



**Governors Brook / Nine Mile River
Compensation/ Restoration Project
As Built Report 2006
Monitoring Reports 2006-2008**



**Prepared by The Sackville Rivers Association
for
Nova Scotia Transportation and Public Works / Environmental Services**

Contract No. TPW-ESG File No. 4.133

November 28, 2008

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As Built Report

On 8th June 2004 the Sackville Rivers Association (SRA) was contracted by the Nova Scotia Department of Transportation and Public Works—Environmental Services to implement the DFO approved Compensation Proposal for the Hwy 103 HADD in the Nile Mile River Watershed (Contract No. TPW-ESG File No. 4.133). The contract included 10 items, one of which is to complete and submit an “as built” report to TPW and DFO/DEL/Coast Guard.

The contract or Compensation Proposal called for the approach of working with nature and the natural pattern of the candidate watercourse (Governors Brook, Nile Mile River Watershed, Tantallon, HRM). All work was to be installed in a manner that does not interfere with any private landowners, recreational interests, or commercial uses within or adjacent to the brook. All structures installed in the brook shall be relatively small, easy to repaired by hand, and not require the use of heavy equipment.

It was agreed that restoration would be enough to compensate for the loss of productive capacity of fish habitat due to infilling and abutment construction of the 101 Highway Nile Mile River Bridge. This was to be a minimum of 1080 square meters of habitat.

The SRA hired Thaumass Environmental Consultants Ltd. (TEC) to assess fish habitat, identify sites suitable for restoration and suggest detailed techniques for restoration on the upper watershed of the Nile Mile River Watershed. This was done on 13 May 2004.

As a result of the investigation Governors Brook was chosen as the best site for restoration. The reaches are very complex changing gradient several times from stillwater to riffle/ run to steep rifles. The mid gradient sections are over widened through past land use and the effects of old stream crossings and dams. The sections rate poorly for juvenile Speckled Trout habitat and the whole reach rates poorly for spawning habitat. Also easy access, good water quality and quantity were other factors in choosing this brook.

Speckled Trout production capacity of the habit is approximately 5 to 10% of its potential. Cover is very poor for 2+ year old trout and older, spawning habitat is perceived as very poor due to the lack of fry. One-year trout habitat is fair to moderate quality, in high flows but poor in low flows. The large water surface to depth ratio, due to over-widening, would cause the water temperatures to closely

tract air temperatures resulting in un-healthy high temperatures in the summer and excessive ice build up in winter.

Restoration would narrow the stream by regulating water temperatures and provide pools with low water depths > 45 cm and in-stream cover for the Speckled Trout. Restoration would produce good numbers of Speckled Trout up to 15 cm in length. The work would raise the productive capacity of the brook to at least 80% of its potential meeting all the DFO requirements for compensation.

The restoration techniques chosen were deflectors, hand made rock sills using instream small boulders, digger logs in the narrower sections of the brook and one Speckled Trout spawning bed.

We have redone the hydrology for the area taking into consideration the subdivisions and industrial park and determined that the channel width of the 1:2 year flood should be approximately 2.85m wide. This would mean the pools would be approx. 17m apart. The current stream is approx twice this width and in places 3x the width. The on the ground pool riffle sequence is approximately 17m and alternates right – left quite well but in many places the point bars are gone resulting in a very wide channel. The cause is not clear but the brook is between a road and rail bed in an area, which had several mills, and small dams in the past.

There were 23 sites included in the original work plan. Twenty structures were installed in total in August 2005. Three sites (sites seven, twelve and twenty-one) that are to be considered control sites for future testing and evaluation of the restoration work. The three sites consisted of two stillwaters and a bridge. The completed work will restore over 1308 sq meters of habitat, 222 meters more than required for compensation.

A Speckled Trout spawning bed consists of areas of small sized rounded stone located at the tail ends of pools that are the ideal habitat for Speckled Trout to make their redds. The tail end of the pool is ideal for the spawning bed because the interface area between the pool and the riffle creates high oxygen flow for the Trout eggs. NS Transportation and Public Works constructed the spawning bed in September 2008 in order to meet additional compensation commitments for HADDs in the nearby East River watershed.

The spawning bed was located at the tail end of a pool downstream of a dead water. The area of the trout spawning bed is approximately 15 square meters. (see appendix 3), at GPS coordinates 44°39'20.83"N, 63°43'50.34"W. This type of structure has been chosen in order to complement habitat improvement structures

(digger logs/rock sills) already installed on Governors Brook by improving spawning habitat.

The location and structure of this spawning bed was determined by Thumas Environmental Consultants, and was installed under their supervision. This structure was established by using a mix of peastone ranging from 3/8" to 2" in diameter to ensure stability of the bed. The type of material used has been determined to be the most appropriate for the type of watercourse and the target species. The volume of this bed has been determined to be about 3.0 cubic meters.

Our Association:

The Sackville Rivers Association (SRA) is a not-for-profit and volunteer based community group with charitable status, concerned with the health of the Sackville River and its watershed. With an active membership of over 200, the SRA has been working on education, restoration and conservation projects in the watershed since 1988.

The SRA's mandate is to:

- 1) Protect and, where necessary, restore the environment of the Sackville River watershed;
- 2) Raise awareness about the environment of the Sackville River and its adjacent watersheds; and
- 3) Establish a Conservation Corridor along the length of the Sackville River.

The Watershed:

The Sackville River begins in Mount Uniacke and flows for over 40 kilometres through the communities of Sackville, Hammonds Plains, Lucasville, Beaver Bank, and finally Bedford, before discharging into the Bedford Basin. The watershed area is 147 square kilometres and contains a diversity of aquatic and terrestrial eco-types including old growth forests, natural riparian areas, 13 lakes, many wetlands, ponds, streams and feeder brooks. This watershed provides habitats for several species listed by the Province and in the Federal Species At Risk Act, including Monarch butterflies, Wood turtles, Peregrine falcons, Bicknell thrushes, short-eared owl, and the Barrows Golden-eye duck. Other species under serious direct pressure due to habitat loss in this watershed include unique

populations of ring neck snakes, freshwater mussels, Atlantic Salmon, Sea run and resident Brook Trout, and rainbow smelt.

The population of the watershed is currently over 50,000 people and is increasing rapidly due to intense development activity. We believe this development can be accommodated if the proper management practices are used and the concept of sustainable development (development that will not deplete or spoil the living natural resource dividends that rightly belong to future generations) is used as the guiding principle. Water purity and water resource management and fish and wildlife habitats are critical components of sustainable development.

It is our goal to successfully protect the physical environment from current and future impacts through education of those who reside within the watershed and the restoration of habitats damaged by past abuses, to return the river and critical and important terrestrial areas to their natural state.

The work we do:

During each field season the SRA undertakes education and restoration projects, including:

- **Trail Construction and Maintenance:** The Conservation Corridor Trail Concept is a 40-kilometre trail along the Sackville River from Mount Uniacke to Fort Sackville.
- **River Ranger-Fish Friends:** Since 1994, the SRA River Ranger program has been involving local elementary students in river protection and awareness (with the aid of the Atlantic Salmon Federation Fish Friends program), and developing a sense of their place in the Sackville River ecosystem, (over 500 school children, teachers and parent chaperones).
- **Installation and maintenance of in-stream structures:** Since 1988, the SRA has installed over 140 in-stream digger logs and over 21 rock sills, which work with the river flows to increase fish habitat by many thousands of square meters.
- **River clean-ups:** In an effort to preserve fish habitat and maintain previously restored habitat the SRA has coordinated and conducted over 60 river clean-ups.
- **Bank Stabilization projects:** The SRA has completed many bank stabilization projects to prevent erosion in the watershed and return the river to its natural path.

- Yearly stocking of Speckled Trout and Atlantic salmon.
- Water quality monitoring.

The expertise used to design and implement the protection, restoration activities and education materials comes from our volunteer membership, assistance from government staff at all levels, donated time from local consultant firms, and summer students when funding is available for them. Using this approach we have been quite successful to date.

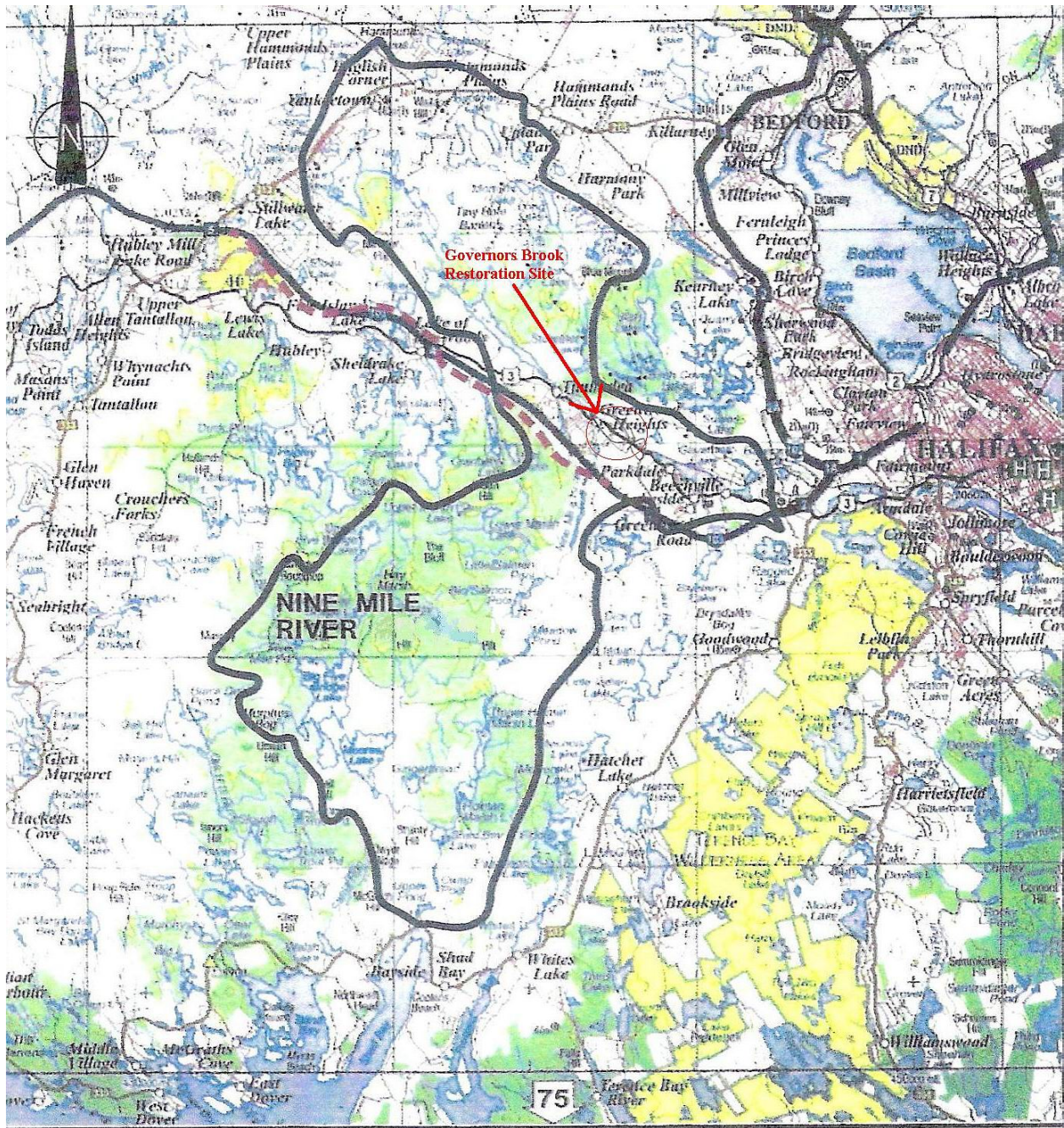
Some awards that the Sackville Rivers Association has received for the above-mentioned efforts are:

- The Nova Scotia Department of Environment and Labour Award for groups over 50 people, 1990;
- National Award for Conservation for 1994, from the Department of Fisheries and Oceans (DFO);
- Forest Stewardship Recognition Program Award, 1999/2000;
- The Go For Green Elaine Burke award for 2000;
- The Affiliate of the Year from the Atlantic Salmon Federation, 2000;
- The Bob Dechman Conservation Award, 2002, (From Small Mouth Bass Anglers);
- The Recreation Nova Scotia Bluenose Achievement Award, 2001, From Recreation Nova Scotia; and
- The Award of Merit, 2002, From Canadian Parks and Recreation Association.



Canadian Geographic, 2004, Restoration and Rehabilitation, Silver Award.

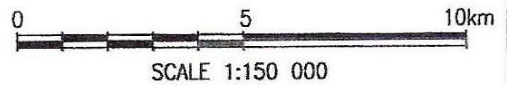
APPENDIX A

**LOCATION MAP OF NINE-MILE WATERSHED
AND GOVERNORS BROOK**



LEGEND:

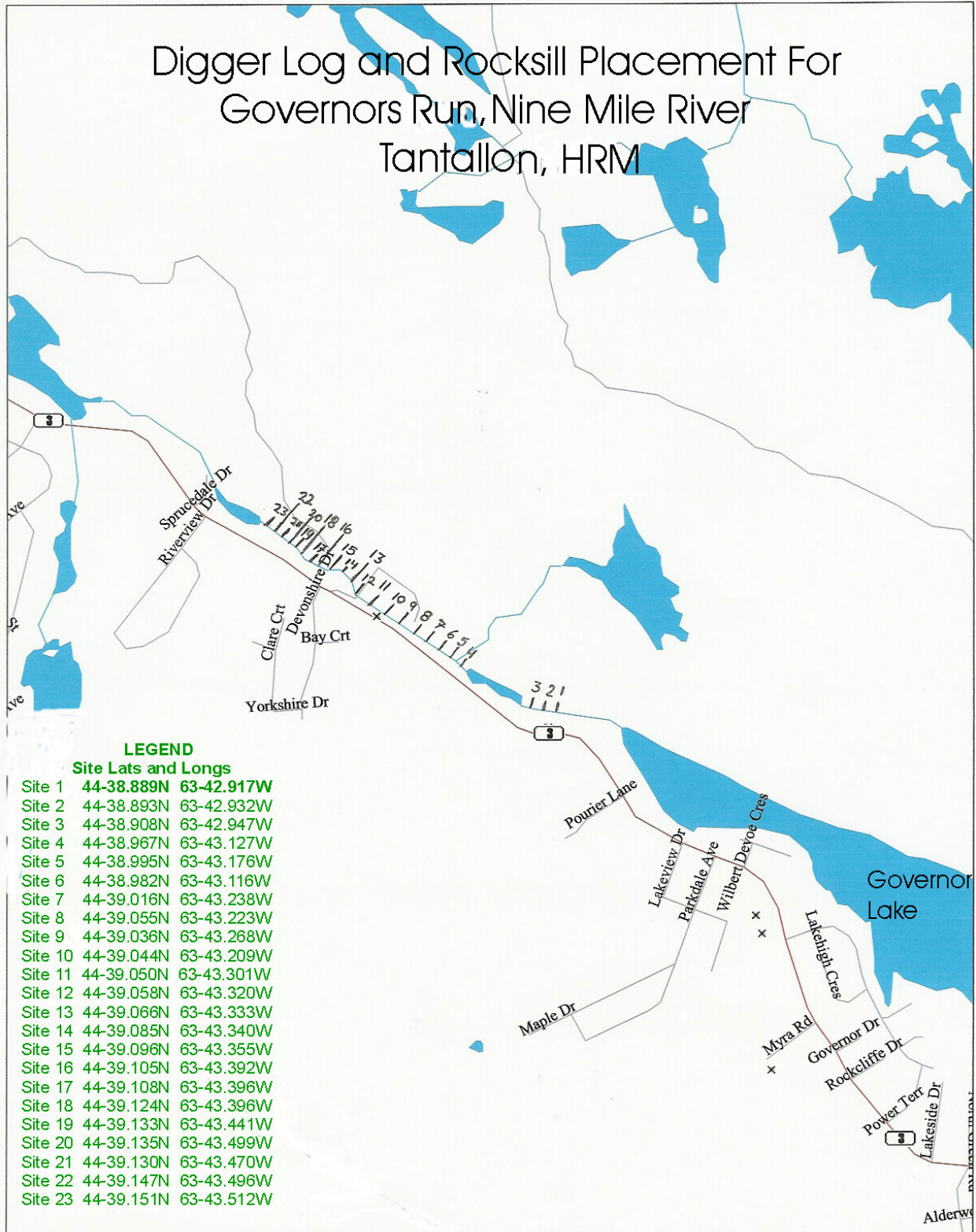
-  APPROXIMATE LOCATION OF TWINNED 103 LANE
-  APPROXIMATE LOCATION OF WATER SHED



APPENDIX B

**LOCATION MAP
OF INSTREAM STRUCTURES**

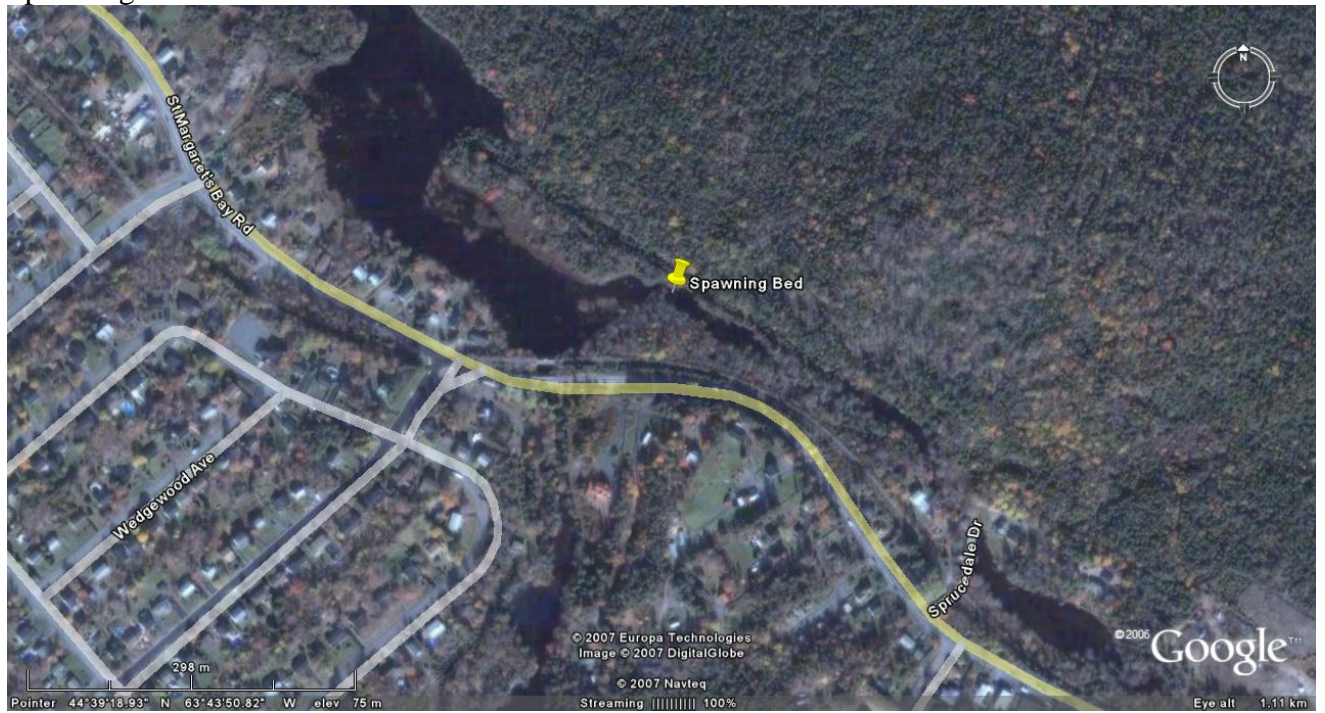
Digger Log and Rocksill Placement For Governors Run, Nine Mile River Tantallon, HRM



