Department of Geography
The University of British Columbia
Vancouver, British Columbia V6T 1Z2

30 March, 2010

Ms. Ann Griffin
Manager, Strategic Mitigation Programs
Emergency Management BC
Ministry of Public Safety and Solicitor General
P O Box 9223 Stn Prov Govt
Victoria, British Columbia V8W 9J1

Dear Ms. Griffin

Please find accompanying this letter a copy of my report "Sediment management in lower Fraser River: criteria for a sustainable long-term plan for the gravel-bed reach". I will forward additional printed copies and signed copies of this letter and my invoice by courier.

In the course of conducting interviews with a number of technically qualified people who have conducted work within the context of the sediment management program, I have encountered substantial scepticism that the current program is either cost-effective or task-effective. Scepticism is based on decisions made within the program; that, in turn, I think, is based on misconceptions about what the program is supposed to achieve versus what it might reasonably be expected to achieve.

The core problem with sediment in the gravel-bed reach is not associated with the average rate of aggradation along the reach (which, on current estimates of sediment influx, amounted to about 8 cm in the half-century between 1952 and 1999, reduced to 2 cm after gravel removals in the period are considered), but with the local accumulation of sediment, which raises water levels at certain locations along the reach (by more than a metre in the same period).

The purpose of the program, presumably, is to mitigate the metre scale rises and the public perception that has been encouraged by the program is that individual gravel removals can address this problem and significantly affect river water levels locally. Hence, if there are local problems associated with a low dyke or with perceived gravel buildup, then gravel removal in the vicinity of the problem will solve it (in my report, this is referred to as "profile control").

However, we know from substantial experience that individual sediment removals short of the order of a million cubic metres will not substantially affect local water levels in the short term. But sediment removal on such a scale would very significantly disrupt the aquatic ecosystem. There is, furthermore, concern that the current program pays too little attention to the potential ecological costs of sediment removal.

What, in contrast, may be feasible is to prevent significant overall aggradation of the river by removing a volume of sediment that, over a period of years, is approximately equal to or slightly in excess of the amount that the river deposits in the reach (in my report, this is referred to as "profile maintenance"). Current problems that must be dealt with if such a

program is to be successful is that, at present, we do not know sufficient about either the sediment budget or the ecosystem response to persistent gravel removals of the order of 100 000 $m^3$ each. Nor are there in place effective measures to gauge the success of the program. And, in the end, this addresses the matter of average aggradation, not the problem of large local accumulations.

Another important public misperception is that the most effective way to remove sediment from the system is to intercept it at the upstream end of the system. Presumably, such thinking led to the 2008 Spring Bar removal. On the contrary, what is vital for the maintenance of the aquatic ecosystem is that sediment movement and a modest rate of morphological change continue throughout the reach. This involves the onward movement of some sediment throughout the reach. Trapping a large volume of sediment at the upstream limit of the reach will slowly shut down this process, but only over a period of years – perhaps decades (since there is a substantial supply of sediment moving within the reach that would have to be exhausted). But, after some decades one will have a different river morphology and a different aquatic ecosystem.

It must be emphasized that what is being attempted in Fraser River – to control the river water level by sediment management without impacting the ecosystem of the river – is unprecedented. Consequently, there is a need for careful monitoring and continual improvement of knowledge. This leads to the conclusion that the program is going to be relatively expensive. My interviewees, who collectively represent a substantial proportion of local expertise on the river, virtually all consider that other measures should be actively considered in combination with sediment removal because they are apt to be as cost effective (and less ecologically threatening) or more effective in dealing with the real problem of local sediment accumulation to relatively high levels.

Such options include raising the dykes – known to be expensive, but perhaps not so much more expensive than a properly constructed and monitored program of sediment removal than has been supposed. Even more effective, in the long term, would be to provide greater dyke setbacks where possible, thereby increasing the river floodway (and thereby moving the river closer to its original state). This would involve restricting land use, possibly buying back certain lands. What is going on today makes this seem unlikely: development is occurring right to the dykes and even inside them. This is simply bad planning that will eventually lead to very great expense to repair, or to foreclosure of the option to maintain the river ecosystem (because we will reach a point at which the river must be very tightly constrained, at great cost).

My proposal for a solution to the local aggradation problem, within the limits set for my report, is to concentrate sediment removals in those zones where major aggradation is observed to occur in the hope that this will, over some years, maintain or reduce water levels there. But this is a relatively weak strategy in comparison with those mentioned above.

The sediment management program to this point has been operated with only a minimal information gathering component (embodied in the site monitoring). This no doubt is related to the cost of the program. I think there may have been some thought at the outset that the program might be revenue neutral. It is clear now that it cannot be. However, for effective monitoring and especially for increase of knowledge so that the program can be

confidently carried on, a substantial increase in expenditures will be required. The most expensive (and urgent) need is to improve knowledge of the aquatic ecosystem beyond site scale studies in the immediate environs of sediment removals and a limited number of control sites. It is evident that we need to know details about how fish use various parts of the river at various times of year before reasoned objections to sediment removal proposals may be overcome.

Absent a commitment to information gathering and comprehensive monitoring, I think the program will continue to generate controversy whether it is mandated year-by-year or for a period of years. In this perspective, seeking a long-term approval process is apt to be viewed as a means to outface reasoned technical and public objections to the program rather than as a step toward more sound management of the river. Given a commitment to appropriate information gathering, the relative costs of various strategies for river management come back into the picture.

I have written this supplementary letter to indicate that there is substantial discomfort in the relevant technical community over the current trajectory of the sediment management program, variously expressed as concern that the program cannot attain the expected goals, and that insufficient cognisance is being taken of ecological issues. The strategy outlined in my report will, I think, move the program toward credibility. But it will entail acceptance that the realisable objectives of a sustainable sediment removal program are limited, and that it will require greater investment of resources than has heretofore been made.

I trust that this perspective will be helpful.

Yours sincerely

Michael Church, P.Geo.

(original to be signed and sealed)