficiently covered.

Sincerely,



Maya Stano, P.Eng., JD.

Herbert Sullivan PhD
Education: 1954 - B. Sc. (Hons.), University of Sheffield, UK
1959 - Ph.D., University of Sheffield, UK
Thesis topic – Petrography and chemistry of coal
Employment: 1959-1964 Lecturer, University of Sheffield

1964-1971 Research Scientist, Amoco Production Company, Tulsa, Oklahoma
1971-1983 Petroleum Geologist, Amoco Canada, Calgary, AB
1983-1988 Chief Geologist, Amoco Canada, Calgary, AB
1988-1992 Manager of Exploration Technical Services, Houston, Texas

Professional Affiliation: Life member Assoc. Petroleum Engineers, Geologists, Geophysicists of Alberta (APEGGA)

From: Herbert Sullivan <sullivanhj@shaw.ca>
Date: Mon, Jun 20, 2011 at 11:40 AM
Subject: Environmental Assesment Raven coals
To: raven@ceaa-acee.gc.ca

COMMENTS ON THE ENVIRONMENTAL ASSESSMENT OF THE PROPOSED RAVEN UNDERGROUND MINE

It is important that the technical information provided by the proponents of the mine be fully substantiated in their proposal because the economic viability of the project depends on the fact that there is a substantial reserve of a metallurgical quality coal which can be extracted, cleaned and transported without major environmental impact. As a resident of Qualicum Beach and a member of the technical committee of Coalwatch, I wish to express my concerns about granting permission to proceed with the mine.

Coal Quality. The proponent's data show that the Raven coals are a high volatile bituminous coal with a high ash and sulphur content. The presence of ash and sulphur make it an unlikely candidate as a met coal and furthermore their claim that the high volatile content (between 30 and 50%) makes it unique in Western Canada as a met coal. I would challenge the statement and say it could make it almost unique in the world. It will be necessary to determine what factors contribute to its singularity and to provide an explanation of why it is restricted to this small area in the Vancouver Island coalfield.

Physical tests such as swelling and plasticity are a measure of a coal's suitability for coking and it will be necessary to document how many samples meet these parameters and to submit duplicate samples for independent testing of by other laboratories.

Coal Zone Continuity and Uniformity. Of the five zones in the Cumberland Member of the Comox Formation only coal zones 1 and 3 will be mined. The term ‘coal zones’ rather than ‘seams’ is used because the Raven coal layers are separated by shale partings. In coal zone 3 the shale parting which separates the two coals is sometimes thicker than the coals themselves. The composite nature of those coal zones means that volume of non-coaly sediments extracted during mining operations far exceeds the company’s estimates. Fault displacement encountered during mining operations will also add to the amount of debris brought to the surface as miners search for the continuation of the coals on the other side of the fault plane.

Surface Accumulations of Rock Debris. Rock debris extracted during mining operations together with fractions removed during washing will be dumped at the surface. Mineral rich coals such as the Raven coal are likely to contain trace amounts of metals such as zinc, copper, barium chromium, manganese, beryllium, selenium and vanadium. Leaching of heavy metals by surface run-off or percolating water will carry them into streams and aquifers water and eventually discharge these toxic elements into Baynes Sound. The destruction of the aquaculture industry is an inevitable consequence.

Sulphur in the coal and shale partings is mainly in the form of the mineral pyrite. Toxic elements such as mercury, phosphorus and arsenic are often incorporated into crystal lattice of pyrite. It is essential that analyses be performed to determine what elements are present in the rock rejects of the mine. The presence of disseminated pyrite also introduces an additional hazard of spontaneous combustion of the debris piles.

Gravity alone can initiate the downhill transport of saturated rock debris as a sediment slurry which can cause damage to life and property. The chances that debris slides will occur are vastly increased by the fact that the mine is located in an active seismic area.

Toxic Pulp Layer in Alberni Inlet. There is a layer of toxic material in the Alberni inlet due to the effluent discharged during chemical processing of the lignin-cellulose components in wood chips over many years of pulp mill operations. An impervious mud now covers this toxic layer and prevents the release of harmful chemicals into the overlying water column. Dredging to accommodate the coal freighters will remove the seal and cause irreparable damage to the fish and invertebrate population of the inlet.

