Gooding
Hydrology

TSOLUM RIVER
Final Design for Bank Protection Works
at the
Babcock/Comox Water Pipeline Crossing Site

For the
Tsolum River Restoration Society
Courtenay, B.C.

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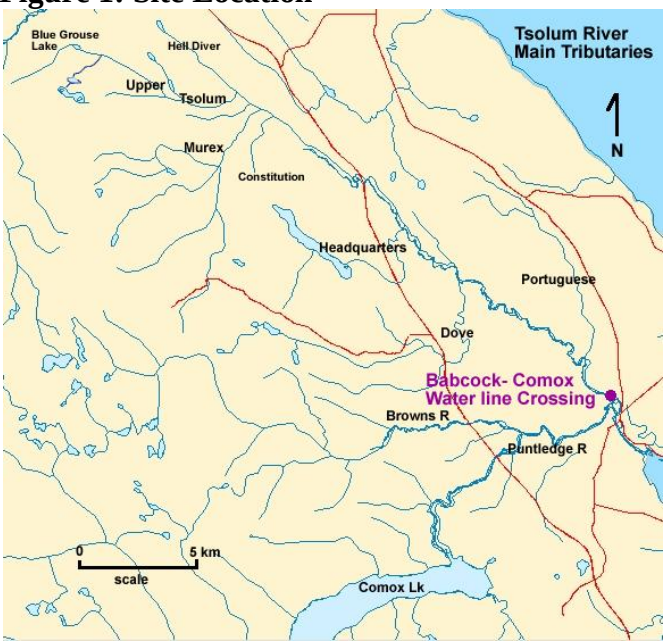
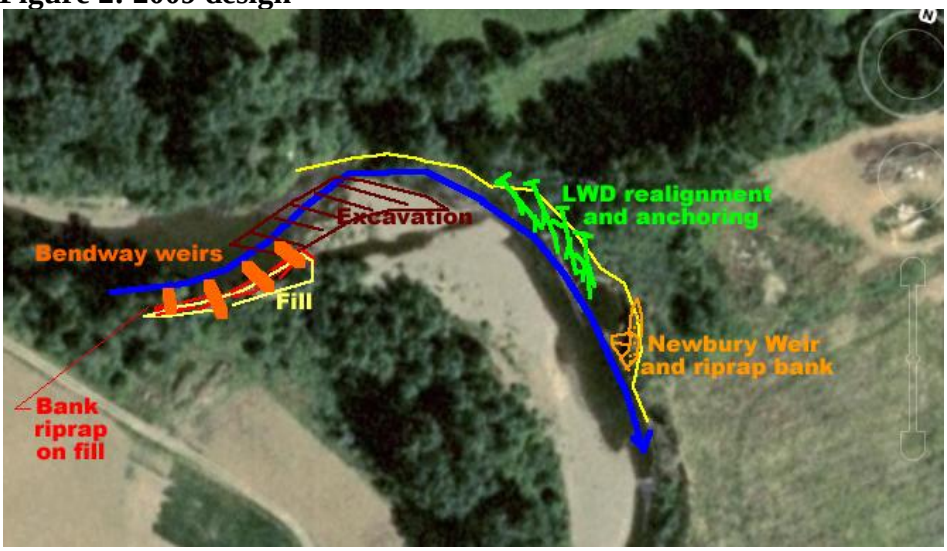
Figure 1: Site Location



Introduction

The bank erosion at the Babcock property, upstream of the Comox water pipeline crossing, was first visited with TRRS and MoE in 2008. CVRD imagery from 2004 to 2012 is given in appendix 1, and shows the channel migration over that period. The relatively rapid bank erosion and channel migration appears to have been initiated at the top (left) end of the imagery where bank erosion into the recently cleared BC Hydro transmission line ROW crossing shifted the channel to the right, then the stronger right bank riparian downstream pushed the flow to impinge on the Babcock property across on the left bank. The original design, drawn in 2009, proposed rebuilding the bank at the Hydro ROW, and restoring the channel to its original location.

