

Watershed Restoration Project 04-01: Removal of the 570 Road, Anthrop's Landing

Watershed Restoration Project 04-01 was the final phase of equipment operations in Larry Damm Creek, a tributary of Lost Man Creek. This project removed the 570 Road and the last culvert on Larry Damm Creek. While there is still approximately 0.75 miles of the Lower B500 located along the lower portion of Larry Damm Creek, no more restoration work is planned for Larry Damm Creek.

Project 04-01 was originally scheduled to be completed at the end of the 2003 equipment season. However, heavy equipment operations were suspended before the work on the 570 could be initiated. Thus, this project was delayed a year and resumed once equipment operations were permitted.

The entire work site is located well within the ¼ mile buffer of suitable habitat for marbled murrelet and spotted owls. This prohibited equipment from operating until after September 15th. The contractor was well aware of this and had his equipment staged proximal to the worksite well before the equipment season was to resume. On September 16th, the notice to proceed was issued and the contractor moved his equipment in on September 21st. Equipment operations began on September 23rd and were concluded on October 15th.

The B570 Road was located within the inner gorge of Larry Damm Creek. Running along the left side of the creek, the B570 crossed two stream courses and terminated at the original park boundary established in 1968. Near its terminus, the slopes adjacent to the B570 steepened sharply, and this resulted in a zone prone to stream side landsliding. In addition, the presence of large bedrock blocks marked the contact between the contrasting lithologies of the Prairie Creek formation and the Franciscan formation. This section of the B570 was the most erosion-prone portion of the road, owing mainly to the over steepened configuration of the road and hillslopes and to the gravity of future failures. Prior debris flows had occurred along the road and numerous fractures were present at the time of treatment. Probability for future failures was indeed very high.

In addition to the failure prone road reach, the two stream crossings were also of concern. Both crossings lacked any engineered nature and showed no signs of any designed drainage structure. The first crossing, ANTHRX1, was most grave due to the amount of material located within the stream course. Immediately adjacent to the crossing was a landing and this was likely a large source for both organic debris and fill. The excavation of ANTHRX1 was indeed a challenge owing to the very large proportion of buried organics, both large woody debris and redwood bark. This redwood bark was particularly troublesome owing to its ability to absorb water like a sponge. This, in turn, increased the moisture content of the excavated material and that added to the difficulty of moving the material to a suitable fill site.

The second crossing was displaying a greater degree of failure but also was of considerably smaller size to ANTHRX1. However, this stream course experienced greater flow during wet times, so the material that did fail was immediately delivered to

the system. This crossing was plagued with large sink holes from collapsing road fill. Evidence showed the failures to be very fresh and likely to continue to increase in dimension.

Adjacent to this crossing was a very large landing. The concern for this site was the amount of material that was likely perched above Larry Damm Creek. Evidence showed a very large pile of sidecast woody debris which was buttressing the fill associated with the landing.

Beyond the landing the B570 intersected the Lower B500 Road and the adjacent streamside gradient was shallower. This was also the location of the major fill site, located along the Lower B500.

The last worksite was the culvert along Larry Damm Creek. This was a 4' corrugated metal pipe which was frequently blocked by woody debris transported down Larry Damm Creek during storms. In addition, fish surveys along Larry Damm Creek implicated the culvert as a probable fish barrier. Downstream of this culvert, coho and Chinook salmon have been observed but none have been detected or observed upstream of the culvert. Erosionally, this crossing was not too problematic, but the potential for the culvert to plug was high. Mainly, treating this crossing was considered to be a great benefit to the fisheries of Larry Damm Creek.

Original estimates indicated a lack of suitable fill sites to accommodate all generated fill from the excavation. Consequently, the design called for most of the generated fill to be endhauled out to the main fill site on the Lower B500. Treatment of the road reaches showed the actual excavation volumes to be considerably less than estimated. Thus, all fill generated along the road reaches was able to be stockpiled along the remaining road reach. Actual excavated road reach volumes were less than the original estimates, but the three stream crossing excavations went above estimates. Fortunately, there were no warranted push differentials applied to the contract which helped to offset the increased costs associated with the stream crossing volumes.

Table 1 shows the incurred costs associated with Watershed Restoration Project 04-01.