Recommendations:

Explain why the high volatile, mineral and sulphur rich Raven coals are unique in Canada and possibly the rest of the world in their coke-forming properties. This study will involve detailed petrograhic analyses of the coal and identification of the macerals that contribute to that

character.

Permit the sampling by an independent and federally certified laboratory of core samples of the Raven coals to do physical testing for swelling and plasticity.

Conduct analyses to identify trace elements in the coal and associated sediments and assess the possible damage those present might cause to the to water in wells within the aquifers and also to the shellfish population of Baynes Sound.

Sample and perform chemical analyses on the toxic pulp layer within Alberni inlet and to document its toxicity to the biota of the inlet and suggest remedial measures will have to be taken in order to prevent the release of those chemicals into the water column.

Herbert Sullivan PhD

Dr. Gilles Wendling, P.Eng. - Credentials

Education: Ph.D. (1991), M.Sc. (1985) and MST (B.Sc. equivalent) (1983).

Employment: Dr. Wendling has started the firm GW Solutions Inc. in 2005. Dr. Wendling has been involved in over a thousand projects in his consulting career.

Professional involvements:

- Dr. Gilles Wendling has been the Director -Technical and Professional Division of the Canadian Groundwater Association in 2003 and 2004.

- Dr. Wendling has been the Director - Technical and Professional Division of the BC Groundwater Association from 2001 to 2006, and its managing Director in 2006, 2007 and 2008.

Involvements in the design and implementation of rules and regulations:

- Drafting of water well construction specification for water wells in the Yukon Territories, Government of Canada, 2004

- Design of material and delivery of workshops to educate the water industry and water purveyors on the Groundwater Protection Regulations, part of the Drinking Water Protection Act, BC, 2005

- Design of a Handbook to illustrate the BC Groundwater Protection Regulations – Phase 1 - 2005 – 2006

EAO process

- Dr. Wendling has completed a review and critique of a large hydrogeological study on behalf of the Halalt First Nation for a proposed series of production wells (water supply for the District of North Cowichan) as part of a provincial and federal environmental assessment process, Chemainus River Aquifer, Halalt First Nation, BC

International

- Gilles Wendling has worked in Europe, Asia, Africa, and North America.
- Gilles Wendling is the president and founder of Global Aquifer Development Foundation (GADF), a Canadian charity creating partnerships with developing countries and assisting in the establishment of groundwater management systems. GADF has merged with Hydrogeologists Without Borders (HWB) in 2010.

Comments on the Draft Application Information requirements, Version 7.0 dated May 2011 (Section 5.3 – Groundwater)

Terms of Reference

The term of reference for the hydrogeological study (Section 5.3 – Groundwater) should include and cover (minimum) the following:

Description of the proposed project and its effects

- A water balance describing the present elements of the water budget as well as their modifications over the next 100 years, taking into consideration the anticipated effects of climate change;
- A detailed conceptual model describing the flux of water, from ridge to shore, through representative cross sections. The soil and bedrock layers should represent the layers encountered in the region. The thickness of the bedrock horizon should represent the main geological units and their state of fracturation and be at least 1000 m thick.
- Models (conceptual, analytical, numerical) have to be produced to describe the flux of water pre, during, and post mining (at least 100 years post mining).
- The models have to describe the flux of water both in the upland of the land tenure (where mining will occur at and close to surface), and in the low land area of the land tenure (where mining will take place at depth).
- The detailed conceptual (and analytical/numerical) model has to describe the interaction between groundwater and surface water for all the surface water features that may be impacted by the direct and indirect effects of the proposed mining operations within and outside of the land tenure.
- The potential effects of mining should be estimated over a sufficient length of time to take into account delays when effects would start to be observed, due to the specifics of the groundwater regimes.
- The detailed conceptual (and analytical/numerical) model has to describe where and how the fresh water and salt water interface will be encountered and how the mining operations will potentially modify the location and movement of this interface.
- The detailed conceptual (and analytical/numerical) model has to describe how the groundwater discharge along the foreshore will be modified by the proposed project.

