APPENDIX A

Summary of Results from Winter 2010 Stream Flow Monitoring Program

December 18, 2012
Report No. 0714140014-501-R-Rev2-3000

Stream Guaging Data Form

STREAM NAME: Millstream Creek

SITE NO: DOH1

Elevation: 180m

UTM COORDINATES: 0462167E, 5369722N

GPS ACCURACY: +/- 4m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3165-3167

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: FP101

MEASUREMENT START TIME: 9:35 am

MEASUREMENT END TIME:

COMMENTS: Measurement location downstream of Hannington Road bridge.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
RB	0.29	0	0			0		
1	0.5	0.21	0.134			0	0.205	0.000
2	0.7	0.41	0.188			0.13	0.2	0.005
3	0.9	0.61	0.258			0.15	0.2	0.008
4	1.1	0.81	0.264			0.16	0.2	0.008
5	1.3	1.01	0.308			0.12	0.2	0.007
6	1.5	1.21	0.33			0.11	0.2	0.007
7	1.7	1.41	0.34			0.07	0.2	0.005
8	1.9	1.61	0.362			0.14	0.2	0.010
9	2.1	1.81	0.396			0.1	0.2	0.008
10	2.3	2.01	0.418			0.06	0.2	0.005
11	2.5	2.21	0.436			0.11	0.2	0.010
12	2.7	2.41	0.404			0.2	0.2	0.016
13	2.9	2.61	0.376			0.21	0.2	0.016
14	3.1	2.81	0.388			0.22	0.2	0.017
15	3.3	3.01	0.38			0.25	0.2	0.019
16	3.5	3.21	0.39			0.2	0.2	0.016
17	3.7	3.41	0.384			0.21	0.2	0.016
18	3.9	3.61	0.38			0.27	0.2	0.021
19	4.1	3.81	0.378			0.24	0.2	0.018
20	4.3	4.01	0.368			0.16	0.2	0.012
21	4.5	4.21	0.344			0.08	0.2	0.006
22	4.7	4.41	0.32			0	0.2	0.000
23	4.9	4.61	0.27			0	0.2	0.000
24	5.1	4.81	0.246			0	0.2	0.000
25	5.3	5.01	0.17			0	0.2	0.000
LB	5.5	5.21	0			0		
						TOTAL DISCHARGE :		**0.229**

Stream Guaging Data Form

STREAM NAME: N/A

SITE NO: DOH4

Elevation: 193m

UTM COORDINATES: 0461702E, 5372502N

GPS ACCURACY: +/- 7.5m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3199-3201

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: N/A

MEASUREMENT START TIME: 3:45 pm

MEASUREMENT END TIME:

COMMENTS:

Turbulent flow, bedrock base, down gradient from Site visited in September 2007

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
RB	0.4	0	0			0		
1	0.5	0.10	0.055			0	0.1	0.000
2	0.6	0.20	0.105			0.09	0.1	0.001
3	0.7	0.30	0.118			0.41	0.1	0.005
4	0.8	0.40	0.1			0.69	0.1	0.007
5	0.9	0.50	0.145			0.65	0.1	0.009
6	1	0.60	0.13			0.45	0.1	0.006
7	1.1	0.70	0.15			0.25	0.1	0.004
8	1.2	0.80	0.146			0.34	0.1	0.005
9	1.3	0.90	0.12			0.22	0.1	0.003
10	1.4	1.00	0.05			0.42	0.1	0.002
11	1.5	1.10	0.085			0.37	0.1	0.003
12	1.6	1.20	0.105			0.34	0.1	0.004
13	1.7	1.30	0.082			0.19	0.1	0.002
14	1.8	1.40	0.085			0.18	0.1	0.002
15	1.9	1.50	0.098			0.15	0.1	0.001
16	2	1.60	0.066			0.14	0.1	0.001
17	2.1	1.70	0.075			0.12	0.1	0.001
18	2.2	1.80	0.02			0.09	0.1	0.000
19	2.3	1.90	0.055			0.11	0.1	0.001
LB	2.4	2.00	0			0		
							TOTAL DISCHARGE :	**0.055**

Stream Guaging Data Form

STREAM NAME: Millstream Creek

SITE NO: D0H5

Elevation: 166 m

UTM COORDINATES: 0462566E, 5372937N

GPS ACCURACY: +/- 6m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3168-3176