**Table 1: Summary Table for Watershed Rehabilitation Project 04-01:
Removal of the B570 Road, Anthrop's Landing**

Heavy Equipment Phase:

Treatment	Quantity (yds³)	# of Jobs	Total Costs: Contract	% of Total Project Costs	Unit Costs (\$/yd3)
Outslope (OS)	0	0	\$0.00	0.0%	---N/A---
Export Outslowing (EOS)	3140	3	\$10,048.00	15.5%	\$3.20
Stream/Road Xings (RX)	8699	3	\$39,296.00	60.5%	\$4.52
Misc. Bid Items	---	7	\$6,347.10	9.8%	---
Sub-Total:	11839		\$55,691.10	85.7%	

Project Implementation:

Task	Time (hrs)	Costs	
Mapping	0 *	\$0.00	0.0%
Prescriptions and Layouts	0 *	\$0.00	0.0%
Surveying	12 *	\$287.64	0.4%
Contract Prep	30 *	\$719.10	1.1%
Technical Assistance	0 *	\$0.00	0.0%
H.E. Supervision	240	\$6,145.60	9.5%
Photo Documentation	16 *	\$383.52	0.6%
Report writing	32 *	\$767.04	1.2%
Contract Administration	40 *	\$958.80	1.5%
Sub-Total:	370	\$9,261.70	14.3%
Total Project Costs:		\$64,952.80	100.0%

The costs depicted in Table 1 show the breakdown from heavy equipment and staff. The staff times shown are misleading due to the investment of others. The initial mapping and layouts (times listed as '0') were conducted last year and those times have already been included in previous reports. Unfortunately the ability to delineate these times has gone with the departure of the original geologist on the project.

In addition to the time of staff, the contractor was the only operator on the site. Because the project was relatively small, the contractor felt it in his best interest to work the site by himself. While this proved no detriment to the resource, and the project was completed on time, the lower production rate obligated the government to expend a higher amount of personnel time to maintain heavy equipment supervision. This is reflected in the high percentage of staff costs to total costs---15.1%.

Work Items Narrative:

This project contained 6 work items related to excavations, 3 of these were export outslope prescriptions and the other 3 were stream crossings. The following is a narrative of the work items, by sequence.

EOS 1:

EOS 1 was the first work item and began at the terminus of the 570 road. This terminus marked the boundary between the original 1968 park boundary and privately owned lands

to the east. This section of the 570 was located along the inner gorge of Larry Damm Creek, and was situated on fairly steep hillslopes. Several recent failures were evident along the outboard edge of the road as well as portions of the road showing prominent incipient fractures. The location of the road in relation to Larry Damm Creek resulted in past failures having a 100% delivery rate to the watercourse.

This portion of the 570 was more or less a glorified skid road but its location above Larry Damm Creek warranted being treated. The road was initially brushed open using the Cat® D8H bulldozer. Once the brushing was complete, the Hitachi® EX220 excavator began removing the outboard edge of the road. Due to the road's location along the inner gorge, the original estimate included the possibility of retrieving a greater amount of sidecast should underlying conditions warrant. However, once excavation began, it became very apparent that there was no need to disturb the bulk of vegetation that had established itself between the road and Larry Damm Creek. Consequently, the estimated volume for this work item was considerably less than the actual.



The production rate for EOS 1 was relatively low for an EOS treatment. This production rate, 55.7 yd³/hr, was influenced both by the nature of the excavation, being done completely by the excavator and the amount of vegetation that was present along the roadway. This excavation was most similar to an outslowing prescription but because of the size of the road and the amount of work required to open the road, it was recognized as appropriate for EOS rates.

ANTHRX1/EOS2:

ANTHRX1 and EOS2 are joined together in the narrative owing to the nature of both work items were derived from one large landing built adjacent to and within a stream

course. These were for the most part identified and surveyed out as separate work items, but the excavation of the two was rather homogenous and separating out the work times for each work item was a challenge. Often excavation of dry material associated with EOS2 was done in harmony with the crossing material in order to reduce overall moisture in the material and make for easier handling of excavated material. Consequently, equipment would often work both work items simultaneously and would not allow for very accurate recording of absolute times. Nonetheless, this was attempted and production rates for the 2 work items were calculated. A better statistic would be to look at the two combined.