- The proponent has to describe the estimated permanent and irreversible changes to the groundwater regimes that may result from the proposed work.
- Where impacts are expected, the proponent has to clearly describe/define what would be an "acceptable" and an "unacceptable" impact. It should also provide the rationale for these definitions.
- Should there be a potential for an extension of the mined area (i.e. by later applying for an amendment of the permit of operation to include the Bear and Anderson Lake projects), the hydrogeological study completed for the Raven project should be adjusted both for its scope and for the boundaries of the study area to reflect this possibility.

Tools

- The data collection must be conducted at a scale that adequately represents the heterogeneity of the system (watershed and subsurface) and its anomalies.
- The information must be gathered with tools (e.g. monitoring wells) designed for the information to be gathered.
- The data collection (monitoring) must describe and be representative of the fluctuation (seasonal, yearly, over decades) of the representative parameters.
- The monitoring programs must be long enough to adequately cover periods pre and post the proposed mining operations.

The above described requested tools infer that an adequate description of the aquifers (both in the overburden and in the bedrock) and of the groundwater regimes is a pre-requisite for the proposed project.

Organisation and funding

- The proponent has to describe the proposed plan to collect, interpret and review monitoring data that will be collected a long time after the proposed mining operations will have stopped. What will be its long-term cost? What organisation(s) will be responsible for conducting this long-term work, and what will be its source of funding?
- Should there be some un-expected effects on the groundwater regimes requiring remediation works, what is the contingency plan. What organisation(s) will be responsible for conducting this potential long-term work, and what will be its source of funding?

Wayne White

Work Experience

Ministry of Environment - 1971 to 2000

Waste Management Permit monitoring and administration for all the mines on Northern Vancouver Island. Appointed Environmental Surveillance Officer for Quinsam Coal from the time it opened until 2000

Ministry of Fisheries and Agriculture - 2000 to 2007

Comments on the dAIR/EIS and Updated Project Description for the Raven Project dated May, 2011 regarding the ML/ARD and Effluent Treatment sections

Wayne White, Tsolum River Restoration Society

Updated Project Description (UPD)

Because the project description and mine plan are fluid at this time I will only make broad comments on these.

The product it should be noted is low grade metallurgical coal to be mixed with higher grade coking coal to meet the minimum requirements of metallurgical coal or it is high quality thermal coal, depending on the market. After processing 30 Mt of run of the mine coal it is estimated that 13 Mt of product will be produced, leaving behind 17 Mt of coarse and fine rejects.

The UPD acknowledges the that an application will have to be supported detailed information on ARD prevention but proposes that coarse rejects (all particles greater than 50 mm after breaking) be discharged to the ground for disposal in the coarse reject stockpile. Stockpiles normally indicate something that is stored temporarily while dumps are the normal terminology for disposal sites; the proposal seems to be for dumps.

What seems to be proposed for both waste rock and coal rejects is a landfill blended “to produce an ideal blend”. As noted in the appended excerpt from Section 4.5 of the Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia this would require “a grain-by-grain mixing of PAG and NPAG material” to produce a NPAG composite. The Policy also

notes major constraints and information and design requirements for blending, all of which should be supported in detail in the Application/EIS.

I have also appended the Guiding Principles from Section 2 of the above referenced Policy and I would like to emphasize that the primary objective of a ML/ARD program is **prevention**. This will be achieved through prediction, design and effective implementation of appropriate mitigation strategies.

Much more information will be required to characterize the geological material and to predict the dynamics of ML/ARD processes than discussed on page 47 of the UPD. The dAIR/EIS recognizes this and ML/ARD prevention and materials management plans will need to be supported by data.

The UPD sites the coal refuse stockpiles and the coal processing facilities over six ephemeral tributary streams and a fish bearing tributary to Cowie Creek but show no water diversions works and gives no detail regarding the settling design criteria nor its size. The settling pond need to sufficient to treat all the process water and all the contaminated runoff from the coal processing yard, stockpile areas and access road during the most intense storm events. The UPD also calls for a polishing pond and catchment ditches which are not shown on any plan. There is no discussion about the possible use of flocculants for effluent treatment.

