

The City of Chilliwack 2007 Ditch Maintenance Program Environmental Monitor's Report



**Prepared for:
The City of Chilliwack**

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**Nova Pacific
Environmental**

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1. Introduction

In 2007, the City of Chilliwack retained Nova Pacific Environmental (NPE) to conduct fish salvage and monitor its annual ditch maintenance program. In addition, NPE provided pre and post stream assessments for these systems in accordance with terms set out in the Department of Fisheries and Oceans Authorization (Referral File No. 05-HPAC-PA2-000-000211).

The 2007 DFO Authorization was valid from July 30th, 2007 to September 30th, 2007 and included 24 systems. Seventeen of the 24 systems were designated as fish-bearing.

Three of the Chilliwack drainage systems projected for maintenance in 2007 potentially support populations of the endangered Salish Sucker *Catostomus catastomus*. As this species is protected under federal jurisdiction (DFO) through the Species at Risk Act, special permits were applied for and acquired prior to conducting salvage and subsequent maintenance work in these areas (Permit Number SECT 07 SCI 029).

2. Background

The City of Chilliwack conducts annual ditch maintenance on a rotational basis. The drainage capacity of watercourses in this area is reduced by the accumulation of sediment and instream vegetation. As a result, specific sections of drainage systems are maintained once every two to four years. Excavated materials are removed by machine from the channels and side cast or taken off site. In-stream work on fish-bearing systems is limited to periods when spawning salmonids, eggs, alevins, or emergent fry are typically absent. The streams that are maintained include creeks, ditches, sediment traps, or other altered watercourses. These systems may support various life stages of salmonids and other significant fish species if water quality and quantity issues do not prevent access.

Best Management Practices were outlined within the conditions of the DFO Authorization and were followed throughout the excavations. Water temperature and dissolved oxygen concentrations were measured in each watercourse, before and after cleaning as per DFO authorization. Pre-maintenance assessment was completed in the two-week period prior to ditch maintenance works. Post maintenance assessment was undertaken after channel conditions had stabilized following completion of works to approximately one month after the Authorization work window.

The standard set of parameters collected for each stream included dissolved oxygen (DO), turbidity, water temperature, adjacent land use, channel characteristics and the condition of the riparian vegetation. Oxygen and temperature readings were taken using an YSI oxygen meter. Relative turbidity (measured in nephelometric

turbidity units (NTU's)) was measured using an Orbeco-Hellige portable turbidity meter; both meters were calibrated prior to taking readings.

Pre-assessment fish presence/absence was determined by using Gee traps, or visual observation combined with water quality data and previous knowledge of the system and the City of Chilliwack's watercourse classification map. If fish were present or if presence remained uncertain, spot electro-fishing was conducted in the system by a certified crew prior to commencing maintenance works. Fish salvaging was completed using a Halltech or Smith-Root backpack electro-fisher. Salvaged fish were transported to upstream locations of suitable habitat within the same system. NPE fish salvage crews also salvaged lamprey eels, amphibians, and crayfish where possible.

In some fish-bearing systems, hand pre-clearing of vegetation was undertaken to allow access for the electro-fishing crew and to improve fish salvage results. City machines undertook some of the pre-cleaning work by mowing overhanging vegetation. As in previous years, riparian and instream vegetation was dominated by reed canary grass (*Phalaris arundinacea*) and Himalayan blackberry (*Rubus discolor*). Native trees and shrubs were left undisturbed by the machine operator where possible.