APPENDIX C

LOCATION OF SPAWNING BED/ADVANCE PICTURES

Spawning bed location



Upstream of proposed spawning bed (yellow arrow) during high water (spring)



Upstream of proposed spawning bed (yellow arrow) during low water (summer)



APPENDIX D

COMPLETED SPAWNING BED PICTURES



Completed spawning bed – Figure 1



Completed spawning bed – Figure 2



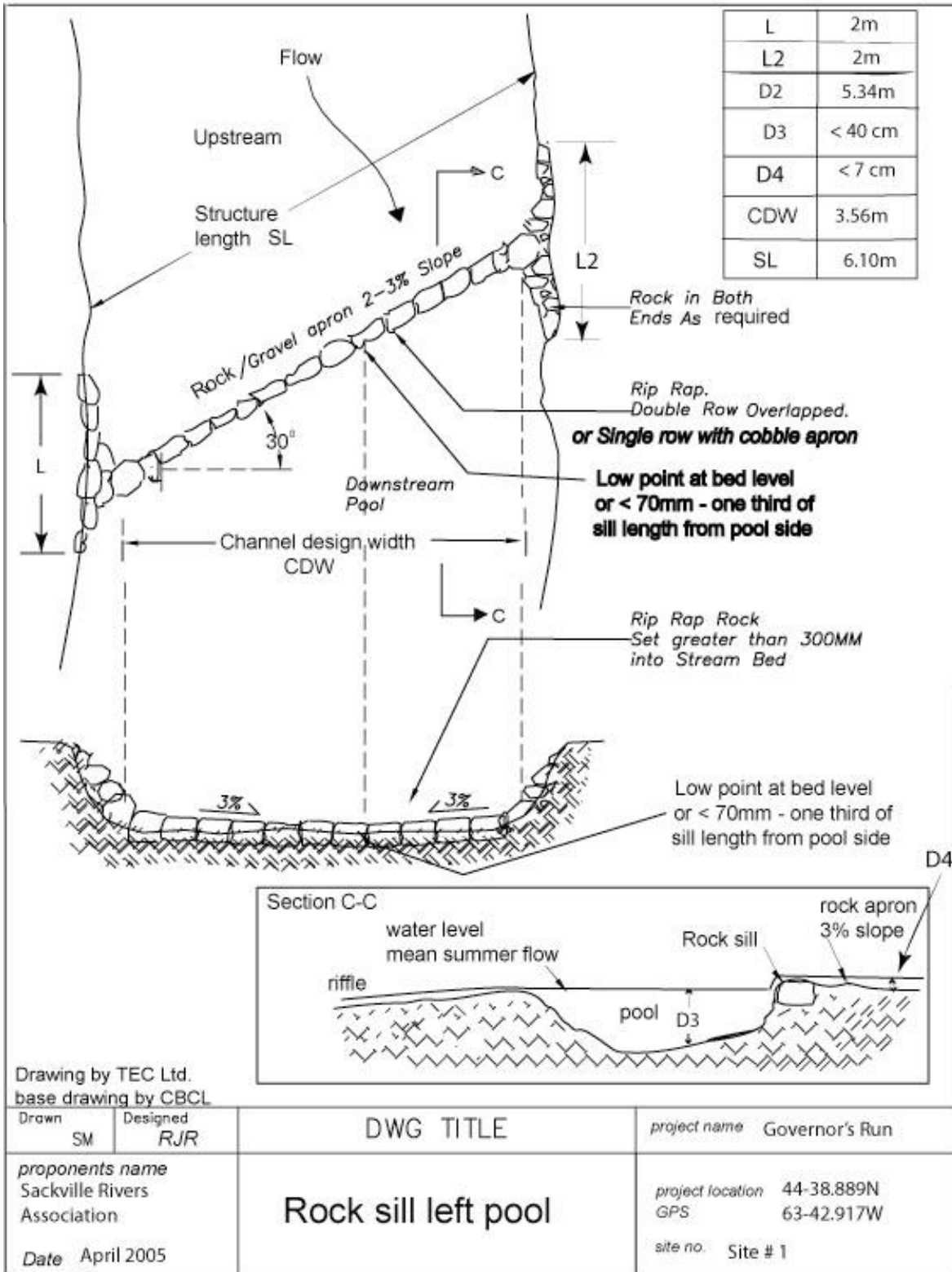
Completed spawning bed – Figure 3



Completed spawning bed – Figure 4

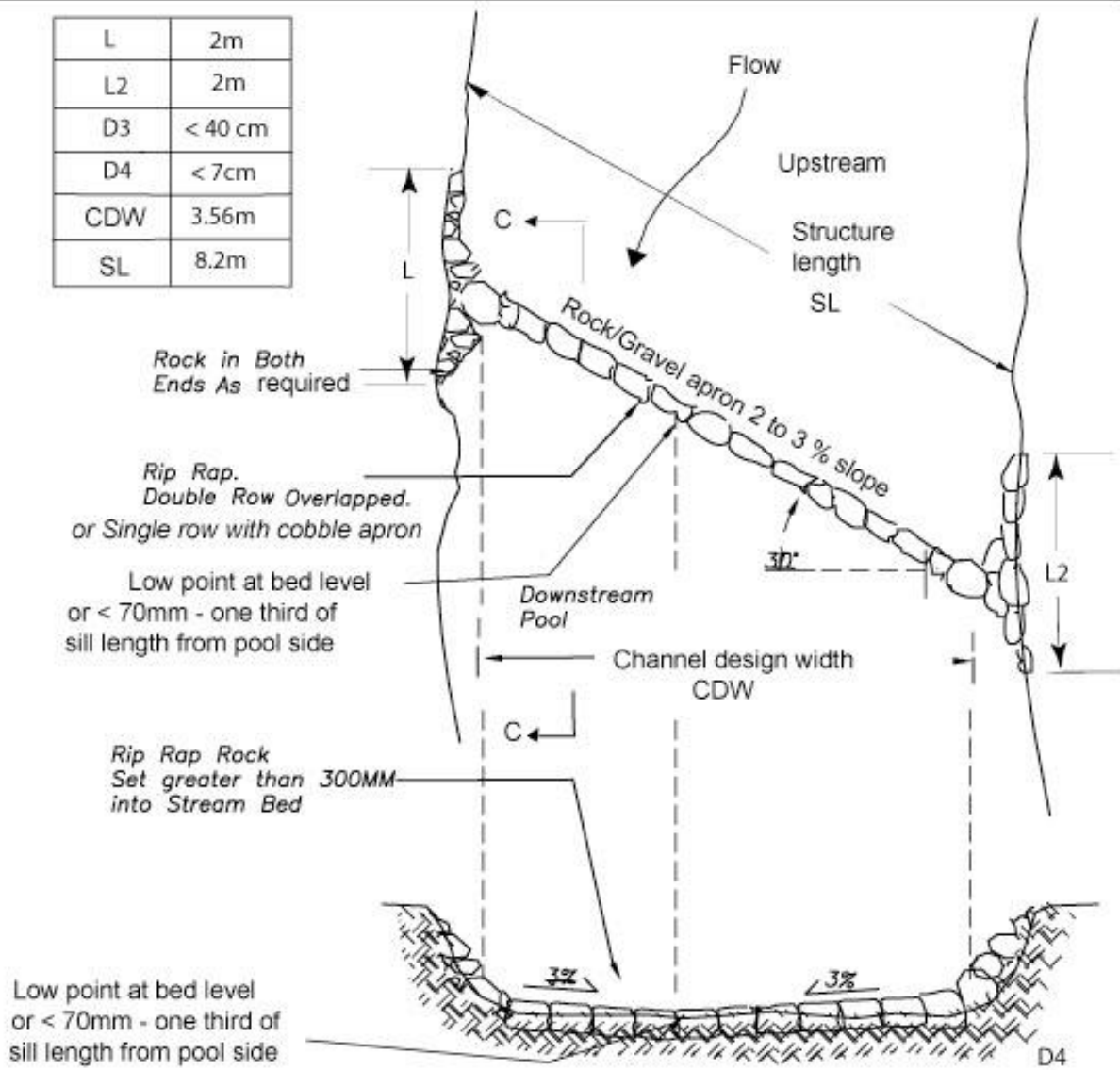
APPENDIX E

**AS BUILT DRAWINGS
ROCKSILLS
AND
DIGGERLOGS**

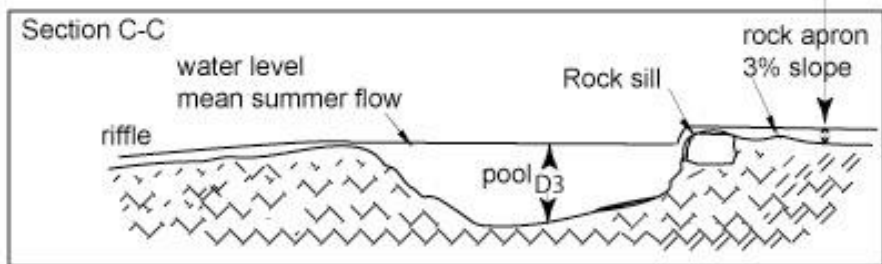


DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7cm
CDW	3.56m
SL	8.2m

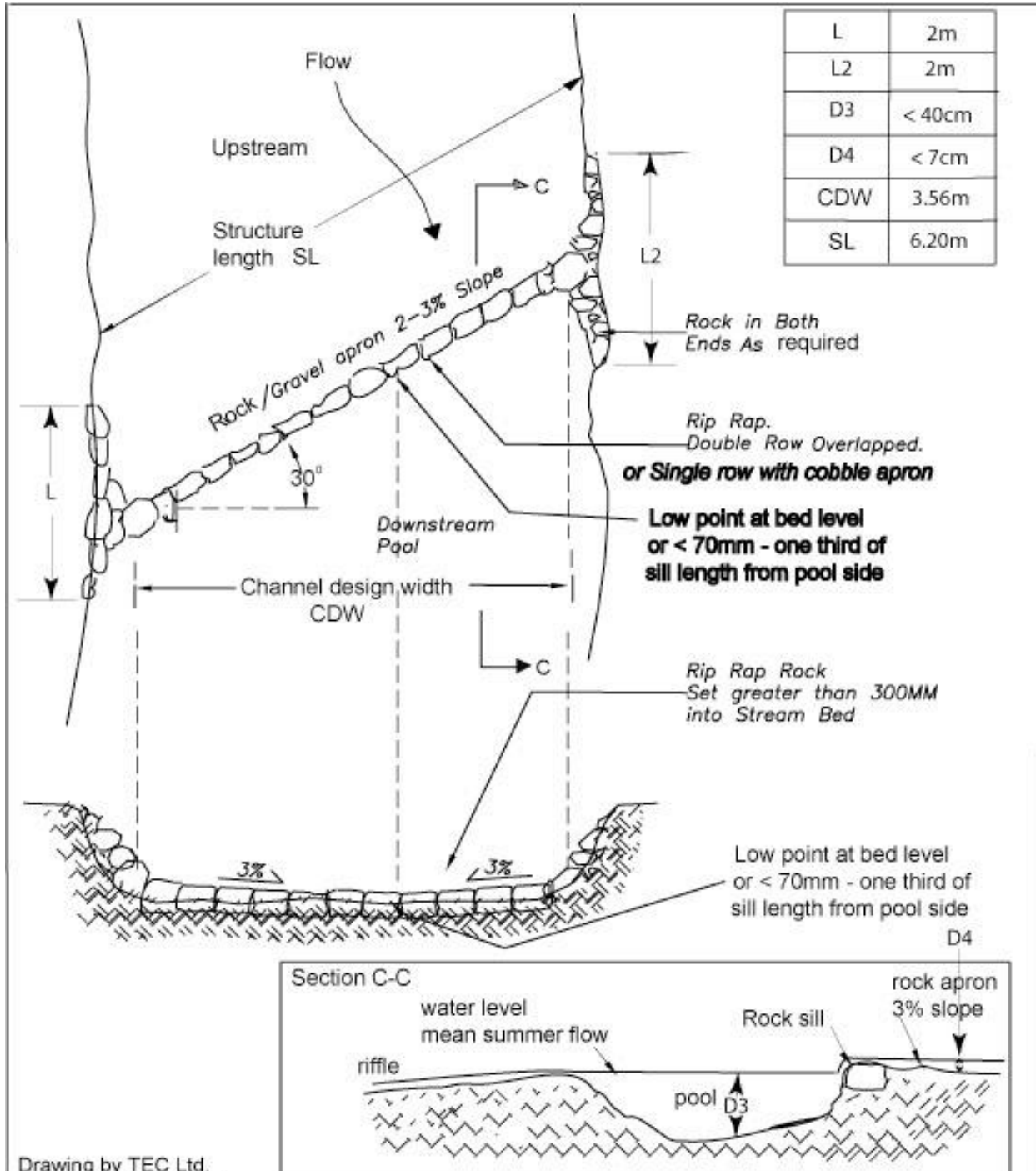


Low point at bed level
or < 70mm - one third of
sill length from pool side



Drawing by TEC Ltd
base drwing by CBCL

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association		Rock sill Right pool	project location GPS 44-38.893N 63-42.932W
Date April 2005			site no. Site # 2