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: FP101

MEASUREMENT START TIME: 10:36 am

MEASUREMENT END TIME:

COMMENTS: Measurement location 20m uptream from original survey location. Vertical left and right banks.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	0.2	0	0.32			0		
1	0.4	0.20	0.546			0.04	0.2	0.004
2	0.6	0.40	0.628			0.1	0.2	0.013
3	0.8	0.60	0.64			0.13	0.2	0.017
4	1	0.80	0.66			0.12	0.2	0.016
5	1.2	1.00	0.68			0.09	0.2	0.012
6	1.4	1.20	0.586			0	0.2	0.000
7	1.6	1.40	0.53			0	0.2	0.000
8	1.8	1.60	0.41			0	0.2	0.000
RB	2	1.80	0.33			0		
							TOTAL DISCHARGE :	**0.062**

Stream Guaging Data Form

STREAM NAME: Hazlitt Creek

SITE NO: DOH6

Elevation: 247m

UTM COORDINATES: 0462700E, 5374855N

GPS ACCURACY: +/- 6.8m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3180-3183

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: FP101

MEASUREMENT START TIME: 11:34 pm

MEASUREMENT END TIME:

COMMENTS: Approximately same location as last survey. LB velocity below range of flow meter. Multiple channels available upstream of culvert, only 1 channel flwoing through main culvert.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	1.4		0			0		
1	1.55	0.15	0.209			0	0.15	0.000
2	1.7	0.30	0.198			0	0.15	0.000
3	1.85	0.45	0.21			0	0.15	0.000
4	2	0.60	0.252			0	0.15	0.000
5	2.15	0.75	0.306			0	0.15	0.000
6	2.3	0.90	0.378			0	0.15	0.000
7	2.45	1.05	0.384			0	0.15	0.000
8	2.6	1.20	0.432			0	0.15	0.000
9	2.75	1.35	0.428			0	0.15	0.000
10	2.9	1.50	0.419			0.09	0.15	0.006
11	3.05	1.65	0.353			0.1	0.15	0.005
12	3.2	1.80	0.372			0.09	0.15	0.005
13	3.35	1.95	0.299			0.05	0.15	0.002
14	3.5	2.10	0.268			0.08	0.15	0.003
15	3.65	2.25	0.16			0	0.15	0.000
RB	3.8	2.40	0			0		
							TOTAL DISCHARGE :	**0.021**

Stream Guaging Data Form

STREAM NAME: N/A

SITE NO: DOH7

Elevation: 167m

UTM COORDINATES: 0464690E, 5372872N

GPS ACCURACY: +/- 5.6m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3192-3193

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: FP101

MEASUREMENT START TIME: 1:58 pm

MEASUREMENT END TIME: 2:05pm

COMMENTS: Flow in ditch next to Munns Road, downstream of black plastic culvert under Munns Road.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	0		0			0		
1	0.1	0.10	0			0	0.1	0.000
2	0.2	0.20	0.027			0	0.1	0.000
3	0.3	0.30	0.029			0	0.1	0.000
4	0.4	0.40	0.052			0.13	0.1	0.001
5	0.5	0.50	0.064			0.15	0.1	0.001
6	0.6	0.60	0.11			0.1	0.1	0.001
7	0.7	0.70	0.1			0.13	0.1	0.001
8	0.8	0.80	0.074			0.19	0.1	0.001
9	0.9	0.90	0.067			0	0.1	0.000
RB	1	1.00	0			0		
							TOTAL DISCHARGE :	**0.005**

Stream Guaging Data Form

STREAM NAME: N/A
SITE NO: DOH8
Elevation: 90m
UTM COORDINATES: 0465577E, 5372166N
GPS ACCURACY: +/- 5.1m
MEASUREMENT BY: NG/TL
COMPUTATIONS BY: TL
PICTURE NUMBERS : 3194-3196