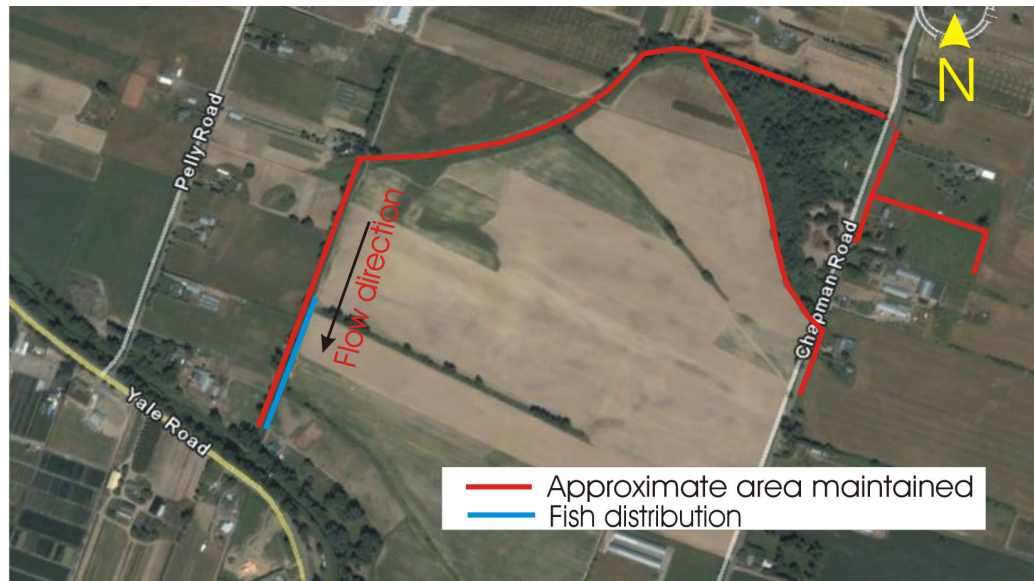
Silt fences or gravel check dams lined with filter cloth were installed at the downstream end of maintenance areas to reduce the effects of increased turbidity caused by the excavations. To isolate the area prior to fish salvage, 0.5 cm mesh fish nets or fences were placed upstream of the silt fences as well as at the upstream end of the fish salvage area. The monitor ensured that the operators followed permit specifications and that silt fences were maintained for continued effectiveness. Regular turbidity readings were also taken downstream of the silt fences at all sites throughout the duration of works. Modifications to maintenance procedures were requested when necessary.

3. Pre and Post Assessment, Monitoring and Fish Salvage

Below is a list of the systems that underwent machine maintenance in 2007, along with fish salvage details and pre and post-assessment data for each system. Part-time environmental monitoring was carried out on the non-fish-bearing watercourses found in Schedule A of the DFO authorization.

3.1 Rae Ditch

Figure 1.



Instream sediment and vegetation was removed from the stream channel from the area indicated in figure 1.

Water quality data from Rae Ditch showed marginal dissolved oxygen levels not conducive to high salmonid productivity (Table 2). Prior to maintenance, spot electro-fishing was undertaken throughout the system to determine fish presence/absence. The fish salvage crew encountered salmonids only within the initial 300 m of the confluence with Hope Slough.

Table 1. Key Biophysical Parameters of Rae Ditch, Pre and Post Maintenance, 2007.

Parameter	Before (July 19)	After (Aug. 14)
DO (%)	4.07	4.37
DO (mg/l)	39.5	39.6
Turbidity (NTUs)	10.3	12.2
Temperature (°C)	14.2	17.4
Wetted Width (m)	1.75	2.0
Wetted Depth (m)	0.35	0.55
Flow (m/s)	low	med
Substrate	organic fines	organic fines

3.2 Nevin Creek

The projected work on Nevin Creek called for the excavation of the sediment trap and creek section immediately downstream of the sediment trap for a distance of 1400m. Ultimately, only the sediment trap was excavated (Photo 1) due to the discovery of a population of tailed frogs (*Ascaphus truei*) within the creek section. As this species and its habitat is protected under federal and provincial jurisdiction, the monitor immediately halted works upon its discovery. The tailed frogs were encountered while electro-fishing the creek section immediately downstream of the sediment trap. A total of four specimens were captured from the area and released un-harmed. The environmental monitor contacted the relative representatives from the Ministry of Environment (MoE) and the DFO and informed them of the previously un-documented population of frogs. As a result, a site meeting was arranged with the environmental monitor, Chilliwack's public works supervisor, an endangered species specialist from the MoE, and a habitat biologist from the DFO. During the course of the meeting, discussions were held regarding the implementation of an environmental management plan for future drainage maintenance work at Nevin Creek.

No tailed frogs were encountered while salvaging the sediment trap at Nevin Creek. Several electro-fishing passes were carried out within the sediment trap until fish salvage numbers had been reduced to zero.