Drawing by TEC Ltd.
base drawing by CBCL

Drawn SM Designed RJR

proponents name
Sackville Rivers
Association

Date April 2005

DWG TITLE

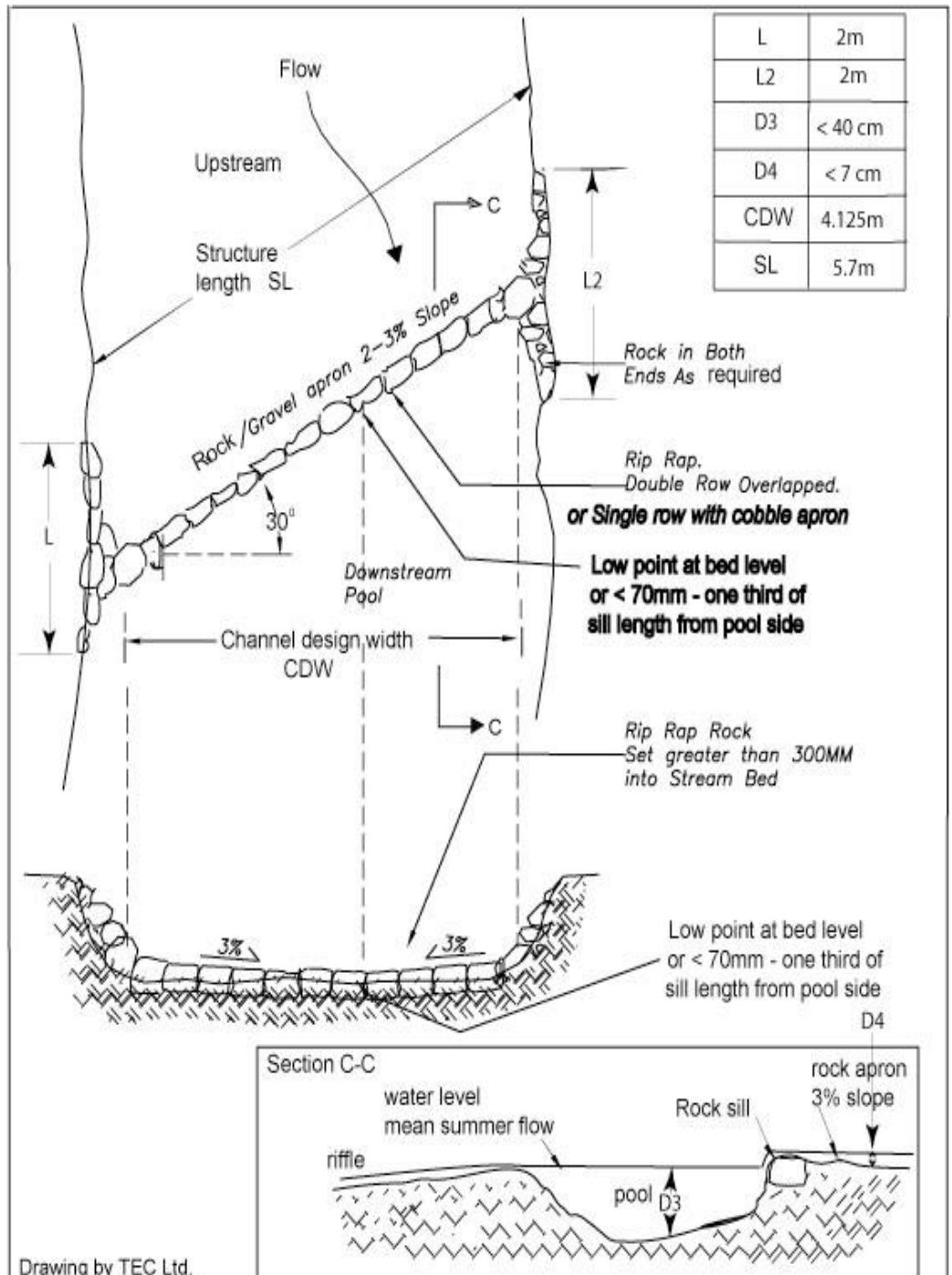
Rock sill left pool

project name Governor's Run

project location 44-38.908N
GPS 63-42.947W

site no. Site # 3

DFO 2005

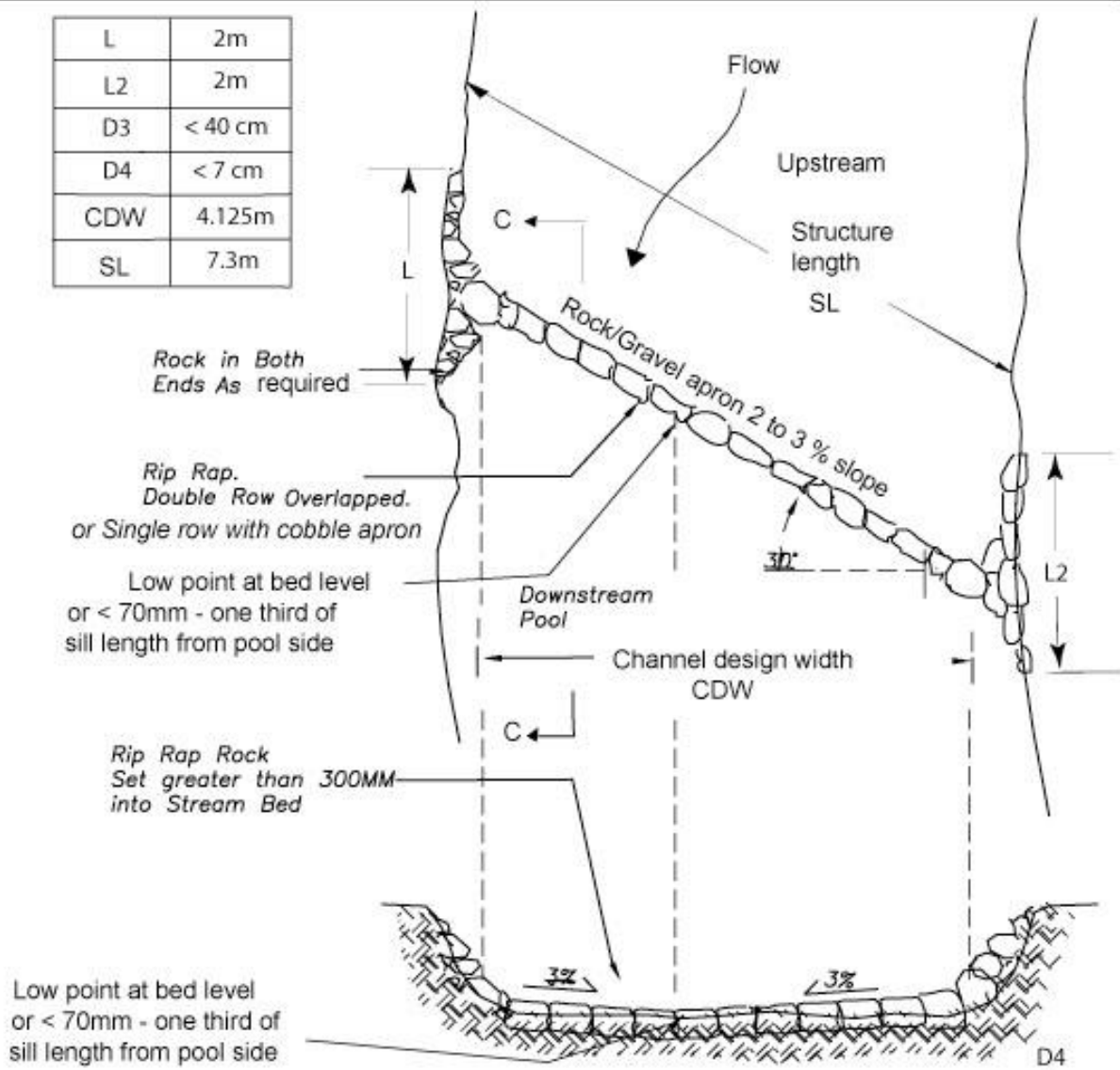


Drawing by TEC Ltd.
base drawing by CBCL

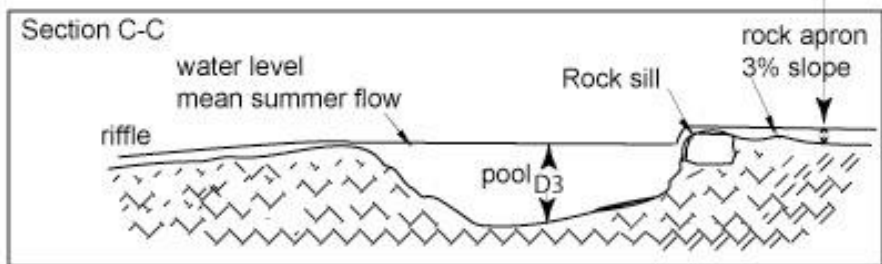
Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association		Rock sill left pool	project location GPS 44-38.967N 63-43.127W
Date April 2005			site no. Site # 4

DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	7.3m

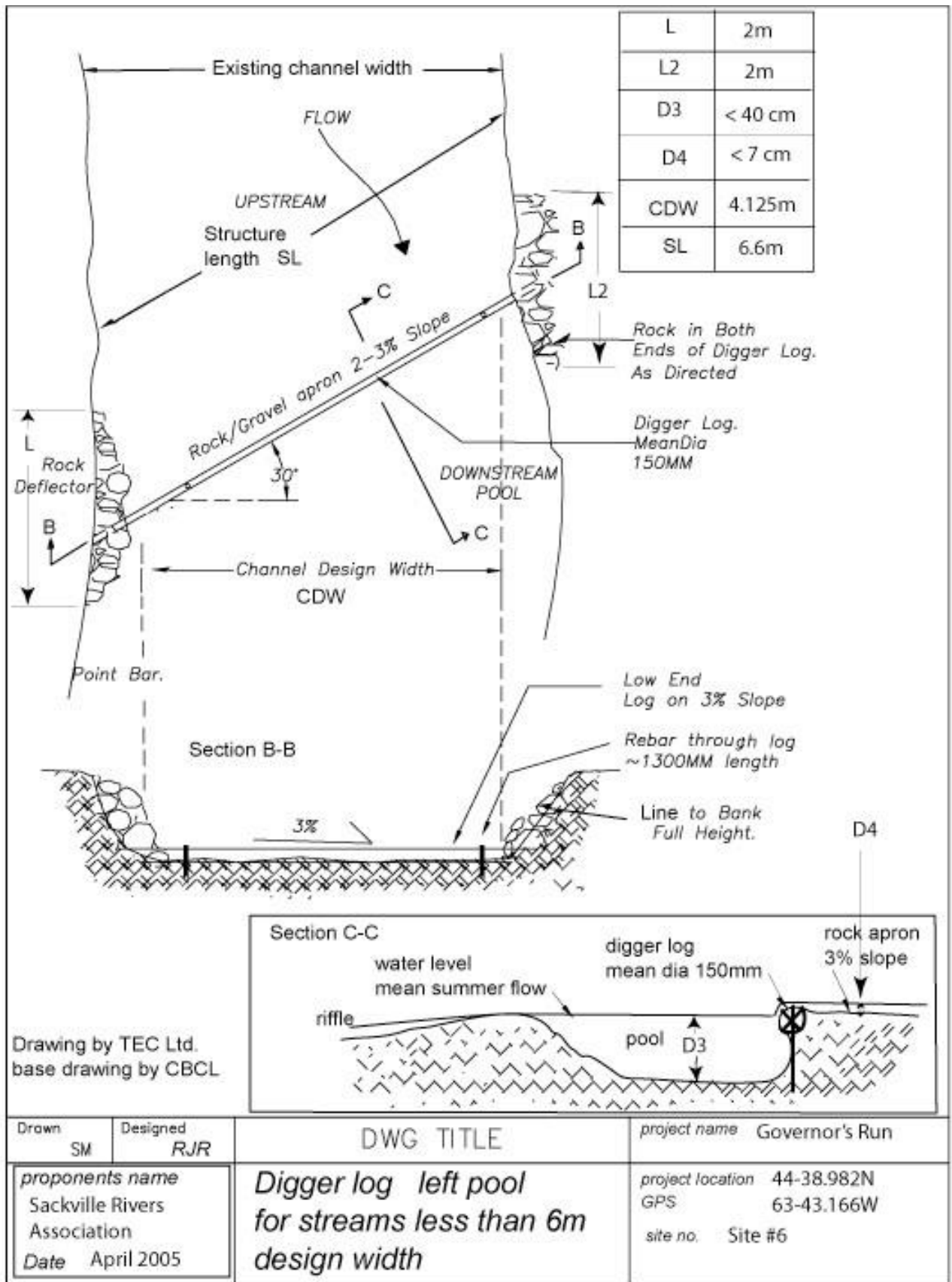


Low point at bed level
or < 70mm - one third of
sill length from pool side

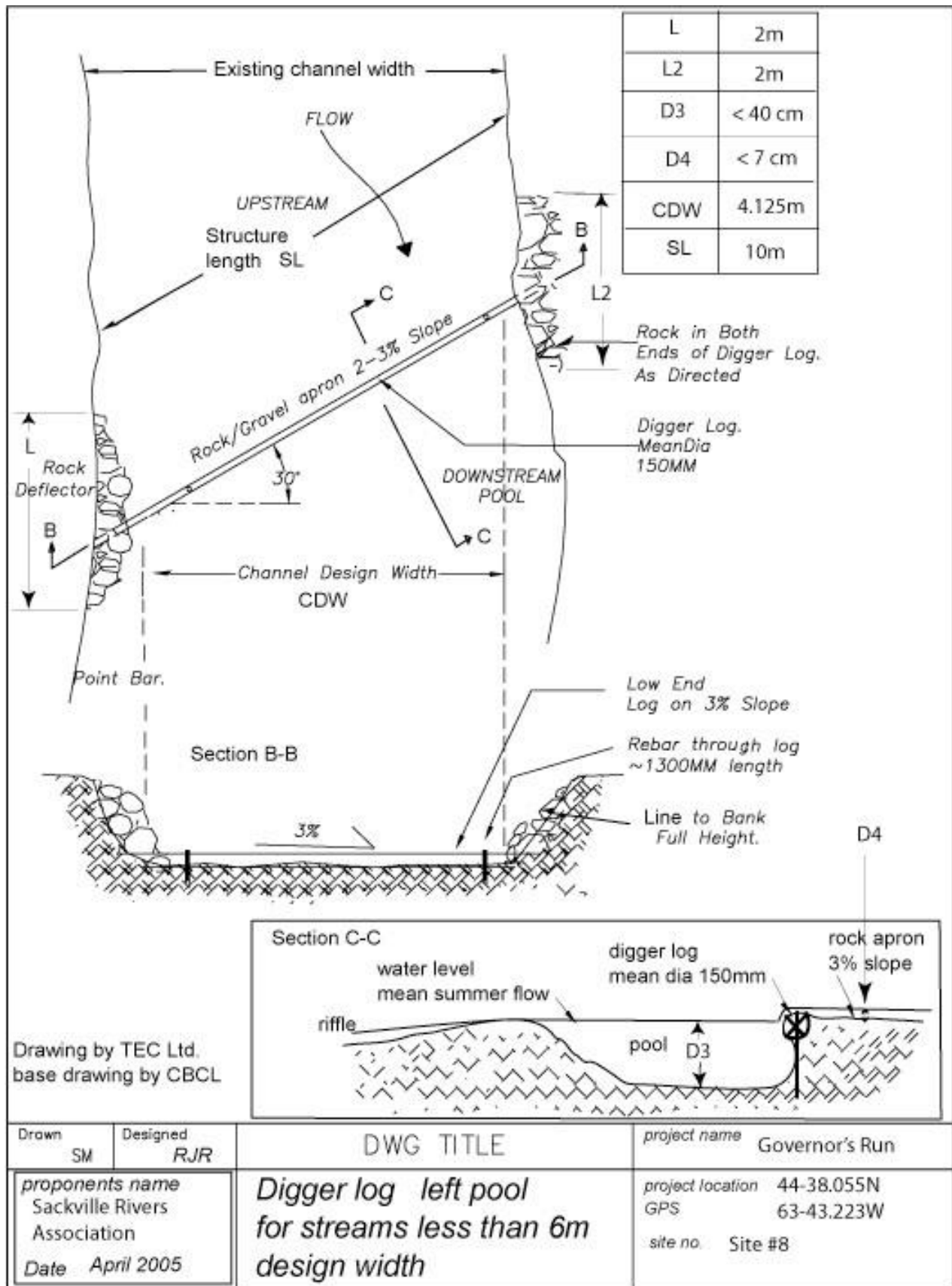


Drawing by TEC Ltd
base drwing by CBCL

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association		Rock sill Right pool	project location GPS 44-38.995N 63-43.176W
Date April 2005			site no. Site #5



DFO 2005



DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	6.6m

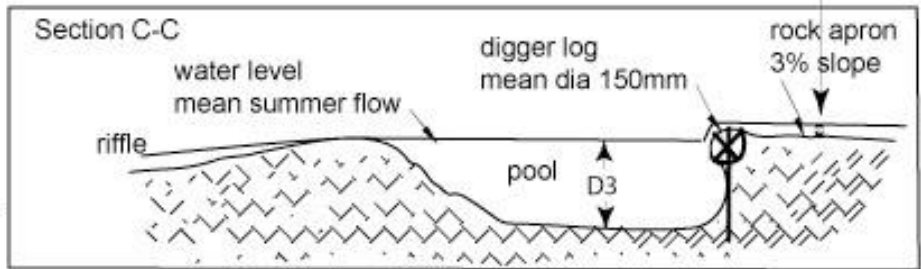
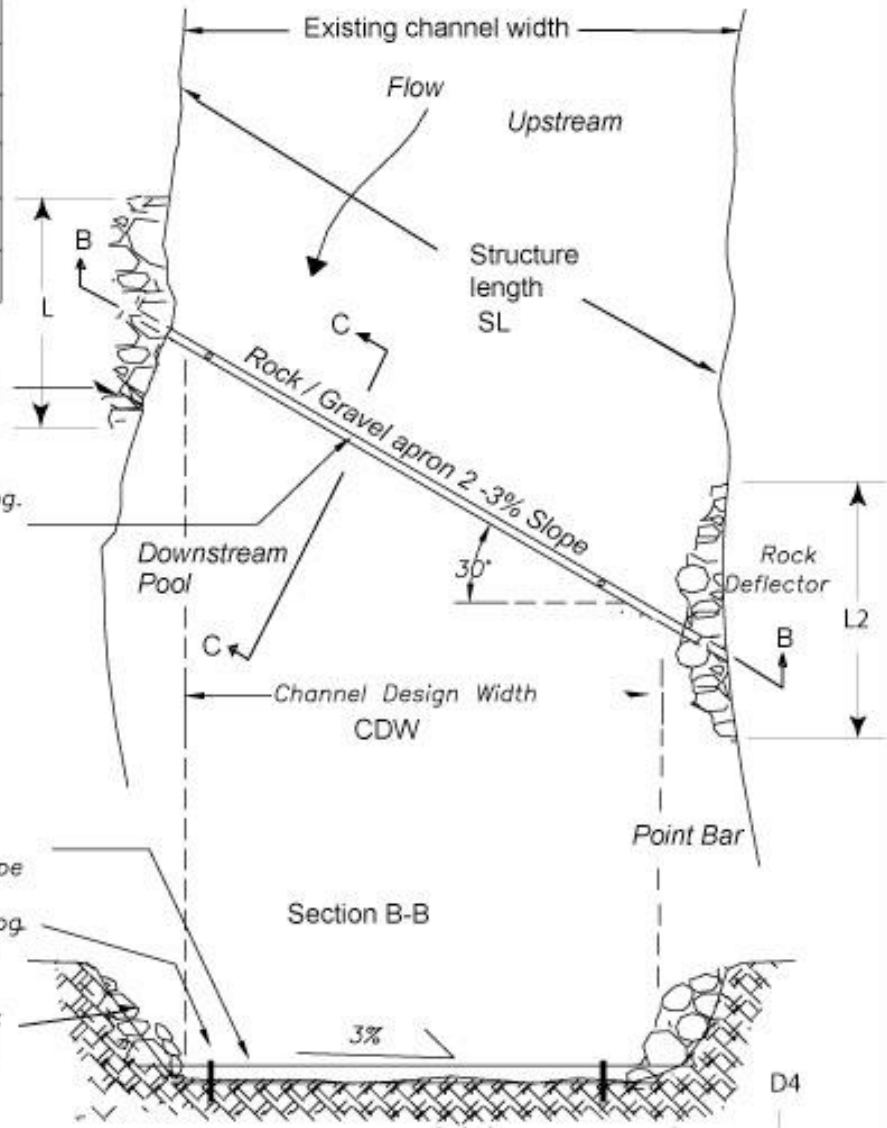
Rock in Both Ends of Digger Log. As Directed

Digger Log. MeanDia 150MM

Low End Log on 3% Slope

Rebar through log. ~1300MM length

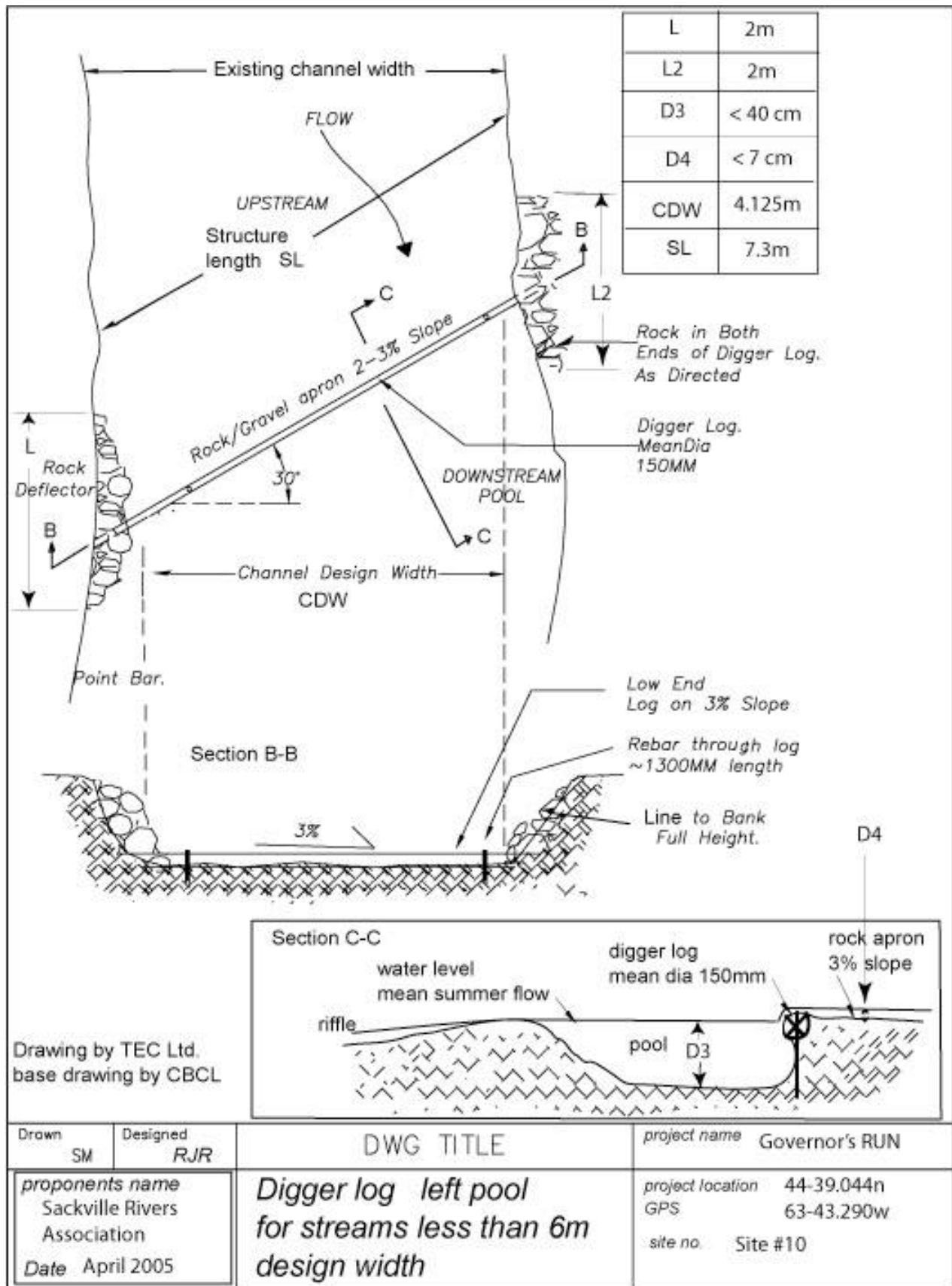
Line to Bank Full Height.



