## Appendix D: Rapid Field Assessment Sheets





### Fluvial Geomorphology Field Key

#### **Table 1 Land Use**

- 1. Forest
- 8. Golf Course

9. Commercial

- 2. Pasture
- 3. Agricultural
- 4. Industrial
- 5. Park
- 6. Institutional
- 7. Residential

#### **Table 2 Valley Type**

- 1. Unconfined
- 2. Confined
- 3. Partially Confined

**Table 3 Channel Type** 

#### **Table 4 Channel Zone**

- 1. Headwater zone
- 2. Transfer zone
- 3. Deposition zone

#### Table 5 Flow Type

- 1. Perennial
- 2. Intermittent
- 3. Ephemeral

#### **Table 6 Dominant Vegetation Type**

- 1. Trees
- 2. Shrubs
- 3. Grasses
- 4. Herbaceous

#### **Table 7 Encroachment Extent into Channel**

- 1. None
- 5. Extreme
- 2. Minimal
- 3. Moderate
- 4. Heavy

# 1. Straight (1 – 1.05)

**Sinuosity** 

Table 9 Type of

2. Irregular Meanders

Sinuosity

1. Sinuous

valley)

2. Low sinuosity (1.06-1.30)

Table 10 Degree of

3. Meandering (1.31 - 3.0)

#### **Table 11 Gradient**

1. Low

Meandering

- 2. Moderate
- 3. High

#### **Table 8 Type of Aquatic Vegetation**

- 1. Rooted Emergent 2. Rooted Submergent
- 3. Rooted Floating
- 4. Free Floating Roots
- 5. Floating Algae
- 6. Attached Algae

# **Table 12 Number of**

1. Single

Channels

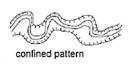
- 2. Up to 3 (Wandering)
- 3. > 3 (Braided)
- 4. >3 (Anastamosing or Anabranching)
- 5. Discontinuous or Absent

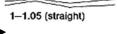
# sinuous

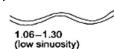
3. Regular Meanders 4. Tortuous Meanders

5. Confined pattern (within

tortuous meanders



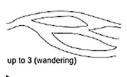














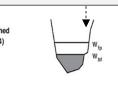


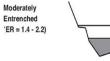


discontinuous or absent

#### Table 13 **Entrenchment**

- 1. Low (>2.2)
- 2. Moderate (1.4 2.2)
- 3. High (<1.4)





**Failure** 

action)

failure)



**Table 14 Type of Bank** 

1. Fluvial Entrainment (Hydraulic

2. Undercutting (Hydraulic action)

3. Slab Failure (Mass failure)

4. Parallel slide (Mass failure)

5. Fall/Sloughing (Mass failure)

6. Rotational slip and slump (Mass

old tree roots exposed

alluvial terrace/valley wal

valley wall contacts at few, if any meande

no tree falls

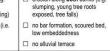


no bank erosion no alluvial terrace



erosion along outer bank (e.g. erosion along both banks (e.g.

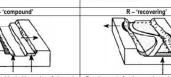
no alluvial terrace

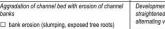


channel downcutting (e.g. bed scour, lov generally straight

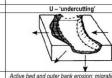
stable except at sharp bends steep, high banks above bankfull leve sharp bends with outside bank erosion, pointno alluvial terrace

har/cut bank development and undercutting no alluvial terrace





sediment denosition on hed (e.g. bar alluvial terrace with erosis



☐ straight alluvial terrace/valley wall

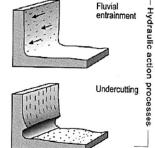
erosion along outer bank (e.g. slumping, you valley wall contact and erosion at majority of deposition along inner bank (i.e. point ba

scoured bed, low emb

Slab failure







#### Table 15 Downs's Model of **Channel Classification**

- S Stable
- D / d Depositional
- M / m Lateral Migration E or e - Enlarging
- C Compound
- R Recovering
- U Undercutting

## Table 16 **Odours**

- 1. None
- 2. Fishv
- 3. Petroleum
- 4. Sewage 5. Chemical
- 6. Other



# **Turbidity**

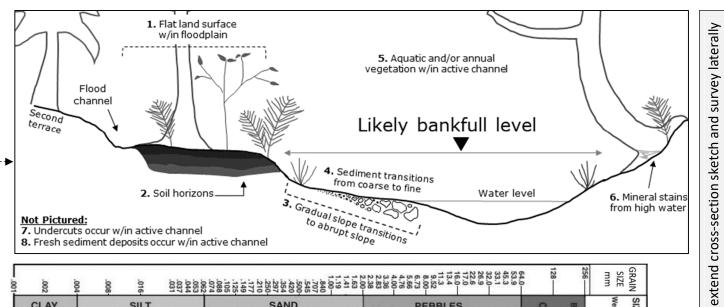
- 1. Clear
- 2. Slightly turbid 3. Turbid
- 4. Opaque
- 5. Stained 6. Other



#### Fluvial Geomorphology Field Key

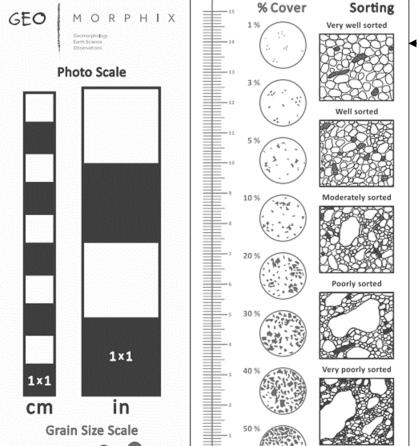
#### <u>Table 18 Bankfull</u> <u>Indicators</u>

- 1. Topography
- 2. Soil Horizons
- 3. Bank Slope
- 4. Sediment Texture
- 5. Vegetation
- 6. Mineral Stains
- 7. Undercuts
- 8. Flood deposits
- 9. Other

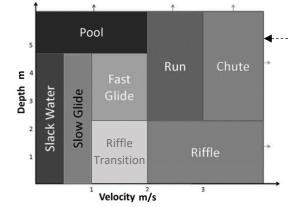


.002	.004	.008-	.016-	.053 .044 .037	.105 .088 .074	.210 .177 .149	.420 .354 .297	.840 .707 .545	1.63 1.19 1.19	2.36 2.38 2.38 2.00	6.73 5.66 4.76	13.4 11.3 9.52	26.9 22.6 17.0	53.9 45.3 33.1	64.0	256—	GRAIN SIZE mm
CLAY		S	ILT				SAND			PEBBLES			co	80	SIZE		
	very fine	fine	medium	coarse	very fine	fine	medium	coarse	very	very fine Granules	fine	medium	coarse	very coarse	BBLES	ULDERS	TERMS (after worth, 1922)

# Table 19 Sediment Size

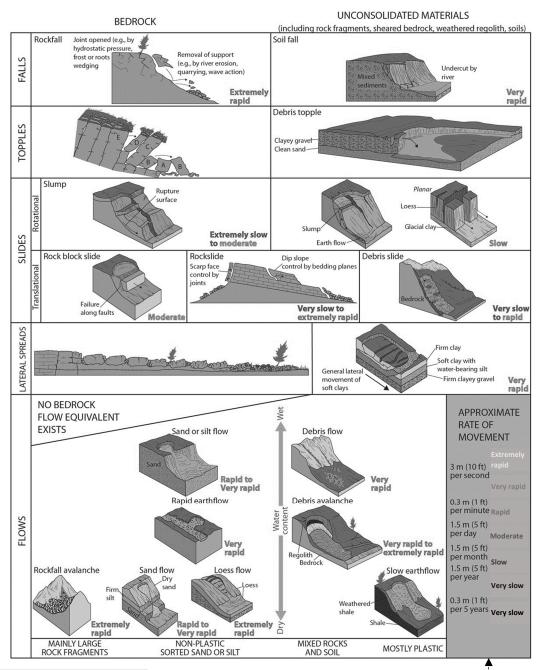


# Table 20 Sediment Sorting

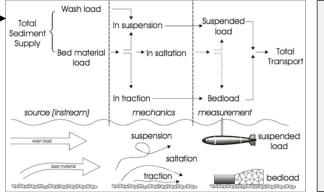


## Table 22 Geomorphic Units

- 1. Rapids
- 2. Cascade
- 3. Chute
- 4. Fast Glide
- 5. Pool
- 6. Riffle
- 7. Riffle Transition
- 8. Run
- 9. Slackwater
- 10. Slow Glide
- 11. Artificially Forced GU (specify 11-GU #)



#### Table 21 Sediment Transport Transport Measurement Alluvial Size Boulder Cobble 1. Traction Bed Load Trap Bed Gravel 2. Saltation Sand Water Column Bank 3. Suspension Sampler Silt Clav



possible.

capture all terraces if

level and

BF

Note: ex beyond B

#### **Table 23 Mass Movement**

- 1. Fall
- 2. Topple
- 3. Translational Slide
- 4. Rotational Slide
- 5. Lateral Spread
- 6. Flow

Version #3 Last edited: 04/04/2023

5 mm

**General Site Characteristics** 

**Project Number:** 

Date: Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed:

rieia :	эсап:		17 AV
Featu	res	Monito	oring
	Reach break	-0-0-0-	Long-profile
只	Station location	11	Monumented XS
XX	Cross-section	0	Monumented photo
	Flow direction	1	Monumented photo
~	Riffle	<b>V</b>	direction
7000	Pool		Sediment sampling
11111111111111111111111111111111111111	Sediment bar	8	Erosion pins
	Eroded bank/slope Undercut bank		Scour chains
XXXXXX	Bank stabilization	Additio	onal Symbols
	Leaning tree		
XX	Fence		
	Culvert/outfall		
	Swamp/wetland		, <u>.</u> ,
WWW	Grasses		
	Tree		
	Instream log/tree		
***	Woody debris		
*******	Beaver dam		
W	Vegetated island		
Flow T	уре		
H1	Standing water H1	A Back	water
H2	Scarcely perceptible	flow	
НЗ	Smooth surface flow		
Н4	Upwelling		
H5	Rippled		
Н6	Unbroken standing w		
H7	Broken standing wav	e	
H8	Chute	Dii-	
H9 Substr	Free fall H9/	Dissip	pates below free fall
S1	Silt	<b>S6</b>	Small boulder
S2	Sand	S7	Large boulder
53	Gravel	S8	Bimodal
<b>S4</b>	Small cobble	59	Bedrock/till
S5	Large cobble		
Other			
вм	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point

Compass  Cottails  Letting dependent of the point of the	Watershed/Subwatershed:	Froncole	Creek
Cottails  23  23  25  25  26  26  20  20  20  20  20  20  20  20	Site Sketch	X X K	Compass
Mosture  Wisher  Posture  Upstream  HZ, HI danstrey  Cattails  in-stream  Veyer of 23m  Veyer of 23m		etland-doo	
Mosture  Wisher  Posture  Upstream  HZ, HI danstrey  Cattails  in-stream  Veyer of 23m  Veyer of 23m	Catails) I a k	KK	
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Posture  Washed  Washe	bw=3.60m / 10 / 1/2 4/2		E)
Posture Hill was surfish of control of the control	WC = 0.2 M \ (6.5 - 100 C. 5		and intentical
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Modes  Posture  Catails  in-stream  Catails  in-stream  Content of the coan from the c	0	+	
Modes  Posture  Catails  in-stream  Catails  in-stream  Content of the coan from the c	( A R 7	Dand 1	e.
Modes  Posture  Catails  in-stream  vegether  Cotted sub  ADI-DD  Forested  ADI-DD	Posture 13/8/VE/	anfish &	
Motes  - Upstream  HZ, HI danstren  - Was 3.0 m  Was 1.90 m  Was 0.16 m  X bd = 0.43 m  Year of the control of	001:10/	Kou	£3
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Photos:  Torested  Toreste	Moles 19963		R
Photos:  The danstrem of the crain from form and the crain from form and the crain form a	- Uptrem		0
Photos:	HZ, HI danstran & D		(2)
Photos:  Forested  Forested  Forested  Sin the  XS2  bw=3.0m  wa=0.16m  Xa=0.16m  Xa=0.13m  xa=0.13m  ba=0.33m  xa=0.13m  xa=0.13m  xa=0.13m  xa=0.13m  xa=0.13m  xa=0.13m  xa=0.3m  xa=0.3m  xa=0.3m  xa=0.3m	(C) X (C)	tile (	Jam from
Photos:  Store  (x)  (x)  (x)  (x)  (x)  (x)  (x)  (x		AD1-20	penal
Photos:    Stare   X82   Dw = 3.0 m   Wu = 0.16 m   Wu = 0.16 m   Wu = 0.16 m   Wu = 0.13 m   Wu = 0.23 m   Wu = 0.23 m   Wu = 0.23 m   Wu = 0.23 m   Wu = 0.33 m   Wu = 0	10 21	· (w)	Forester
Photos:  \[ \text{XS1} \\ \text{W} \\ \text{SI} \\ \text{VS1} \\ \text{VS1} \\ \text{VS1} \\ \text{VS2} \\ \text{VS1} \\ \text{VS1} \\ \text{VS2} \\ \text{VS1} \\ \text{VS2} \\ \text{VS1} \\ \text{VS1} \\ \text{VS2} \\ \text{VS2} \\ \text{VS1} \\ \text{VS2} \\ V	P	Aust Dilo	
Posture  Cattails  X  W  Dasture  Cattails  X  W  Dasture  Cattails  X  W  Dasture  Cattails  X  W  Dasture  Cooked sub Vegetarin patch  Photos:  Pasture  Pasture  Pasture  Pasture  Pasture  Cooked sub Vegetarin patch  Sedment filled  Ma: 0.3 m	. ( · X · V		
Pasture  Cattails  in-stream  www-0.23m  wat 0.13m  bat 0.33m  x year of 23m  x y		DW= 3.	on
Pasture  Cattails  in-stream  www-0.13m  wat 0.13m  bat 0.33m  x year an policy  regarder of policy  regarder of policy  Red of 3 m  Photos:		WW = 0.	16 m
Pasture  Catails X W X X X X X X X X X X X X X X X X X	× ×	- hd= 0.	13m
Catails 2 X W X X X X X X X X X X X X X X X X X	Dalue III	Pa	sture
Photos:	X		
Notes:  XSI  WW = 0.23 m  WW = 0.13 m  Da = 0.38 m  X  Yeyerestor Jodel Sedment tilled  Negerestor Jodel Sedment tilled  Notes 0.3 m	Catails 2 x w		
Notes:  XSI  WW = 0.23 m  WW = 0.13 m  Da = 0.38 m  X  Yeyerestor Jodel Sedment tilled  Negerestor Jodel Sedment tilled  Notes 0.3 m	in-stream x	0	
Photos:			
Photos:			
Photos:	X31	4	
Photos:	00= 1.55m	1	
Photos:	wol= 0.13m	(A)	24/
Photos:	00= 0.55m	TI PR	
Photos: Wd=0.3 m	X	we /	
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Photos: Wd=0.3 m	roofed sub	July 1	2.0m=0lur
	V V	66	ediment tilled
	Notes:	~~~	-0.514

Version #4 Last edited: 21/02/2023





Project Number: 24009 Rapid Geomorphic Assessment Date: Stream: Time: Reach: Location: Weather: Watershed/Subwatershed: Field Staff: Present? Geomorphological Indicator Factor Process Value Yes Description No. 1 Lobate bar 2 Coarse materials in riffles embedded Siltation in pools Evidence of Aggradation Medial bars (AI) 5 Accretion on point bars 6 Poor longitudinal sorting of bed materials 7 Deposition in the overbank zone Sum of indices = Exposed bridge footing(s) Exposed sanitary / storm sewer / pipeline / etc. 2 Elevated storm sewer outfall(s) 3 Undermined gabion baskets / concrete aprons / etc. Evidence of Scour pools downstream of culverts / storm sewer outlets Degradation 6 Cut face on bar forms (DI) 7 Head cutting due to knickpoint migration 8 Terrace cut through older bar material 9 Suspended armour layer visible in bank 10 Channel worn into undisturbed overburden / bedrock 0.0 Sum of indices = Fallen / leaning trees / fence posts / etc. 1 Occurrence of large organic debris 2 3 Exposed tree roots Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle Widening 6 Outflanked gabion baskets / concrete walls / etc. (WI) 7 Length of basal scour >50% through subject reach 8 Exposed length of previously buried pipe / cable / etc. 9 Fracture lines along top of bank 10 Exposed building foundation Sum of indices = Formation of chute(s) Single thread channel to multiple channel Evidence of 3 Evolution of pool-riffle form to low bed relief form Planimetric Form Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) 6 Thalweg alignment out of phase with meander form Bar forms poorly formed / reworked / removed Sum of indices = Notes: Stability Index (SI) = (AI+DI+WI+PI)/4 = In Regime In Transition/Stress In Adjustment **⋈** 0.00 - 0.20 □ 0.21 - 0.40 □ 0.41 Senior staff sign-off (if required): Senior staff sign-off (if required): Checked by: Completed by: Version #3