The Closure and Remediation section of the UPD makes no mention of post closure monitoring nor to measures to be taken for the long term ML/ARD prevention, mitigation and/or treatment.

dAIR/EIS Guidelines

It is very important that the AIR be as complete as possible since the best decision are made with as much information as practical. There will be no opportunity to collect baseline date once the project starts, so as full a set of baseline data as possible should be collected in order to assess some low probability, high consequence situation in the future. Contaminants of high local concern, like cadmium, need to be assessed in full detail if there is any potential of a negative effect. It is in this spirit that I off the following comments:

Section 2.2 – Should there be a second stockpile of “all substrate and glacial till/weathered bedrock till” that is removed from the project and kept in a separate area as indicated in the UPD?

Section 2.2.5 – A benchmark NPR should be established to delineate between PAG and NAG rock. Recent work at Quinsam Coal notes that there is no consensus that an NPR of 2, which is the benchmark noted on page 46 of the UPD, eliminates the potential for ARD as research

suggests that the acid drainage potential will be considered uncertain if materials have an NPR of then than 4. The presence of sulphides influences this uncertainty.

Section 2.2.11 – Should include a description of post closure monitoring of all the effected or potentially effected watersheds including any watershed under which the mine passes. Both water quality and quality should be measured to identify any residual effects resulting from the project.

Section 2.7 – Project benefits have to be weighed against the existing economy of Baynes Sound and any potential disruption that ML/ARD production could cause that industry. Of particular concern would be any mobilization of cadmium since oysters from BC waters are very close to the cadmium limits set by many countries for importing this product and any point source discharge of cadmium could jeopardize the area's economy. The proponent should assess this parameter from a no increase over background levels perspective rather than meeting a set permit limit.

Table 5.3-1 – Should include groundwater recharge areas in or downstream of the work areas, stockpiles and ponds. The Tsable River should be added to the possible watersheds effected.

Section 5.4.1.2 – Water balance special boundaries should include all watersheds subject to subsidence and resultant risks of interactions between surface water, groundwater and mine dewatering processes.

Section 5.4.1.3 – Surface water special boundaries of the Surface Water LSA should include the Tsable River its tributaries which drain the access road and which may carry ARD seepage from mine workings.

Section 5.4.2.1 – The hydrological program should include all other potentially effected creeks where subsidence could effect steam flows (eg: Tsable River and Hindoo Creek).

Table 5.6-1 – Should include potential ARD seeps into Cowie Creek and the Tsable River in the Interactions column. Clams should also be a Species of Focus in this table that may be affected by water and sediment quality.

Section 5.6.1.1 – The LSA should include the Tsable River estuary because of the potential for ARD or mine water seepage because of subsidence induced connections to the surface water. And the RSA should include any watershed that may be subject to subsidence (eg: Hindoo Creek).

Section 5.6.2.1 – The detailed marine baseline should include tissue metal analysis of clams and oysters. Also a Mussel Watch program, a recognized bio-monitoring technique for accumulation of toxins by mussels and other shellfish, should also be established to monitor any bio-accumulation of metals over time.

Section 5.6.2.2 – The Baynes Sound assessment should include the Tsable River watershed because of potential ARD seeps and direct discharge of sediments from access road drainage. Potential changes in the sediment chemistry should also be monitored for the possibility subsequent reprecipitation of ML/ARD products as experienced at Quinsam Coal.

Concluding Statement

The ML/ARD management plan will dictate the economics of the project over the long term. A mine plan which prevents ARD production may cost more up front but will pay dividends in the avoidance of post closure liabilities. Relying on subsequent neutralization of ARD products by excess alkalinity in a blended waste dump may not prevent metal leaching even if the seepage leaving the site is neutral or basic. Once the metal is mobilized it may take costly, long term water treatment to remove it.