Base drawing by CBCL and TEC

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association Date April 2005		Digger log right pool for streams less than 6m wide	project location GPS 44-39.036N 63-43.268W site no. Site #9

DFO 2005



DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	5m

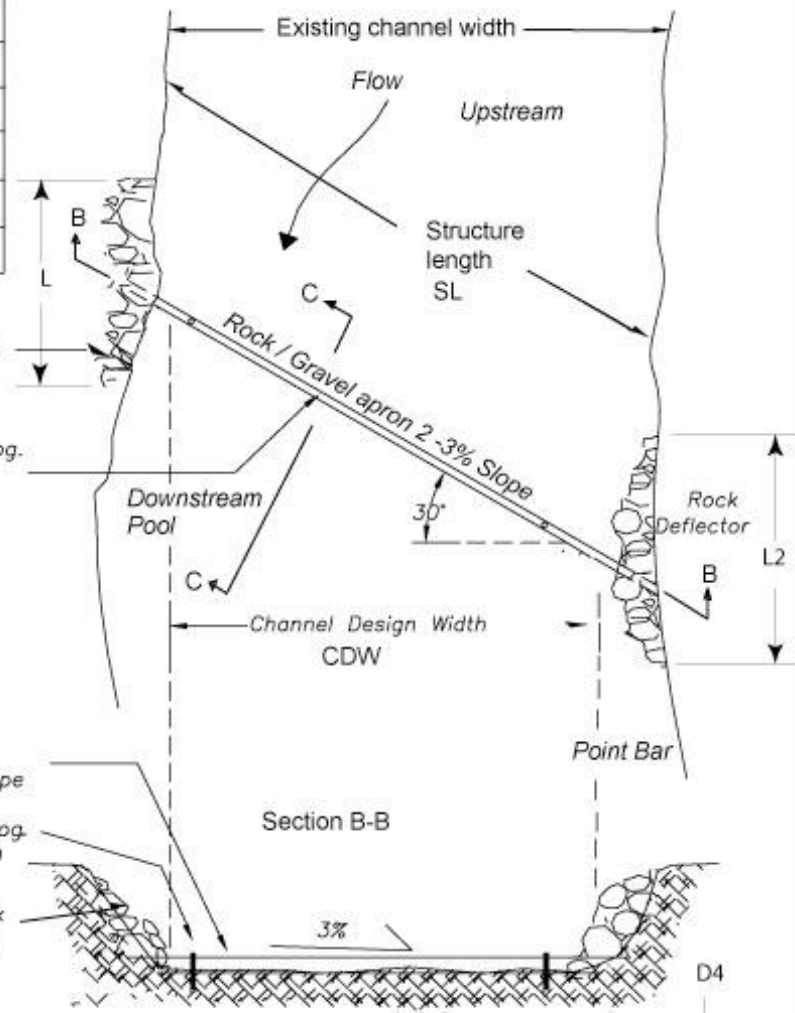
Rock in Both Ends of Digger Log. As Directed

Digger Log. MeanDia 150MM

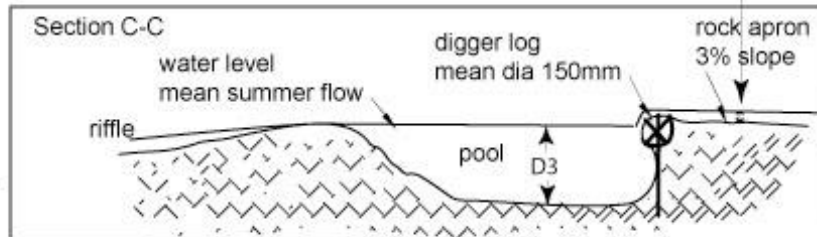
Low End Log on 3% Slope

Rebar through log. ~1300MM length

Line to Bank Full Height.



Section B-B



Base drawing by CBCL and TEC

Drawn SM	Designed RJR	DWG TITLE	project name Governor's run
proponents name Sackville Rivers Association		Digger log right pool for streams less than 6m wide	project location 44-39.050N
Date April 2005			GPS 63-43.301W
			site no. Site #11

DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	4.2m

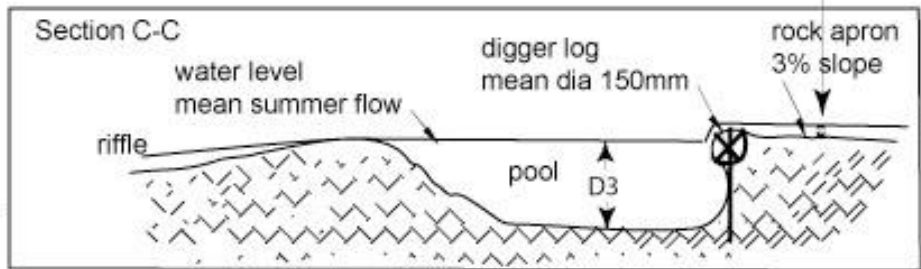
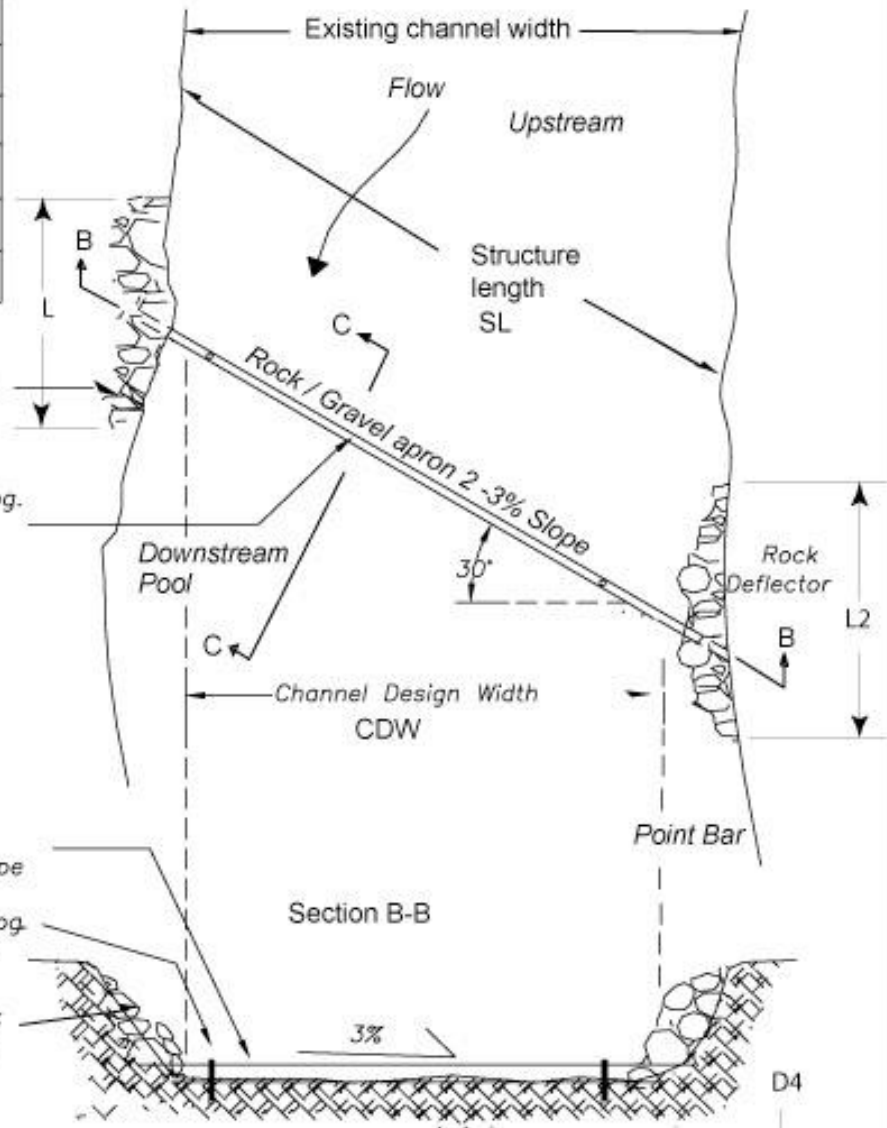
Rock in Both Ends of Digger Log. As Directed

Digger Log. Mean Dia 150MM

Low End Log on 3% Slope

Rebar through log. ~1300MM length

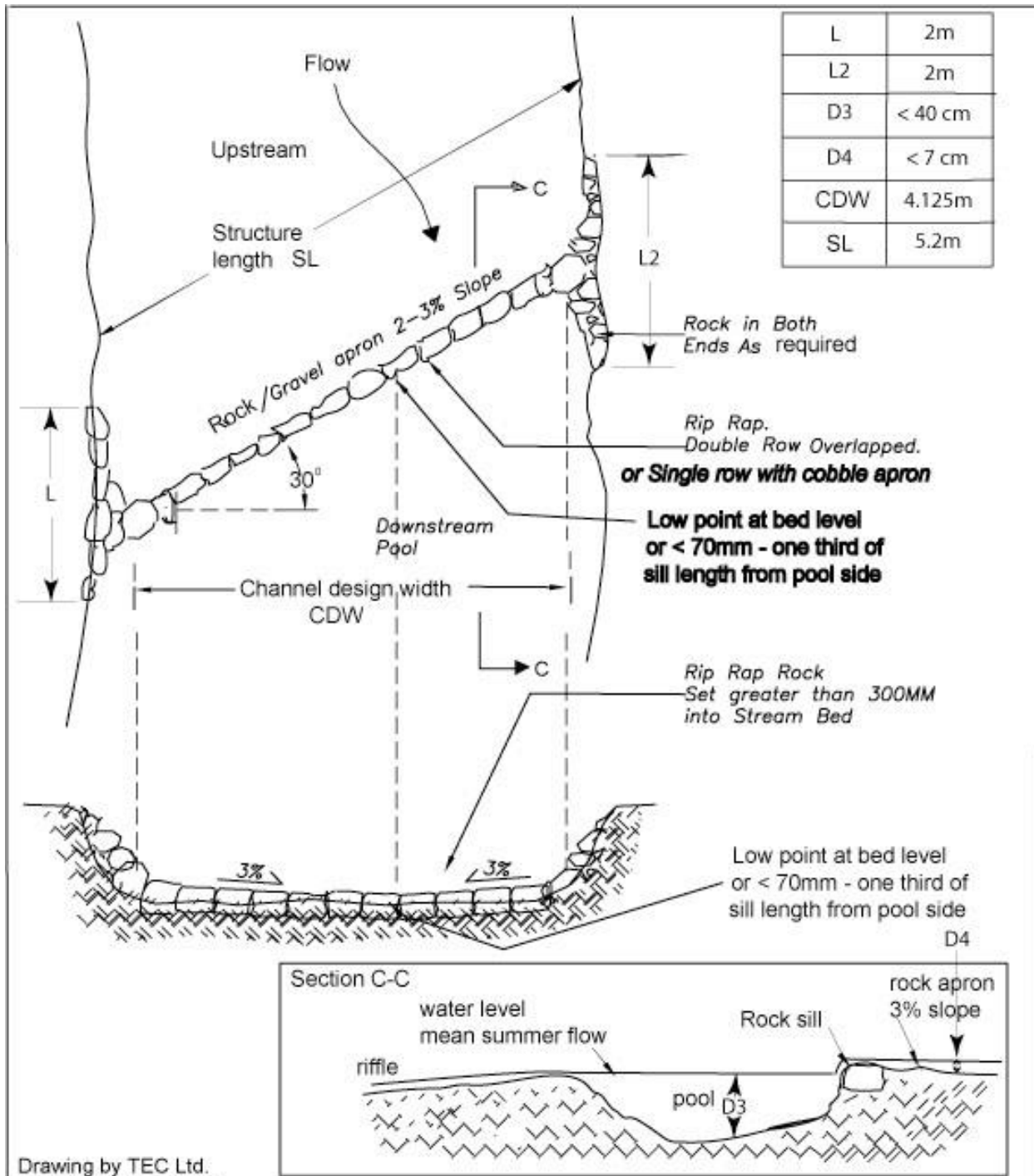
Line to Bank Full Height.



Base drawing by CBCL and TEC

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association Date April 2005		Digger log right pool for streams less than 6m wide	project location GPS 44-39.066N 63-43.333W site no. Site # 13

DFO 2005



Drawing by TEC Ltd.
base drawing by CBCL

Drawn SM

Designed RJR

DWG TITLE

project name Governor's Run

proponents name

Sackville Rivers Association

Rock sill left pool

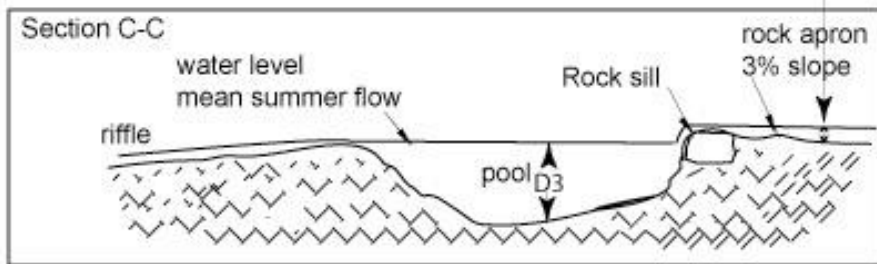
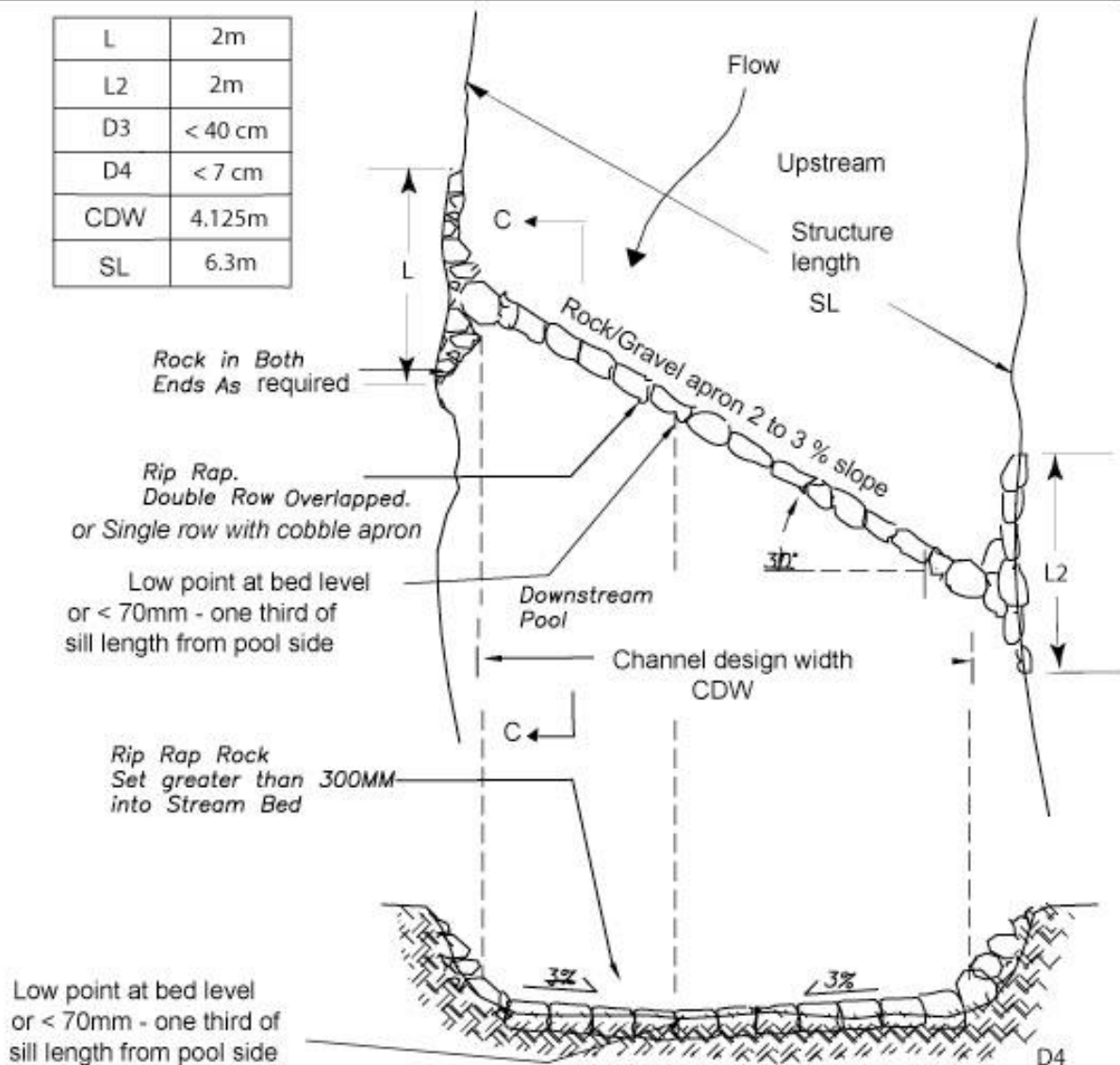
project location 44-39.085N
GPS 63-43.340W