Last edited: 10/02/2023



Project Number: 1/24009 Rapid Stream Assessment Technique

2024-05-02 Date: Stream: 2:00pm Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: Category Poor Fair Good Excellent < 50% of bank network</li> • 50-70% of bank network · 71-80% of bank network · > 80% of bank network stable stable stable stable · Recent bank sloughing, Recent signs of bank Infrequent signs of bank No evidence of bank slumping or failure sloughing, slumping or sloughing, slumping or sloughing, slumping or frequently observed failure fairly common failure failure Stream bend areas highly · Stream bend areas · Stream bend areas very · Stream bend areas stable unstable unstable Outer bank height 0.6-0.9 stable Outer bank height 1.2 m · Outer bank height 0.9m above stream bank (1.2-Height < 0.6 m above above stream bank 1.2 m above stream 1.5 m above stream bank stream (< 1.2 m above stream bank for large (2.1 m above stream for large mainstem areas) bank for large mainstem (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) areas) bank for large mainstem Bank overhang < 0.6 m Bank overhang > 0.8-1.0 areas) Bank overhang 0.8-0.9m Channel Stability · Young exposed tree roots · Young exposed tree roots Exposed tree roots Exposed tree roots old, abundant common predominantly old and large and woody > 6 recent large tree falls large, smaller young roots 4-5 recent large tree falls Generally 0-1 recent large per stream mile per stream mile scarce tree falls per stream mile 2-3 recent large tree falls per stream mile Bottom 1/3 of bank is Bottom 1/3 of bank is Bottom 1/3 of bank is · Bottom 1/3 of bank is highly erodible material generally highly erodible generally highly resistant generally highly resistant Plant/soil matrix severely material plant/soil matrix or material plant/soil matrix or material compromised Plant/soil matrix compromised · Channel cross-section is Channel cross-section is · Channel cross-section is · Channel cross-section is generally trapezoidallygenerally trapezoidallygenerally V- or U-shaped generally V- or U-shaped shaped shaped Point range 0 0 1 0 2 □ 3 □ 4 □ 5 □ 6 × 7 □ 8 □ 9 □ 10 □ 11 > 75% embedded (> 50-75% embedded (60-· 25-49% embedded (35-• Riffle embeddedness < 85% embedded for large 85% embedded for large 59% embedded for large 25% sand-silt (< 35% mainstem areas) mainstem areas) mainstem areas) embedded for large mainstem areas) Few, if any, deep pools · Low to moderate number · Moderate number of deep · High number of deep pools Pool substrate of deep pools pools (> 61 cm deep) composition >81% sand- Pool substrate Pool substrate composition (> 122 cm deep for large silt composition 30-59% sand-silt mainstem areas) 60-80% sand-silt Pool substrate composition <30% sand-silt · Streambed streak marks Streambed streak marks · Streambed streak marks Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped Scouring/ sediment deposits sediment deposits sediment deposits sediment deposits absent Sediment common common uncommon Deposition · Fresh, large sand · Fresh, large sand · Fresh, large sand deposits Fresh, large sand deposits deposits very common in deposits common in uncommon in channel rare or absent from channel channel channel · Small localized areas of No evidence of fresh Small localized areas of Moderate to heavy sand fresh sand deposits along sediment deposition on deposition along major fresh sand deposits along top of low banks overbank portion of overbank area top of low banks Point bars present at Point bars common, · Point bars small and stable, Point bars few, small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated moderate to large and armoured with little or no unstable with high and/or armoured with little unstable with high amount of fresh sand fresh sand or no fresh sand amount of fresh sand Point range  $\square$  0  $\square$  1  $\square$  2 □ 3 □ 4 □ 5 □ 6 7 🗆 8

Version #2

Last edited: 10/02/2023

Date: 20	24-05-02	PN: 91/2409	Location:	your rd, 19110s	
Category	Poor	Fair	Good	Excellent	
	<ul> <li>Wetted perimeter &lt; 40%         of bottom channel width         (&lt; 45% for large         mainstem areas)</li> </ul>	Wetted perimeter 40- 60% of bottom channel width (45-65% for large mainstem areas)	Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	<ul> <li>Wetted perimeter &gt; 85% of bottom channel width (&gt; 90% for large mainstem areas)</li> </ul>	
	Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	Few pools present, riffles and runs dominant.     Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	Good mix between riffles, runs and pools     Relatively diverse velocity and depth of flow	<ul> <li>Riffles, runs and pool habitat present</li> <li>Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)</li> </ul>	
	Riffle substrate composition: predominantly gravel with high amount of sand < 5% cobble	Riffle substrate composition: predominantly small cobble, gravel and sand     5-24% cobble	Riffle substrate composition: good mix of gravel, cobble, and rubble material     25-49% cobble	<ul> <li>Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand</li> <li>&gt; 50% cobble</li> </ul>	
	• Riffle depth < 10 cm for large mainstem areas	Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	<ul> <li>Riffle depth &gt; 20 cm for large mainstem areas</li> </ul>	
	Large pools generally <     30 cm deep (< 61 cm for large mainstem areas)     and devoid of overhead cover/structure	Large pools generally 30- 46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure	
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	No channel alteration or significant point bar formation/enlargement	
	• Riffle/Pool ratio 0.49:1; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1	
MA	Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	Summer afternoon water temperature < 20°C	
Point range	0 0 1 2 2	□ 3 □ 4	□ 5 □ 6	□ 7 □ 8	
	Substrate fouling level:     High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)	
Hara II - W	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L	
Water Quality	Objects visible to depth     < 0.15m below surface	Objects visible to depth 0.15-0.5m below surface	Objects visible to depth     0.5-1.0m below surface	Objects visible to depth     > 1.0m below surface	
	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	• No odour	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	5 0 6	□ 7 □ 8	
Riparian	Narrow riparian area of mostly non-woody vegetation	Riparian area     predominantly wooded     but with major localized     gaps	Forested buffer generally     31 m wide along major     portion of both banks	Wide (> 60 m) mature forested buffer along both banks	
Habitat Conditions	Canopy coverage:     <50% shading (30% for large mainstem areas)	Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	Canopy coverage:     60-79% shading (45-59% for large mainstem areas)	Canopy coverage:     >80% shading (> 60% fo large mainstem areas)	
Point range	□ 0 □ 1	□ 2 전 3	□ 4 □ 5	□ 6 □ 7	

Total overall score (0-42) = 2

Fair (13-24) Good (25-34)

Excellent (>35)

Version #2 Last edited: 10/02/2023



		Dar	140.00					
Reach Characteri			7009					MORPHIX"
Date:	2024-05-0	Field St	taff: KA	4.5	Watershed/S	Subwatershed:	Myspical	6 Charle
Time:	2:00pm	Stream	: Alloo	Chan	UTM (Upstre	am):		
Weather:	Suny, 180	Reach:	ADI=	2	UTM (Downs	tream):		
	Valley Type	Channel Type (Table 3)	Channel Zone (Table 4)	Flow Type (Table 5)	/ □ Evide	ence of Groundwate	r Location:	Photo:
Riparian Vegetation	1 =			Instream Vegetati	ion	Wate	r Quality	
Dominant Type (Table 6)	I None	-4 🗆 Immature	(<5) Type (Table 8)	Woody Debris ☐ In Cutbank	WD Density  Low  WD		Odour able 16)	Turbidity (Table 17)
Encroachment (Table 7)	☐ Fragmented	V %	Roach				/	2
<b>Channel Characteri</b>	stics							
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)			(Table 19) <b>Bank</b>	Clay/Silt Sa			Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)			Riffle Pool	8 [			
Entrenchment (Table 13)	Bank Failure (Table 14)		rcut 🗆 60 - 100%	<b>Bed</b> (if no riffle-pool morphology)	y ×	1 0 0		
Down's Model (Table 15)	Bankfull Indicators (Table 18)		Bankfull Wid (1		3.60	Wetted Width (m)	0.23 1.0	90 2.65
Sed Sorting (Table 20)	Sediment Transport Observed?	□ Yes 🛛 No 🗆 No	t Visible Bankfull Dep	oth 0.33 0.43	0.50	Wetted Depth (m)	0.13	16 0.20
Transport Mode (Table 21)	% of Bed Active	MA	Undercuts (r	m)		Velocity (m/s)		
Geomorphic Units (Table 22)	Mass Movement (Table 23)		95 Pool Dep	n)		Velocity Estimate Method		
Riffle-Pool Spacing (m):	% Riffles:	5 % Pools:	Riffle Length (r	m)	M	eander Amplitude (m)		
	bank ang es eauly Creaching	making Ho ( dejan tream	harrel loss of with upstream	olined on Arraych &	vert large	rended)		
Photos:								

Version #4 Last edited: 04/04/2023

**General Site Characteristics** Project Number: PN24000 Date: Stream: Time: DM Reach: Weather: Location: Field Staff: Watershed/Subwatershed: Site Sketch **Features** Monitoring Compass Tile Reach break 只 Station location Monumented XS widening It! Cross-section 0 Monumented photo localized Flow direction Monumented photo Riffle direction Pool Sediment sampling CHAND Sediment bar Erosion pins Tile 8 Dain HHHHHHH Eroded bank/slope Scour chains O.Zm crushed **Additional Symbols** Undercut bank XXXXXX Bank stabilization Leaning tree x---x---x Fence localized od=1.0m Culvert/outfall V=0.287m/S exposed roots Swamp/wetland WWW Grasses grasses & Tree waterrous (w.c Instream log/tree in channel \* \* \* Woody debris Field \*XXXXX Beaver dam WV Vegetated island Flow Type H1 Standing water H1A Back water **H2** Scarcely perceptible flow НЗ Smooth surface flow =0.108 M/S 0.3m **H4** Upwelling H5 Rippled Tile drain HA this locat **H6** Unbroken standing wave PA **H7** Broken standing wave (ED) bricks m **H8** Chute Tile drain from tood **H9** Free fall H9A Dissipates below free fall x grassy Substrate S1 Silt **S6** Small boulder Lown **S2** Sand rossing **S7** Large boulder perations **S3** Gravel **S8** Bimodal **S4** Small cobble **S9** Bedrock/till **S5** Large cobble Ja = 039m Other ВМ Benchmark EP Erosion pin J=0.315m/5 BS Backsight RB Rebar DS Downstream US Upstream

Version #4 Last edited: 21/02/2023

Woody debris jam

Valley wall contact

Bottom of slope

Top of slope

TR

FC

FP

**KP** 

Terrace

Flood chute

Flood plain

Knick point

WDJ

VWC

BOS

TOS

Senior staff sign-off (if required): 550

Photos:

Notes:

\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:

hmagurousy





Date:	120	24-05-02	Stream:		Allog 1	rain	3	
Time:	1	1.15 pm	Reach:		110a 8	1 air	1	
Weather:	Sun		Location:		Na	1 //		
Field Staff:	300	2011			Mayfreld	4 4	lad.	
rieid Stail:	14	+ HY	Watershed/Subwatershed	:	1-tobical	16 (	reck	
Process			eomorphological Indicator			Pre	esent?	Factor
	No.	Description				Yes	No	Value
	1	Lobate bar					~	
		Coarse materials in riffle	es embedded				1	
Evidence of		Siltation in pools				~		2/
Aggradation (AI)		Medial bars					1/	7 / 7
(/1/)		Accretion on point bars					1/	
		Poor longitudinal sorting		<b></b>		7		
	7	Deposition in the overba			~			
				Sui	m of indices =	2	2	0.28
	1	Exposed bridge footing(s	5)			NI	M	
	2	Exposed sanitary / storn		N	14			
	3	Elevated storm sewer ou	in	1/		-		
Evidence of	4	Undermined gabion bask		W	A	1 , ,		
Degradation	5 5	Scour pools downstream			1/	1 1/		
(DI)	6	Cut face on bar forms			1/	1//		
	7 1	lead cutting due to knic	kpoint migration				/	
	8	Terrace cut through olde	r bar material				1	1
		Suspended armour layer					1	1
	10 0	Channel worn into undist	turbed overburden / bedrock				/	
				Sur	n of indices =	1	6	0.143
	1 F	fallen / leaning trees / fe	ence posts / etc.					
	2 (	Occurrence of large orga		1/				
	3 E	exposed tree roots			2/			
Evidence of	4 E	Basal scour on inside me		1/	1/8			
Evidence of Widening	5 E	Basal scour on both sides		1				
(WI)		Outflanked gabion baske	W	IA				
		ength of basal scour >5		1/				
		xposed length of previous	/					
-		racture lines along top o			1			
	10 E	xposed building foundat		N	119	1		
				Sun	n of indices =		7	0.125
	1 F	ormation of chute(s)					1	
Evidence of	2 S	ingle thread channel to	multiple channel					
Planimetric	3 E	volution of pool-riffle for	m to low bed relief form				./	11
Form	4 C	ut-off channel(s)						17
Adjustment (PI)		ormation of island(s)					1/	, ,
, ,	6 T	halweg alignment out of			1/			
	7 B	ar forms poorly formed ,	/ reworked / removed					
				Sum	of indices =	A A	6	0.143
otes:			Stability I	Index	(SI) = (AI+I	DI+WT-		D 171
			In Regi		In Transition			djustment
			Ø 0.00 -					
			/7 3.30		U 0.21	0.40		0.41

Last edited: 10/02/2023

Rapid Stream Assessment Technique Project Number: PN 2400 Q

Date:	2024-05-02	Stream:		Alloa Dra	~		
Time:	1:15pm	Reach:	188	Ana			
Weather:	Sunny, 18°C	Location:	STREET LOT	MayFreid	0 m 1/1.		
Field Staff:	A AF	Watershed/Subwate	rshed:	Etabrol4	road, Alloa		
Category	Poor	Fair		Good	Excellent		
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> </ul>	stable • Infreque	of bank network ent signs of bank g, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>		
Channel Stability	<ul> <li>Stream bend areas highly unstable</li> <li>Outer bank height 1.2 m above stream bank</li> <li>(2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang &gt; 0.8-1.0 m</li> </ul>	Stream bend areas unstable  Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas)  Bank overhang 0.8-0.9m	• Outer ba m above 1.5 m at for large	bend areas stable onk height 0.6-0.9 stream bank (1.2- bove stream bank mainstem areas) erhang 0.6-0.8 m	Stream bend areas very stable Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) Bank overhang < 0.6 m		
	<ul> <li>Young exposed tree roots abundant</li> <li>&gt; 6 recent large tree falls per stream mile</li> </ul>	<ul> <li>Young exposed tree roots common</li> <li>4-5 recent large tree falls per stream mile</li> </ul>	predomin large, sm scarce	tree roots nantly old and naller young roots nt large tree falls am mile	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile		
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	<ul> <li>Bottom 1/3 of bank is generally highly erodible material</li> <li>Plant/soil matrix compromised</li> </ul>	generally	/3 of bank is highly resistant matrix or material	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or materia		
N -	Channel cross-section is generally trapezoidally- shaped	Channel cross-section is generally trapezoidally-shaped	• Channel of generally	cross-section is V- or U-shaped	Channel cross-section is generally V- or U-shaped		
Point range		□ 3 □ 4 □ 5	□ 6	7 0 8	□ 9 □ 10 □ 11		
terfles	> 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	• 25-49% e 59% emb mainster	embedded (35- pedded for large n areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)		
	silt	<ul> <li>Low to moderate number of deep pools</li> <li>Pool substrate composition</li> <li>60-80% sand-silt</li> </ul>	pools	number of deep trate composition sand-silt	High number of deep pools     (> 61 cm deep)     (> 122 cm deep for large mainstem areas)     Pool substrate composition <30% sand-silt		
Channel Scouring/ Sediment Deposition	Streambed streak marks and/or "banana"-shaped sediment deposits common	<ul> <li>Streambed streak marks and/or "banana"-shaped sediment deposits common</li> </ul>			Streambed streak marks and/or "banana"-shaped sediment deposits absent		
	deposits very common in channel	deposits common in	<ul><li>uncommo</li><li>Small loca</li></ul>	ge sand deposits n in channel lized areas of d deposits along banks	<ul> <li>Fresh, large sand deposits rare or absent from channe</li> <li>No evidence of fresh sediment deposition on overbank</li> </ul>		
	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand	Point bars small and stable well-vegetated and/or armoured with little or no fresh sand		Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand		
Point range	<b>00102</b>	□ 3 □ 4	'n	5 6	□ 7 □ 8		