Water quality at Nevin Creek is highly favourable as its headwaters originate from a densely forested, high-gradient watershed resulting in relatively cool, oxygen-rich water.

DFO authorization conditions that relate to compensatory habitat at Nevin Creek were not carried out as the majority of the scheduled work was not undertaken.

Figure 2.

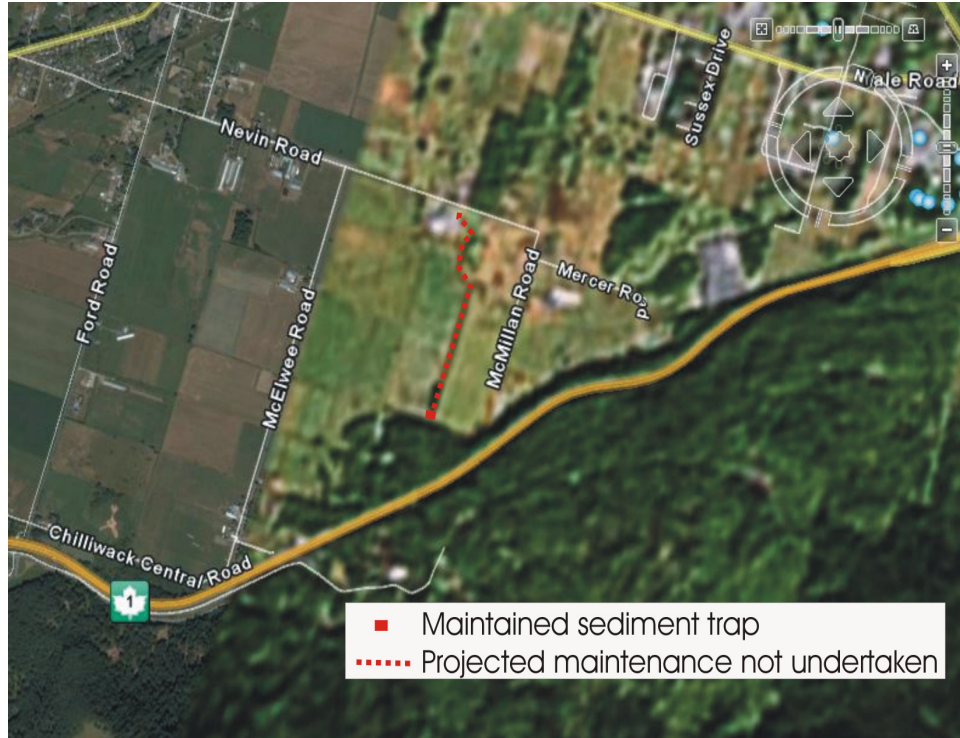


Table 2. Fish Salvage Data from Nevin Creek Sediment Trap 2007

Species	Number Salvaged
Coho	155
Cutthroat Sculpin	32 6

Table 3. Key Biophysical Parameters of Nevin Creek Sediment Trap, Pre and Post Maintenance, 2007.

Parameter	Before (July)	After (Aug.)
DO (%)	108.8	104.7
DO (mg/l)	11.75	10.61
Turbidity (NTUs)	4.01	4.4
Temperature (°C)	11.7	12.4
Wetted Width (m)	~1.5	3
Wetted Depth (m)	~.35	1.5
Flow (m/s)	med	med
Substrate	50% fines 50% gravel	60% fines 40% gravel

Photo 1. Nevin Creek sediment trap during excavation.



3.3 Gillespie Ditch

Instream sediment and vegetation was removed from the watercourses' confluence with Big Ditch, upstream for approximately 500m (Figure 3). Gillespie Ditch is surface water-fed. Recent and historic water quality data collected during summer months indicates that this system may only support rearing salmonids during winter months. The fish salvage crew electro-fished in the first 50m of Gillespie Ditch starting at the confluence with Big Ditch. No salmonids or other fish species were captured. A down-graded re-classification from Class A to Class A (over-wintering) has been requested by the City.

Figure 3.



Table 4. Key Biophysical Parameters of Gillespie Ditch, Pre and Post Maintenance, 2007.