Date April 2005

site no. Site # 14

DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	6.3m



Drawing by TEC Ltd
base drwing by CBCL

Drawn
SM

Designed
RJR

DWG TITLE

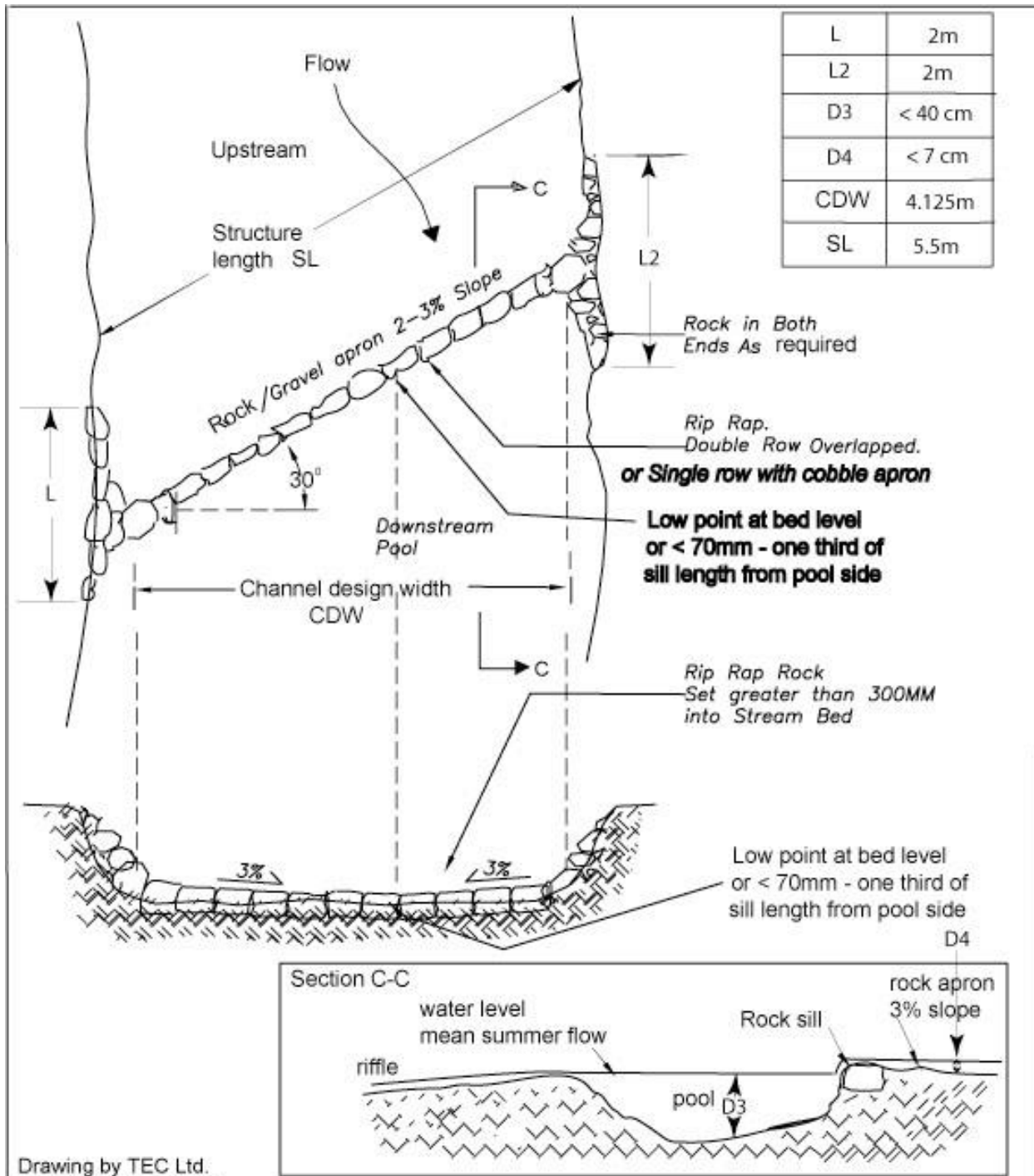
project name Governor's Run

proponents name
Sackville Rivers
Association

Rock sill Right pool

project location 44-39.098N
GPS 63-43.355W
site no. Site # 15

Date April 2005



L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	5.5m

Drawing by TEC Ltd.
base drawing by CBCL

Drawn SM
Designed RJR

DWG TITLE

project name Governor's Run

proponents name
Sackville Rivers
Association

Rock sill left pool

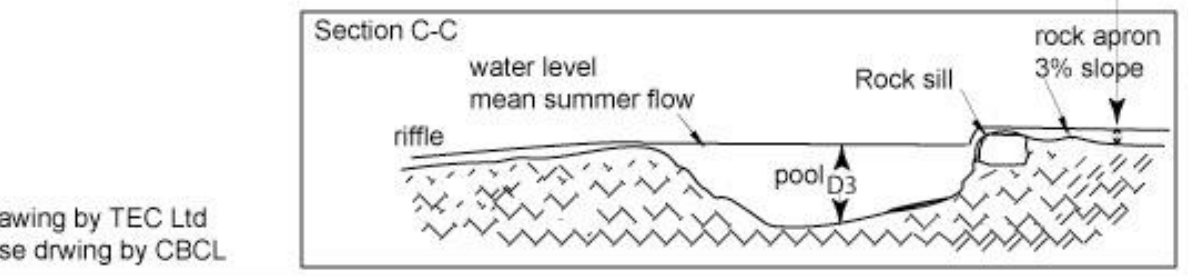
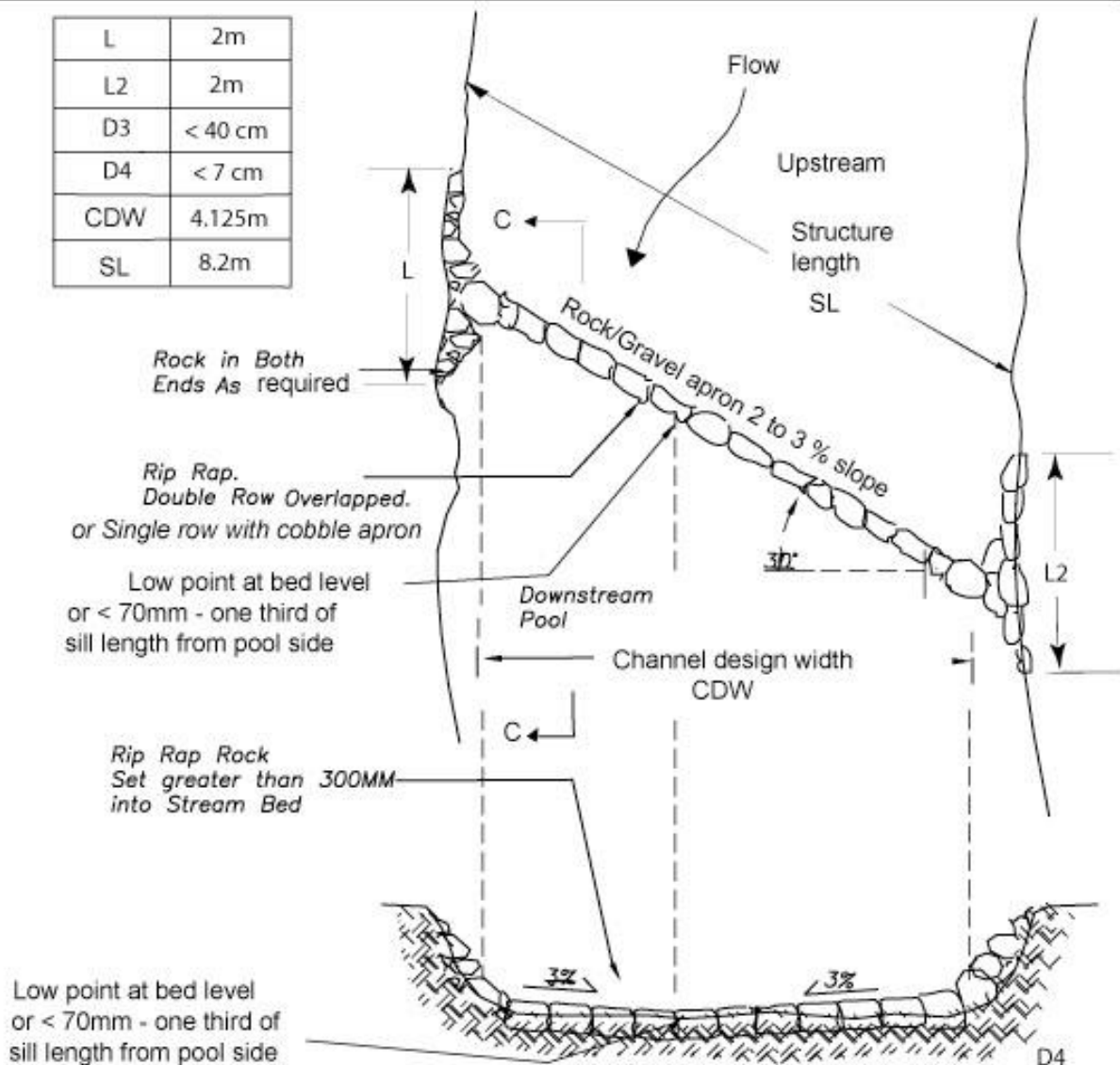
project location 44-39.105N
GPS 63-43.392W

Date April 2005

site no. Site # 16

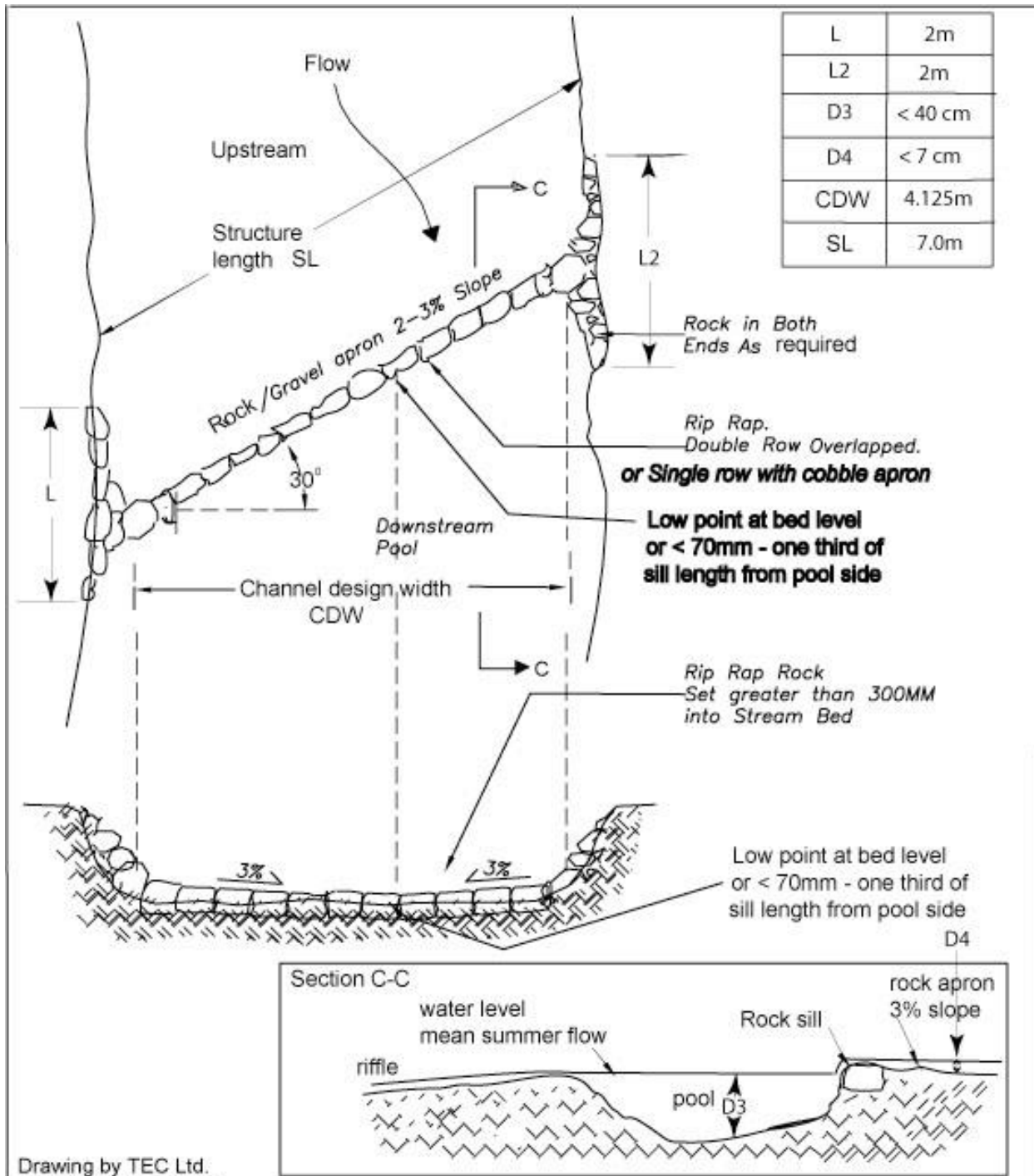
DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	8.2m



Drawing by TEC Ltd
base drwing by CBCL

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association		Rock sill Right pool	project location GPS 44-39.108N 63-43.396W
Date April 2005			site no. Site # 17



L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	7.0m

Drawing by TEC Ltd.
base drawing by CBCL

Drawn SM
Designed RJR

DWG TITLE

project name Governor's Run

proponents name
Sackville Rivers
Association

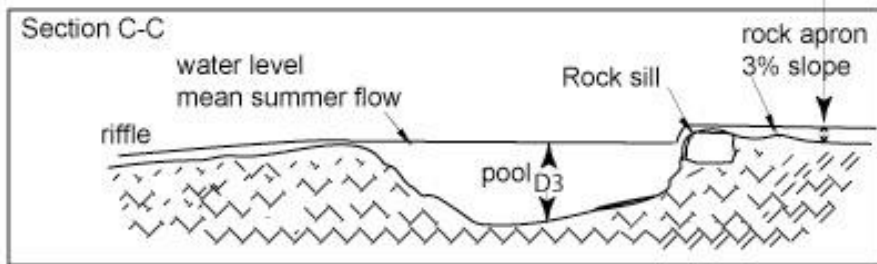
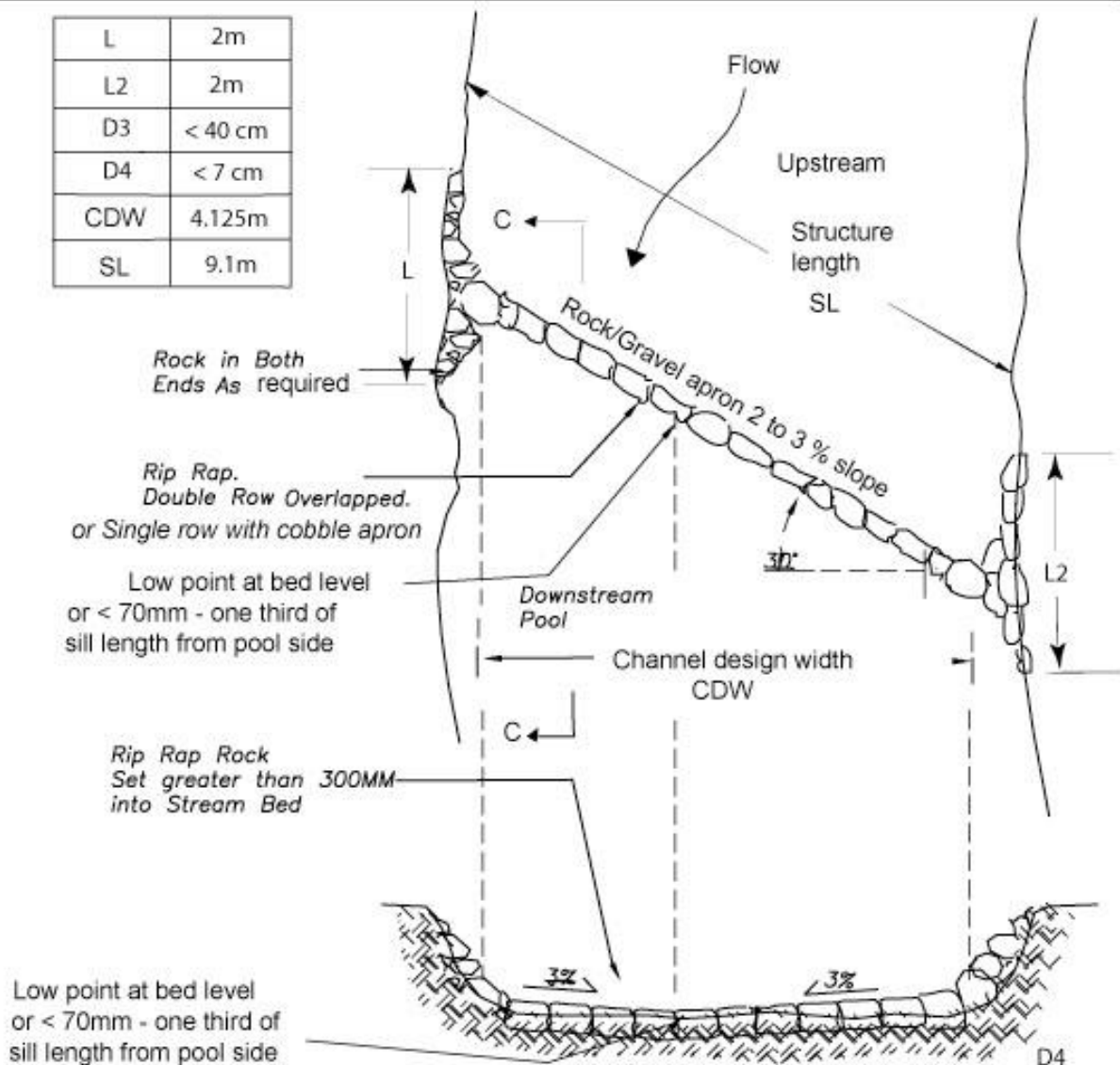
Rock sill left pool

project location 44-39.124N
GPS 63-43.396W
site no. Site # 18

Date April 2005

DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	4.125m
SL	9.1m



Drawing by TEC Ltd
base drwing by CBCL

Drawn
SM

Designed
RJR

DWG TITLE

project name Governor's Run

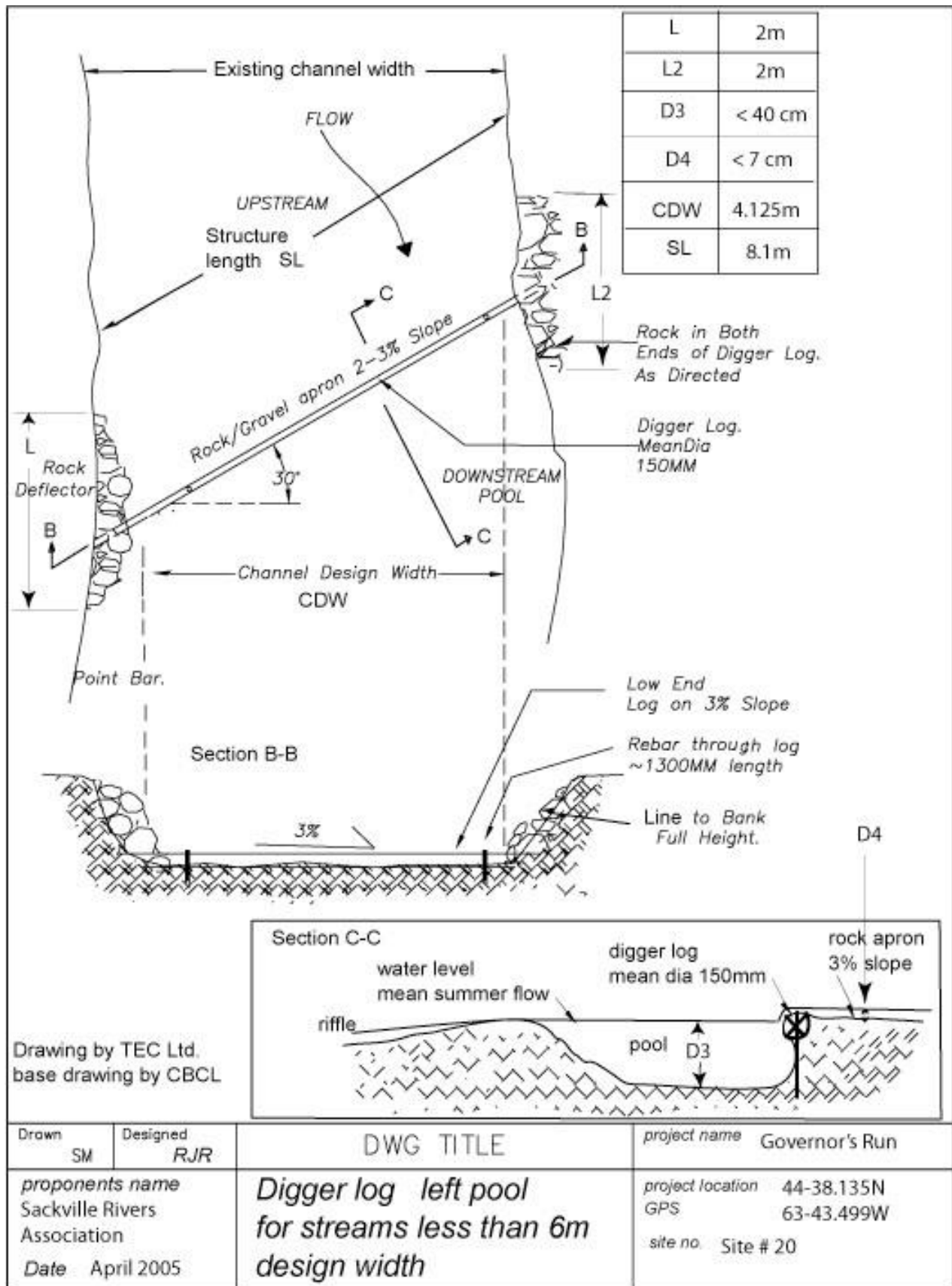
proponents name
Sackville Rivers
Association