Pate: 202	14-05-02	PN: 924009	Location: M	ayfield road \$1/09	
Category	Poor	Fair	Good	Excellent	
	Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	Wetted perimeter 40- 60% of bottom channel width (45-65% for large mainstem areas)	Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)	
	Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	<ul> <li>Few pools present, riffles and runs dominant.</li> <li>Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)</li> </ul>	<ul> <li>Good mix between riffles, runs and pools</li> <li>Relatively diverse velocity and depth of flow</li> </ul>	<ul> <li>Riffles, runs and pool habitat present</li> <li>Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)</li> </ul>	
Physical Instream Habitat	<ul> <li>Riffle substrate composition: predominantly gravel with high amount of sand</li> <li>&lt; 5% cobble</li> </ul>	<ul> <li>Riffle substrate composition: predominantly small cobble, gravel and sand</li> <li>5-24% cobble</li> </ul>	<ul> <li>Riffle substrate composition: good mix of gravel, cobble, and rubble material</li> <li>25-49% cobble</li> </ul>	<ul> <li>Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand</li> <li>&gt; 50% cobble</li> </ul>	
	Riffle depth < 10 cm for large mainstem areas	Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	Riffle depth > 20 cm for large mainstem areas	
	Large pools generally <     30 cm deep (< 61 cm for large mainstem areas)     and devoid of overhead cover/structure	Large pools generally 30- 46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure	
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	No channel alteration or significant point bar formation/enlargement	
	• Riffle/Pool ratio 0.49:1; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1	
NA	Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C	
Point range	□ 0 □ 1 □ 2	□ 3 💆 4	□ 5 □ 6	□ 7 □ 8	
	Substrate fouling level:     High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	Substrate fouling level:     Rock underside (0-10%)	
	Brown colour     TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L	
Water Quality	Objects visible to depth     < 0.15m below surface	Objects visible to depth     0.15-0.5m below surface	Objects visible to depth     0.5-1.0m below surface	Objects visible to depth     1.0m below surface	
	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	• No odour	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	□ 5 Å 6	□ <b>7</b> □ 8	
Riparian Habitat Conditions	Narrow riparian area of mostly non-woody vegetation	Riparian area predominantly wooded but with major localized gaps	Forested buffer generally     31 m wide along major     portion of both banks	Wide (> 60 m) mature forested buffer along both banks	
	• Canopy coverage: <50% shading (30% for large mainstem areas)	Canopy coverage: 50- 60% shading (30-44% for large mainstem areas)	Canopy coverage:     60-79% shading (45-59% for large mainstem areas)	Canopy coverage:     >80% shading (> 60% foliarge mainstem areas)	
Point range	0 0 1	□ 2 □ 3	□ 4 □ 5	□ 6 □ 7	
Total overall	score (0-42) = 25	Poor (<13)	Fair (13-24) Good (25	-34) Excellent (>35)	

Total overall score (0-42) = 25

Version #2 Last edited: 10/02/2023

Project Number: PN24009 **Reach Characteristics** Date: 024-05-02 Field Staff: Watershed/Subwatershed: Time: 1:15 PM Stream: UTM (Upstream): ra m Weather: SUNNU Reach: UTM (Downstream): Land Use Valley Type **Channel Type Channel Zone** Flow Type (Table 1) Evidence of Groundwater Location: (Table 2) (Table 3) (Table 4) Photo: (Table 5) CRSS Riparian Vegetation **Aquatic & Instream Vegetation Water Quality Dominant Type** Coverage **Channel Widths** Age (yrs) Woody Debris **WD Density** Type Odour (Table 6) **Turbidity** ☐ None X 1 - 4 (Table 8) WDJ/50m: ☐ In Cutbank 🖄 Low (Table 16) (Table 17) ☐ Fragmented 4 - 10 ☐ Established (5-30) ☑ In Channel **Encroachment** 2 Z Continuous Reach □ > 10 (Table 7) □ Mature (>30) □ Not Present □ High Coverage % **Channel Characteristics Sinuosity Type Bank Angle Sinuosity Degree Bank Erosion** (Table 19) Clay/Silt Sand Gravel Cobble Boulder **Parent** Rootlets (Table 9) (Table 10) □ 0 - 30 X < 5% X X Bank Gradient # of Channels □ 30 - 60 □ 5 - 30% Riffle X X  $\Box$ (Table 11) (Table 12) ₩ 60 - 90 □ 30 - 60% Pool Entrenchment **Bank Failure** □ Undercut □ 60 - 100% Bed X (Table 13) X (if no riffle-pool (Table 14) morphology) Down's Model **Bankfull Indicators Bankfull Width** (Table 15) (Table 18) Wetted Width (m) (m) Sed Sorting Sediment Transport Bankfull Depth ☐ Yes 🗖 No 🗆 Not Visible (Table 20) Observed? Wetted Depth (m) (m) Transport % of Bed Active Mode (Table 21) Undercuts (m) Velocity (m/s) Geomorphic Mass Movement % runs: **Pool Depth Velocity Estimate** Units (Table 22) (Table 23) (m) Method Riffle-Pool % Riffles: Riffle Length (m) Meander Amplitude % Pools: Spacing (m): (m) Photos:

Version #4

Last edited: 04/04/2023

Gen	eral Site Cha	racte	ristics	Proj	ect Number:	PN 2400	7	M O R P H I X~
Date:		20	24-05-02		Stream:		Alloa D	rain
Time:		11	2:25 pm		Reach:	LE EYELEY	AD3	
Weath	ier:	Su	my 18°c		Location:		Maybreid	rd, Alloa
Field 9	Staff:		PA HF		Watershed/Subw	atershed:	Etobicole	Creek
Featur	es	Monitor	ing	- Site		rew rd -		Compass
	Reach break Station location Cross-section Flow direction Riffle Pool Sediment bar Eroded bank/slope Undercut bank Bank stabilization Leaning tree Fence Culvert/outfall Swamp/wetland Grasses Tree Instream log/tree		Annumented XS  Monumented photo  Monumented phot	A03-	O35 EMBS	Cosses Company (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	esidential  XO  X  X  X  X  X  X  X  X  X  X  X  X	x vegetated  x veg
***	Woody debris						Prolem and	Litur the do
WWW W	Beaver dam				(616	5)	papel = 0.5	The second second
Flow T	Vegetated island				()1-0	6	1111	E guing
H1	Standing water <b>H1</b>	A Back v	vater		5 1042	inos /	A A	(2)
H2	Scarcely perceptible	flow			2,	"""	業	
НЗ	Smooth surface flow					/ XS	2	41
H4	Upwelling					( bu ~ 3	2.45m	Ax leaning
H5	Rippled					Lid - C	1.43m	1 Learning dence
Н6	Unbroken standing v					V=05	zhows so so	)»·
H7	Broken standing wav	/e			AO	3-4	Ar W	- 011 1
H8 H9	Chute Free fall <b>H9</b>	A Dissin	ates below free fall			1	EN HATT	- Luce ( really
Substi		A Dissip	ates below free fair			123	6334	-10 m
S1	Silt	S6	Small boulder			1 4	Thate lerei	th=7m
52	Sand	<b>S7</b>	Large boulder			131	9	
53	Gravel	<b>S8</b>	Bimodal	Vortas Suall	AD8-3	7		
54	Small cobble	<b>S9</b>	Bedrock/till			1		
<b>S</b> 5	Large cobble			Chouse	MJO A03-2	1/2	11.0=0.00	in
Other				Chaine	`)	1	0.13.19	ims
вм	Benchmark	EP	Erosion pin		Dodeina	( )(3) =	- U.C.=0.3	0.15m
BS	Backsight	RB	Rebar		occurrent has	ed 6.1	5	7
DS	Downstream	US	Upstream		as banks one	1 /2 1	en	. 6
WDJ	Woody debris jam	TR	Terrace		and shaped		3 6 700	
VWC	Valley wall contact	FC	Flood chute		as such	1	-(S\/S25	

Version #4

BOS

TOS

Last edited: 21/02/2023

Bottom of slope

Top of slope

Senior staff sign-off (if required):  $\underline{550}$ 

Photos:

Notes:

Flood plain

Knick point

KP

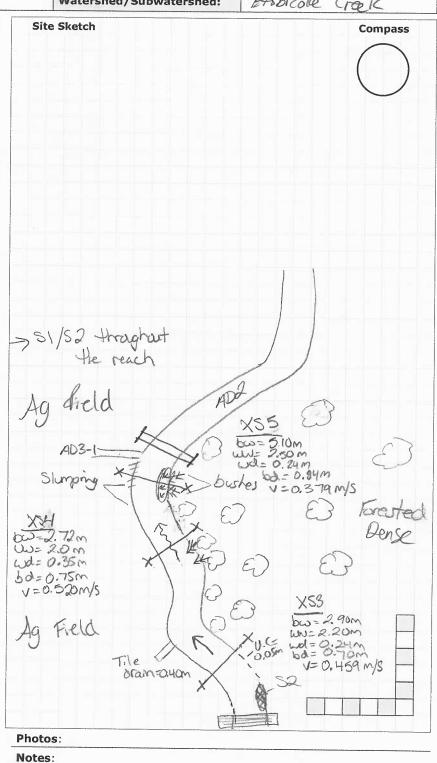
\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_

continued

General Site Characteristics Project Number: 7024009

Date:	2024-05-02	Stream:	Alloa Orain
Time:	12:25 pm	Reach:	AD3
Weather:	Surry, 18"	Location:	Mayfreld od Alle
Field Staff:	BA HE	Watershed/Subwatershed:	Etobrooke Crack

rieia	otaii:	KA HI				
Featur	res	Monit	oring			
	Reach break	-00	Long-profile			
只	Station location	<b></b>	Monumented XS			
XX	Cross-section	0	Monumented photo			
	Flow direction	I	Monumented photo			
~~ <b>&gt;</b>	Riffle	*	direction			
$\bigcirc$	Pool		Sediment sampling			
<b>WITTE</b>		шш	Erosion pins			
HHHHHH	Eroded bank/slope	8	Scour chains			
	Undercut bank	Additi	onal Symbols			
XXXXXX	Bank stabilization					
	Leaning tree					
XX	Fence					
	, , , , , , , , , , , , , , , , , , , ,					
	Swamp/wetland					
AAA	Grasses					
	Tree					
	Instream log/tree					
* * *	Woody debris					
**************************************	Beaver dam		2			
(VV)	Vegetated island					
Flow T						
H1	Standing water H1		water			
H2	Scarcely perceptible	rlow				
H3 H4	Smooth surface flow					
H5	Upwelling Rippled		•			
H6	Unbroken standing w	21/0	91			
H7	Broken standing wave					
Н8	Chute	C				
H9	Free fall H9A	) Dissii	pates below free fall			
Substr		. D1331	odies below free fair			
S1	Silt	S6	Small boulder			
S2	Sand	<b>S7</b>	Large boulder			
S3	Gravel	S8	Bimodal			
<b>S4</b>	Small cobble	59	Bedrock/till			
S5	Large cobble					
Other						
ВМ	Benchmark	EP	Erosion pin			
BS	Backsight	RB	Rebar			
DŞ	Downstream	US	Upstream			
WDJ	Woody debris jam	TR	Terrace			
VWC	Valley wall contact	FC	Flood chute			
BOS	Bottom of slope	FP	Flood plain			
TOS	Top of slope	KP	Knick point			



Version #4 Last edited: 21/02/2023





Project Number: **Rapid Geomorphic Assessment** Date: Stream: Time: Reach: Weather: load Location: Field Staff: Watershed/Subwatershed: Geomorphological Indicator Present? Factor Process Value No. Description Yes No 1 Lobate bar Coarse materials in riffles embedded 3 Siltation in pools Evidence of Aggradation 4 Medial bars (AI) 5 Accretion on point bars 6 Poor longitudinal sorting of bed materials 7 Deposition in the overbank zone Sum of indices = Exposed bridge footing(s) 1 2 Exposed sanitary / storm sewer / pipeline / etc. 3 Elevated storm sewer outfall(s) Undermined gabion baskets / concrete aprons / etc. 4 Evidence of 5 Scour pools downstream of culverts / storm sewer outlets Degradation 6 Cut face on bar forms (DI) 7 Head cutting due to knickpoint migration 8 Terrace cut through older bar material 9 Suspended armour layer visible in bank 10 Channel worn into undisturbed overburden / bedrock Sum of indices = Fallen / leaning trees / fence posts / etc. 2 Occurrence of large organic debris 3 Exposed tree roots 4 Basal scour on inside meander bends Evidence of 5 Basal scour on both sides of channel through riffle Widening 6 Outflanked gabion baskets / concrete walls / etc. (WI) Length of basal scour >50% through subject reach 7 Exposed length of previously buried pipe / cable / etc. 8 9 Fracture lines along top of bank 10 Exposed building foundation Sum of indices = 0 Formation of chute(s) 2 Single thread channel to multiple channel Evidence of 3 Evolution of pool-riffle form to low bed relief form Planimetric Form 4 Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) 6 Thalweg alignment out of phase with meander form 1/

Notes:	(SI) = (AI+DI+WI+PI)	14= 0.1/20	
	In Regime	In Transition/Stress	In Adjustmen
	0.00 - 0.20	□ 0.21 - 0.40	□ 0.41

Version #3 Last edited: 10/02/2023 Senior staff sign-off (if required): SG Checked by: Completed by:

Bar forms poorly formed / reworked / removed

Sum of indices =





Project Number: 4N24m9 Rapid Stream Assessment Technique Date: Stream: Time: Reach: Weather: rd. Location: Field Staff: Watershed/Subwatershed: real Category Poor Fair Good Excellent < 50% of bank network</li> · 50-70% of bank network 71-80% of bank network • > 80% of bank network stable stable stable stable · Recent signs of bank Recent bank sloughing, Infrequent signs of bank No evidence of bank slumping or failure sloughing, slumping or sloughing, slumping or sloughing, slumping or frequently observed failure fairly common... failure failure Stream bend areas highly Stream bend areas · Stream bend areas stable Stream bend areas very unstable unstable Outer bank height 0.6-0.9 stable Outer bank height 1.2 m Outer bank height 0.9m above stream bank (1.2-Height < 0.6 m above above stream bank 1.2 m above stream 1.5 m above stream bank stream (< 1.2 m above (2.1 m above stream bank stream bank for large for large mainstem areas) bank for large mainstem (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) areas) bank for large mainstem Bank overhang < 0.6 m</li> Bank overhang > 0.8-1.0 areas) Bank overhang 0.8-0.9m Channel Stability Young exposed tree roots · Young exposed tree roots Exposed tree roots · Exposed tree roots old, abundant common predominantly old and large and woody > 6 recent large tree falls 4-5 recent large tree falls Generally 0-1 recent large large, smaller young roots per stream mile per stream mile scarce tree falls per stream mile 2-3 recent large tree falls per stream mile • Bottom 1/3 of bank is · Bottom 1/3 of bank is · Bottom 1/3 of bank is · Bottom 1/3 of bank is highly erodible material generally highly erodible generally highly resistant generally highly resistant plant/soil matrix or material Plant/soil matrix severely material plant/soil matrix or material compromised Plant/soil matrix compromised Channel cross-section is Channel cross-section is · Channel cross-section is · Channel cross-section is generally trapezoidallygenerally trapezoidallygenerally V- or U-shaped generally V- or U-shaped shaped shaped Point range □ 0 □ 1 □ 2 **3 4 5** X 6 D 7 D 8 □ 9 □ 10 □ 11 > 75% embedded (> • 50-75% embedded (60-25-49% embedded (35- Riffle embeddedness <</li> 85% embedded for large 85% embedded for large 59% embedded for large 25% sand-silt (< 35% mainstem areas) mainstem areas) mainstem areas) embedded for large mainstem areas) · Few, if any deep pools · Low to moderate number · High number of deep pools · Moderate number of deep Pool substrate of deep pools pools (> 61 cm deep) composition >81% sand- Pool substrate Pool substrate composition (> 122 cm deep for large silt composition 30-59% sand-silt mainstem areas) 60-80% sand-silt Pool substrate composition <30% sand-silt Streambed streak marks Streambed streak marks · Streambed streak marks Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped Scouring/ sediment deposits sediment deposits sediment deposits sediment deposits absent Sediment common common uncommon Deposition Fresh, large sand Fresh, large sand Fresh, large sand deposits Fresh, large sand deposits deposits very common in deposits common in uncommon in channel rare or absent from channel channel channel Small localized areas of No evidence of fresh Moderate to heavy sand Small localized areas of fresh sand deposits along sediment deposition on deposition along major fresh sand deposits along top of low banks overhank portion of overbank area top of low banks Point bars present at · Point bars common. Point bars small and stable, Point bars few, small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated moderate to large and unstable with high armoured with little or no and/or armoured with little