Appendix 1

Excerpts from the Policy for Metal Leaching and Acid Rock Drainage at Minesites in BC

The full text of the ML/ARD Policy and Guidelines can be seen at:
http://www.empr.gov.bc.ca/Mining/Permitting-Reclamation/ML-ARD/Pages/default.aspx

2. GUIDING PRINCIPLES

Mining and exploration activities in British Columbia will be regulated in a manner which supports the Province's goals of sustainable resource development, reclamation, environmental protection and minimization of economic risks. To this end, the Provincial Government supports productive mineral extraction while recognizing that the mining industry can only be sustained through environmentally sound, economically viable management practices.

Guiding principles for the regulation of ML/ARD in the Province of British Columbia include:

Ability and Intent - A mine proponent must demonstrate the necessary understanding, site capacity, technical capability and intent to operate a mine in a manner which protects the

environment. Mitigation[3] plans must meet the environmental and reclamation objectives for the site and be compatible with the mine plan and site conditions.

Site Specific - The current regulatory philosophy appreciates that every mine has a unique set of geological and environmental conditions and therefore ML/ARD will be evaluated on a site-specific basis.

ML/ARD Program - Whenever significant[4] bedrock or unconsolidated earth will be excavated or exposed, the proponent is responsible for the development and implementation of an effective ML/ARD program. The program must include prediction, and, if necessary, mitigation and monitoring strategies.

Prediction and Prevention - The primary objective of a ML/ARD program is prevention. This will be achieved through prediction, design and effective implementation of appropriate mitigation strategies.

Contingency - Additional mitigation work or contingency plans will be required when existing plans create unacceptable risks to the environment as a result of uncertainty in either the prediction or primary mitigation measures. The timing and degree of preparation required will depend on the risk, when the potential event of concern may occur and the resources required for implementation.

Minimize Impacts - Where ARD or significant metal leaching cannot be prevented, mines are required to reduce discharge to levels that assure long-term protection of the receiving environment. An important secondary objective is to minimize the alienation of on-site land and water resources from future productive use. Impacts and risks must be clearly identified by the proponent and will be considered during the project review process, in conjunction with other environmental, economic, community and aboriginal impacts and benefits. Mitigation is usually more effective if problem prediction and prevention occur prior to the occurrence of significant metal leaching or ARD.

Cautious Approach - Cautious regulatory conditions based on conservative assumptions will be applied where either the ML/ARD assessment or the current level of understanding is deficient.

Reasonable Assurance - The regulation of ML/ARD will be carried out in a manner which minimizes environmental risk and with reasonable assurance that government will not have to pay the costs of mitigation.

Financial Security - As a permitting condition, financial assurance will be required to ensure sufficient funds are available to cover all outstanding ML/ARD obligations, including long-term

costs associated with monitoring, maintenance, outstanding mitigation requirements, and collection and treatment of contaminated drainage

4.5 Blending of PAG and NPAG Wastes

Blending refers to the co-deposition of potentially acid generating (PAG) wastes with materials with excess neutralization potential (NP), or non-potentially acid generating (NPAG) wastes. The objective in blending is to create a composite in which the acid produced by PAG wastes is neutralized by excess NP and drainage alkalinity from NPAG materials, with a consequent reduction in metal solubility.

The degree of mixing and the spatial relationship between PAG and NPAG materials plays a major role in determining both the performance and the effectiveness of the blend. Performance is generally maximized when complete, grain-by-grain mixing of PAG and NPAG produces a composite that is entirely NPAG. Where there is some degree of physical segregation between the blended materials, acidic pH conditions are expected to develop to some degree in the PAG material.

Blending has some potential strengths as a mitigation tool, including limited maintenance requirements, compatibility with a wide variety of terrestrial end land uses and in some cases fewer long-term geotechnical concerns (i.e. compared to a water retaining dam) and lower costs. However, blending also has a number of potential disadvantages which currently restrict its use. The type of constraints will, to some degree, depend on the degree of mixing and the spatial relationship between PAG and NPAG materials.

Major constraints include:

<u>Costs</u> - The major constraint for a completely mixed blend of PAG and NPAG wastes are the potentially prohibitive materials handling or amendment costs.