Rock sill Right pool

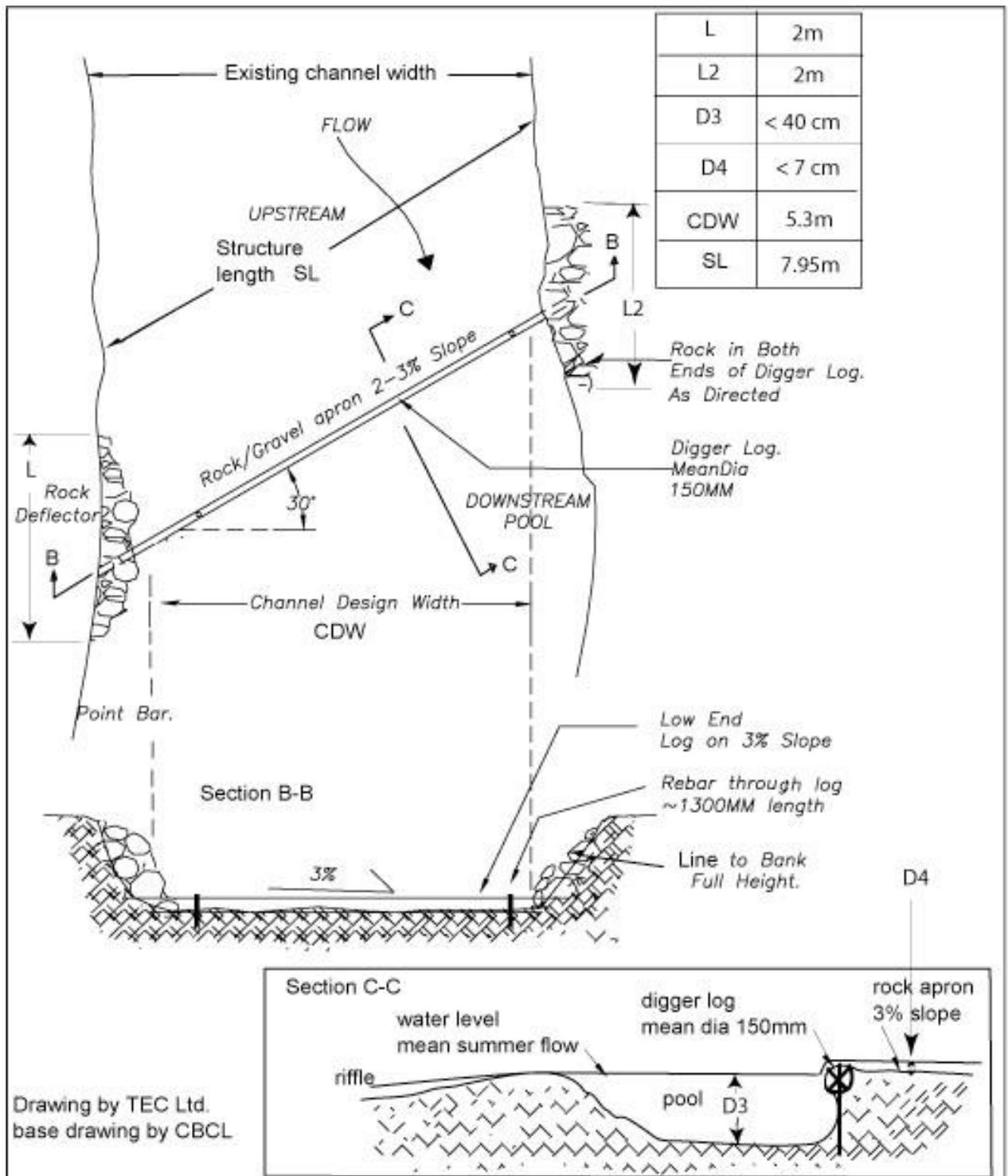
project location 44-38.135N
GPS 63-43.499W

Date April 2005

site no. Site # 19



DFO 2005



Drawing by TEC Ltd.
base drawing by CBCL

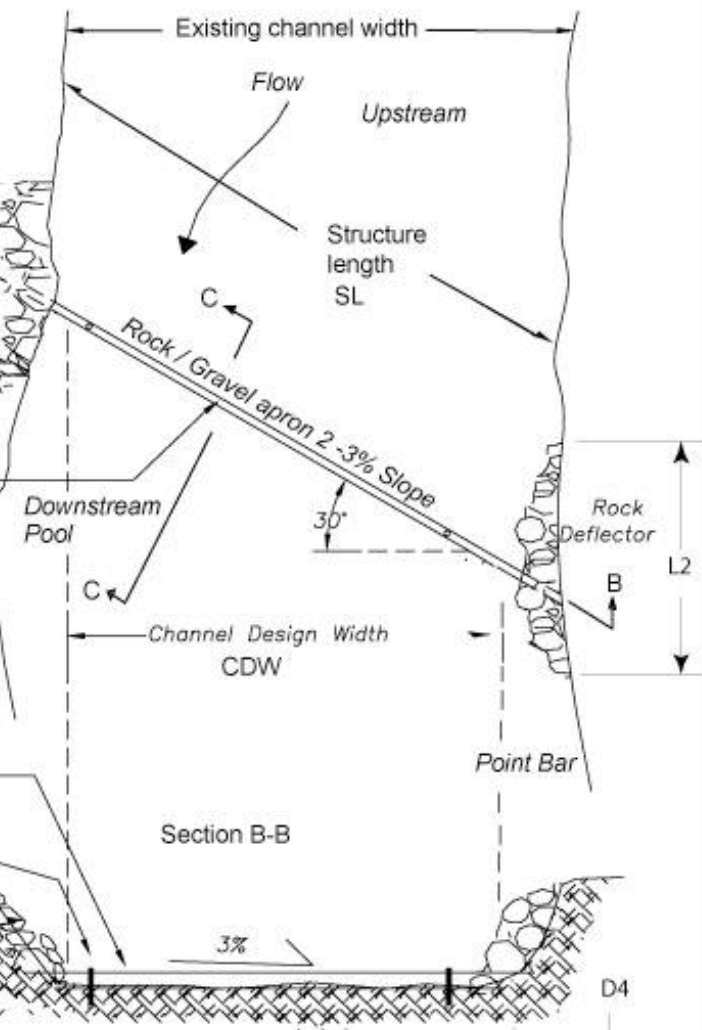
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proponents name Sackville Rivers Association Date April 2005		Digger log left pool for streams less than 6m design width	project location GPS 44-39.147N 63-43.496W site no. Site # 22

DFO 2005

L	2m
L2	2m
D3	< 40 cm
D4	< 7 cm
CDW	5.3m
SL	7.95m

Rock in Both Ends of Digger Log. As Directed

Digger Log. MeanDia 150MM



Low End Log on 3% Slope

Rebar through log. ~1300MM length

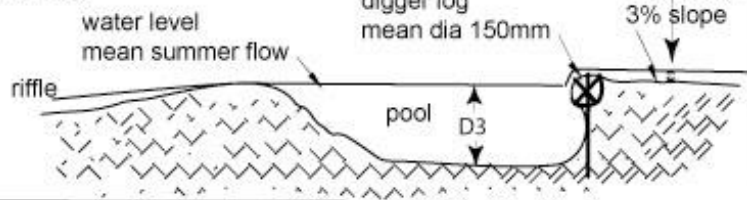
Line to Bank Full Height.

Section B-B

3%

D4

Section C-C



Base drawing by CBCL and TEC

Drawn SM	Designed RJR	DWG TITLE	project name Governor's Run
proponents name Sackville Rivers Association Date April 2005		Digger log right pool for streams less than 6m wide	project location GPS 44-39.151N 63-43.512W site no. Site # 23

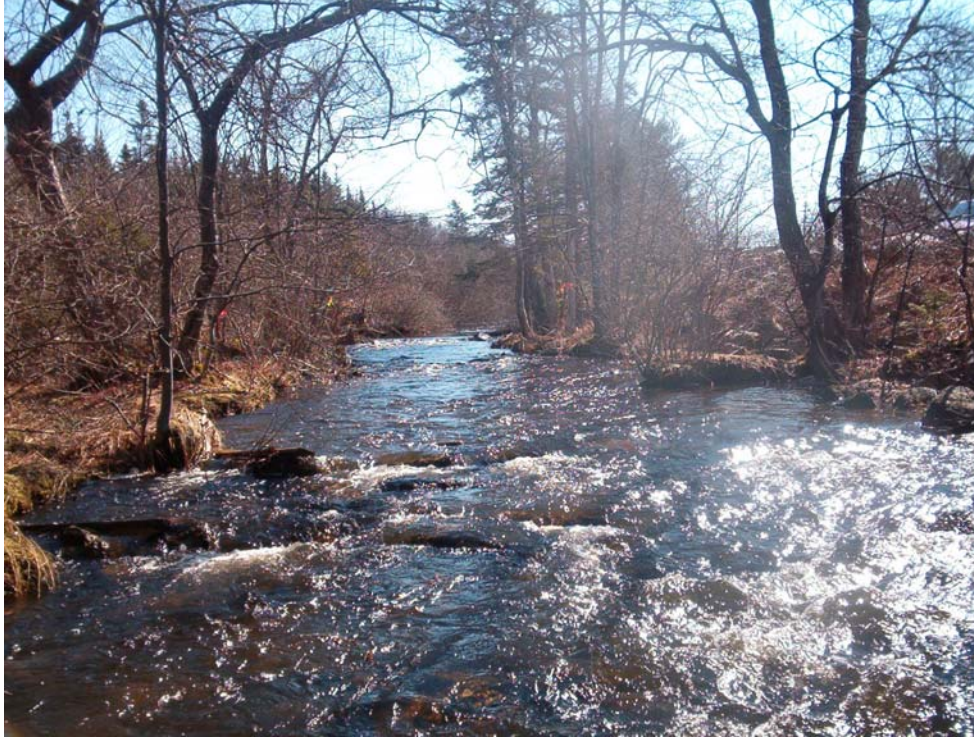
DFO 2005

APPENDIX F

**DIGGER LOG AND ROCK SILL
BEFORE AND AFTER PHOTOS**

BEFORE

Site 1



Site 2



Site 3



Site 4



Site 5



Site 6



Site 8



Site 9



Site 10



Site 11



Looking Downstream from Control Site 12



Site 13



Site 14



Site 15



Site 16



Site 17



Site 18



Site 19



Site 20



Control Site 21 “dam”