Version #2 Last edited: 10/02/2023

Point range

unstable with high

□ 0

amount of fresh sand

□ 1

□ 2

Senior staff sign-off (if required):

amount of fresh sand

□ 3 □ 4

550

fresh sand

⊠ 5 □ 6

\_ Checked by: \_\_\_\_\_ Completed by:

or no fresh sand



2024-05-02 1124009 Location: PN: Date: **Excellent** Good Fair Poor Category · Wetted perimeter 61-85% Wetted perimeter > 85% of · Wetted perimeter 40- Wetted perimeter < 40%</li> bottom channel width (> 60% of bottom channel of bottom channel width of bottom channel width 90% for large mainstem (66-90% for large width (45-65% for large (< 45% for large mainstem areas) areas) mainstem areas) mainstem areas) · Riffles, runs and pool · Good mix between riffles, · Dominated by one habitat Few pools present, riffles habitat present and runs dominant. runs and pools type (usually runs) and · Diverse velocity and depth Relatively diverse velocity by one velocity and depth Velocity and depth of flow present (i.e., slow, and depth of flow generally slow and condition (slow and fast, shallow and deep shallow) (for large shallow (for large water) mainstem areas, runs mainstem areas, few and pools dominant, riffles present, runs and pools dominant, velocity velocity and depth diversity intermediate) and depth diversity low) Riffle substrate Riffle substrate Riffle substrate Riffle substrate composition: good mix of composition: cobble, composition: composition: gravel, rubble, boulder mix predominantly small gravel, cobble, and rubble predominantly gravel cobble, gravel and sand with little sand material Physical with high amount of sand . > 50% cobble 5-24% cobble 25-49% cobble < 5% cobble</li> Instream · Riffle depth > 20 cm for Habitat Riffle depth 15-20 cm for • Riffle depth 10-15 cm for • Riffle depth < 10 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas Large pools generally 46-61 Large pools generally > 61 · Large pools generally 30- Large pools generally <</li> cm deep (91-122 cm for cm deep (> 122 cm for 46 cm deep (61-91 cm 30 cm deep (< 61 cm for large mainstem areas) with large mainstem areas) with for large mainstem large mainstem areas) good overhead some overhead areas) with little or no and devoid of overhead cover/structure overhead cover/structure cover/structure cover/structure Slight amount of channel No channel alteration or Moderate amount of · Extensive channel significant point bar channel alteration and/or alteration and/or slight alteration and/or point formation/enlargement increase in point bar moderate increase in bar formation/enlargement point bar formation/enlargement formation/enlargement • Riffle/Pool ratio 0.9-1.1:1 · Riffle/Pool ratio 0.7-0.89:1 Riffle/Pool ratio 0.5- Riffle/Pool ratio 0.49:1; 0.69:1; 1.31-1.5:1 ; 1.11-1.3:1 ≥1.51:1 · Summer afternoon water Summer afternoon water · Summer afternoon water Summer afternoon water NA temperature < 20°C temperature 24-27°C temperature 20-24°C temperature > 27°C □ 7 □ 8 **⋈** 5 □ 6 □ 3 □ 4 0 🗆 1 🗆 2 Point range Substrate fouling level: Substrate fouling level: Substrate fouling level: Substrate fouling level: Rock underside (0-10%) Very light (11-20%) Moderate (21-50%) High (> 50%) · Clear flow Slightly grey colour Grey colour · Brown colour TDS: < 50 mg/L</li> TDS: 50-100 mg/L TDS: 101-150 mg/L TDS: > 150 mg/L Water Quality · Objects visible to depth · Objects visible to depth Objects visible to depth Objects visible to depth > 1.0m below surface 0.5-1.0m below surface 0.15-0.5m below surface < 0.15m below surface No odour Slight organic odour Slight to moderate · Moderate to strong organic odour organic odour 6 □ 7 □ 8 □ 5 □ 3 □ 4 □ 0 □ 1 □ 2 Point range Wide (> 60 m) mature · Forested buffer generally Riparian area Narrow riparian area of forested buffer along both > 31 m wide along major predominantly wooded mostly non-woody banks but with major localized portion of both banks vegetation Riparian gaps Habitat · Canopy coverage: Canopy coverage: 50- Canopy coverage: Canopy coverage: Conditions >80% shading (> 60% for 60% shading (30-44% 60-79% shading (45-59% <50% shading (30% for large mainstem areas) for large mainstem areas) for large mainstem large mainstem areas) areas) □ 6 □ **7** 4 □ 5 0 A 1 □ 2 □ 3 Point range

Version #2 Last edited: 10/02/2023

Total overall score (0-42) =

Senior staff sign-off (if required): Senior staff sign-off (if required): Checked by: \_\_\_\_\_ Completed by:

Poor (<13)

Fair (13-24)

Good (25-34)

Excellent (>35)

Reach Characteris		NV 24009				MORPHIX"
Date:	2024-05-02	Field Staff:	KA HP		Watershed/Subwatershed	1: Etabricale Creek
Time:	12:25 pm	Stream:	Alloa Dain	^	UTM (Upstream):	
Weather:	svny, 18.c	Reach:	A03		UTM (Downstream):	
	Table 2) Channel (Table 3)			Flow Type (Table 5)	Evidence of Groundw	ater Location:Photo:
Riparian Vegetation			Aquatic & Instrea	m Vegetati	on Wa	ter Quality
Dominant Type (Table 6)	☐ None 🔀 1 - 4 🖂	Age (yrs)  I Immature (<5)  (Established (5-30)	(Table 8)	Woody Debris	WD Density  Low WDJ/50m:	Odour Turbidity (Table 16) (Table 17)
Encroachment (Table 7)		Mature (>30)	Reach Coverage %	☑ In Channel ☐ Not Present	□ Mod	ight corporc
Channel Characteris	tics		i i	ater cress		
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)	Bank Angle  □ 0 - 30	Bank Erosion □ < 5%	(Table 19) Bank	Clay/Silt Sand Gravel C	Cobble Boulder Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)	⊠ 60 ~ 90	√5 – 30% □ 30 – 60%	Riffle Pool		
Entrenchment (Table 13)	Bank Failure (Table 14)	Vundercuty	□ 60 - 100%	<b>Bed</b> (if no riffle-pool marphology)		
Down's Model (Table 15)	Bankfull Indicators (Table 18)		Bankfull Width (m)	3.5	2,90 Wetted Width (1	n) 2.8 2.45 1.20
Sed Sorting (Table 20)	Sediment Transport Observed?	X No □ Not Visible	Bankfull Depth (m)	1.20	0,70 Wetted Depth (	n) 0.30 0.43 0.24
Transport 2/3	% of Bed Active		Undercuts (m) 0.05	0.30	0.05 Velocity (m/	s) 0.385 0.240 0.459
Geomorphic Units (Table 22)	Mass Movement (Table 23)	% Rers: 65	Pool Depth (m)		Velocity Estima Meth	
Riffle-Pool Spacing (m):	% Riffles: 25		iffle Length (m)	10		m)
Notes: XSH Bw = 2.72 m	XS5	, V	rous substrate			
DW-2.12 M	bu= 5.10m cw= 2.50m	case				d run demmat
tud = 0.35 m	Wd = 0.24m	3 Jon	rally straigh		ed by hymons	
bd=0.75m	60=0.84m	27 2019	areas areas	ear my	reently.	
v=0.520 m/s	V= 0.379m/S					
1 4						
Photos:						
						3

Version #4 Last edited: 04/04/2023

**General Site Characteristics** 

Project Number: PN24009

2024-05-02 11:30 AM Date: Stream: Alloa Oram Time: Reach: Weather: Location:

			01110		Location:	Maybeld rd, Allaa
Field S	Staff:		KA AK		Watershed/Subwatershed:	Etabroke Creek
Featur		Monit	oring	Site	Sketch	Compass
	Reach break		Long-profile			
<b>只</b>	Station location	1	Monumented XS	1		
XX	Cross-section	0	Monumented photo		LA05	
-	Flow direction		Monumented photo	k	1	
~~	Riffle	*	direction		Tile Dr	1-3
$\bigcirc$	Pool		Sediment sampling		10	1 3
WHID	Sediment bar	шш	Erosion pins		VIE I	
HHHHHH	Eroded bank/slope	8	Scour chains	C.NO	cettal () It	
	Undercut bank	Additi	onal Symbols	5	cettail OFV	an places
XXXXXX	Bank stabilization				MAN COMPU	m sore places
	Leaning tree		>	(5)	La La Coca	$\Lambda_{\alpha}$
xx	Fence		5	5=4.0M	I'v Ev Sufx	Ag
	Culvert/outfall		المالية الدر و	= 3.2m	w Gxx trees leaving to	unled field
	Swamp/wetland		bo	* at \$5	Tres many	Willey . Wi Co
<b>VVV</b>	Grasses		V:	0,1331/5	LAX XS7	
	Tree				1 DW = 5.45 M VEO	.271m/s
	Instream log/tree			-	Mash O Asw	
K * *	Woody debris			×	SON!	-0
*XXXXX	Beaver dam			Cetter -		3800
VV	Vegetated island				W 159 /39 W A	- hect = 0.03m
low Ty				A04-2 =	King Su Kong	shed culvery = 0.9m
	Standing water H14	Back	water		2 2 4 1 3	
	Scarcely perceptible f			1000	Le un die	XS3
	Smooth surface flow			Amores n= 0.900 nd= 0.160	A SISION X	bw= H.3m
H4	Upwelling			100 = 0.10M	(DUPLETS LUM	W=2.9m
	Rippled				ud=0.33m	bot-1.0m
	Unbroken standing wa	ave			WK e	1=0.331ms Ag
	Broken standing wave					Tield
	Chute					y w
H9	Free fall H9A	Dissig	oates below free fall			
ubstra					Ag	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
S1 :	Silt	S6	Small boulder		(3)	
	Sand	<b>S7</b>	Large boulder		TIELO	
	Gravel	S8	Bimodal			le XS4
<b>S4</b> 9	Small cobble	<b>S9</b>	Bedrock/till		Ę	1 Land 2.77m
S5	Large cobble					6 hid= 3 (and
ther		F 841 F				* WO = 0.58 m
	Benchmark	EP	Erosion pin			W W   W & V=02
S E	Backsight	RB	Rebar			K I
<b>S</b> [	Downstream	US	Upstream			XKKKK
/DJ V	Woody debris jam	TR	Terrace			K K F F TONO
WC \	/alley wall contact	FC	Flood chute			Culvert tergent = 1.3
	Bottom of slope	FP	Flood plain	Photos		Culient leight = 1.30 Water death = 0.1
	Top of slope			32		7
	op or slope	KP	Knick point	Notes:		/(

Version #4 Last edited: 21/02/2023





Kapia Geom	югрі	nic Assessment	Project Number:	2400	) 9			M O R P H I )		
Date:	-	1024-05-02	Stream:		A1100	Dran	0			
Time:	1	1:35 AM	Reach:		ADY	U1011				
Weather:	Si	nny 18°	Location:		Marehall	0	d	11.		
Field Staff:	RF	+ HF	Watershed/Subwatersh	ed:	Idablas (	C 1500	ica,	MIDG		
Process		Ge	omorphological Indicator		F 1021C014		sent?	Contain		
1100035	No.	Description				Yes	No	Factor Value		
	1	Lobate bar				100	110			
	2	Coarse materials in riffles	s embedded							
Evidence of	3	Siltation in pools						11/		
Aggradation	4	Medial bars					6.7	1/7		
(AI)	5	Accretion on point bars					1	- / /		
	6	Poor longitudinal sorting	of bed materials				1			
	7	Deposition in the overbar	ik zone							
				Sun	n of indices =	1	6	0.143		
	1	Exposed bridge footing(s)				11/	n	0.0/3		
	2	Exposed sanitary / storm				n //	n			
	3	Elevated storm sewer out				10/	10	_		
	4	Undermined gabion basks		//	1121					
Evidence of Degradation	5	Scour pools downstream		///	- 1/1					
(DI)	6	Cut face on bar forms								
	7	Head cutting due to knick	point migration				V			
	8	Terrace cut through older	bar material				1			
	9	Suspended armour layer	visible in bank					-		
	10	Channel worn into undistu	irbed overburden / bedrock				-			
				Sum	of indices =	1	5	0.167		
	1	Fallen / leaning trees / fer	nce posts / etc.			7				
:	2	Occurrence of large organ		/						
	3	Exposed tree roots	,		-					
Evidence of	4	Basal scour on inside mea		1/						
Widening	5	Basal scour on both sides			1 4/2					
(WI)	6	Outflanked gabion baskets	N	A	10					
		Length of basal scour >50		1	1					
	8		sly buried pipe / cable / etc. (	70st		V	4	1		
		Fracture lines along top of		/						
	10	Exposed building foundation	on			W	9			
				Sum	of indices =	2	6	0.25		
		Formation of chute(s)					V			
Evidence of		Single thread channel to m					/	-		
Planimetric		Evolution of pool-riffle form	n to low bed relief form				/	- , ,		
Form Adjustment		Cut-off channel(s)						1/2		
(PI)		Formation of island(s)					V	11		
	6	Thalweg alignment out of p	phase with meander form				/	1		
	7	Bar forms poorly formed /	reworked / removed							
				Sum	of indices =	1	6	0.143		
otes:	<del></del>		Stabilit	y Index	(SI) = (AI+	DI+WI+		0-176		
			In Re		In Transiti			djustment		
			A 0.00	0 - 0.20	□ 0.21			0.41		



Rapid Stream Assessment Technique Project Number: M24009

Date: Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: Category Poor Fair Good Excellent < 50% of bank network</li> 50-70% of bank network · 71-80% of bank network · > 80% of bank network stable stable stable stable · Recent bank sloughing, · Recent signs of bank Infrequent signs of bank No evidence of bank slumping or failure sloughing, slumping or sloughing, slumping or sloughing, slumping or frequently observed failure fairly common failure failure · Stream bend areas highly · Stream bend areas Stream bend areas stable Stream bend areas very unstable Outer bank height 0.6-0.9 unstable stable Outer bank height 1.2 m • Outer bank height 0.9m above stream bank (1.2-Height < 0.6 m above above stream bank 1.2 m above stream 1.5 m above stream bank stream (< 1.2 m above (2.1 m above stream bank for large mainstem areas) stream bank for large bank for large mainstem (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) areas) bank for large mainstem Bank overhang < 0.6 m Bank overhang > 0.8-1.0 areas) Channel Bank overhang 0.8-0.9m Stability · Young exposed tree roots · Young exposed tree roots Exposed tree roots · Exposed tree roots old, abundant common predominantly old and large and woody > 6 recent large tree falls 4-5 recent large tree falls large, smaller young roots • Generally 0-1 recent large per stream mile per stream mile scarce tree falls per stream mile 2-3 recent large tree falls per stream mile Bottom 1/3 of bank is · Bottom 1/3 of bank is Bottom 1/3 of bank is Bottom 1/3 of bank is highly erodible material generally highly erodible generally highly resistant generally highly resistant Plant/soil matrix severely material plant/soil matrix or material plant/soil matrix or material compromised · Plant/soil matrix compromised Channel cross-section is Channel cross-section is Channel cross-section is · Channel cross-section is generally trapezoidallygenerally trapezoidallygenerally V- or U-shaped generally V- or U-shaped shaped shaped Point range □ 0 □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 ⋈ 8 □ 9 □ 10 □ 11 > 75% embedded (> 50-75% embedded (60-· 25-49% embedded (35-· Riffle embeddedness < 85% embedded for large 85% embedded for large 59% embedded for large 25% sand-silt (< 35% mainstem areas) mainstem areas) mainstem areas) embedded for large mainstem areas) · Few, if any, deep pools · Low to moderate number · Moderate number of deep · High number of deep pools Pool substrate of deep pools pools (> 61 cm deep) composition >81% sand Pool substrate Pool substrate composition (> 122 cm deep for large composition 30-59% sand-silt mainstem areas) 60-80% sand-silt Pool substrate composition <30% sand-silt Streambed streak marks Streambed streak marks Streambed streak marks · Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped Scouring/ and/or "banana"-shaped sediment deposits sediment deposits sediment deposits Sediment sediment deposits absent common common Deposition uncommon · Fresh, large sand · Fresh, large sand Fresh, large sand deposits Fresh, large sand deposits deposits very common in deposits common in uncommon in channel rare or absent from channel channel channel Small localized areas of No evidence of fresh Moderate to heavy sand Small localized areas of fresh sand deposits along sediment deposition on deposition along major fresh sand deposits along top of low banks overbank portion of overbank area top of low banks Point bars present at Point bars common, · Point bars small and stable, Point bars few small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated moderate to large and unstable with high armoured with little or no and/or armoured with little unstable with high amount of fresh sand fresh sand or no fresh sand amount of fresh sand Point range □ 0 □ 1 □ 2 □ 3 □ 4 □ 5 **X** 6 □ 7 □ 8 Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:

Version #2

Last edited: 10/02/2023

Page 1 of 2



24009 Location: PN: 7024-05-02 Date: Excellent Good Fair Poor Category Wetted perimeter > 85% of Wetted perimeter 61-85% Wetted perimeter < 40%</li> · Wetted perimeter 40bottom channel width (> of bottom channel width 60% of bottom channel of bottom channel width 90% for large mainstem width (45-65% for large (66-90% for large (< 45% for large areas) mainstem areas) mainstem areas) mainstem areas) · Good mix between riffles, · Riffles, runs and pool Few pools present, riffles Dominated by one habitat habitat present runs and pools type (usually runs) and and runs dominant. Diverse velocity and depth Relatively diverse velocity Velocity and depth by one velocity and depth and depth of flow of flow present (i.e., slow, generally slow and condition (slow and fast, shallow and deep shallow (for large shallow) (for large water) mainstem areas, runs mainstem areas, few and pools dominant, riffles present, runs and velocity and depth pools dominant, velocity and depth diversity low) diversity intermediate) · Riffle substrate Riffle substrate Riffle substrate • Riffle substrate composition: good mix of composition: cobble, composition: composition: gravel, rubble, boulder mix gravel, cobble, and rubble predominantly small predominantly gravel with little sand cobble, gravel and sand material with high amount of sand Physical > 50% cobble 25-49% cobble • 5-24% cobble < 5% cobble</p> Instream • Riffle depth > 20 cm for · Riffle depth 15-20 cm for Habitat Riffle depth 10-15 cm for • Riffle depth < 10 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas Large pools generally > 61 Large pools generally 46-61 · Large pools generally 30-Large pools generally < cm deep (> 122 cm for cm deep (91-122 cm for 30 cm deep (< 61 cm for 46 cm deep (61-91 cm large mainstem areas) with large mainstem areas) with for large mainstem large mainstem areas) some overhead Ans good overhead areas) with little or no and devoid of overhead generally cover/structure cover/structure overhead cover/structure cover/structure · No channel alteration or Slight amount of channel Moderate amount of Extensive channel significant point bar channel alteration and/or alteration and/or slight alteration and/or point formation/enlargement increase in point bar moderate increase in formation/enlargement point bar formation/enlargement formation/enlargement • Riffle/Pool ratio 0.9-1.1:1 Riffle/Pool ratio 0.7-0.89:1 · Riffle/Pool ratio 0.5-• Riffle/Pool ratio 0.49:1; ; 1.11-1.3:1 0.69:1; 1.31-1.5:1 ≥1.51:1 Summer afternoon water · Summer afternoon water Summer afternoon water Summer afternoon water temperature < 20°C MA temperature 20-24°C temperature 24-27°C temperature > 27°C □ 7 □ 8 □ 5 □ 6 □ 3 □ 0 □ 1 □ 2 Point range Substrate fouling level: Substrate fouling level: Substrate fouling level: Substrate fouling level: Rock underside (0-10%) Very light (11-20%) Moderate (21-50%) High (> 50%) · Clear flow Slightly grey colour · Grey colour Brown colour • TDS: < 50 mg/L TDS: 50-100 mg/L TDS: 101-150 mg/L TDS: > 150 mg/L · Objects visible to depth Water Quality Objects visible to depth Objects visible to depth · Objects visible to depth > 1.0m below surface 0.15-0.5m below surface 0.5-1.0m below surface < 0.15m below surface No odour Slight organic odour · Slight to moderate Moderate to strong organic odour organic odour □ 7 □ 8 **∑** 5 □ 6 □ 3 □ 4 0 0 1 0 2 Point range Wide (> 60 m) mature · Forested buffer generally Riparian area · Narrow riparian area of forested buffer along both > 31 m wide along major predominantly wooded mostly non-woody banks but with major localized portion of both banks vegetation Riparian gaps Habitat Canopy coverage: Canopy coverage: Canopy coverage: 50-Canopy coverage: >80% shading (> 60% for Conditions 60-79% shading (45-59% <50% shading (30% for 60% shading (30-44% large mainstem areas) for large mainstem areas) for large mainstem large mainstem areas) areas) □ 6 □ **7** □ 4 □ 5 □ 2 □ 3 Point range Excellent (>35) Good (25-34) Fair (13-24) Poor (<13)

Version #2

Last edited: 10/02/2023

Total overall score (0-42) =

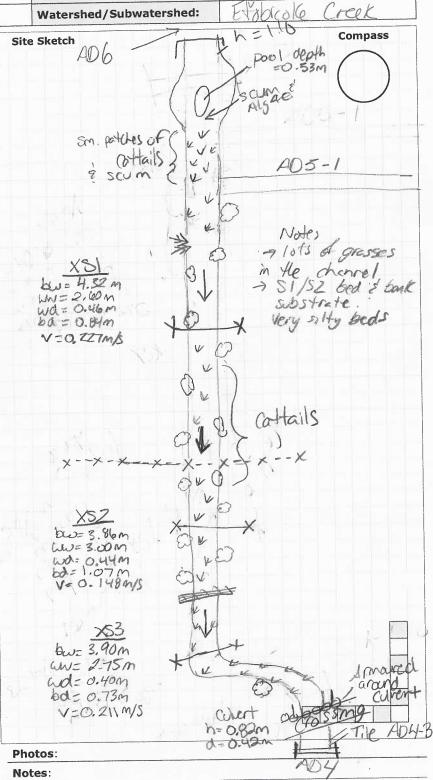
Reacii Chara	cteristics	Project	Number	r: PNZ400	9								GLC
Date:	2024-	05-01		Field Staff:	DA.	41-		Wate	rshed/Subwa	torchodu	This	10	мокрні
Time:	11:20	AM		Stream:	Allac	Dan			(Upstream):	tersneu:	Etobical	e cre	ek
Weather:	SUMM	4. 1800	-	Reach:	ANU	2			(Downstream	١.			
Table 1)		e \	Channel (Table 3)		Channel Zone (Table 4)	~	w Type ole 5)	1	☐ Evidence of (		Location:	Р	hoto:
Riparian Veget	ation				Aquatic &			00					
(Table 6)  Encroachment (Table 7)	S Coverage  None  Fragme	X1 nted □4	- 10	Age (yrs)  □ Immature (<5)  □ Established (5-30)	Type (Table 8)	Wood In	ly Debris Cutbank Channel	WD Den ∠Low □ Mod	wDJ/50m:		Quality Odour able 16)	(Ta	rbidity ble 17)
hannel Chara		ous 🗆 >	, 10	□ Mature (>30)	Coverage %	20 0 N	t Present	□ High		L			
Sinuosity Type								- 11204					
(Table 9)	Sinuc	Sity Degre (Table 10		Bank Angle  □ 0 - 30	Bank Erosion < 5%	(Ta	ble 19) Bank	Clay/Si		avel Cobb	le Boulder	Parent	Rootlets
<b>Gradient</b> (Table 11)	/ #	of Channel (Table 12	- 1	□ 30 - 60 □ 60 - 90	□ 5 ~ 30% □ 30 ~ 60%		Riffle Pool	e la constante de la constante	7				
(Table 13)	2	B <b>ank Failur</b> (Table 14		□ Undercut	□ 60 - 100%	(if no	Bed riffle-pool orphology)						
Oown's Model (Table 15)	S Bankful	Indicators (Table 18		5	Bankfull Widt (m	hun	5.45	4.3	3.6 Wetted	Width (m)	3.2	3.//	2.9
Sed Sorting (Table 20)	Sedimen	t Transport Observed?		⊠No □ Not Visible	Bankfull Depti		0.50	10	0.85 Wetted I	Depth (m)		0,42	0.52
Transport ode (Table 21)	3 % of	Bed Active	e <i>N//</i> 9		Undercuts (m	)			Veloc	city (m/s)		0. 27	0.331
Geomorphic nits (Table 22)	8 Mass	Movemen (Table 23		1/2 nus /80	Pool Depti				Velocit	y Estimate Method	Wiffe	Bel	
Riffle-Pool Spacing (m):	VA	% Riffles	: 0	% Pools:	Riffle Length (m	)			Meander	L			
tes: > Co > Mul -> Silter	hanrel the tiple cross I bed an	9/	and	nn domina	Dorlan Me	g enci	dachi	y an	chonre	L	lats a	e ms	streen g
itos:													

Version #4 Last edited: 04/04/2023

Senior staff sign-off (if required): Senior staff sign-off (if required): Checked by: Completed by:

General Site	Characteristics	Project Number:	24009	MORPHIX
Date:	2024-05-02	Stream:		Alloa Orain
Time:	11:15 pm	Reach:		AD 5
Weather:	Sury 19°C	Location:		Mayfreld rd, Alloa
Field Staff:	RATHE	Watershed/Subwa	atershed:	Etablicale Creek

Weatin	CIT	-	~	10.10	1 + 5
Field S	taff:		K	A	HF
Feature	es	Мо	nite	oring	
	Reach break	<del>-</del>	<del>-</del> -	Lon	g-profile
只	Station location	<b> </b>		Mor	numented XS
××	Cross-section	[	ภ	Mor	numented photo
	Flow direction			Mor	numented photo
~~ <b>&gt;</b>	Riffle	1	7	dire	ection
	Pool	1		Sed	liment sampling
\$500 M	Sediment bar			Ero	sion pins
#######################################	Eroded bank/slope		8	Sco	ur chains
	Undercut bank	Ad	diti	ona	l Symbols
XXXXXX	Bank stabilization				
	Leaning tree				
xx	Fence				
	Culvert/outfall				
	Swamp/wetland				
AAA	Grasses				
<b>C</b>	Tree				
	Instream log/tree				
***	Woody debris				
*XXXXXX	Beaver dam				
W	Vegetated island				
Flow 7					
H1	Standing water <b>H</b> :	LA	Bacl	k wa	ter
H2	Scarcely perceptible				
нз	Smooth surface flow	٧			
H4	Upwelling				
H5	Rippled				
Н6	Unbroken standing	wav	'e		
H7	Broken standing wa	ive			
Н8	Chute				
H9	Free fall H	9A	Dis	sipal	tes below free fall
Subst	rate			in e	
S1	Silt		S	6	Small boulder
52	Sand		S	7	Large boulder
S3	Gravel		S	8	Bimodal
54	Small cobble		S	9	Bedrock/till
S5	Large cobble				
Other					
ВМ	Benchmark		EP		Erosion pin
BS	Backsight		RB		Rebar
DS	Downstream		US		Upstream
MDJ	Woody debris jam		TR		Terrace
VWC	Valley wall contact		FC		Flood chute
BOS	Bottom of slope		FP	•	Flood plain
TOS	Top of slope		KF	•	Knick point



Version #4 Last edited: 21/02/2023

Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:

\_\_\_\_ of \_\_\_\_\_



2400 **Project Number: Rapid Geomorphic Assessment** Stream: Date: Reach: Time: Location: Weather: Watershed/Subwatershed: Field Staff: Present? Factor Geomorphological Indicator Value Process Yes No No. Description Lobate bar 1 Coarse materials in riffles embedded 2 Siltation in pools 3 Evidence of Aggradation Medial bars 4 (AI) 5 Accretion on point bars Poor longitudinal sorting of bed materials 6 Deposition in the overbank zone Sum of indices = 1 Exposed bridge footing(s) Exposed sanitary / storm sewer / pipeline / etc. 2 3 Elevated storm sewer outfall(s) Undermined gabion baskets / concrete aprons / etc. Evidence of Scour pools downstream of culverts / storm sewer outlets Degradation Cut face on bar forms 6 (DI) Head cutting due to knickpoint migration 7 Terrace cut through older bar material 8 9 Suspended armour layer visible in bank Channel worn into undisturbed overburden / bedrock 10 Sum of indices = Fallen / leaning trees / fence posts / etc. 1 Occurrence of large organic debris 2 Exposed tree roots 3 Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle Widening Outflanked gabion baskets / concrete walls / etc. 6 (WI) 7 Length of basal scour >50% through subject reach Exposed length of previously buried pipe / cable / etc. 8 Fracture lines along top of bank 9 Exposed building foundation 10 Sum of indices = Formation of chute(s) 1 Single thread channel to multiple channel 2 Evidence of Evolution of pool-riffle form to low bed relief form 3 Planimetric Cut-off channel(s) Form 4 Adjustment 5 Formation of island(s) (PI) Thalweg alignment out of phase with meander form 6 Bar forms poorly formed / reworked / removed Sum of indices = Stability Index (SI) = (AI+DI+WI+PI)/4 = Notes: In Transition/Stress In Adjustment In Regime X 0.00 - 0.20 0.21 - 0.40 □ 0.41 Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_\_\_\_ Version #3

Last edited: 10/02/2023

Project Number: M24009 Rapid Stream Assessment Technique

ite:	2024-05-02	Stream:		Allva Us	m		
me:	11:15 pm	Reach:	TETE III	A05			
eather:	sunny, 18°c	Location:		1000	of Allor		
eld Staff:	RA HT	Watershed/Subwater	shed:	Etobreole	Craile		
Category	Poor	Fair		Good	Excellent		
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> </ul>	stable Infreque sloughin failure	of bank network ent signs of bank ng, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>		
	Stream bend areas highly unstable Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) Bank overhang > 0.8-1.0 m	<ul> <li>Stream bend areas unstable</li> <li>Outer bank height 0.9-1.2 m above stream bank</li> <li>(1.5-2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang 0.8-0.9m</li> </ul>	Outer by m above 1.5 m a for large	bend areas stable ank height 0.6-0.9 e stream bank (1.2- bove stream bank e mainstem areas) verhang 0.6-0.8 m	<ul> <li>Stream bend areas very stable</li> <li>Height &lt; 0.6 m above stream (&lt; 1.2 m above stream bank for large mainstem areas)</li> <li>Bank overhang &lt; 0.6 m</li> </ul>		
Channel Stability	Young exposed tree roots abundant     > 6 recent large tree falls per stream mile	Young exposed tree roots common     4-5 recent large tree falls per stream mile	predom large, s scarce • 2-3 rece	d tree roots inantly old and maller young roots ent large tree falls eam mile	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile		
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	Bottom 1/3 of bank is generally highly erodible material     Plant/soil matrix compromised	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material		Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material		
	Channel cross-section is generally trapezoidally- shaped	Channel cross-section is generally trapezoidally- shaped		l cross-section is ly V- or U-shaped	• Channel cross-section is generally V- or U-shaped		
Point range	□ 0 □ 1 □ 2	<b>3 4 5</b>	□ 6	5   7   8	9 0 10 0 11		
nople	> 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	59% er	6 embedded (35- mbedded for large em areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)		
	Few, if any, deep pools     Pool substrate     composition >81% sand-     silt	Low to moderate number of deep pools     Pool substrate composition 60-80% sand-silt	pools • Pool su	te number of deep bstrate composition 6 sand-silt	High number of deep pools     (> 61 cm deep)     (> 122 cm deep for large mainstem areas)     Pool substrate composition     <30% sand-silt		
Channel Scouring/ Sediment	Streambed streak marks and/or "banana"-shaped sediment deposits common	Streambed streak marks and/or "banana"-shaped sediment deposits common	and/or	bed streak marks "banana"-shaped ent deposits mon	Streambed streak marks and/or "banana"-shaped sediment deposits absent		
Deposition	<ul> <li>Fresh, large sand deposits very common in channel</li> <li>Moderate to heavy sand deposition along major portion of overbank area</li> </ul>	Fresh, large sand deposits common in channel     Small localized areas of fresh sand deposits along top of low banks	uncommon in channel Small localized areas of fresh sand deposits along banks common, to large and with high  uncommon in channel Fra No Small localized areas of fresh sand deposits along top of low banks  over Sond in Common, step large and well-vegetated and/or armoured with little or no		Fresh, large sand deposits rare or absent from chann     No evidence of fresh sediment deposition on overbank		
	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand			Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4		□ 5 DX 6	□ 7 □ 8		