Parameter	Before (July 29)	After (Aug 31)
DO (mg/l)	2.10	2.22
DO (%)	24.9	25.7
Temperature (°C)	18.7	19.3
Turbidity (NTU)	12.6	19
Wetted Width (m)	1.2	1.5
Wetted Depth (m)	.4	.6
Flow	low	low
Substrate	fines	fines

3.4 Carl Creek East

The projected work at Carl Creek called for the removal of instream sediment and vegetation from its confluence with Chilliwack Creek, upstream for a total length of 500m. Ultimately, only 200m of the downstream segment underwent drainage maintenance works (Figure 4). Machinery access issues associated with large trees in the upper 300m segment prevented excavation in the upstream area.

Figure 4.



Table 5. Fish salvage data from Carl Creek East 2007.

Species	Number Salvaged
Coho	79
Cutthroat	3
Total	82

Table 4. Key Biophysical Parameters of Carl Creek East, Pre and Post Maintenance, 2007.

Parameter	Before (July 29)	After (Aug 31)
DO (mg/l)	5.19	5.1
DO (%)	49.7	48.8

Temperature (°C)	17.7	18.3
Turbidity (NTU)	13.6	18
Wetted Width (m)	1.6	1.9
Wetted Depth (m)	.4	.8
Flow	low	low
Substrate	finer	finer

3.4 Kropp Ditch

Instream sediment and vegetation was removed from Kropp Ditch from Interception Ditch, upstream for a total length of 2000m (Figure 5). The ditch was found to be dry at the time of pre-maintenance data collection and fish salvage. An outfall drop of approximately 1.2m exists at the ditch’s confluence with Interception Ditch. The drop likely acts as a year-round fish barrier. This ditch is currently classified as year-round fish-bearing. Re-classification is recommended based on the ephemeral nature of the ditch, its lack of head-waters, and the permanent fish passage barrier.

Figure 5.



3.5 Interception Ditch-East

In-stream sediment and vegetation was removed from the channel from Banford Road, upstream for a total distance of 800m (Figure 6). The lower reaches of Interception Ditch have historically produced Salish Sucker. However, no historic fish

salvage data for the projected upper, eastern-most reach was available. As a result, this office included this reach of Interception Ditch in a SARA permit application in the event that Salish Sucker were encountered during salvage or associated maintenance work. Extremely low water quality values, particularly dissolved oxygen, encountered during 2007 pre-maintenance stream data collection (Table 5) precluded the need for fish salvage.

Figure 6.