Site 22



Site 23



AFTER

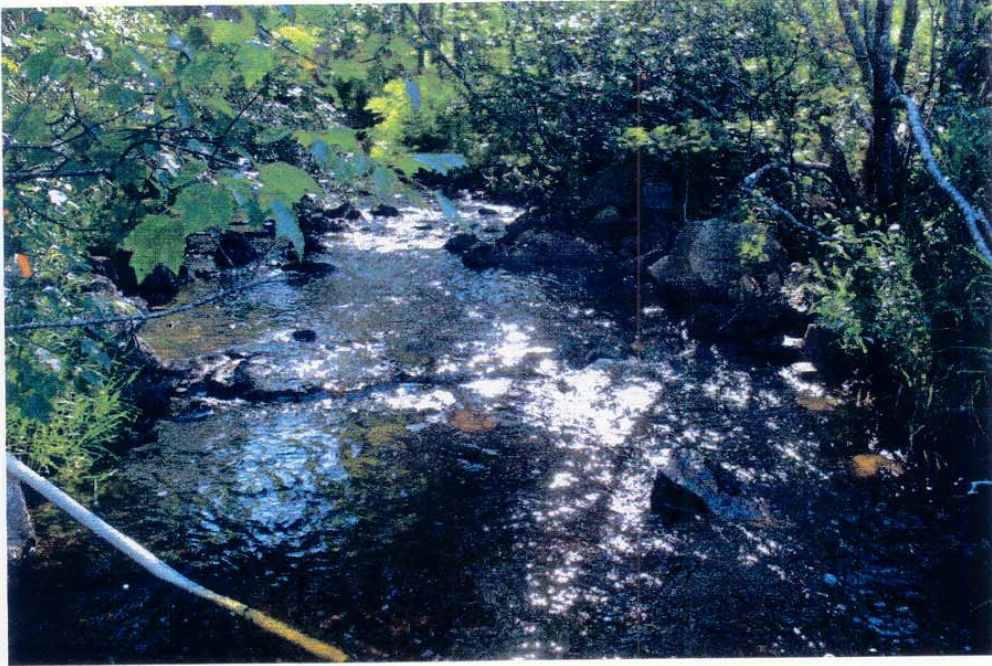
SITE # 1



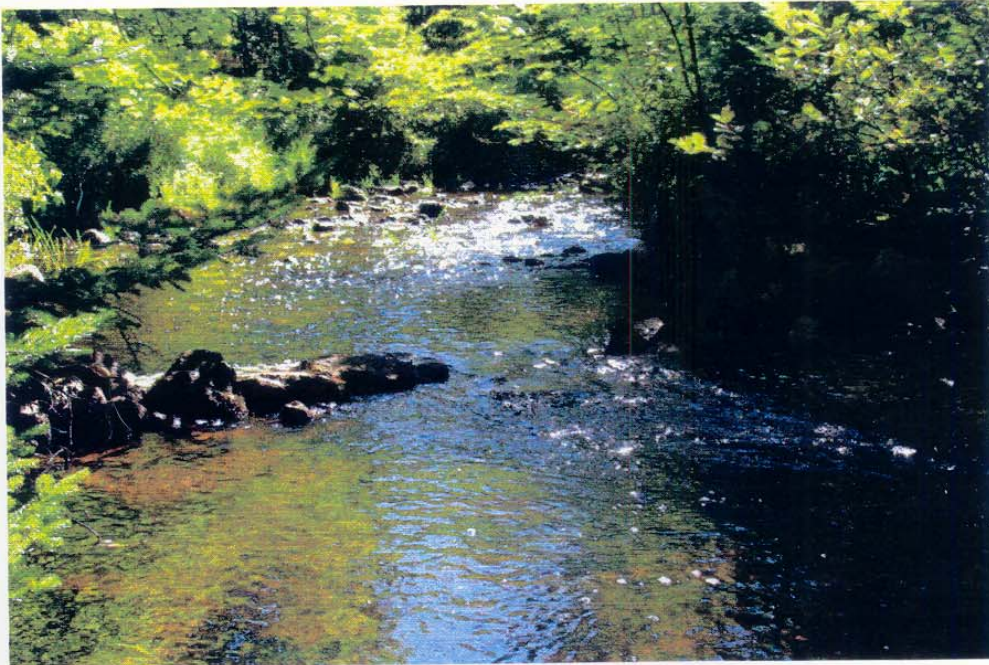
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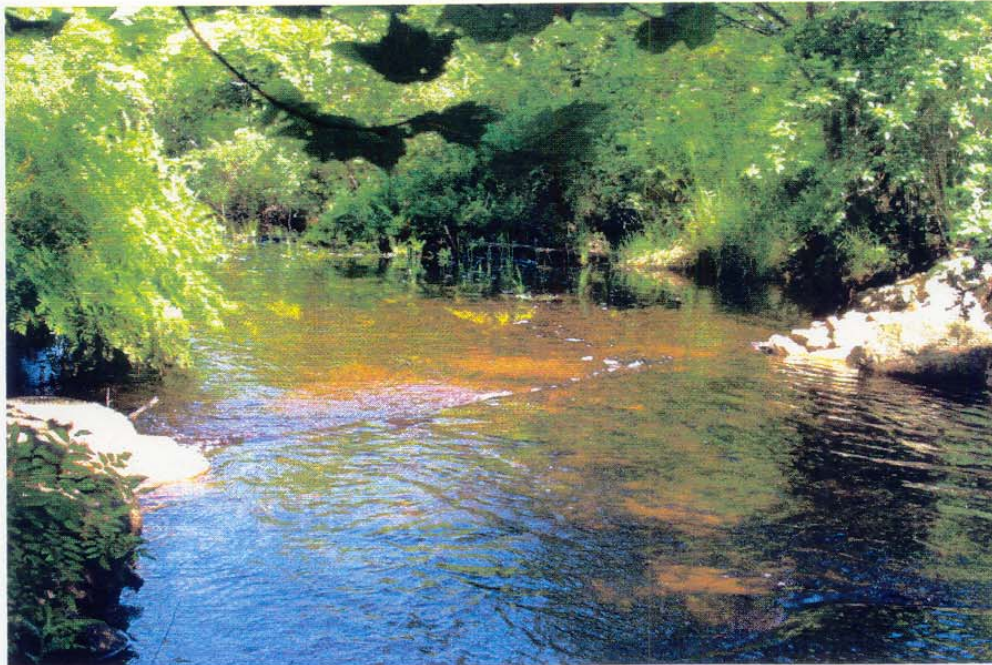
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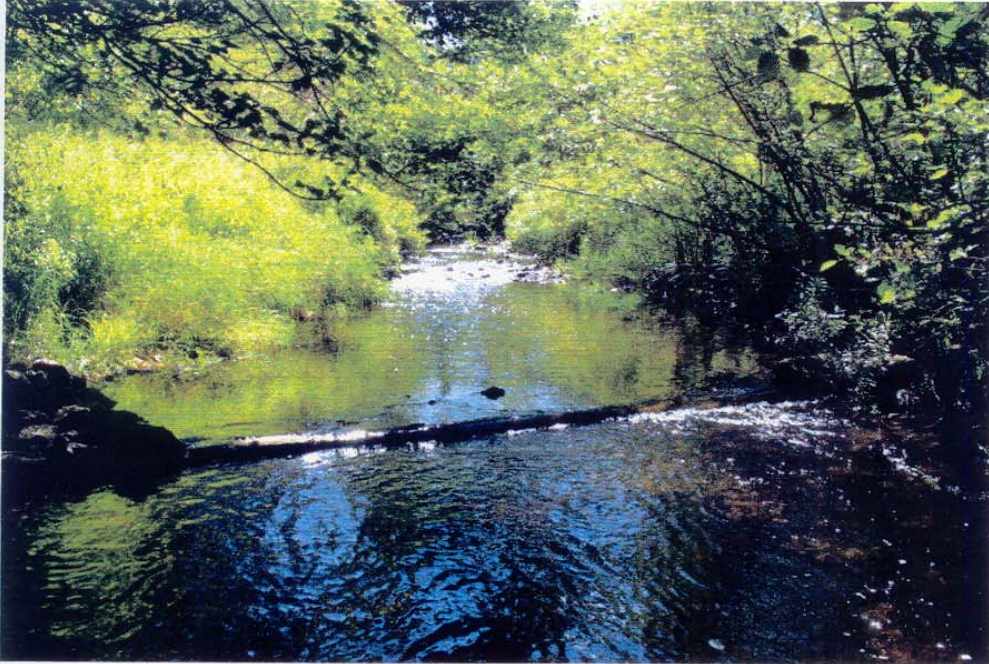
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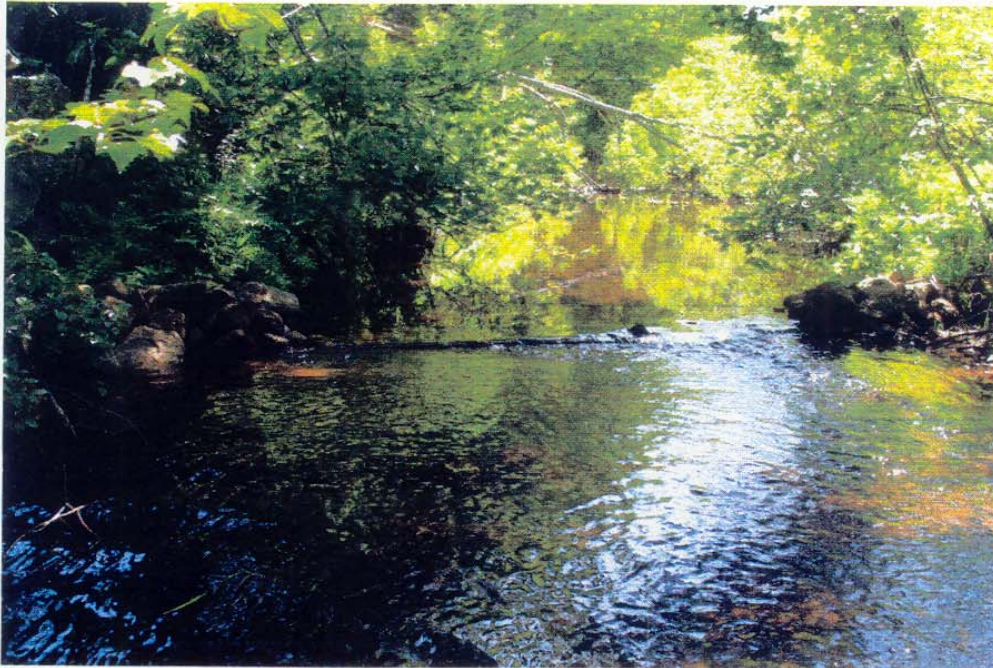
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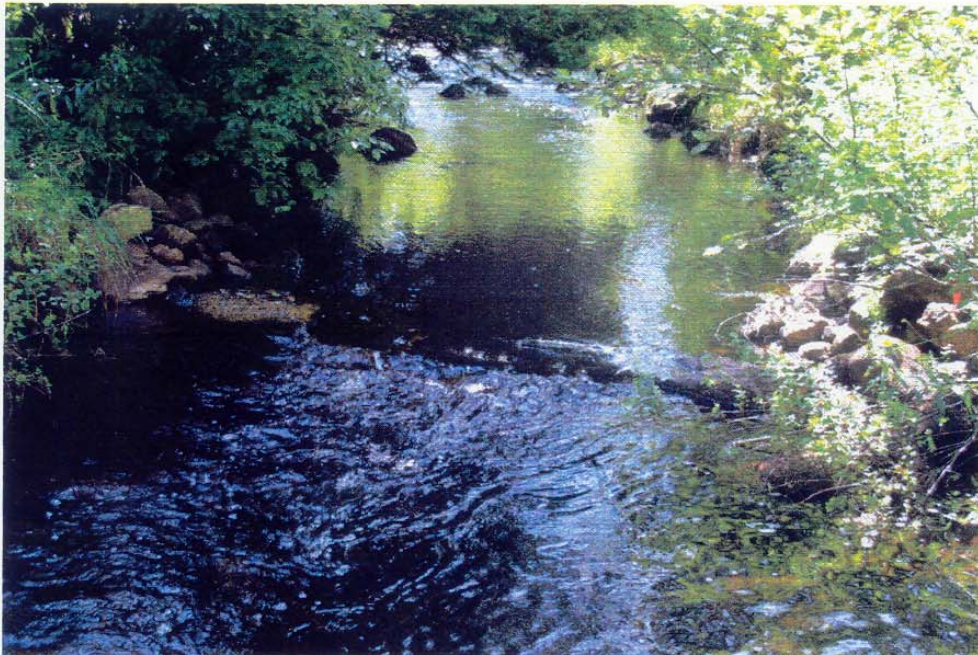
SITE #10



SITE # 11



SITE #13



SITE # 14



SITE # 15



SITE # 16



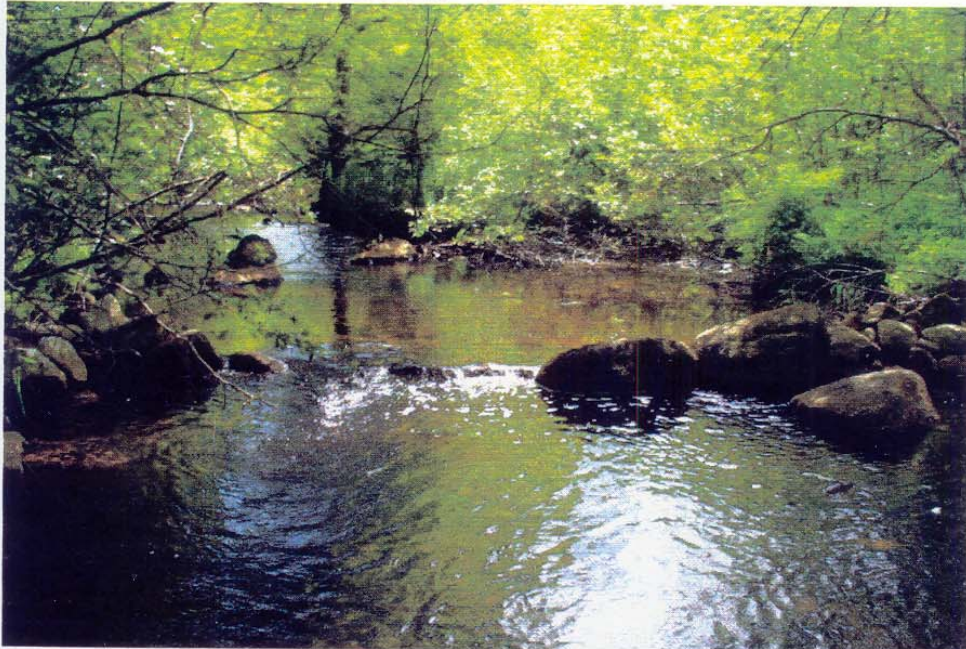
SITE # 17



SITE # 18



SITE # 19
PETTS POOL



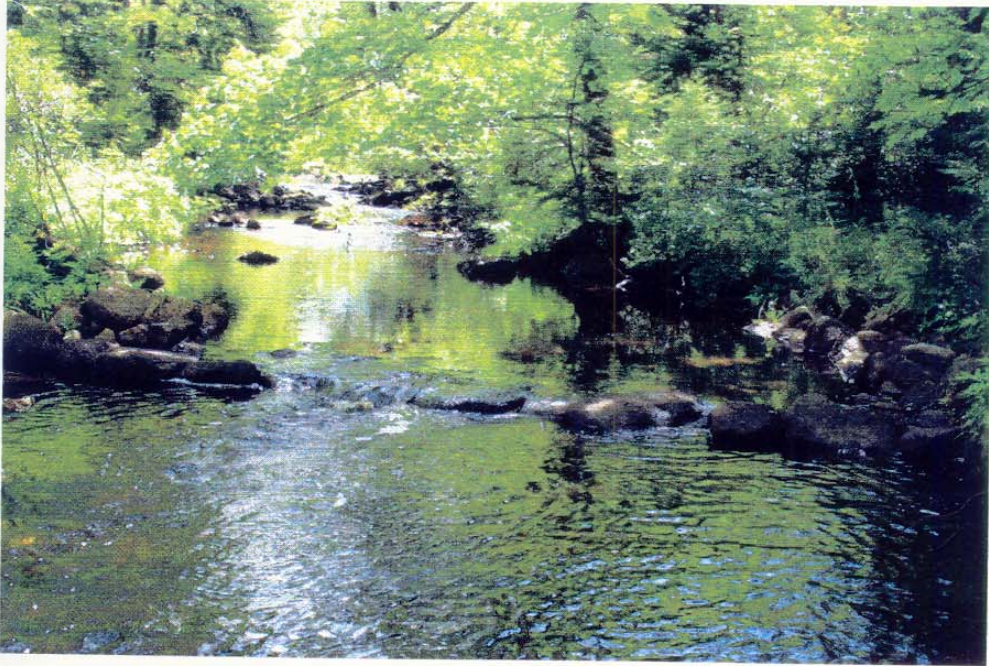
SITE 20



SITE 21
CONTROL SITE



SITE # 22



SITE # 23



APPENDIX G

**PRELIMINARY ELECTRO-FISHING REPORT
DATED JULY 13, 2004**

Electrofishing Report

Location: Electrofishing was conducted at two sites along Governor's Brook, which runs from Governor's Lake to the Nine Mile River through Timberlea, NS. The first site was located in a riffle/run reach just downstream of the tributary from Six Mile Lake. The second site was located in a riffle/pool reach just downstream from the trail bridge (formerly a train bridge) that crosses Governor's Brook just above the road to City Auto Salvage.

Method: Three sweep-removal was used at both sites. A lip sine and dip net were used for removal.

Statistic Analysis: The Zippen method was used to statistically analyze the data collected.

Machine: Smith Root 12B

Settings: J-8, 300V

Site #1 Data:

Location: Riffle/run reach just downstream for the tributary from Six Mile Lake

Date: July 13, 2004

Weather: Sunny

Water Temperature: 19.3 °C

pH: 7.3

Site Area: 317.86 m²

Catch:

Sweep	Species						Sweep Length
#	Eel	Trout	Sucker	Killifish	Salmon	Chub	Seconds
1	11	5	15	4	3	0	817
2	8	0	8	7	1	3	571
3	8	1	3	5	0	0	687

The four salmon caught were 6.3cm, 5.7cm, 5.5cm and 5.5cm in length.

Analysis:

Species	Density per 100 m ²
Eel	21.5
Trout	1.9
Sucker	9.1
Killifish	-
Salmon	1.3
Chub	-

*The small number of Killifish and Chub captured prevented analysis.

Site #2 Data

Location: Riffle/pool reach just downstream from the trail bridge (formerly a train bridge) that crosses Governor's Brook. This site will act as the control site for the habitat restoration planned for this brook.

Date: July 29, 2004

Weather: Sunny, with partial cloud

Water Temperature: 19.0 °C

pH: 6.7

Site Area: 109.90 m²

Catch:

Sweep	Species						Sweep Length
	#	Eel	Trout	Sucker	Killifish	Salmon	
1	16	2	1	1	0	0	642
2	11	0	1	0	0	0	462
3	7	0	1	2	0	0	589

Analysis:

Species	Density per 100 m ²
Eel	43.8
Trout	-
Sucker	-
Killifish	-
Salmon	-
Chub	-

*The small number of Trout, Suckers, Killifish, Salmon and Chub captured prevented analysis.

APPENDIX H

NEWS PAPER ARTICLE

THE MASTHEAD NEWS – AUGUST 17 2005

The Fish Are Coming Back—Restoration of Governor’s Brook Showing Good Results

By Keith Ayling

The fish are coming back—so are the insects, birds and natural growth surrounding the Nine Mile River in the Governor’s Brook area in Timberlea.

And it’s a direct result of the efforts of the Sackville Rivers Association (SRA) for the last two years.

Walter N. Regan, president of the association, explained that his organization was approached by the Provincial Department of Transportation to commence work on the river because of habitat damage caused by the building of a bridge over Hwy 103 due to twinning.

The SRA in turn engaged Thaumass Environmental Consultants to look for areas of damage.

They found that part of the Nine Mile River system had been severely impacted by logging work in the 1800s in the Governor’s Brook area.

The brook had been channelized, widened and straightened to facilitate the movement of logs, severely impacting the fish population.

The association felt that by bringing the brook up to current Atlantic Salmon habitat standards—an

important water quality indicator—conditions would significantly improve.

Natural water flows, pools and meanders were created with the installation of rock sills and log overflows—23 structures in all—

bringing back the original brook characteristics.

Electrofishing tests in recent months on the brook revealed the presence of several species of fish and a few baby Atlantic salmon fry.



Some of the volunteers helping to restore the habitat of the Nine Mile River in the Governor’s Brook area of Timberlea.

APPENDIX I

**YEAR ONE REPORT
INCLUDING
ELECTRO-FISHING REPORT
DATED AUGUST 16, 2006**

Governors Brook Year One Report

Thaumas Environmental Consultants Ltd.

Andrew Newbould

August 26th, 2006

Site Survey

Visual survey of each structure was conducted on August 14th, 2006. Structures were not built at sites 7 (because of a bridge), 12 (because of a bridge) and 21 (because of a former dam), so surveys of these sites were not conducted.

Site 1

Table 1. Structure information for site 1

Site Location (GPS, NAD83)	44-38.889N 63-42.917W
Site Location Description	Located in reach running from Governor's Lake to the first Stillwater downstream. Roughly behind the Trinity United Church
Type of Structure	Rock Sill
Length of Structure	6.10 m

Structure is in good condition (Figure 1). There isn't a noticeable concentration of water flow at the upstream end of the structure (Figure 1), however water levels were unseasonably high. The

structure does appear to be digging (Table 2) and the substrate in pool is not embedded. Deepest section of pool is currently located on the downstream end of the structure, however more fines in between the substrate were present.

Recommendation: Dig out the pool to help further pool development.

Table 2. Depth information for site 1

Pool Depth	1' 4.8"
Crest of Pool Depth	4.8"

Figure 1. Rock sill at site 1



Site 2

Table 3. Structure information for site 2

Site Location (GPS, NAD83)	44-38.893N 63-42.932W
Site Location Description	Located in reach running from Governor's Lake to the first Stillwater downstream. Roughly behind the Trinity United Church.
Type of Structure	Rock sill
Length of Structure	8.2 m

Structure is in good condition (Figure 2). Water flow is appropriately concentrated and the sill is sized properly. The structure does appear to be digging (Table 4) and the substrate in pool is not embedded.

Recommendation: Dig out the pool to help further pool development.

Table 4. Depth information for site 2

Pool Depth	1' 6"
Crest of Pool Depth	8.4"

Figure 2. Rock sill at site 2



Site 3

Table 5. Structure information for site 3

Site Location (GPS, NAD83)	44-38.908N 63-42.947W
Site Location Description	Located in reach running from Governor's Lake to the first Stillwater downstream. Roughly behind the Trinity United Church.
Type of Structure	Rock sill
Length of Structure	6.2 m

Structure is in good condition (Figure 3). Water flow is appropriately concentrated and the sill is sized properly. The structure does appear to be digging (Table 6) and the substrate in pool is not embedded.

Recommendation: Dig out the pool to help further pool development.

Table 6. Depth information for site 3

Pool Depth	1' 1.2"
Crest of Pool Depth	4.8"

Figure 3. Rock sill at site 3



Site 4

Table 7. Structure information for site 4

Site Location (GPS, NAD83)	44-38.967N 63-43.127W
Site Location Description	Located in the reach running from the first stillwater to the second stillwater. Below tributary from Six Mile Lake.
Type of Structure	Rock sill
Length of Structure	5.7 m

Table 8. Depth information for site 4

Pool Depth	1' 2.4"
Crest of Pool Depth	9.6"

Structure is in fair condition (Figure 4). Majority of flow is concentrated appropriately, however water is also flowing through the downstream end of the structure. Downstream end of the structure is larger than required, but does not need to be changed. Structure is digging (Table 8), but more sediment is present where the pool should be.

Recommendation: Dig out the pool to help further pool development and rebuild ramp leading to the structure to decrease the amount of water flowing through the downstream end of the structure. Decreasing the size of the structure would be desirable, but not required.

Figure 4. Rock sill at site 4



Site 5

Table 9. Structure information for site 5

Site Location (GPS, NAD83)	44-38.908N 63-42.947W
Site Location Description	Located in the reach running from the first stillwater to the second stillwater.
Type of Structure	Rock sill
Length of Structure	7.3 m

Structure is in good condition (Figure 5), however it is too large and has created a pool upstream from the structure (Figure 6). The concentration of water flow passes over the very upstream end of the structure. It is digging somewhat (Table 10).