Figure 2: 2009 design



NOTE: This is not the only location in the Tsolum where clearing of a BC Hydro ROW to river's edge has appeared to initiate bank erosion and channel migration. Is topping of riparian areas of ROW an option?

Over the succeeding years, as the river worked to regain a more natural curvature, the right bank below the Hydro ROW, and the left bank downstream, have eroded enough so that, instead of sending the thalwag directly across the river to impinge at around an 80° angle into the left bank, these two bends are now approaching a natural curvature. Unfortunately, this has moved the channel almost a full width into the left (Babcock property) bank. This lower bend has still not reached a natural curvature, and in continuing to try to do so is cutting behind the left bank solid riprap protecting the Comox water pipeline crossing, at this time for around 16 m.

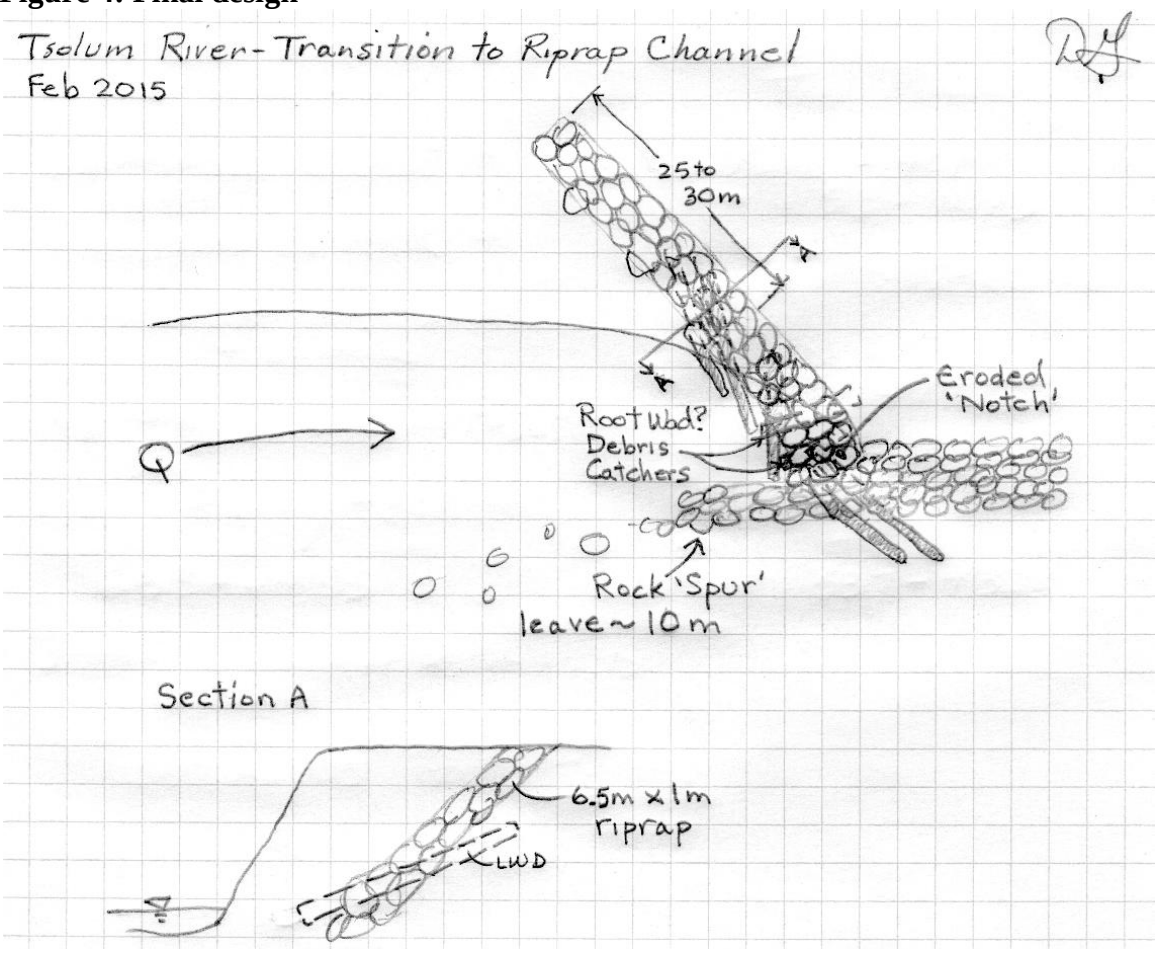
Figure 3: Preliminary 2014 design

Channel to rearing ponds:
With the shifting of the channel to the right in the upstream bend (on the left side of figure 3 above), a lateral bar has grown along the left bank, and is beginning to vegetate. The 2014 preliminary design proposed excavating a channel to connect the old mouth of the constructed rearing ponds, located behind the left bank riparian area, with the new river channel. However, a closer inspection of this area in January 2015 revealed that a natural side channel has formed along the edge of the old channel (where the blue line is located above), and that fry are still able to access the rearing ponds. At this time it is recommended that this area be left to naturally evolve, and fry access checked again at a later date.

NOTE: While walking the rearing ponds, it was noted that there is very little LWD in these ponds. It is suggested that addition of LWD to the rearing ponds and channels would be beneficial.

Erosion behind the solid riprap at d/s end of curve:
The upstream end of the solid riprap protecting the Comox water pipeline crossing represents the transition between continuous riprap banks downstream, and a more natural river channel upstream. As well, it has been observed during reconnaissance of the high bed load Tsolum mainstem that good deep pools are generally associated with large, solid flow obstruction features. The design for bank erosion protection at this site will attempt to prevent the river getting behind the downstream riprap, create a flow obstruction obstacle, provide LWD cover in the scour pool, and hopefully trap additional LWD.