ANTHRX1, the first stream crossing treatment, required the excavation of a large landing that was constructed at the bottom of a draw. This crossing/landing was located right above Larry Damm Creek. No drainage structure was located within the crossing and considerable flow was diverted over the crossing and down the outboard edge of the road. This had resulted in gullying of the outboard edge of the road. The close proximity of Larry Damm Creek resulted in 100% delivery of eroded sediment.

ANTHRX1 allowed for the use of the Cat® D8H bulldozer to do considerable amount of dishing of the crossing. However, unlike EOS1, all fill had to be pushed down the 570 to the prominent landing associated with EOS3. This push, approximately 250 feet, resulted in a reduced production rate, even though the bulldozer was able to move the material. In addition, the initial workspace was very confined owing to the amount of vegetation. Clearing the vegetation required suitable sites to stockpile and most of those sites were located within the work zone. Thus the contractor chose to keep things relatively confined in order to establish finished areas which would then be stockpiles with vegetation.



Major dilemmas associated with this excavation were uncovering the channel bottom and the lack of channel definition on the right side of the crossing. The channel bottom was difficult to determine owing to the amount of material that had been pushed out on to the flood plain of Larry Damm Creek and the absence of a drainage structure within the crossing. Since flow was diverted over the crossing, it had gullied the outboard edge and developed a channel below the road and out to Larry Damm Creek. This was taken as a default for the design of the excavated channel which proved to be incorrect. The actual

channel was located farther to the left and this added difficulty due to having to remove more vegetation and relocate previously cleared vegetation to remove underlying fill. All this occurred in a very restricted workspace. In addition, as the excavation progressed, the moisture of the underlying material increased considerably, though never reached saturated conditions. This added to the difficulty in pushing the material to the distant fill site at EOS3. Much of this moisture was attributed to the large amount of buried woody debris and redwood bark which acted like a sponge. Approximately 25% of the excavated volume was composed of this woody debris. This material likely comprised over 25% of the excavated material.

EOS2 was the remaining portion of the landing and dealt with the portion that was located between ANTHR1 and ANTHR2, the other stream crossing on the 570 road. EOS2 was a rather straight forward excavation, and was composed of relatively dry sidecast fill. However, this portion of the landing contained a high percentage of buried organic material and concerns of future failure warranted the treatment of this portion of the landing.

Initially, the landing associated with EOS2 was used as a temporary site for stockpiling organic debris removed for the treatment of ANTHR1. The contractor planned to design the channel bottom of ANTHR1 and then, once a portion of the crossing was complete, use this as the final place for dispersing the stockpiled organics. However, because of the unfortunate challenge of uncovering the channel of ANTHR1, the excavation of EOS2 became complicated, mainly due to the burden of the stockpiled organics. The contractor hoped to keep the stockpiled organics close to the channel bottom for easy retrieval and dispersal but as excavation of ANTHR1 indicated the channel was more left than originally designed, much of the organics had to be moved to facilitate the excavation. This caused the worksite to get cluttered and impeded production. In addition, the extra handling of the organic material took extra time and this compromised the contractor's production.

All excavated material from EOS2 went to the same fill site as ANTHR1. This allowed the excavation of both of these sites to be done in harmony. An example would be the excavator utilizing dry material from the landing along EOS2 along with moist material excavated from the moist crossing of ANTHR1. This was often done by digging a few buckets of the crossing material and then swinging around and scooping up a bucket or two of the dry material. This would lower the overall moisture content of the excavated material, making it more easily pushed to the distant fill site associated with EOS3.

ANTHR2:

ANTHR2 was a moderate stream crossing along the 570 road. This crossing had showed prominent signs of failure, developing large sink holes that were actively eroding. This crossing lacked any drainage structure, instead flow was piped through the fill by the large quantity of buried woody debris.

Excavation of ANTHR2 was pretty straightforward. Much of the initial excavating was performed by bulldozer and the fill site was closely located. However, the calculated production rate of 52.3 yd³/hr needs to be explained. The production rates of ANTHR1, EOS2 and ANTHR2, are 63.3 yd³/hr, 76.2 yd³/hr, and 52.3 yd³/hr, respectively. Since ANTHR2 is both closer to the fill site and much of the material was handled by bulldozer, the numbers seem to be very anomalous.