Version #2 Last edited: 10/02/2023



2024-05-02 Date: PN: PN24009 Mayfreld Location: Category Poor Fair Good **Excellent**  Wetted perimeter < 40%</li> · Wetted perimeter 40-· Wetted perimeter 61-85% · Wetted perimeter > 85% of of bottom channel width 60% of bottom channel of bottom channel width bottom channel width (> (< 45% for large width (45-65% for large (66-90% for large 90% for large mainstem mainstem areas) mainstem areas) mainstem areas) areas) Dominated by one habitat Few pools present, riffles Good mix between riffles, · Riffles, runs and pool type (usually runs) and and runs dominant. runs and pools habitat present by one velocity and depth Velocity and depth Relatively diverse velocity Diverse velocity and depth condition (slow and generally slow and and depth of flow of flow present (i.e., slow, shallow) (for large shallow (for large fast, shallow and deep mainstem areas, few mainstem areas, runs water) riffles present, runs and and pools dominant, pools dominant, velocity velocity and depth and depth diversity low) diversity intermediate) Riffle-substrate Riffle substrate · Riffle substrate · Riffle substrate composition: composition: composition: good mix of composition: cobble, predominantly gravel predominantly small gravel, cobble, and rubble gravel, rubble, boulder mix Physical with high amount of sand cobble, gravel and sand material with little sand Instream < 5% cobble 5-24% cobble · 25-49% cobble > 50% cobble Habitat Riffle depth < 10 cm for · Riffle depth 10-15 cm for · Riffle depth 15-20 cm for • Riffle depth > 20 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas Large pools generally < · Large pols generally 30-Large pools generally 46-61 Large pools generally > 61 46 cm deep (61-91 cm 30 cm deep (< 61 cm for cm deep (91-122 cm for cm deep (> 122 cm for large mainstem areas) for large mainstem runs large mainstem areas) with large mainstem areas) with and devoid of overhead areas) with little or no some overhead good overhead cover/structure overhead cover/structure cover/structure cover/structure Extensive channel · Moderate amount of Slight amount of channel No channel alteration or alteration and/or point alteration and/or slight channel alteration and/or significant point bar moderate increase in increase in point bar formation/enlargement formation/enlargement point bar formation/enlargement formation/enlargement Riffle/Pool ratio 0.49:1; · Riffle/Pool ratio 0.5- Riffle/Pool ratio 0.7-0.89:1 • Riffle/Pool ratio 0.9-1.1:1 ≥1.51:1 0.69:1; 1.31-1.5:1 ; 1.11-1.3:1 · Summer afternoon water · Summer afternoon water · Summer afternoon water · Summer afternoon water NA temperature > 27°C temperature 24-27°C temperature 20-24°C temperature < 20°C Point range □ 0 □ 1 □ 2 3 □ 4 □ 5 □ 6 □ 7 □ 8 · Substrate fouling level: Substrate fouling level: · Substrate fouling level: · Substrate fouling level: High (> 50%) Moderate (21-50%) Very light (11-20%) Rock underside (0-10%) · Brown colour Slightly grey colour · Grey colour · Clear flow TDS: > 150 mg/L TDS: 101-150 mg/L • TDS: 50-100 mg/L TDS: < 50 mg/L</li> Water Quality · Objects visible to depth Objects visible to depth · Objects visible to depth · Objects visible to depth < 0.15m below surface 0.15-0.5m below surface 0.5-1.0m below surface > 1.0m below surface Moderate to strong Slight to moderate · Slight organic odour No odour organic odour organic odour Point range □ 0 □ 1 □ 2 □ 3 □ 4 5 🗆 6 □ 7 □ 8 Narrow riparian area of · Riparian area · Forested buffer generally • Wide (> 60 m) mature mostly non-woody predominantly wooded > 31 m wide along major forested buffer along both vegetation but with major localized portion of both banks banks Riparian gaps Habitat Canopy coverage: Canopy coverage: 50-Conditions · Canopy coverage: Canopy coverage: <50% shading (30% for 60% shading (30-44% 60-79% shading (45-59% >80% shading (> 60% for large mainstem areas) for large mainstem for large mainstem areas) large mainstem areas) areas) Point range □ 0 ⊠ □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Total overall score (0-42) = / Poor (<13) Fair (13-24) Good (25-34) Excellent (>35)

Version #2 Last edited: 10/02/2023



Reach Charac	teristi	cs Project N	umber:	PN24000	1						-, -,	10 7	MORPHIX
Date:	ter ist.	2024-05-0		Field Staff:	KA HF	-			I/Subwatersh	ed: 🗡	tobico 1	Q (1	reck
Time:		11:15 pm		Stream:	37000	rain		ITM (Upst					
Weather:		suny, 18°c		Reach:	AD5			JTM (Dow	nstream):				
Land Use (Table 1)	- 1		Channel 1 (Table 3)	W-1	able 4)	Flow 7 (Table	; ;	□ E\	ridence of Ground			Pl	noto:
Riparian Veget	ation				Aquatic & In	stream Ve	getation		N	Vater Qu	ality		
Dominant Type (Table 6)	3	Coverage Channel	-4 🗆	ge (yrs) Immature (<5)	Type (Table 8)		Debris Williamsk X	LOW	WD3/50m:	Odor (Table		(Ta	ble 17)
Encroachment (Table 7)	_	☐ Fragmented ☐ 4 Continuous ☐ >		Established (5-30)  Mature (>30)	Reach Coverage %	-	Present 🗆						
Channel Chara	cteristi	cs						Serve - E		Calabia	Boulder	Parent	Rootlets
Sinuosity Type (Table 9)		Sinuosity Degre (Table 10		Bank Angle  □ 0 - 30	Bank Erosion	(Table	e 19) Ci Bank	lay/Silt ※	Sand Gravel	Cobble	Boulder		
Gradient (Table 11)	1	# of Channel (Table 12		□ 30 - 60	□ 5 - 30% □ 30 - 60%	F	Riffle Pool						
Entrenchment (Table 13)	2	<b>Bank Failur</b> (Table 14	F1///// 1 1	□ Undercut	□ 60 - 100%	(if no rif morp	Bed fle-pool hology)	×					
Down's Model (Table 15)	S	Bankfull Indicator (Table 18			Bankfull Width (m)	4.32	3.86	3,90	Wetted Widt	h (m) Z.	60	3.00	2.75
Sed Sorting (Table 20)	light	Sediment Transpor Observed	t	No □ Not Visible	Bankfull Depth (m)	0.84	1.07	0.73	Wetted Dept	h (m) ().	.46	2.44	0.40
Transport Mode (Table 21)	3	% of Bed Activ	e NIA		Undercuts (m)				Velocity	(m/s) ().	227	0.148	0.21/
Geomorphic Units (Table 22)	8	Mass Movemer (Table 23		1. Pas 100	Pool Depth (m)	0.53			1	lethod 4	WALL	89	
Riffle-Pool Spacing (m):	/	% Riffle	s: ()	% Pools:	Riffle Length (m)				Meander Amp	(m)			
Notes:	pario	in vegetatra	in en	roaching in	to chance	. Very	gras	15y					
,													
Photogram													
Photos:													
Vorsion #4					Sen	ior staff sigr	n-off (if re	equired): _	550 Check	ked by:	Co	ompleted	by: 4

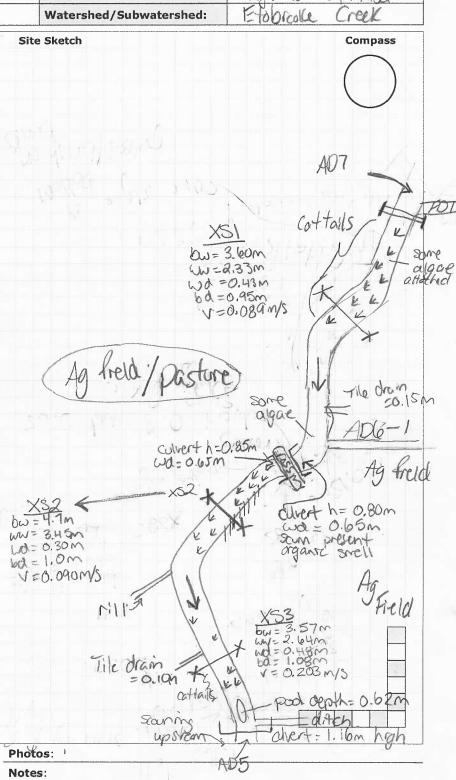
Version #4 Last edited: 04/04/2023

General Site Characteristics

Project Number: PN24009

Date:	2024-05-02	Stream:	Alloa Drain
Time:	10:50 AM	Reach:	ADO
Weather:	sunny, 18°	Location:	Mayfreld rd, Allon
Field Staff:	RA HF	Watershed/Subwatershed:	Etobricola Creek

Field S	Staff:	1	RA ITF
Featur	es	Monit	toring
===	Reach break		- Long-profile
尺	Station location	<b>—</b>	Monumented XS
××	Cross-section	0	Monumented photo
<b>→</b>	Flow direction	1	Monumented photo direction
	Riffle	_	
	Pool		Sediment sampling
	Sediment bar	8	Erosion pins
#######################################	Eroded bank/slope		Scour chains
	Undercut bank	Addit	ional Symbols
KXXXXX	Bank stabilization		
***	Leaning tree		
xx	Fence		
	Culvert/outfall		
	Swamp/wetland		
AAA	Grasses		
	Tree		
	Instream log/tree		
***	Woody debris		
*****	Beaver dam		
W	Vegetated island		
Flow T	уре		
H1	3		c water
H2	Scarcely perceptible		
НЗ	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
Н6	Unbroken standing v		
H7	Broken standing wav	ve	
Н8	Chute		
Н9	Free fall H9	A Diss	sipates below free fall
Substr			
S1	Silt	S	
S2	Sand	S	3
S3	Gravel	S	
S4	Small cobble	S	Bedrock/till
S5	Large cobble		
Other			
ВМ	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point



Version #4

Last edited: 21/02/2023

Senior staff sign-off (if required): 550 Checked by: \_\_\_\_\_ Completed by:



Page \_\_\_\_ of \_

Project Number: Rapid Geomorphic Assessment 2124-05-02 Date: Stream: 10:50 AM Time: Reach: Weather: Location: Field Staff: Fob1006 Watershed/Subwatershed: Geomorphological Indicator Present? Factor Process Description Value Yes 1 Lobate bar 2 Coarse materials in riffles embedded 3 Siltation in pools Evidence of Aggradation 4 Medial bars (AI) 5 Accretion on point bars 6 Poor longitudinal sorting of bed materials 7 Deposition in the overbank zone ().143 Sum of indices = Exposed bridge footing(s) 1 2 Exposed sanitary / storm sewer / pipeline / etc. 3 Elevated storm sewer outfall(s) Undermined gabion baskets / concrete aprons / etc. Evidence of Scour pools downstream of culverts / storm sewer outlets Degradation Cut face on bar forms (DI) 7 Head cutting due to knickpoint migration 8 Terrace cut through older bar material 9 Suspended armour layer visible in bank 10 Channel worn into undisturbed overburden / bedrock Sum of indices = 1 Fallen / leaning trees / fence posts / etc. 2 Occurrence of large organic debris 3 Exposed tree roots 4 Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle Widening 6 Outflanked gabion baskets / concrete walls / etc. (WI) 7 Length of basal scour >50% through subject reach 8 Exposed length of previously buried pipe / cable / etc. 9 Fracture lines along top of bank Exposed building foundation 10 Sum of indices = 1 Formation of chute(s) Single thread channel to multiple channel Evidence of Evolution of pool-riffle form to low bed relief form 3 Planimetric Form 4 Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) 6 Thalweg alignment out of phase with meander form 7 Bar forms poorly formed / reworked / removed

Notes: Stability Index (SI) = (AI+DI+WI+PI)/4 = In Regime In Transition/Stress In Adjustment Ď 0.00 - 0.20 □ 0.21 - 0.40 □ 0.41

Version #3 Last edited: 10/02/2023 Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_\_\_



Sum of indices =



Project Number: PN24009 Rapid Stream Assessment Technique

2024-05-02 Date: Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: Category Poor Fair Good Excellent < 50% of bank network</li> • 50-70% of bank network • 71-80% of bank network > 80% of bank network stable stable stable stable · Recent bank sloughing, · Infrequent signs of bank Recent signs of bank No evidence of bank slumping or failure sloughing, slumping or sloughing, slumping or sloughing, slumping or frequently observed failure fairly common failure failure · Stream bend areas highly · Stream bend areas · Stream bend areas stable Stream bend areas very unstable unstable Outer bank height 0.6-0.9 stable · Outer bank height 0.9-· Outer bank height 1.2 m m above stream bank (1.2-Height < 0.6 m above above stream bank 1.2 m above stream 1.5 m above stream bank stream (< 1.2 m above (2.1 m above stream for large mainstem areas) stream bank for large bank for large mainstem (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) areas) bank for large mainstem Bank overhang < 0.6 m</li> Bank overhang > 0.8-1.0 Bank overhang 0.8-0.9m Channel Stability Young exposed tree roots · Young exposed tree roots · Exposed tree roots Exposed tree roots old, abundant common predominantly old and large and woody > 6 recent large tree falls 4-5 recent large tree falls large, smaller young roots Generally 0-1 recent large per stream mile per stream mile scarce tree falls per stream mile 2-3 recent large tree falls per stream mile · Bottom 1/3 of bank is Bottom 1/3 of bank is Bottom 1/3 of bank is · Bottom 1/3 of bank is highly erodible material generally highly erodible generally highly resistant generally highly resistant Plant/soil matrix severely material plant/soil matrix or material plant/soil matrix or material compromised Plant/soil matrix compromised · Channel cross-section is Channel cross-section is · Channel cross-section is Channel cross-section is generally trapezoidallygenerally trapezoidallygenerally V- or U-shaped generally V- or U-shaped shaped shaped Point range □ 0 □ 1 □ 2 3 □ 4 □ 5 6 2 7 8 □ 9 □ 10 □ 11 > 75% embedded (> 50-75% embedded (60-· 25-49% embedded (35-• Riffle embeddedness < 85% embedded for large 59% embedded for large 25% sand-silt (< 35% 85% embedded for large mainstem areas) mainstem areas) mainstem areas) embedded for large mainstem areas) Few, if any, deep pools · Low to moderate number · Moderate number of deep · High number of deep pools Pool substrate of deep pools (> 61 cm deep) pools composition >81% sand-Pool substrate Pool substrate composition (> 122 cm deep for large silt composition 30-59% sand-silt mainstem areas) 60-80% sand-silt Pool substrate composition <30% sand-silt • Streambed streak marks · Streambed streak marks · Streambed streak marks Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped Scouring/ and/or "banana"-shaped sediment deposits sediment deposits sediment deposits sediment deposits absent Sediment common common uncommon Deposition Fresh, large sand · Fresh, large sand Fresh, large sand deposits Fresh, large sand deposits deposits very common in deposits common in uncommon in channel rare or absent from channel channel channel Small localized areas of · No evidence of fresh Moderate to heavy sand Small localized areas of fresh sand deposits along sediment deposition on deposition along major fresh sand deposits along top of low banks overbank portion of overbank area top of low banks Point bars present at · Point bars common, · Point bars small and stable, Point bars few, small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated moderate to large and unstable with high armoured with little or no and/or armoured with little unstable with high amount of fresh sand fresh sand or no fresh sand amount of fresh sand Point range 0 0 1 D 2 □ 3 □ 4 □ 7 □ 8

Version #2 Last edited: 10/02/2023

Pate: 20	24-05-02	PN: NZYOOG	Location:	ayheld rd, 4/16a		
Category	Poor	Fair	Good	Excellent		
	Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	<ul> <li>Wetted perimeter 40- 60% of bottom channel width (45-65% for large mainstem areas)</li> </ul>	<ul> <li>Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)</li> </ul>	Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)		
	Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	<ul> <li>Few pools present, riffles and runs dominant.</li> <li>Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)</li> </ul>	<ul> <li>Good mix between riffles, runs and pools</li> <li>Relatively diverse velocity and depth of flow</li> </ul>	Riffles, runs and pool habitat present  Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)		
Physical Instream	<ul> <li>Riffle substrate         composition:         predominantly gravel         with high amount of sand</li> <li>&lt; 5% cobble</li> </ul>	<ul> <li>Riffle substrate     composition:     predominantly small     cobble, gravel and sand</li> <li>5-24% cobble</li> </ul>	<ul> <li>Riffle substrate composition: good mix of gravel, cobble, and rubble material</li> <li>25-49% cobble</li> </ul>	<ul> <li>Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand</li> <li>&gt; 50% cobble</li> </ul>		
Habitat	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	Riffle depth > 20 cm for large mainstem areas		
( ddw	Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure		
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	No channel alteration or significant point bar formation/enlargement		
1	• Riffle/Pool ratio 0.49:1; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1		
NA	• Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C		
Point range	□ 0 □ 1 □ 2	□ 3 12 4	□ 5 □ 6	□ 7 □ 8		
	Substrate fouling level:     High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	Substrate fouling level:     Rock underside (0-10%)		
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L		
Water Quality	Objects visible to depth     < 0.15m below surface	Objects visible to depth 0.15-0.5m below surface	Objects visible to depth     0.5-1.0m below surface	Objects visible to depth     > 1.0m below surface		
	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	No odour		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	<b>⋈</b> 5 □ 6	□ 7 □ 8		
Riparian	Narrow riparian area of mostly non-woody vegetation	Riparian area     predominantly wooded     but with major localized     gaps	Forested buffer generally     31 m wide along major     portion of both banks	Wide (> 60 m) mature forested buffer along both banks		
Habitat Conditions	• Canopy coverage: <50% shading (30% for large mainstem areas)	Canopy coverage: 50- 60% shading (30-44% for large mainstem areas)	Canopy coverage:     60-79% shading (45-59% for large mainstem areas)	Canopy coverage:     >80% shading (> 60% for large mainstem areas)		
Point range	□ 0 🕱 1	□ 2 □ 3	□ 4 □ 5	□ 6 □ 7		