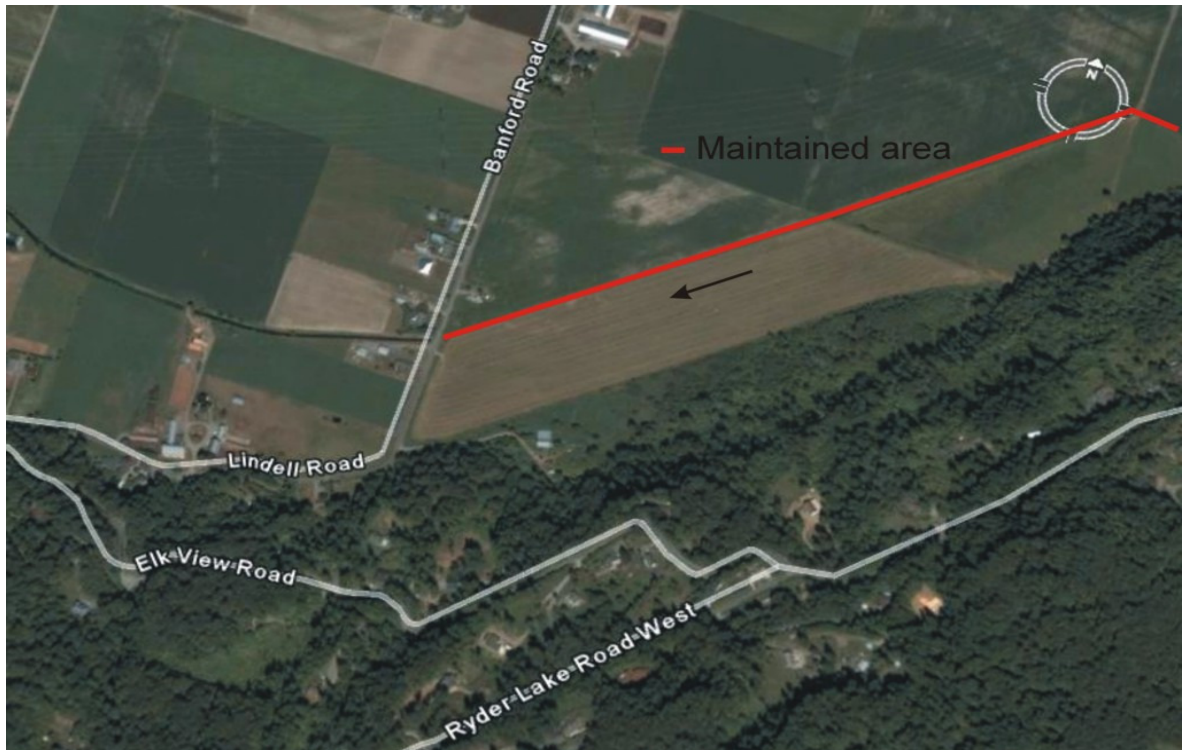


Table 5. Key Biophysical Parameters of Interception Ditch, Pre and Post Maintenance 2007.

Parameter	Before (Aug. 2007)	After (Sept. 2007)
DO (%)	<15	25.3
DO (mg/l)	--	2.45
Turbidity (NTUs)	22.2	14.3
Temperature (°C)	16.8	15.4
Wetted Width (m)	~1.5	2
Wetted Depth (m)	~.45	.65
Flow (m/s)	low	low
Substrate %	100 fines	100 fines

3.6 Lateral B of Stewart Creek

Instream sediment and vegetation were removed from the channel from Stewart Creeks' confluence with Branch A, upstream for distance of 700m (Figure 7). Comprehensive fish salvage was conducted from the Branch A confluence, upstream to Wilson Road. At this point the channel passes under Wilson Road, veers sharply to the south, and becomes Wilson Road Ditch. Connectivity and general degradation of habitat and water quality (<15% dissolved oxygen) to that portion of Stewart Creek cited in the authorization as Top End of Branch A precluded the need for fish salvage in the reach.

Figure 7.



Table 6. Key Biophysical Parameters of Lateral B- Stewart Creek (West of Wilson Road) Pre and Post Maintenance, 2007.

Parameter	Before (Aug. 30)	After (Sept. 15)
DO (mg/l)	5.39	5.6
DO (%)	50.6	54.9
Temperature (°C)	12.4	12.0
Turbidity (NTU)	1.6	7.1
Wetted Width (m)	1.8	1.1
Wetted Depth (m)	1.1	1.2
Flow	med.	med.
Substrate %	95 fines 5 gravel	95 fines 5 gravel

Table 8. Fish Salvage Data from Lateral B- Stewart Creek (West of Wilson Road), 2007.

Species	Number Salvaged
Coho	589
Cutthroat	221
Stickleback	4
Lampetra Sp.	>500
Crayfish	11
Sculpin	2
Total	827 (excluding Lampetra Sp.)

3.7 Big Ditch

In-stream vegetation and fine sediment was removed from the channel from Prairie Central Road, upstream for a distance of 1200m (Figure 8). Turbidity downstream of works was kept below 75 NTUs by the installation of a gravel check dam lined with geo-textile clothe (Photo 2). Banks were mowed and the monitor ensured that no desirable native riparian species were lost (Photo 3). Gravel weirs installed in previous years remained in tact and the monitor ensured that they were not excavated (Photo 4). Prior to undertaking fish salvage, the stream channel was cleared of instream vegetation that would otherwise hamper fish salvage efforts (Photo 5). This was achieved by using light equipment and hand tools. Big Ditch is a highly productive trout and salmon producer and also supports a population of the SARA listed Salish Sucker *Catostomus catostomus* in its lower reaches. Details pertaining to Big Ditch Salish Sucker associated with the 2007 works can be found in Appendix 3 of this report.

Figure 8.