One of the noticeable effects of pushing material from ANTHR1 and EOS2 across ANTHR2 to the fill site at EOS3 was the elevating of the road prism along ANTHR2. As material was deposited at EOS3, this caused the push ramp to rise and this in turn was deposited in part along ANTHR2. When the bulldozer began to remove this elevated prism, it was documented as working in ANTHR2 when in reality it was still moving material from both ANTHR1 and EOS2.

Another factor that impeded production was the fill site itself. Having taken the muddy material from ANTHR1, it became very difficult push material into the fill site. In addition, the fill site had also taken a fair amount of material and the push from ANTHR2 was not gentle but had a greater steepness. This steepness, in conjunction with the muddy base, greatly slowed down production.

The overall production for ANTHR1, EOS2 and ANTHR2 is 61.9 yd³/hr. Considering the push distances, moisture contents, and vegetation issues, this is a decent production rate.

EOS3:

EOS3 treated the last prominent landing on the 570 road. The outboard edge of this landing was perched above Larry Damm Creek and this portion of the landing contained a high percentage of buried organic debris. This material was showing outward signs of decay, represented by slumps, cracks, and minor scarps. This material posed a direct delivery to Larry Damm Creek.

The treatment of the landing associated with EOS3 was considerably easier than anticipated. Original estimates indicated excavation bottoms extending down to Larry Damm Creek but that proved to be too ambitious. Fortunately, the actual excavations were much shallower, allowing for the retention of a fair portion of the existing riparian vegetation. In addition, much of the large woody debris was located along the original surface so much of it was able to remain relatively undisturbed.



These photos were taken from the intersection of the 570 and Lower B500 roads. Large vegetation pile in top left photo needed to be relocated to accommodate additional fill from down station work items. Top right photo shows bulldozer atop of growing fill pile. Bottom left photo shows finished surface, with groomed fill site and dispersed vegetation. Note that most of the finished surface is fill site and not recently excavated side slopes.

The production rate for EOS3 also requires explanation. As with ANTHRX2, additional factors played heavily in on the production rate of EOS3. The most impacting factor was the amount of stockpiled vegetation that resulted from clearing the landing and fill site. This vegetation was pushed to the outboard edge of the landing, and eventually became a big obstacle. This required a portion of the fill site to be groomed and prepped for the vegetation and then spreading it. Because the fill site was rather expansive, there was a large area requiring dressing and grooming. And, finally, much of the fill site was very rough due to the attempts to work the site while covered in moist material (spoils from ANTHRX1). Clearly, the dressing and finishing of the fill site was time spent on all the work items which utilized the fill site (ANTHRX1, EOS2, ANTHRX2, and EOS3), but there was no real logical way to break out the times. Consequently, all time spent finishing the sill site was 'billed' to EOS3.

CULVERT 1:

CULVERT 1 was the final work item on the project and also the final work for the immediate future in Larry Damm Creek. CULVERT 1 crossing is also the last obstructed

crossing on Larry Damm Creek and its removal will hopefully herald in fish passage to the upstream portions of Larry Damm Creek. This crossing was constructed using a 48'' corrugated metal pipe. This crossing experienced frequent blocking by woody debris transported down Larry Damm Creek during storms. In addition, fish surveys along Larry Damm Creek implicated the culvert as a probable fish barrier. Downstream of this culvert, coho and Chinook salmon have been observed but none have been detected or observed upstream of the culvert. Erosionally, this crossing was not too problematic, but the potential for the culvert to plug was high. Excavation and treatment of this site was a benefit predominately to the fisheries of Larry Damm and Lost Man Creeks.



Excavation of CULVERT 1 was initially performed exclusively with the Cat® D8H bulldozer. The initial surface of road rock was scraped off and bladed along the remaining portion of the Lower B500 road while the underlying fill was pushed into the fill site on the treated side of the crossing. This fill was evenly spread along the old road surface of the Lower B500, located east of the B570 intersection. The Cat® D8H bulldozer worked almost exclusively on the crossing, until the culvert was uncovered at which time the excavator was used.

The final portion of the excavation required diverting the flow of Larry Damm Creek around the excavation. This measure, as well as the electroshocking of the work area of Larry Damm Creek, was necessary to protect aquatic species. Before the crossing was pumped and the culvert pulled everything on the opposite side (east side) of the crossing,

needed to be completed. The fill site along the treated portion of the Lower B500 was finished and dressed with woody debris and the left side of the crossing completed. Once that was done, the pumps were started and the culvert was removed.