<u>Performance Limitations</u> - Elevated neutral pH concentrations of some metals are possible even if ARD from the segregated PAG material is neutralized. For a well mixed composite, there is the possibility of elevated neutral pH metal leaching from metal-rich sulphides even under neutral pH weathering conditions.

<u>Technical Uncertainty</u> - For a segregated blend, the composite waste performance will depend on the interactions of complex geochemical and hydrological processes, factors which are difficult to study and for which the current understanding is limited. This makes the prediction of water movement and geochemical performance difficult.

Demanding Information Requirements - Blending requires comprehensive material characterization and, in the case of a segregated blend, waste design and construction plans, both of which must be supported by detailed prediction information.

Extensive Material and Construction Requirements - PAG and NPAG materials must have suitable characteristics. NPAG wastes must occur in sufficient proportions and their composition and timing of excavation must be compatible with that of PAG waste. The requirement for detailed operational material characterization may delay excavation, materials handling and deposition. Also, blending often has demanding materials rehandling and deposition requirements.

The acceptability of a blending proposal will depend on the mitigation objectives, site-specific conditions, evidence provided and the proposed design. Blending will only be accepted as an environmental protection tool if supported by detailed design criteria, strong evidence of feasibility and effectiveness, and in the case of a segregated blend, adequate back-up or contingency measures. With a large surplus of effective NP, small drainage inputs and/or low, neutral-pH metal loadings, a blended waste may produce acceptable drainage for discharge. Where site conditions are less favourable, the role of blending will likely be restricted to that of an accessory tool to other more feasible or reliably effective mitigation procedures.

4.5.1 Information and Design Requirements

A proposal to blend wastes must include detailed materials handling and placement plans, supported by comprehensive material- and site-specific testing. A knowledge of the geochemistry, hydrology and consequent long-term contaminant discharge rates are required to set design criteria and determine the potential need and timing of contingency mitigation measures. Since the performance of blended wastes depends on complex site-specific processes, it is not possible to set generic blending design constraints.

Effective Neutralization - Effective neutralization requires NPAG materials with suitable weathering characteristics to be available in sufficient proportions and properly placed relative to PAG materials. Design objectives to improve NP effectiveness include measures to reduce the rate of acid generation, maximize ARD contact with NP and reduce the blinding of neutralizing minerals by iron and aluminum precipitation.

Drainage Reduction - Reductions in the volume and rate of flow of drainage, especially through PAG materials, will maximize NP effectiveness and reduce metal loadings. Placement of the blended waste, especially its PAG components, in a topographic position that limits drainage inputs will reduce drainage discharge. The physical properties and configuration of PAG and

NPAG materials within the blended waste can also be used to minimize the leaching of PAG strata.

<u>Material Characterization and Monitoring</u> - The proponent will be required to undertake pre-operational and post-deposition material characterization, and monitor the quality and quantity of drainage and the progress of weathering within the waste. It is essential that the mine plan allows sufficient time to carry out the necessary material characterization prior to material placement or mixing.

<u>Compatibility with the Mine Plan</u> - The proponent must demonstrate that the proposed PAG/NPAG material segregation and blending is compatible with the mine geology and excavation plan. The blending plan must show the relative proportions of PAG and NPAG rock types excavated during different phases of mine development, demonstrate that the plan is compatible with the mining sequence and indicate that there are sufficient resources for any required materials rehandling. A favourable waste balance, compatible PAG and NPAG material excavation, and the timely availability of disposal sites all minimize the need for rehandling.

<u>Interim and Contingency Prevention/Mitigation Measures</u> - Where significant uncertainty exists, detailed contingency plans will be required and blended wastes must be placed in a location and manner that permits drainage collection. A contingency plan must include provision of the necessary resources and a monitoring program to ensure timely and effective implementation of the secondary mitigation measures. Sufficient resources must be available to conduct any outstanding materials handling and mitigation requirements for stockpiled PAG waste in the event that a shut down precludes part of the plan. Interim prevention/mitigation measures may be required to delay ML/ARD onset in materials exposed in temporary stockpiles prior to final disposal in a blended dump or impoundment.

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