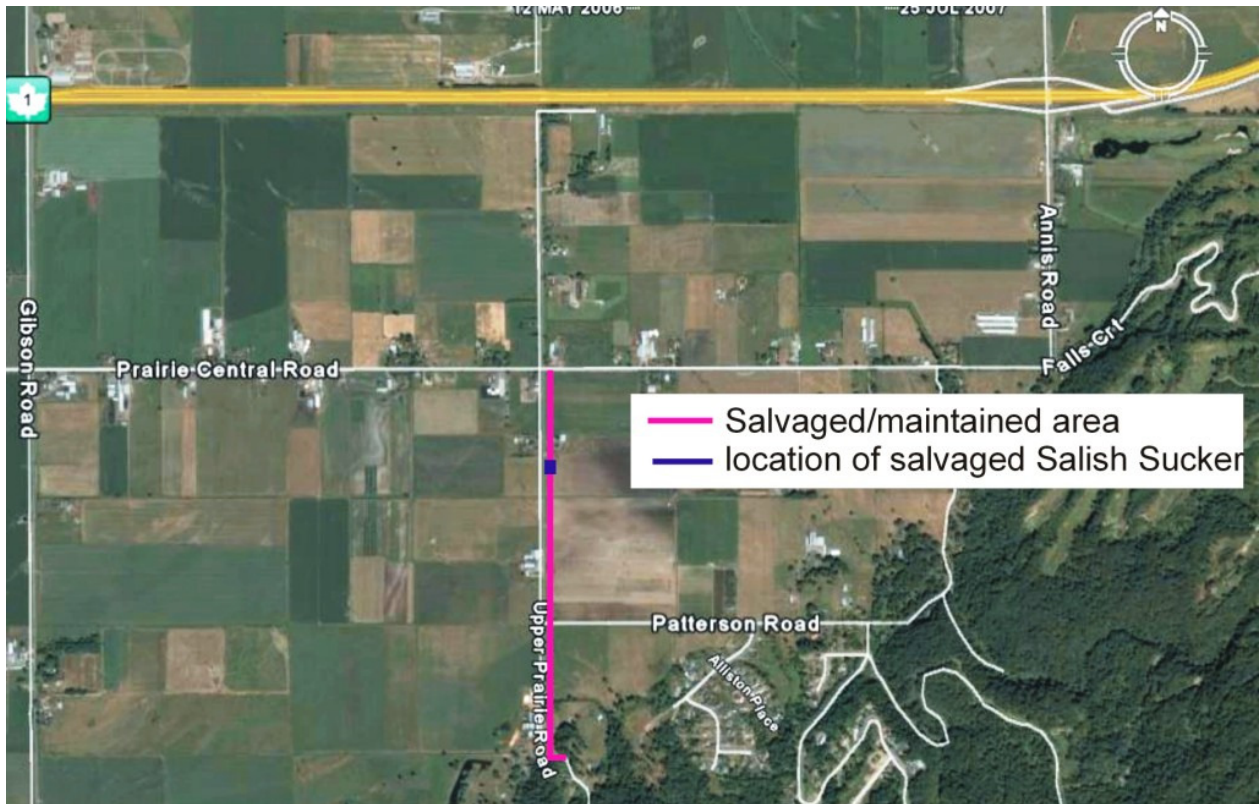


Table 9. Key Biophysical Parameters of Big Ditch Pre and Post Maintenance, 2007.

Parameter	Before (Aug. 2007)	After (Sept. 2007)
DO (%)	98.7	104
DO (mg/l)	10.4	11.39
Turbidity (NTUs)	1.1	2.1
Temperature (°C)	13.1	12.4
Wetted Width (m)	1.45	1.75
Wetted Depth (m)	0.55	0.65
Flow (m/s)	low/med	med
Substrate %	90 organic fines 10 gravel	90 organic fines 10 gravel

Table 10. Fish Salvage Data from Big Ditch, 2007

Species	Number Salvaged
Coho	566
Cutthroat	103
Stickleback	66
Lampetra Sp.	43
Salish Sucker	1
Sculpin	9
Crayfish	4
Red-legged Frog	2
Total	794

Photo 2. Turbidity control measures at downstream end of maintenance area.