Figure 4: Final design



Material needs:
7 long (10-15 m) pieces of LWD (no root wad necessary), 2 or 3 shorter pieces LWD with root wads (5-8 m), and at least 250 cubic m of rock (D50~0.6 m). This gives a minimal 20 m key-in into the bank. From this base amount, each additional 65 cubic m gives another 5 m key-in as an additional safety factor. Coarse gravel or filter cloth will

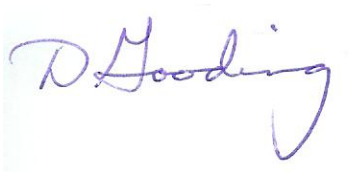
be needed on the inside of the riprap to prevent leaching of the fine alluvial soil through the coarse riprap.

Design Comments
This design will prevent the river from getting behind the downstream solid riprap, while continuing to create the deep pool habitat which the turbulence around the upstream end of this solid riprap bank is creating. Addition of trailing LWD will create cover within and upstream of this pool. The 'rock spur' which helps create the scour pool will be stabilized, with smaller rock used to fill the voids.

A potential danger of this design is that, when the bank cuts back further into the key-in, the curve of the key-in and the rock filling part of the notch may direct flow too strongly towards the other bank. To minimize this, the LWD upstream of the 'notch', and LWD/root wad debris catchers, with any debris caught, will help create turbulence to disrupt this cross channel flow.

Siltation Control & Fish Trapping
Stabilization of the 'spur' with clean rock, dropped by machine and hand placed, will be relatively clean. Construction of the key-in can be in the dry. A silt fence between just upstream of the key-in and the riprap bank end of the spur will hold any silt within that area, which can be trapped out before construction.

Planting
After construction, riparian planting should be done around and upstream of the key-in. This floodplain area is currently covered in blackberry, which tends to discourage tree growth.



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Appendix 1 CVRD imagery
2004

2005

2007

2012

Appendix 2- Photos

Photo 1: Looking downstream towards erosion behind the upstream end of the solid riprap bank (center right). Note the stabilizing bank at center left (actively eroding in the 2002 to 2007 imagery above), and the LWD and access channel to the rearing ponds.

Photo2: Access side channel to the constructed rearing ponds.

Photo 3: Rock Spur at end of riprap bank protecting Comox Lake water pipeline crossing