After excavation, the culvert was flattened and buried. The entire surface of CULVERT 1 was winterized with straw for erosion control. This straw had been used to construct barriers in Larry Damm Creek to keep fish from swimming into the work site. After excavations were completed, the straw was recovered and spread along the finished surface.

Production on CULVERT 1 also warrants explanation. First, while most of the crossing was excavated using the Cat® D8H bulldozer, the material needed to be pushed into the fill site east of the crossing. This required a push of approximately 200 feet. In addition, a large area was exposed which needed to be dressed and finished by the excavator. These two factors helped to take a large amount of time. Finally, the last portion of the fill being excavated around the pipe needed to be pushed out to the fill site. The worksite at this time was very confined and required one piece to wait while the other worked.

Summary Table for Watershed Rehabilitation Project 04-01:
Removal of the B570 Road, Anthrop's Landing

		ACTUAL				Equipment Hours				Production	COSTS			
Bid	Item	Estimated	Excavation	Unit	Unit Price		Cat	Hitachi	Cat		Rate	Original	Final	
Item	Title	Volume (yds ³)	Volume (yds ³)	Length (ft)	Contract	Final	D8H	220	235	TOTAL	(yds ³ /hour)	Contract	Contract	Modification
1	Equipment Move In	1 job	100%	N/A	\$665.00	\$1,549.00	N/A	N/A	N/A	N/A	---NA---	\$665.00	\$1,549.00	\$884.00
1a.	Bonding	1 job	0%	N/A	\$1,530.00	\$1,530.00	N/A	N/A	N/A	N/A	---NA---	\$1,530.00	\$0.00	-\$1,530.00
1b.	Walking Equipment	1 job	100%	N/A	\$453.75	\$329.55	N/A	N/A	N/A	N/A	---NA---	\$453.75	\$329.55	-\$124.20
1c.	Stream Diversion	1 job	100%	N/A	\$500.00	\$500.00	N/A	N/A	N/A	N/A	---NA---	\$500.00	\$500.00	\$0.00
2	Equipment Move Out	1 job	100%	N/A	\$665.00	\$3,639.00	N/A	N/A	N/A	N/A	---NA---	\$665.00	\$3,639.00	\$2,974.00
2b.	Walking Equipment	1 job	100%	N/A	\$453.75	\$329.55	N/A	N/A	N/A	N/A	---NA---	\$453.75	\$329.55	-\$124.20
2c.	Winterization	1 job	0%	N/A	\$500.00	\$500.00	N/A	N/A	N/A	N/A	---NA---	\$500.00	\$0.00	-\$500.00
3	EOS 1	1004	654	341	\$3.20	\$3.20	2.75	9.00	0.00	11.75	55.7	\$3,212.80	\$2,092.80	-\$1,120.00
3a	Push Differential (300')	824	0	---NA---	\$2.25	\$2.25	0.00	0.00	0.00	0.00	N/A	\$1,854.00	\$0.00	-\$1,854.00
4	ANTRX1	3333	5346	102	\$4.00	\$4.50	38.75	20.75	25.00	84.50	63.3	\$13,332.00	\$24,057.00	\$10,725.00
4a	Push Differential (200')	3000	0	---NA---	\$1.50	\$1.50	0.00	0.00	0.00	0.00	N/A	\$4,500.00	\$0.00	-\$4,500.00
5	EOS 2	1645	1258	72	\$3.20	\$3.20	8.00	0.50	8.00	16.50	76.2	\$5,264.00	\$4,025.60	-\$1,238.40
5a	Push Differential (200')	1478	0	---NA---	\$1.50	\$1.50	0.00	0.00	0.00	0.00	N/A	\$2,217.00	\$0.00	-\$2,217.00
6	ANTRX2	881	1505	89	\$4.60	\$4.60	19.75	6.00	4.25	30.00	52.3	\$4,052.60	\$6,923.00	\$2,870.40
7	EOS 3	2717	1228	242	\$3.20	\$3.20	4.75	6.25	11.25	22.25	55.2	\$8,694.40	\$3,929.60	-\$4,764.80
8	CULVERT 1	972	1848	158	\$3.71	\$4.50	17.00	16.00	0.00	33.00	56.0	\$3,606.12	\$8,316.00	\$4,709.88
---	IDLE	---NA---	---NA---	---NA---	---NA---	---NA---	37.50	74.75	86.75	199.00	---NA---	---NA---	---NA---	---NA---
---	WALK	---NA---	---NA---	---NA---	---NA---	---NA---	0.00	0.00	0.00	0.00	---NA---	---NA---	---NA---	---NA---
---	FUEL	---NA---	---NA---	---NA---	---NA---	---NA---	0.00	0.00	0.00	0.00	---NA---	---NA---	---NA---	---NA---
---	SERVICE	---NA---	---NA---	---NA---	---NA---	---NA---	0.00	0.00	0.25	0.25	---NA---	---NA---	---NA---	---NA---
---	DOWN	---NA---	---NA---	---NA---	---NA---	---NA---	9.50	5.25	3.00	17.75	---NA---	---NA---	---NA---	---NA---
---	DISCUSSION	---NA---	---NA---	---NA---	---NA---	---NA---	0.00	0.00	0.00	0.00	---NA---	---NA---	---NA---	---NA---
Totals:		10552	11839	1004			91.00	58.50	48.50	198.00	TOTALS:	\$51,500.42	\$55,691.10	\$4,190.68