PROJECT NUMBER : 07-1414-0014-3000
MEASUREMENT DATE: March 4, 2010
METER NUMBER: N/A
MEASUREMENT START TIME: 2:30 pm
MEASUREMENT END TIME:
COMMENTS: Site is downstream of 2 culverts which cross under Munn Road. Culvert diameters = 1m.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	0.4		0			0		
1	0.5	0.10	0.07			0.18	0.1	0.001
2	0.6	0.20	0.09			0.19	0.1	0.002
3	0.7	0.30	0.085			0.21	0.1	0.002
4	0.8	0.40	0.088			0.21	0.1	0.002
5	0.9	0.50	0.1			0.17	0.1	0.002
6	1	0.60	0.102			0.21	0.1	0.002
7	1.1	0.70	0.112			0.23	0.1	0.003
8	1.2	0.80	0.126			0.27	0.1	0.003
9	1.3	0.90	0.168			0.22	0.1	0.004
10	1.4	1.00	0.138			0.2	0.1	0.003
11	1.5	1.10	0.162			0.18	0.1	0.003
12	1.6	1.20	0.115			0.06	0.1	0.001
13	1.7	1.30	0.15			0	0.1	0.000
14	1.8	1.40	0.09			0	0.1	0.000
15	1.9	1.50	0.1			0	0.1	0.000
16	2	1.60	0.07			0.02	0.1	0.000
17	2.1	1.70	0.052			0.08	0.1	0.000
18	2.2	1.80	0.02			0	0.1	0.000
19	2.3	1.90	0.03			0	0.1	0.000
20	2.4	2.00	0.005			0	0.1	0.000
RB	2.5	2.10	0			0		
						TOTAL DISCHARGE :		**0.027**

Stream Guaging Data Form

STREAM NAME: Craigflower Creek

SITE NO: DOH10

Elevation: 41m

UTM COORDINATES: 0465762E, 5369684N

GPS ACCURACY: +/- 6.0m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: NG

PICTURE NUMBERS : 3202 - 3204

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: N/A

MEASUREMENT START TIME: 4:55 pm

MEASUREMENT END TIME:

COMMENTS: Site is east of bridge on Highland Road, flat land on creek sides, cobbles, sand and gravel creek base.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	0.5		0.14			0		
1	0.6	0.10	0.15			0	0.1	0.000
2	0.7	0.20	0.192			0	0.1	0.000
3	0.8	0.30	0.208			0	0.1	0.000
4	0.9	0.40	0.236			0.04	0.1	0.001
5	1	0.50	0.27			0	0.1	0.000
6	1.1	0.60	0.286			0.06	0.1	0.002
7	1.2	0.70	0.268			0.07	0.1	0.002
8	1.3	0.80	0.326			0.07	0.1	0.002
9	1.4	0.90	0.29			0.07	0.1	0.002
10	1.5	1.00	0.312			0.08	0.1	0.002
11	1.6	1.10	0.334			0.11	0.1	0.004
12	1.7	1.20	0.332			0.11	0.1	0.004
13	1.8	1.30	0.346			0.11	0.1	0.004
14	1.9	1.40	0.334			0.11	0.1	0.004
15	2	1.50	0.31			0.12	0.1	0.004
16	2.1	1.60	0.28			0.13	0.1	0.004
17	2.2	1.70	0.322			0.12	0.1	0.004
18	2.3	1.80	0.308			0.13	0.1	0.004
19	2.4	1.90	0.336			0.14	0.1	0.005
20	2.5	2.00	0.328			0.13	0.1	0.004
21	2.6	2.10	0.286			0.15	0.1	0.004
22	2.7	2.20	0.3			0.14	0.1	0.004
23	2.8	2.30	0.338			0.14	0.1	0.005
24	2.9	2.40	0.329			0.13	0.1	0.004
25	3	2.50	0.304			0.14	0.1	0.004
26	3.1	2.60	0.308			0.15	0.1	0.005
27	3.2	2.70	0.298			0.14	0.1	0.004
28	3.3	2.80	0.318			0.13	0.1	0.004
29	3.4	2.90	0.276			0.12	0.1	0.003
30	3.5	3.00	0.256			0.13	0.1	0.003
31	3.6	3.10	0.282			0.03	0.1	0.001
32	3.7	3.20	0.15			0.12	0.1	0.002
RB	3.8	3.30	0			0		
						TOTAL DISCHARGE :		**0.094**

Stream Guaging Data Form

STREAM NAME: N/A

SITE NO: DOH11

Elevation: 231m

UTM COORDINATES: 0462904E, 5375598N

GPS ACCURACY: +/- 8.3m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3184-3187

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: FP101

MEASUREMENT START TIME: 12:20 pm

MEASUREMENT END TIME:

COMMENTS: Left bank is vertical. New location.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
LB	0.45	0	0.339			0.1	0.05	0.002
1	0.55	0.10	0.38			0	0.1	0.000
2	0.65	0.20	0.404			0	0.1	0.000
3	0.75	0.30	0.479			0	0.1	0.000
4	0.85	0.40	0.456			0	0.1	0.000
5	0.95	0.50	0.42			0.08	0.1	0.003
6	1.05	0.60	0.439			0.09	0.1	0.004
7	1.15	0.70	0.372			0.06	0.1	0.002
8	1.25	0.80	0.29			0.15	0.1	0.004
9	1.35	0.90	0.238			0.14	0.075	0.002
RB	1.4	0.95	0			0		
							TOTAL DISCHARGE :	**0.016**

Stream Guaging Data Form

STREAM NAME: N/A

SITE NO: DOH12

Elevation: 224m

UTM COORDINATES: 0461702E, 5372502N

GPS ACCURACY: +/- 5.2m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3188-3191

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: N/A

MEASUREMENT START TIME: 1:15 pm

MEASUREMENT END TIME:

COMMENTS: Next to Munn Road Park, downstream of culvert under Munns Road. Stream is deeply incised. Concrete culvert is 1.5 in diameter.

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
RB	0.4	0	0			0		
1	0.5	0.10	0.088			0.05	0.1	0.000
2	0.6	0.20	0.111			0.04	0.1	0.000
3	0.7	0.30	0.158			0.04	0.1	0.001
4	0.8	0.40	0.18			0.05	0.1	0.001
5	0.9	0.50	0.215			0.07	0.1	0.002
6	1	0.60	0.211			0.05	0.1	0.001
7	1.1	0.70	0.224			0.06	0.1	0.001
8	1.2	0.80	0.163			0.08	0.1	0.001
9	1.3	0.90	0.16			0	0.1	0.000
10	1.4	1.00	0.115			0	0.1	0.000
LB	1.5	1.10	0			0		
							TOTAL DISCHARGE :	**0.008**

Stream Guaging Data Form

STREAM NAME: N/A

SITE NO: DOH13

Elevation: 125m

UTM COORDINATES: 0465506E, 5373140N

GPS ACCURACY: +/- 6.6m

MEASUREMENT BY: NG/TL

COMPUTATIONS BY: TL

PICTURE NUMBERS : 3197-3198

PROJECT NUMBER : 07-1414-0014-3000

MEASUREMENT DATE: March 4, 2010

METER NUMBER: N/A

MEASUREMENT START TIME: 3:00 pm

MEASUREMENT END TIME:

COMMENTS: Incised creek in vally south of Blue Valley Road, steep banks, sand and gravel creek base, right vertical bank

Station No.	Measured Distance (m)	Distance From Bank (m)	Depth (m)	Velocity			Width (m)	Discharge (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
RB	0.3	0	0.02			0		
1	0.4	0.10	0.06			0	0.1	0.000
2	0.5	0.20	0.112			0	0.1	0.000
3	0.6	0.30	0.168			0.06	0.1	0.001
4	0.7	0.40	0.16			0.07	0.1	0.001
5	0.8	0.50	0.178			0.07	0.1	0.001
6	0.9	0.60	0.19			0.06	0.1	0.001
7	1	0.70	0.2			0.09	0.1	0.002
8	1.1	0.80	0.186			0.09	0.1	0.002
9	1.2	0.90	0.2			0.1	0.1	0.002
10	1.3	1.00	0.182			0.14	0.1	0.003
11	1.4	1.10	0.11			0.14	0.1	0.002
12	1.5	1.20	0.09			0.09	0.1	0.001
LB	1.6	1.30	0			0		
							TOTAL DISCHARGE :	**0.015**

APPENDIX B

Photographs of Monitoring Well Upgrade

Photograph 1: Pre-existing condition of monitoring well DOH-04A. The well was completed in a well pit and the casing did not extend a minimum of 0.3 m above the floor of the pt, as required under the BC Ground Water Protection Regulation.

Photograph 2: The well casing was extended so that the top of casing would be greater than 0.3 m above ground surface adjacent to the well following removal of the retaining walls and regrading of the area.

Photograph 3: The area around the well casing was excavated and a form was placed around the casing. Bentonite was placed in the excavation and the form and hydrated to establish a seal around the well casing. The well was secured with a lockable cap.

Photograph 4: The wooden retaining walls were removed and the well pit was filled with clean fill materials. Ground surface was graded to convey surface water away from the wellhead. A well identification plate was attached to the well casing.