Photo 3. Native riparian trees left intact after bank mowing.



Photo 4. Gravel weir left intact after channel excavation (centre frame).



Photo 5. NPE field crew pre-clears vegetation to allow for effective fish salvage.



3.8 Marble Hill Creek

Fine sediment and in-stream vegetation was removed from the channel from the creeks' confluence with Big Ditch, upstream for a distance of 900m (Figure 9). Pre-clearing of some in-stream vegetation was required at this site to allow for effective fish salvage. A series of three sediment traps near the top end of the authorized work area were also excavated. The implementation of an environmental management plan that addresses the need for streamside planting, livestock watering stations, and improving flow complexity would greatly improve Marble Hill Creek's functionality as salmon and trout habitat.

Figure 9.



Table 10. Key Biophysical Parameters for Marble Hill Creek, 2007.

Parameter	Before (July 13)	After (Sept 7)
DO (mg/l)	0.54	5.39
DO (%)	4.97	50.4
Temperature (°C)	17.5	12.8
Turbidity (NTU)	22.7	10.7
Wetted Width (m)	1.5	1.5
Wetted Depth (m)	0.4	0.5
Flow	low	low
Substrate	fines	fines

Table 11. Fish Salvage Data from Marble Hill Creek, 2007.

Species	Number Salvaged
Coho	438
Cutthroat	109
Stickleback	65
Lampetra Sp.	>500
Total	612 (excluding Lampetra Sp.)

3.8 Wilson Road Ditch

Instream sediment was removed from the stream channel from Majuba Hill Road downstream for a total length of approximately 200m (Figure 8). The work area was isolated with stop nets and fish salvage was undertaken. Gravel sections within the maintained area of Wilson Road Ditch were left intact as suggested by the monitor.

Figure 8.



Table 11. Key Biophysical Parameters at Wilson Road Ditch, 2007.

Parameter	Before (July)	After (Sept)
DO (mg/l)	10.67	8.46
DO (%)	109.2	77.8
Temperature (°C)	16.5	11.7
Turbidity (NTU)	1.2	0.7
Wetted Width (m)	1.55	1.55
Wetted Depth (m)	0.15	0.25
Flow	high	high
Substrate %	90 sand 10 gravel	90 sand 10 gravel

Table 12. Fish Salvage Data from Wilson Road Ditch, 2007.

Species	Number Salvaged
Coho	68
Cutthroat	58
Total	126

3.9 Teskey Creek Sediment Trap

Instream sediment and vegetation was removed from approximately 40 linear metres of the sediment trap on Teskey Creek. Prior to cleaning, electro fishing was undertaken throughout the reach to determine fish presence/absence. No fish were encountered. Though this segment of watercourse offers good riparian cover, marginal water quality may account for the lack of fish use during summer months. Post-maintenance data collection occurred following a significant rain event and this may account for improvements in water quality parameters.

Figure 9.



Table 13. Key Biophysical Parameters of the Teskey Creek Sediment Trap, Pre and Post Maintenance, 2007.

Parameter	Before (July)	After (Sept)
DO (mg/l)	6.13	6.29
DO (%)	54.6	59.8
Temperature (°C)	17.1	13.8
Turbidity (NTU)	7.8	51.0
Wetted width (m)	1	3
Wetted Depth (m)	0.75	1
Flow	low	low
Substrate %	100 fines	100 fines

3.10 Bailey Ditch

Instream sediment and vegetation was removed from the watercourse from its confluence with interception ditch, upstream for approximately 2700m. Given the significant length of the area to be maintained, a total of three silt control fences were installed to keep turbidity below the safe limit set out by the DFO. A potential barrier to fish passage exists at Bailey Ditch's confluence to Interception Ditch in the form of a cement weir that creates a .6m drop at low summer flows. This may account for limited fish salvage results within the maintained section (Table 17).

Figure 10.



Table 14. Key Biophysical Parameters of Bailey Ditch, Pre and Post Maintenance, 2007.