Table 2: Summary Table for Stream Crossing Excavations, Watershed Rehabilitation Project 04-01:
Removal of the B570 Road, Anthrop's Landing

		ACTUAL													
Bid Item	Item Title	Estimated	Excavation	Unit			Equipment Hours				Production	COSTS			
		Volume	Volume	Length	Unit Price		Cat	Hitachi	Cat	TOTAL	Rate	Original	Final	Modification	
		(yds ³)	(yds ³)	(ft)	Contract	Final	D8H	220	235		(yds ³ /hour)	Contract	Contract		
4	ANTRX1	3333	5346	102	\$4.00	\$4.50	38.75	20.75	25.00	84.50	63.27	\$13,332.00	\$24,057.00	\$10,725.00	
4a	Push Differential (200')	3000	0	---NA---	\$1.50	\$1.50	0.00	0.00	0.00	0.00	N/A	\$4,500.00	\$0.00	-\$4,500.00	
6	ANTRX2	881	1505	89	\$4.60	\$4.60	19.75	6.00	4.25	30.00	52.31	\$4,052.60	\$6,923.00	\$2,870.40	
8	CULVERT 1	972	1848	158	\$3.71	\$4.50	17.00	16.00	0.00	33.00	56.00	\$3,606.12	\$8,316.00	\$4,709.88	
							75.50	42.75	29.25						
Totals:		5186	8699	349								Totals:	\$25,490.72	\$39,296.00	\$13,805.28

Table 3: Summary Table for Export Outslope Excavations, Watershed Rehabilitation Project 04-01:
Removal of the B570 Road, Anthrop's Landing

Bid Item	Item Title	ACTUAL					Equipment Hours				Production Rate (yds ³ /hour)	COSTS		
		Estimated Volume (yds ³)	Excavation Volume (yds ³)	Unit Length (ft)	Unit Price		Cat D8H	Hitachi 220	Cat 235	TOTAL		Original Contract	Final Contract	Modification
					Contract	Final								
3	EOS 1	1004	654	341	\$3.20	\$3.20	2.75	9.00	0.00	11.75	55.66	\$3,212.80	\$2,092.80	-\$1,120.00
3a	Push Differential (300')	824	0	---NA---	\$2.25	\$2.25	0.00	0.00	0.00	0.00	N/A	\$1,854.00	\$0.00	-\$1,854.00
5	EOS 2	1645	1258	72	\$3.20	\$3.20	8.00	0.50	8.00	16.50	76.24	\$5,264.00	\$4,025.60	-\$1,238.40
5a	Push Differential (200')	1478	0	---NA---	\$1.50	\$1.50	0.00	0.00	0.00	0.00	N/A	\$2,217.00	\$0.00	-\$2,217.00
7	EOS 3	2717	1228	242	\$3.20	\$3.20	4.75	6.25	11.25	22.25	55.19	\$8,694.40	\$3,929.60	-\$4,764.80
										50.50				
Totals:		5366	3140	655							Totals:	\$21,242.20	\$10,048.00	-\$11,194.20