Recommendations: Rebuild structure to appropriate size, with water concentration (low point) 1/3 of the total distance from the upstream end and no more than 3-4 inches from the natural stream bottom. Bank construction to assist with eliminating the pool created upstream of the structure will also be required. Dig out pool to help further pool development

Table 10. Depth information for site 5

Pool Depth	1' 3.6"
Crest of Pool Depth	10.8"
Upstream Pool Depth	1'

Figure 5. Rock sill at site 5

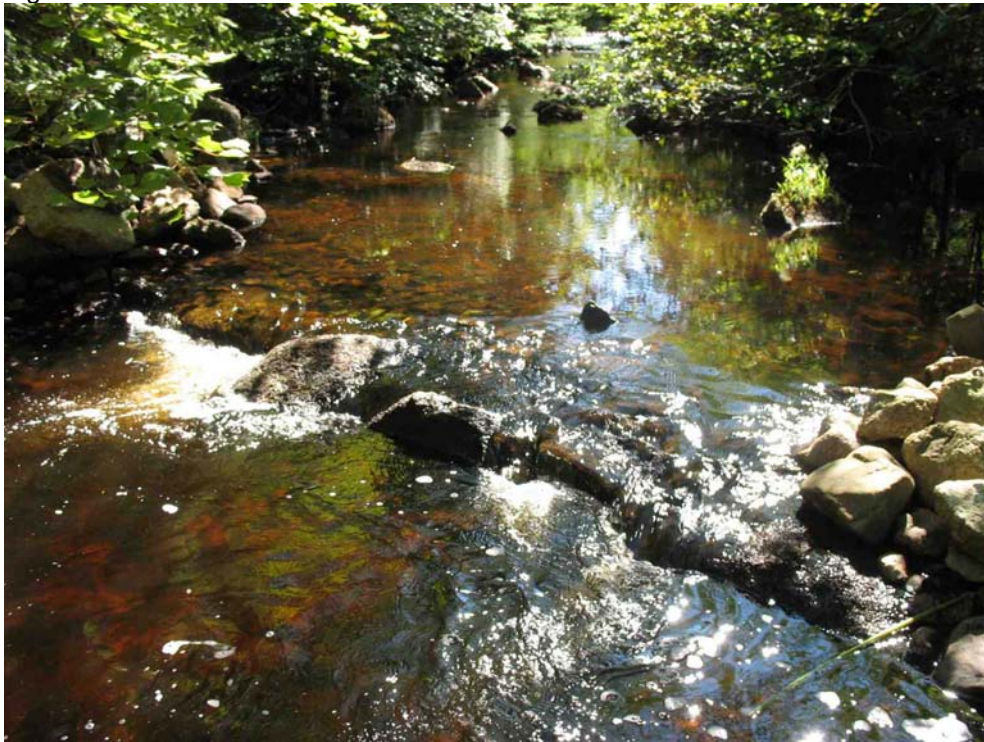


Figure 6. Upstream from site 5



Site 6

Table 11. Structure information for site 6

Site Location (GPS, NAD83)	44-38.982N 63-43.166W
Site Location Description	Located in the reach running from the first stillwater to the second stillwater. Close to the head of the second stillwater.
Type of Structure	Digger log
Length of Structure	6.6 m

Structure is in good condition, and has undercut well (Figure 7). However, it does not seem to be digging very well as the pool below is shallow (Table 12) and many fines remain where the pool should be located. A required section of bank just downstream from the upstream end was not built or has washed out (Figure 8).

Recommendation: Construct bank at upstream end of the structure and dig out pool.

Table 12. Depth information for site 6

Pool Depth	1'
Crest of Pool Depth	8.4"

Figure 7. Digger log at site 6



Figure 8. Missing bank at upstream end at site 6



Site 8

Table 13. Structure information for site 8

Site Location (GPS, NAD83)	44-38.055N 63-43.223W
Site Location Description	Reach between trail bridge and bridge leading to auto salvage yard.
Type of Structure	Digger Log
Length of Structure	10m

Structure is in good condition (Figure 9). Structure doesn't appear to be digging (Table 14), which is surprising as the substrate consists of small rocks and fines.

Recommendation: Dig out the pool to help further pool development.

Table 14. Depth information for site 8

Pool Depth	9.6"
Crest of Pool Depth	7.2"

Figure 9. Digger log at site 8



Site 9

Table 15. Structure information for site 9

Site Location (GPS, NAD83)	44-39.036N 63-43.268W
Site Location Description	Reach between trail bridge and bridge leading to auto salvage yard.
Type of Structure	Digger Log
Length of Structure	6.6m

Structure is in good condition and appears to be digging (Table 16).

Recommendation: Dig out the pool to help further pool development.

Table 16. Depth information for site 9

Pool Depth	1' 4.8"
Crest of Pool Depth	6"

Site 10

Table 17. Structure information for site 10

Site Location (GPS, NAD83)	44-39.044N 63-43.290W
Site Location Description	Reach between trail bridge and bridge leading to auto salvage yard.
Type of Structure	Digger Log
Length of Structure	7.3m

Structure is good condition. Structure doesn't appear to be digging (Table 18), which is surprising as the substrate consists of small rocks and fines.

Recommendation: Dig out the pool to help further pool development.

Table 18. Depth information for site 10

Pool Depth	8.4"
Crest of Pool Depth	6"

Figure 10. Digger log at site 10



Site 11

Table 19. Structure information for site 11

Site Location (GPS, NAD83)	44-39.050N 63-43.301W
Site Location Description	Reach between trail bridge and bridge leading to auto salvage yard.
Type of Structure	Digger Log
Length of Structure	5m

Structure is in good condition and appears to be digging (Table 20). The structure appears to be set too high and has created a pool upstream.

Recommendation: Lower structure to an appropriate level to drain upstream pool and dig out the pool to help further pool development.

Table 20. Depth information for site 11

Pool Depth	10.8''
Crest of Pool Depth	2.4''

Figure 11. Digger log at site 11



Site 13

Table 21. Structure information for site 13

Site Location (GPS, NAD83)	44-39.066N 63-43.333W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	4.2m

Structure is in good condition (Figure 12) and appears to be digging (Table 22), despite the presence of larger substrate. Water flow is concentrated in the middle of the structure.

Recommendations: Fix water flow concentration and dig out the pool to help further pool development.

Table 22. Depth information for site 13

Pool Depth	1'
Crest of Pool Depth	3.6''

Figure 12. Rock sill at site 13



Site 14

Table 23. Structure information for site 14

Site Location (GPS, NAD83)	44-39.085N 63-43.340W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	5.2m

Structure is in good condition (Figure 13) and appears to be digging (Table 24). Good concentration of water flow.

Recommendations: Dig out the pool to help further pool development.

Table 24. Depth information for site 14

Pool Depth	1' 2.4"
Crest of Pool Depth	4.8"

Figure 13. Rock sill at site 14



Site 15

Table 25. Structure information for site 15

Site Location (GPS, NAD83)	44-39.098N 63-43.355W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	6.3m

Structure is in good condition (Figure 14) and appears to be digging (Table 26). The structure is larger than required. Water concentration is appropriate, but low point is set higher off bottom than is optimal. Outfall pipe is discharging thick orange sludge into the pool at site 15 (Figure 15).

Recommendations: Adjust low point of the structure to an appropriate level (3-4 inches off the natural pool bottom) and dig out the pool to help further pool development. Deal appropriately with illegal outfall.

Table 26. Depth information for site 15

Pool Depth	1' 3.6"
Crest of Pool Depth	7.2"

Figure 14. Rock sill at site 15



Figure 15. Pipe discharging orange sludge into site 15



Site 16

Table 27. Structure information for site 16

Site Location (GPS, NAD83)	44-39.105N 63-43.392W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	5.5m

Structure has been partially washed out (Figure 16), but appears to be digging regardless (Table 28).

Recommendations: By the size of the material still present, sill was too large to begin with. Current situation resembles natural rock sill. Dig out the pool to help further pool development, do not bother rebuilding.

Table 28. Depth information for site 16

Pool Depth	1' 2.4"
Crest of Pool Depth	6"

Figure 16. Rock sill at site 16



Site 17

Table 29. Structure information for site 17

Site Location (GPS, NAD83)	44-39.108N 63-43.396W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	8.2m

Structure is in good condition (Figure 17) and appears to be digging (Table 30); however, it is much too large. Water is concentrated over the center of the structure.

Recommendations: Rebuild structure to appropriate size and water concentration. Dig out the pool to help further pool development.

Table 30. Depth information for site 17

Pool Depth	1' 4.8"
Crest of Pool Depth	8.4"

Figure 17. Rock sill at site 17



Site 18

Table 31. Structure information for site 18

Site Location (GPS, NAD83)	44-39.124N 63-43.396W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	7.0m

Structure is in good condition (Figure 18) and appears to be digging (Table 32). Water flow is concentrated in the center of the structure.

Recommendations: Realign water flow concentration appropriately and dig out the pool to help further pool development.

Table 32. Depth information for site 18

Pool Depth	1'
Crest of Pool Depth	3.6"

Figure 18. Rock sill at site 18



Site 19

Table 33. Structure information for site 19

Site Location (GPS, NAD83)	44-39.133N 63-43.441W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	9.1m

Structure is in good condition, and appropriately sized (Figure 19) for its location. It appears to be digging (Table 34).

Recommendations: Dig out the pool to help further pool development.

Table 34. Depth information for site 19

Pool Depth	1' 10.8
Crest of Pool Depth	4.8"

Figure 19. Rock sill at site 19



Site 20

Table 35. Structure information for site 20

Site Location (GPS, NAD83)	44-38.135N 63-43.499W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	8.1m

Structure is in decent condition (Figure 20), and appears to be digging (Table 36). Concentration of water flow is appropriate, however the downstream end of the structure could be improved to reduce the amount of water that is passing through it.

Recommendation: Fix downstream end of the structure and dig out the pool to help further pool development.

Table 36. Depth information for site 20

Pool Depth	1' 2.4"
Crest of Pool Depth	4.8"

Figure 20. Rock sill at site 20



Site 22

Table 37. Structure information for site 22

Site Location (GPS, NAD83)	44-39.143N 63-43.481W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	6.7m

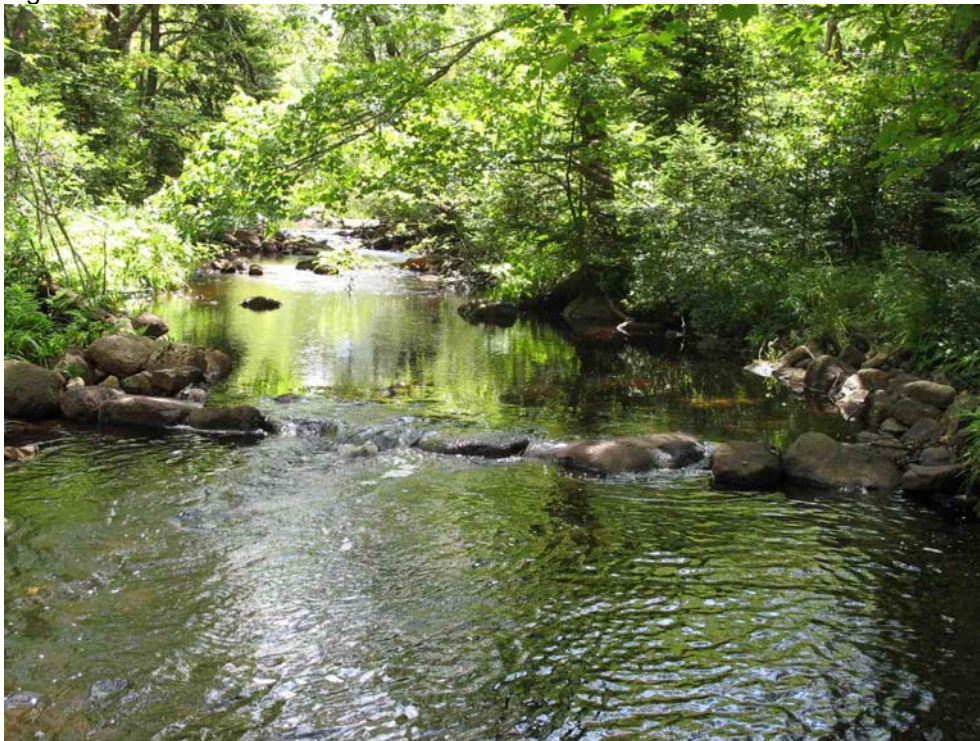
Structure is in good condition (Figure 21) and appears to be digging (Table 38). Bank construction/stabilization located upstream is still in place. Stream is twice as wide as it should be (or more) below the structure.

Recommendation: Dig out the pool to help further pool development. If it is possible, the section of the brook would greatly benefit from extensive bank construction downstream of the site.

Table 38. Depth information for site 22

Pool Depth	10.8"
Crest of Pool Depth	3.6"

Figure 21. Rock sill at site 22



Site 23

Table 39. Structure information for site 23

Site Location (GPS, NAD83)	44-39.146N 63-43.487W
Site Location Description	Reach between bridge leading to auto salvage yard and 3 rd stillwater.
Type of Structure	Rock sill
Length of Structure	5.9

Structure is in decent condition (Figure 22), has appropriate water flow concentration and appears to be digging (Table 40). Rocks comprising the downstream end of the structure were loose.

Recommendation: Re-set the downstream section of the sill and dig out the pool to help further pool development.

Table 40. Depth information for site 23

Pool Depth	1' 3.6"
Crest of Pool Depth	8.4"

Figure 22. Rock sill at site 23



Electrofishing Survey

Electrofishing was conducted on August 16th, 2006. Barrier nets were set up at each end of each site and three-sweep sampling was conducted by a two-person team.

Site 1

Site 1 is located between the trail crossing bridge and structure 8. Electrofishing was conducted from 10:10 am to 11:25 am.

Pass 1: 10:10 am – 10:25 am

Species	Length
Brook trout	4 cm
American eel	
American eel	

Pass 2: 10:30 am – 10:45 am

Species	Length
Brook trout	5 cm
Brook trout	11 cm
Gaspereau	3 cm
Gaspereau	3 cm
American eel	
American eel	
American eel	
American eel	
American eel	
American eel	
American eel	

Pass 3: 10:50 am – 11:06

Species	Length
Gaspereau	3 cm
American eel	
American eel	
American eel	
American eel	

Pass 4: 11:10 am – 11:25 am

Species	Length
American eel	40 cm

Approximately three quarters of the way through completing pass 4 a small opening in the upstream barrier net was noticed, along with approximately 200 juvenile Gaspereau caught on the upstream side of the net. Ten juvenile Gaspereau were caught in the section in pass 4, however they were not included as Gaspereau were observed entering the site through the opening.

Site 2

Site 2 is located between structure 5 and 6. Electrofishing was conducted between 11:55 am to 12:50 pm.

Pass 1: 11:55 am – 12:15 pm

Species	Length
Banded killifish	4 cm
Banded killifish	5 cm
American eel	
American eel	
American eel	
American eel	

At the completion of pass 1, approximately 200 juvenile Gaspereau were removed from the upstream side of the upstream barrier net and moved to below the downstream barrier net.

Pass 2: 12:19 pm – 12:23 pm

Species	Length
Nil	Nil

At the completion of pass 2, approximately 300 juvenile Gaspereau were removed from the upstream side of the upstream barrier net and moved to below the downstream barrier net.

Pass 3: 12:30 pm – 12:50 pm

Species	Length
Sucker	6 cm
Banded killifish	4 cm
Banded killifish	3 cm
Banded killifish	3 cm

While conducting pass 3, approximately 600 juvenile Gaspereau were removed from the upstream side of the upstream barrier net and moved to below the downstream barrier net. Despite the presence of a new species in pass 3, electrofishing was not continued because of the excessive number of juvenile Gaspereau becoming caught in the upstream barrier net.

The excessive number of juvenile Gaspereau migrating downstream may negatively influence species composition and densities at the sites surveyed. On the upside, Gaspereau are a anadromous species, so their presence is a very strong indicator that fish passage between the ocean and Governors Brook is readily available.

Appendix J

**YEAR 3 ELECTRO-FISHING SURVEY REPORT
PERFORMED ON SEPT 30, 2008**

Location: Electrofishing was conducted at two sites along Governor's Brook, which runs from Governor's Lake to the Nine Mile River through Timberlea, NS. The first site was located in a riffle/run reach just downstream of the tributary from Six Mile Lake. The second site was located in a riffle/pool reach just downstream from the trail bridge (formerly a train bridge) that crosses Governor's Brook just above the road to City Auto Salvage.

The number of fish caught was too small to statistically predict the extent of the population.

Method: Three sweep-removal was used at both sites. A lip sine and dip net were used for removal.

Machine: Smith Root 12B
Settings: J-8, 300V

Site 1

Weather: Sunny
Site Area: 317.86 m²

Pass 1:

Species	Length (cm)
Speckled Trout	5
American Eel	20
American Eel	25
American Eel	27
White Sucker	4

Pass 2:

Species	Length (cm)
American Eel	16
American Eel	18
American Eel	23

Pass 3:

Species	Length (cm)
Speckled Trout	4
Speckled Trout	7
American Eel	14
American Eel	15
American Eel	15
American Eel	18
American Eel	20
American Eel	24
White Sucker	4

Site 2

Weather: Sunny
Site Area: 109.90m²

Pass 1:

Species	Length (cm)
Speckled Trout	6
Speckled Trout	22
American Eel	20
American Eel	22
American Eel	25
American Eel	30
Banded Killifish	2
Banded Killifish	3
Banded Killifish	3
Banded Killifish	4
Banded Killifish	4
Banded Killifish	4
Banded Killifish	6
Banded Killifish	6
Stickleback	4
Stickleback	4
Stickleback	4
Stickleback	4
Common Shiner	4
Common Shiner	4
Common Shiner	5

Pass 2:

Species	Length (cm)
American Eel	20
American Eel	20
American Eel	25
White Sucker	4
White Sucker	4
White Sucker	5
Banded Killifish	6
Banded Killifish	6
Banded Killifish	7
Common Shiner	3

Pass 3:

Species	Length (cm)
---------	-------------

Speckled Trout	5
Speckled Trout	6
Speckled Trout	7
American Eel	10
American Eel	27
White Sucker	4
White Sucker	4
White Sucker	5
White Sucker	5
Banded Killifish	4
Banded Killifish	4
Banded Killifish	6

Data Analysis

The numbers of individual species caught were too small to analyze statistically, however some comparisons can be drawn. Eight Speckled Trout were caught in 2008 and only three were caught in the 2006 electro fishing survey, not enough to properly analyze, but there was an observed increase. Not counting juvenile Gaspereau (>3) twice as many more total fish were caught in 2008 compared to 2006. Small numbers of Stickleback and Common Shiner's were caught, which is significant since none were caught during the 2004 and 2006 Governor's Brook electro fishing surveys.