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Subject
Objet **MT. NANSEN MINE- VICTORIA CREEK GABION DETERIORATION**

When departing the Mt.Nansen site at the end of the FCSAP ES joint site visit on September 11, 2008, I noticed what appeared to be a disturbed gabion basket immediately downstream of the Victoria Creek culvert. I asked fellow DFO biologist Al von Finster if he was aware of any gabion baskets previously installed in this area. Al recalled some past discussion about gabions in this area, but we could not find anything documented in existing DFO files. After checking past personal files, Al produced a photograph from the fall of 1996, at a time when BYG was still operating in the area, that showed the installation of the culvert in Victoria Creek. It was at this time that gabions were installed downstream of the culvert. The culvert remains in place. Existence of these gabions does not appear to be well-documented or well-known, and therefore monitoring of the structures is likely non-existent.

Several gabion structures/baskets were visible in the general vicinity of the culvert when I visited the site on September 25, 2008. Baskets are located both upstream and downstream of the culvert. The upstream baskets are apparent on the left hand margin of culvert (Figure 1); their function appears to have been for bank stabilization/erosion protection. Erosion of the left hand bank upstream of the gabion baskets is apparent. On the right hand margin of the culvert, baskets are clearly apparent from underneath the road surface material to the mid-point of the depth of the culvert (Figure 2). The upstream gabions appear to be relatively intact and appear to be functioning as intended. There is, however, considerable damage to the downstream baskets which were positioned within the bed of the creek.

Although I am not an engineer, I am assuming that the downstream gabion structures were put in place to stabilize gravels/bed material at the tail end of the culvert, perhaps in order to prevent any undercutting of the material under/at the tail end of the culvert. Such a change to channel morphology/characteristics could impede fish access to habitats upstream of the culvert by creating a falls at the tail end of the culvert. Although I do not have a long term record of Victoria Creek discharge, this area is likely subject to elevated spring freshet conditions where debris within the creek is not uncommon.

Closer examination of these downstream gabions showed that the baskets have likely shifted from their original placement and currently contain considerable debris (e.g., sticks, leaves, etc...) (Figure 3). They appear to be devoid of much of the rock material that would have originally been placed within them. The wire mesh used for basket construction was fairly large diameter. Since little material remains within many of the baskets, it is likely that rocks used to fill the gabion baskets originally was either too small relative to the size of the mesh used, or has since broken down and has been washed out of the baskets (Figure 4). In several places the gabion baskets have pulled apart and have left the pointed wire ends of the mesh exposed (Figure 5). Although the orientation of the pointed ends of the mesh did not appear to be such that it could cause significant damage to passing fish (i.e., impaling them), further erosion of bed materials could lead to such an outcome. Either the construction of the baskets or their placement was not adequate to withstand water velocities in this reach of stream. Gabions, at least in the currently form, do not appear to be the best solution for stabilization downstream of the culvert, and appear to require more (or at least some) maintenance.

The downstream gabions located within the bed of the creek, rather than the upstream gabions, are my primary concern. Under current conditions, the extent of the deterioration is unlikely to prevent fish passage of the culvert, however under lower flow conditions, or should further deterioration of the baskets occur, fish access to the culvert may become impeded. I would expect that a series of high water events in combination with large amounts of debris within the creek could lead to further movement of bed materials downstream of the culvert, perhaps creating a falls at the culvert outlet and/or further limiting flow within the culvert.

Since reclamation of the mine and monitoring of the site will occur for many years, the access road to the site needs to remain passable and the culvert will likely remain in place. I would suggest that, should there be a desire to leave these gabion structures in place, there will be the need for some maintenance and monitoring of these structures, particularly downstream of the culvert. At any rate, it is likely that the downstream gabions will need to be replaced with something more resilient in time to ensure successful fish passage of the culvert.

Below is a subset of photographs (and associated description) of the culvert and surrounding gabion structures taken on September 25, 2008.

It should be noted that the summer of 2008 was a cool, wet year in south-central Yukon. Although flow in creeks and rivers was decreasing by late September, water was elevated in most watercourses throughout the summer and fall.

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Figure 1. Gabion baskets were installed on the left-hand side of the stream (river-left) presumably as an erosion protection device. Baskets installed at this location appear to have been effective in preventing bank erosion adjacent to the culvert. Erosion of the left bank upstream of the baskets is occurring.



Figure 2. Gabion baskets were also installed on the right hand side of the culvert under the road bed material. Note the large tree stuck in the culvert in the foreground.



Figure 3. Gabion baskets appear to have shifted from the location at which they were originally placed. Baskets have been pushed up and out of the water in several spots. Baskets have also become filled with debris.



Figure 4. Much of the rock material appears to have been washed out of the gabion baskets since their construction.



Figure 5. In several places, gabion baskets have pulled apart and have left pointed wire ends of the mesh exposed.