Parameter	Before (July)	After (Sept)
DO (mg/l)	6.13	6.29
DO (%)	54.6	59.8
Temperature (°C)	17.1	13.8
Turbidity (NTU)	7.8	9.0
Wetted width (m)	1	3
Wetted Depth (m)	0.75	1
Flow	low	low
Substrate %	100 fines	100 fines

Table 15. Fish Salvage Data from Bailey Ditch 2007

Species	Number Salvaged
Coho	37
Cutthroat	9
Crayfish	4
Total	50

3.11 Big Ditch Sediment Trap

Instream bed load material and vegetation was removed from the sediment trap for an approximate length of 35m. The traps functionality had been significantly reduced due to in-filling since its excavation during the 2006 fisheries works window. Works at this site in 2007 also included enlargement of the sediment trap to reduce the frequency of future drainage maintenance works downstream. Stream-side planting at this site will be undertaken in the spring of 2008 (as per authorization compensatory habitat conditions). A rock weir was installed at the mid-point of the trap to increase habitat and flow complexity (Photo 8). Large woody debris pieces installed in 2005 were left intact.

Figure 11.



Table 16. Key Biophysical Parameters of Big Ditch Sediment Trap, Pre and Post Maintenance, 2007.

Parameter	Before (Aug.)	After (Sept.)
DO (mg/l)	10.41	11.57
DO (%)	103.3	108.9
Temperature (°C)	12.7	12.7
Turbidity (NTU)	1.2	1.6
Wetted width (m)	1.5	3.5
Wetted Depth (m)	0.15	1
Flow	med/high	med
Substrate %	80 fines 20 gravel	100 fines

Table 17. Fish Salvage Data from Big Ditch Sediment Trap, 2007.

Species	Number Salvaged
Coho	98
Cutthroat	66
Total	164

Photo 8. Big Ditch sediment trap post-maintenance.



3.12 Elk Creek Sediment Trap

Bed load material was removed from the sediment trap located downstream of Prairie Central Road. The maintenance area was approximately 125 linear metres that included two large sediment traps. The traps had aggraded more sediment than in previous years and flow through the area existed as shallow riffle and glide with no pool habitat (Photo 9). The lack of pool habitat explains lower fish densities encountered during the 2007 fish salvage work. Salvage crews employed a combination of seining and electro-fishing at this site.

Downstream turbidity levels remained within acceptable limits throughout maintenance works. Turbidity was kept in check through the installation of a gravel check dam lined with filter clothe. In addition to this turbidity control method, the

monitor instructed excavation crews to take frequent breaks that allowed for a 'flushing' of fresh water that aided in maintaining low turbidity levels.

Figure 12.



Table 18. Fish Salvage Data from Elk Creek Sediment Trap, 2007.

Species	Number Salvaged
Coho	561
Cutthroat	123
Lampetra Sp.	23
Total	707

Table 19. Key Biophysical Parameters of Elk Creek Sediment Trap, Pre and Post Maintenance, 2007.

Parameter	Before (Aug.)	After (Sept.)
DO (mg/l)	11.42	11.39
DO (%)	106.0	104.0
Temperature (°C)	12.1	11.3
Turbidity (NTU)	1.2	2.1
Wetted width (m)	4	7.5
Wetted Depth (m)	.35	1.75

Flow	low/med	low
Substrate	10%gravel 90%fines	10%gravel 90%fines

Photo 9. Elk Creek sediment trap in-filled to capacity and limiting pool habitat.



4. Conclusions and Recommendations

The City of Chilliwack's 2007 summer watercourse maintenance program ultimately encompassed approximately 16,000 meters of ditch in 14 fish-bearing systems. Fish salvage efforts yielded 3315 salmonids as well as hundreds of other coarse fish species and aquatic organisms.

It is recommended that all riparian zone planting compensatory works outlined in the DFO authorization that have not been undertaken be carried out this spring (2008).

Through careful planning and work scheduling meetings, Nova Pacific Environmental and Staff of The City of Chilliwack worked effectively with the common goal of environmentally sound watercourse drainage maintenance. Under the direction of The City of Chilliwack's Public Works Supervisor, Nova Pacific Environmental's monitoring and fish salvage crews salvaged 3315 salmonids and monitored all drainage maintenance work as per DFO permit specifications.

Appendix 1: Regulatory Permits
(Hard Copy Only)