Fair (13-24) Good (25-34) Total overall score (0-42) = 23Poor (<13) Excellent (>35)

Version #2 Last edited: 10/02/2023



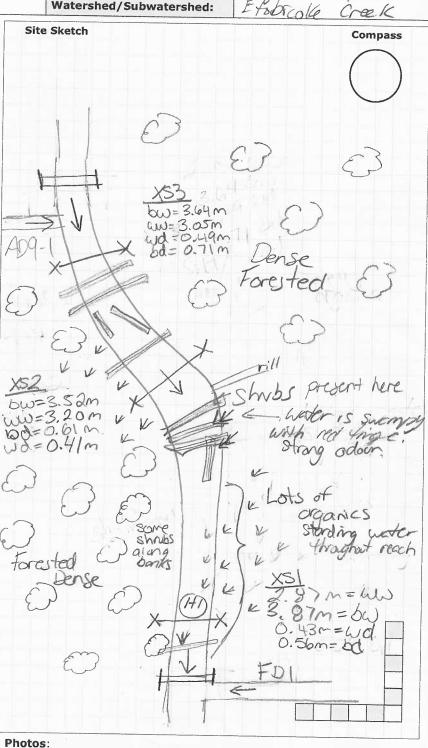
Reach Character	istics Project Number:	HV24009	0				MORPHIX"
Date:	2024-05-02	Field Staff:	IA HP		Watershed/Subwate	rshed: Etobrole	e (reck
Time:	10:50 AM	Stream:	Alloa Dr	ma	UTM (Upstream):		
Weather:	Serry 18°C	Reach:	ADL		UTM (Downstream):		
Land Use (Table 1)	Valley Type Channel 1 (Table 2)		ole 4)	Flow Type (Table 5)	☐ Evidence of Gro	oundwater Location:	Photo:
Riparian Vegetatio	n		Aquatic & Inst	ream Vegetatio	on	Water Quality	
Dominant Type (Table 6)	./	ge (yrs) Immature (<5)	Type (Table 8)	Woody Debris  In Cutbank	WD Density  Low  WD3/50m:	Odour (Table 16)	Turbidity (Table 17)
Encroachment (Table 7)		Established (5-30) Mature (>30)	Reach Coverage %	☐ In Channel  Not Present	☐ Mod ☐ High		2
Channel Character	istics						
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)	Bank Angle	Bank Erosion	(Table 19) <b>Bank</b>	Clay/Silt Sand Gra	vel Cobble Boulder	Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)	□ 30 - 60 □ 30 - 90	□ 5 - 30% □ 30 - 60%	Riffle Pool			
Entrenchment (Table 13)	Bank Failure (Table 14)	□ Undercut	□ 60 - 100%	Bed (if no riffle-pool morphology)			
Down's Model (Table 15)	Bankfull Indicators (Table 18)		Bankfull Width (m)	60 4.7	3.57 Wetted W	/idth (m) 2.33	3.45 2.64
Sed Sorting (Table 20)	Sediment Transport Observed?	X No □ Not Visible	Bankfull Depth (m)	95 1.0	1,08 Wetted D	epth (m) 0,43	0.30 6.48
Transport Mode (Table 21)	% of Bed Active		Undercuts (m)			12.	0.090 0.203
Geomorphic Units (Table 22)	Mass Movement (Table 23)	% runs 100	Pool Depth (m)	.62		Method Wille	Ball
Riffle-Pool Spacing (m):	% Riffles:		Riffle Length (m)		Meander A	(m)	
Notes: > Kin Petcles > Bed Silt	Smart reach and the recent the re		(myoriax) al		thails were a	also preser	f in say
Photos:							
							7
							$\nu_{\wedge}$

Version #4 Last edited: 04/04/2023

General Site Characteristics Project Number: 2400

Troject Namber.						
Date:	2024-05-02	Stream:	Alle Dais			
Time:	10:25 AM	Reach:	ADT			
Weather:	Snny 18°C	Location:	Mayfield rd, Allos			
Field Staff:	RA HF	Watershed/Subwatershed:	Etabricale Creek			

Field	Staff:		RAHF			
Feat	Features		Monitoring			
=	Reach break	-0-0-0-	Long-profile			
只	Station location	<b>—</b>	Monumented XS			
X	Cross-section	0	Monumented photo			
	1 low direction	I	Monumented photo			
~	Riffle	▼	direction			
	Pool		Sediment sampling			
		шш	Erosion pins			
######################################	# Eroded bank/slope	8	Scour chains			
	Ondercut bank	Additi	onal Symbols			
XXXXX						
	_					
XX)	7 01100					
AAA	Grasses					
	Tree					
	Instream log/tree					
***						
*******	Beaver dam					
W	Vegetated island					
Flow						
H1	Standing water H14		water			
H2	Scarcely perceptible	flow				
НЗ	Smooth surface flow					
H4	Upwelling					
H5	Rippled					
Н6	Unbroken standing wave					
H7	Broken standing wave					
H8	Chute					
H9 Subst	Free fall H9A	Dissip	pates below free fall			
S1	Silt					
S2	Sand	S6	Small boulder			
S3	Gravel	S7	Large boulder			
S4	Small cobble	S8	Bimodal			
S5	Large cobble	S9	Bedrock/till			
Other	zarge copple					
вм	Benchmark	EP	Erosion pin			
BS	Backsight	RB	Rebar			
DS	Downstream	US	Upstream			
WDJ	Woody debris jam	TR	Terrace			
VWC	Valley wall contact	FC	Flood chute			
BOS	Bottom of slope	FP	Flood plain			
TOS	Top of slope	KP				
		IXI'	Knick point			



Version #4	
Last edited:	21/02/2023

Notes:

bed & Dank substrate



		0.1		ber: 2400	<i>)</i> (						
Date:	20	124-05-02	Stream:		Alloa	Dro	Va				
Time:		0:25 AM	Reach:		AD7						
Weather:	SU	mny 18°C	Location:		May Rela	[ COA!	d d	11.			
Field Staff:	-	AHF	Watershed/Su	bwatershed:	ENDE	1/000	FOR II	700			
Process		Ge	omorphological Indica	itor	PYORCO	Present?		F			
FIOCESS	No.	Description				Yes	No	Factor Value			
	1	Lobate bar	The second secon			103	110	value			
	2	Coarse materials in riffles	embedded				1	-			
Evidence of	3	Siltation in pools					1				
Aggradation	4	Medial bars					1	1/7			
(AI)	5	Accretion on point bars	· · · · · · · · · · · · · · · · · · ·				/	- / /			
	6	Poor longitudinal sorting of bed materials				······	1				
	7	Deposition in the overbank zone					1				
				Su	m of indices =	7	6	1014			
	1	Exposed bridge footing(s)				1/	10	1001-1			
	2	Exposed sanitary / storm				, v	110				
	3	Elevated storm sewer out				/V					
	4	Undermined gabion baske		/ etc.		//	16				
Evidence of Degradation	5	Scour pools downstream				01	n	0/_			
(DI)	6	Cut face on bar forms				///	14	15			
	7	Head cutting due to knick	point migration								
	8	Terrace cut through older					V				
	9	Suspended armour layer v	visible in bank				V				
	10	Channel worn into undistu	ırbed overburden / be	edrock			./				
				Sur	n of indices =	0	5	0.0			
	1	Fallen / leaning trees / fer	nce posts / etc.			V					
	2	Occurrence of large organ	ic debris			~		-			
=	3	Exposed tree roots  Basal scour on inside meander bends				1		-			
Fulldamen 6	4						w :/	2/			
Evidence of Widening	5	Basal scour on both sides of channel through riffle					11/	3/0			
(WI)	6	Outflanked gabion baskets / concrete walls / etc.				W,	10	/0			
		Length of basal scour >50% through subject reach				/	1/	1			
_		Exposed length of previously buried pipe / cable / etc.					1/				
		Fracture lines along top of bank					V	1			
	10	Exposed building foundation	on			N	NIA				
				Sun	of indices =	3	5	0.375			
	1	Formation of chute(s)					1				
Evidence of	2	Single thread channel to multiple channel					1	-			
Planimetric	3	Evolution of pool-riffle form to low bed relief form				V	21				
Form	4 (	Cut-off channel(s)						4			
Adjustment (PI)		Formation of island(s)						1/			
		Thalweg alignment out of phase with meander form									
	7 E	Bar forms poorly formed /	reworked / removed			/					
				Sum	of indices =	1	6	0.147			
otes:				Stability Index	(SI) = (AI+	DI+WT+		0112			
		In Regime In Transit				djustment					
				0.00 - 0.20		-,		-Jasenie iit			



Rapid Stream Assessment Technique Project Number: \$2400 9

Date:	Date: 2024-05-02 Stream:			Alla Drain		
Time:	10:25 AM	Reach:	AUER -	207	0.77	
Weather:	Suny, 1800	Location:	Samilian not	May freed 12	Alloa	
Field Staff:	AHF	Watershed/Subwat	ershed:	Etablcole		
Category	Poor	Fair		Good	Excellent	
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> <li>Stream bend areas highly</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> <li>Stream bend areas</li> </ul>	stable • Infreque sloughin failure	of bank network ent signs of bank g, slumping or bend areas stable	> 80% of bank network stable     No evidence of bank sloughing, slumping or failure      Stream bend areas very	
Channel	unstable  Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas)  Bank overhang > 0.8-1.0 m	unstable  Outer bank height 0.9- 1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) Bank overhang 0.8-0.9m	Outer bar m above 1.5 m al for large Bank over	ank height 0.6-0.9 e stream bank (1.2- bove stream bank e mainstem areas) erhang 0.6-0.8 m	stable	
Stability	<ul> <li>Young exposed tree roots abundant</li> <li>&gt; 6 recent large tree falls per stream mile</li> </ul>	Young exposed tree roots common     4-5 recent large tree falls per stream mile	predomin large, sn scarce	nantly old and naller young roots nt large tree falls	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile	
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	Bottom 1/3 of bank is generally highly erodible material     Plant/soil matrix compromised	generally	./3 of bank is highly resistant I matrix or material	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	
	<ul> <li>Channel cross-section is generally trapezoidally- shaped</li> </ul>	Channel cross-section is generally trapezoidally- shaped	Channel generally	cross-section is V- or U-shaped	Channel cross-section is generally V- or U-shaped	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4 × 5	□ 6	□ 7 □ 8	□ 9 □ 10 □ 11	
No	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	• 25-49% e 59% emb mainsten	embedded (35- pedded for large n areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)	
	Few, if any, deep pools     Pool substrate     composition >81% sand-     silt	<ul> <li>Low to moderate number of deep pools</li> <li>Pool substrate composition 60-80% sand-silt</li> </ul>	pools	number of deep trate composition and-silt	High number of deep pools     (> 61 cm deep)     (> 122 cm deep for large mainstem areas)     Pool substrate composition     <30% sand-silt	
Channel Scouring/ Sediment Deposition	Streambed streak marks and/or "banana"-shaped sediment deposits common	<ul> <li>Streambed streak marks and/or "banana"-shaped sediment deposits common</li> </ul>	Streambe and/or "b sediment uncommo	•	Streambed streak marks and/or "banana" shaped sediment deposits absent	
	deposits very common in channel	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small localized areas of fresh sand deposits along top of low banks</li> </ul>	<ul><li>uncommo</li><li>Small loca</li></ul>	ge sand deposits n in channel nlized areas of d deposits along banks	Fresh, large sand deposits rare or absent from channel     No evidence of fresh sediment deposition on overbank	
1 A	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand	well-veget	small and stable, wated and/or with little or no	Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4		5 🗆 6	7 🗆 8	

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Page 1 of 2

ate: 20	24-05-02	PN: AV24009	Location:	autrell rd, Allog	
Category	Poor	Fair	Good	Excellent	
cacegory	Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	Wetted perimeter 40- 60% of bottom channel width (45-65% for large mainstem areas)	Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	<ul> <li>Wetted perimeter &gt; 85% of bottom channel width (&gt; 90% for large mainstem areas)</li> </ul>	
	Dominated by one habitat type (usually runs) and	<ul> <li>Few pools present, riffles and runs dominant.</li> <li>Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)</li> </ul>	<ul> <li>Good mix between riffles, runs and pools</li> <li>Relatively diverse velocity and depth of flow</li> </ul>	<ul> <li>Riffles, runs and pool habitat present</li> <li>Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)</li> </ul>	
Physical Instream			<ul> <li>Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand</li> <li>&gt; 50% cobble</li> </ul>		
Habitat	• Riffle depth < 10 cm for	Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	Riffle depth > 20 cm for large mainstem areas	
jul de	Large pools generally <     30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	Large pools generally 30-46 cm deep (61-91 cm for large mainstem (24) areas) with little or no overhead cover/structure	Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure	
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	No channel alteration or significant point bar formation/enlargement	
	• Riffle/Pool ratio 0.49:1; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1	
NIA	Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	Summer afternoon water temperature < 20°C	
Point range	□ 0 □ 1 □ 2	<b>3</b> □ 4	□ 5 □ 6	□ <b>7</b> □ 8	
Sm	Substrate fouling level:     High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	Substrate fouling level:     Rock underside (0-10%)	
	Brown colour     TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L	
Water Quality	Objects visible to depth O 15m below surface	Objects visible to depth     0.15-0.5m below surface	Objects visible to depth     0.5-1.0m below surface	Objects visible to depth     1.0m below surface	
	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	No odour	
Point range	□ 0 □ 1 ≥ 2	□ 3 □ 4	□ 5 □ 6	□ 7 □ 8	
Riparian	vegetation but with major localized portion of both banks gaps		> 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks	
Habitat Conditions	Canopy coverage:     <50% shading (30% for large mainstem areas)	Canopy coverage: 50- 60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)	
Point range	□ 0 □ 1	□ 2 □ 3	□ 4 □ 5	≥ 6 □ 7	

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**Reach Characteristics Project Number:** Date: 2024-05-02 Field Staff: Watershed/Subwatershed: 10:25 AM Time: Stream: Drawn UTM (Upstream): Weather: 18°C SUMMU. Reach: UTM (Downstream): Land Use Valley Type **Channel Type Channel Zone** Flow Type (Table 1) ☐ Evidence of Groundwater Location: (Table 2) (Table 3) (Table 4) Photo: (Table 5) Riparian Vegetation **Aquatic & Instream Vegetation Water Quality** Coverage Dominant Type Channel Widths Age (yrs) Woody Debris **WD Density** Type Odour (Table 6) Turbidity □ None (Table 8) □ 1 - 4 ☐ Immature (<5) WDJ/50m: (Table 16) ☐ In Cutbank ☐ Low (Table 17) ☐ Fragmented □ 4 - 10 ☐ Established (5-30) In Channel 🔏 Mod Encroachment X > 10 Reach (Table 7) Mature (>30) □ Not Present □ High Coverage % **Channel Characteristics Sinuosity Type** Sinuosity Degree **Bank Angle Bank Erosion** (Table 19) Clay/Silt Sand Gravel Cobble Boulder **Parent** Rootlets (Table 9) (Table 10)  $\Box 0 - 30$ X < 5% X X Bank П Gradient □ 30 - 60 # of Channels □ 5 - 30% Riffle (Table 11) (Table 12) **≥** 60 − 90 □ 30 - 60% Pool **Entrenchment Bank Failure** □ Undercut □ 60 - 100% Bed X (Table 13) (Table 14) (if no riffle-pool morphology) Down's Model Bankfull Indicators Bankfull Width (Table 15) (Table 18) Wetted Width (m) (m) Sed Sorting **Sediment Transport** Bankfull Depth ☐ Yes 🕅 No 🗆 Not Visible (Table 20) Observed? Wetted Depth (m) (m) Transport % of Bed Active Mode (Table 21) Undercuts (m) Velocity (m/s) Geomorphic **Mass Movement Pool Depth Velocity Estimate** /slux Units (Table 22) (Table 23) (m) Method Riffle-Pool % Riffles: Meander Amplitude % Pools: Riffle Length (m) Spacing (m): (m) Photos:

Version #4 Last edited: 04/04/2023 Senior staff sign-off (if required):

\_\_\_ Checked by: \_\_\_\_ Completed by:

Gen	eral Site Cha	racteristics	Pro	ject Numb	er: 2400	59	M O R P H I X~
Date:		2024-55	-02	Stream:		Kraser	Dain
Time		9:55 AM	٨	Reach:		601	O lott !
Weat	her:	Suny 18	cC	Location:		Maudie	A 15 d 4//00
Field	Staff:	A HE		Watershed/S	Subwatershed		of coad, 1910a
Featu		Monitoring		e Sketch	02		Compass
	Undercut bank Bank stabilization Leaning tree	Monumented Monumented Monumented direction Sediment sa Erosion pins Scour chains Additional Symbol	photo photo gally mpling	oss mg	22 - 9 cm XSI 2= 2 losm 0= 2.10m 0= 0.10m 0= 0.40m v= 0.380 m/s Fra Fo	Notes > 1- pics -> 50me sn -> x = s	oveter present in
***	Instream log/tree Woody debris Beaver dam Vegetated island			Bully 1.0m	1 %	t scurpoid of	The drain = 0.2mdla surface during with some backwith
Flow 1	Гуре			Forestec	)	The state of the s	ile drain = 0.2mdie
H1 H2 H3 H4 H5	Standing water H1A Scarcely perceptible of Smooth surface flow Upwelling Rippled Unbroken standing w	ilow	É		scum faird	2 2 2	.43m sour pool
H7 H8	Broken standing wave Chute	9		~~	(2)	0 10	
H9	Free fall H9A	Dissipates below fr	ree fall	3 6	لر	6	AG
Substr		. Sissipaces below it	ec iuii		6	() V8	Meld
\$1 \$2 \$3 \$4 \$5	Silt Sand Gravel Small cobble Large cobble	\$6 Small bould \$7 Large bould \$8 Bimodal \$9 Bedrock/til	der		gully vegbrs		XS3 W= 2.66m W= 1.35 m
Other					()	0 0 8	d: 0.56m
BM BS DS WDJ	Benchmark Backsight Downstream Woody debris jam	RB Rebar US Upstream TR Terrace		Q Q HI	Sumil	Five S	v=0.101My
VWC BOS	Valley wall contact Bottom of slope	FC Flood chute	Photo	This	on A	4	

Version #4 Last edited: 21/02/2023

Top of slope

ΚP

Knick point

Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:

Notes:





Date:	12	024-05-02	Stream:	1	raser	100	i a		
Time:	.0	1:55 04	Reach:		+ DI	Dia	<i>y</i> / \		
Weather:	E,1	Anni i Que			FUI	1 10	Λ.		
	-	00010	Location:	M	lay frel	de	ord		
Field Staff:		WA AP	Watershed/Subwatershed:	F	400100	Le C	reek		
Process		G	eomorphological Indicator			Pres	sent?	Factor	
	No.	Description				Yes	No	Value	
	1	Lobate bar					V		
	2	Coarse materials in riffle	es embedded				<b>/</b>		
Evidence of	3	Siltation in pools				/		7 1/	
Aggradation	4	Medial bars					/	1/7	
(AI)	5	Accretion on point bars					V	7 '	
	6	Poor longitudinal sorting	of bed materials				<b>V</b>		
· · · · · · · · · · · · · · · · · · ·	7	Deposition in the overba	ank zone				/		
				Sum o	of indices =		6	0.14	
	1	Exposed bridge footing(	s)			N/	A		
	2	Exposed sanitary / storn	n sewer / pipeline / etc.	~		M	A		
	3	Elevated storm sewer ou	ıtfall(s)	*****		N	A		
	4	Undermined gabion bask	kets / concrete aprons / etc.			N	A	10/	
Evidence of Degradation	5	Scour pools downstream	of culverts / storm sewer outlets				1	9/1	
(DI)	6	Cut face on bar forms							
	7	Head cutting due to knic	kpoint migration				~		
	8	Terrace cut through olde	er bar material				/	7	
	9	Suspended armour layer	visible in bank					1	
	10	Channel worn into undis	turbed overburden / bedrock				V		
				Sum o	f indices =	0	6	0.0	
	1	Fallen / leaning trees / fe	ence posts / etc.			V			
	2	Occurrence of large organic debris						-	
	3	Exposed tree roots							
	4	Basal scour on inside meander bends					1	/	
Evidence of Widening	5	Basal scour on both side	s of channel through riffle				J	1 4/0	
(WI)	6	Outflanked gabion baske	ets / concrete walls / etc.			W	A	18	
	7	Length of basal scour >50% through subject reach							
	8	Exposed length of previously buried pipe / cable / etc.							
	9	Fracture lines along top of bank					V.		
	10	Exposed building founda	tion			NX	n	1	
				Sum of	findices =	4	4	0.50	
	1	Formation of chute(s)							
Evidence of	2	Single thread channel to	multiple channel				1/		
Planimetric	3	Evolution of pool-riffle fo	rm to low bed relief form						
Form	4	Cut-off channel(s)					1/	1/	
Adjustment (PI)	5	Formation of island(s)					V	11	
(11)	6	Thalweg alignment out of phase with meander form					/		
	7	Bar forms poorly formed						1	
				Sum of	indices =	1	6	0.143	
lotes:			Stability In	dex (S	ST) = (AT+	DTTMTT		B10-	
			In Regim		In Transiti			djustment	
			Ø 0.00 - 0		□ 0.21			0.41	
			1,92 0.00 0		U 0.21	0.70		3 0.41	

Rapid Stream Assessment Technique Project Number: 24609

Date:	2024-05-02	Stream:	Frager ()	ram	
Time:	9:55 AM	Reach:	EDI		
Weather:	Sunny 18°c	Location:	Musical	road Allag	
Field Staff:	RA HE	Watershed/Subwate	ershed: Zabback	Cho t	
Category	Poor	Fair	Good	Excellent	
Live Live of	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> </ul>	<ul> <li>71-80% of bank network stable</li> <li>Infrequent signs of bank sloughing, slumping or failure</li> </ul>	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>	
Channel	<ul> <li>Stream bend areas highly unstable</li> <li>Outer bank height 1.2 m above stream bank</li> <li>(2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang &gt; 0.8-1.0 m</li> </ul>	<ul> <li>Stream bend areas unstable</li> <li>Outer bank height 0.9-1.2 m above stream bank</li> <li>(1.5-2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang 0.8-0.9m</li> </ul>	Stream bend areas stable Outer bank height 0.6-0.9 m above stream bank (1.2- 1.5 m above stream bank for large mainstem areas) Bank overhang 0.6-0.8 m	Stream bend areas very stable Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) Bank overhang < 0.6 m	
Stability	<ul><li>Young exposed tree roots abundant</li><li>&gt; 6 recent large tree falls per stream mile</li></ul>	Young exposed tree roots common     4-5 recent large tree falls per stream mile	Exposed tree roots     predominantly old and     large, smaller young roots     scarce     2-3 recent large tree falls     per stream mile	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile	
	<ul> <li>Bottom 1/3 of bank is highly erodible material</li> <li>Plant/soil matrix severely compromised</li> </ul>	<ul> <li>Bottom 1/3 of bank is generally highly erodible material</li> <li>Plant/soil matrix compromised</li> </ul>	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or materia	
	Channel cross-section is generally trapezoidally- shaped	<ul> <li>Channel cross-section is generally trapezoidally- shaped</li> </ul>	Channel cross-section is generally V- or U-shaped	Channel cross-section is generally V- or U-shaped	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4 □ 5	□ 6 🕱 7 □ 8	□ 9 □ 10 □ 11	
Alles	75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	• 25-49% embedded (35- 59% embedded for large mainstem areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)	
	Few, if any, deep pools     Pool substrate     composition >81% sand-     silt	<ul> <li>Low to moderate number of deep pools</li> <li>Pool substrate composition 60-80% sand-silt</li> </ul>	<ul> <li>Moderate number of deep pools</li> <li>Pool substrate composition 30-59% sand-silt</li> </ul>	High number of deep pools     (> 61 cm deep)     (> 122 cm deep for large mainstem areas)     Pool substrate composition     <30% sand-silt	
Channel Scouring/ Sediment Deposition	Streambed streak marks and/or "banana"-shaped sediment deposits common	<ul> <li>Streambed streak marks and/or "banana"-shaped sediment deposits common</li> </ul>	<ul> <li>Streambed streak marks and/or "banana"-shaped sediment deposits uncommon</li> </ul>	Streambed streak marks and/or "banana"-shaped sediment deposits absent	
100	deposits very common in channel  • Moderate to heavy sand deposition along major portion of overbank area	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small localized areas of fresh sand deposits along top of low banks</li> </ul>	Fresh, large sand deposits uncommon in channel     Small localized areas of fresh sand deposits along top of low banks	<ul> <li>Fresh, large sand deposits rare or absent from channe</li> <li>No evidence of fresh sediment deposition on overbank</li> </ul>	
X E	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand	Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	<ul> <li>Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand</li> </ul>	
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	5 0 6	□ <b>7</b> □ 8	



Location: PN: Date: Excellent Good Fair **Poor** Category Wetted perimeter > 85% of Wetted perimeter 61-85% Wetted perimeter < 40%</li> Wetted perimeter 40bottom channel width (> of bottom channel width 60% of bottom channel of bottom channel width 90% for large mainstem (66-90% for large width (45-65% for large (< 45% for large mainstem areas) areas) mainstem areas) mainstem areas) · Good mix between riffles, · Riffles, runs and pool Dominated by one habitat · Few pools present, riffles runs and pools habitat present type (usually runs) and and runs dominant. Diverse velocity and depth · Relatively diverse velocity Velocity and depth by one velocity and depth of flow present (i.e., slow, generally slow and and depth of flow condition (slow and fast, shallow and deep shallow (for large shallow) (for large water) mainstem areas, runs mainstem areas, few and pools dominant, riffles present, runs and pools dominant, velocity velocity and depth and depth diversity low) diversity intermediate) Riffle substrate Riffle substrate Riffle substrate Riffle substrate composition: cobble, composition: good mix of composition: composition: gravel, rubble, boulder mix gravel, cobble, and rubble predominantly gravel predominantly small material with little sand with high amount of sand cobble, gravel and sand Physical > 50% cobble 5-24% cobble · 25-49% cobble Instream < 5% cobble</p> Habitat • Riffle depth > 20 cm for · Riffle depth 10-15 cm for · Riffle depth 15-20 cm for • Riffle depth < 10 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas Large pools generally 46-61 Large pools generally > 61 Large pools generally 30-· Large pools generally < cm deep (> 122 cm for cm deep (91-122 cm for 46 cm deep (61-91 cm 30 cm deep (< 61 cm for large mainstem areas) with for large mainstem large mainstem areas) with large mainstem areas) good overhead some overhead areas) with little or no and devoid of overhead cover/structure cover/structure overhead cover/structure cover/structure · No channel alteration or Slight amount of channel Moderate amount of Extensive channel significant point bar channel alteration and/or alteration and/or slight alteration and/or point formation/enlargement increase in point bar moderate increase in formation/enlargement point bar formation/enlargement formation/enlargement • Riffle/Pool ratio 0.9-1.1:1 Riffle/Pool ratio 0.7-0.89:1 Riffle/Pool ratio 0.5- Riffle/Pool ratio 0.49:1; ; 1.11-1.3:1 0.69:1:1.31-1.5:1 ≥1.51:1 Summer afternoon water · Summer afternoon water Summer afternoon water · Summer afternoon water NIA temperature < 20°C temperature 20-24°C temperature > 27°C temperature 24-27°C □ 7 □ 8 □ 5 □ 6 □ 3 □ 4 □ 0 1 🗆 2 Point range Substrate fouling level: Substrate fouling level: Substrate fouling level: Substrate fouling level: Rock underside (0-10%) Very light (11-20%) Moderate (21-50%) High (> 50%) · Clear flow Slightly grey colour · Grey colour · Brown colour • TDS: < 50 mg/L • TDS: 50-100 mg/L TDS: 101-150 mg/L TDS: > 150 mg/L Water Quality · Objects visible to depth Objects visible to depth · Objects visible to depth Objects visible to depth > 1.0m below surface 0.5-1.0m below surface 0.15-0.5m below surface < 0.15m below surface · No odour · Slight organic odour Slight to moderate Moderate to strong organic odpur organic odour □ 7 □ 8 □ 5 □ 6 □ 3 **X** 4 □ 0 □ 1 □ 2 Point range Wide (> 60 m) mature · Forested buffer generally Riparian area · Narrow riparian area of forested buffer along both > 31 m wide along major portion of both banks predominantly wooded mostly non-woody banks but with major localized vegetation Riparian gaps Habitat Canopy coverage: Canopy coverage: Canopy coverage: 50-· Canopy coverage: >80% shading (> 60% for Conditions 60-79% shading (45-59% <50% shading (30% for 60% shading (30-44% large mainstem areas) for large mainstem areas) for large mainstem large mainstem areas) areas) □ 6 □ 7 □ 4 □ 5 □ 2 □ 0 □ 1 Point range Total overall score (0-42) = Excellent (>35) Good (25-34) Fair (13-24) Poor (<13)

Version #2

Last edited: 10/02/2023

Senior staff sign-off (if required): \$50

Checked by: \_\_\_\_\_ Completed by:

Reach Characteris		2400-1	.0		MORPHIX
Date:	2024-05-02	Field Staff:	LA HE	Watershed/Subwatershed:	Etabicola Creak
Time:	9:55 AM	Stream:	Frager Dram	UTM (Upstream):	
Weather:	Sunny, 18 ==	Reach:	FOI	UTM (Downstream):	
	Table 2) Channel (Table 3)		annel Zone Flow Type (Table 5)	Levidence of Groundwat	er Location:Photo:
Riparian Vegetation			Aquatic & Instream Vegetal		er Quality
Dominant Type (Table 6)	□ None <b>×</b> 1 - 4	Age (yrs) I Immature (<5)	Type Woody Debris	KLow WDJ/50m:	Odour Turbidity (Table 16) (Table 17)
Encroachment (Table 7)	Continuous X > 10	Established (5-30)	Reach Coverage % In Channel	1 / 1 1	b 2
Channel Characteris	tics				
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)	Bank Angle  □ 0 - 30	Bank Erosion         (Table 19)           □ < 5%         Bank	7	bble Boulder Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)	□ 60 - 90	★5 - 30%       Riffle         □ 30 - 60%       Pool		
Entrenchment (Table 13)	Bank Failure (Table 14)	□ Undercut	□ 60 - 100%  Bed  (if no riffle-pool morphology)	$\times$ $\times$ $\Box$	
Down's Model (Table 15)	Bankfull Indicators (Table 18)		Bankfull Width 268	2.66 Wetted Width (m)	2.16 2.38 1.35
(Table 20)	Sediment Transport Observed?	XNo □ Not Visible	Bankfull Depth (m) 0.40	0.56 Wetted Depth (m)	0.16 0.31 0.36
Transport Mode (Table 21)	% of Bed Active		Undercuts (m)	Velocity (m/s)	0.380 0.130 0.102
Geomorphic Units (Table 22)	Mass Movement (Table 23)	1. hns: 95	Pool Depth (m) 0,43	Velocity Estimate Method	Wille Ball
Riffle-Pool Spacing (m):	% Riffles:		Riffle Length (m)	Meander Amplitude (m)	21.4
Notes: A On Scum We Dullies of Scum We Dar Ded Fear Posible	s observed at son nel rill commonly s were also pre	e woody old observed ( barf with So send.	ebris pie ups miltiple) and bleatified point however not ever	blated and nemy.	hide wooded major o
Photos:					
	tata and the same of the same				

Version #4 Last edited: 04/04/2023

Senior staff sign-off (if required): So Checked by: \_\_\_\_ Completed by: \_\_\_\_

**General Site Characteristics Project Number:** 24009 Date: Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: **Features** Monitoring Site Sketch Reach break Someonted-O 5m ------ Long-profile Station location Monumented XS Wd= 0.20 m Cross-section 0 Monumented photo Flow direction Monumented photo Riffle direction Pool Sediment sampling CHAND Sediment bar Erosion pins HHHHHHH8 Eroded bank/slope Scour chains Undercut bank **Additional Symbols** Bank stabilization Leaning tree X----X Fence aw= 2.24m Culvert/outfall SZ 60 = 0.74mSwamp/wetland Wd = 0.17m WWW Grasses W Tree Instream log/tree \* \* \* Woody debris XSI \*XXXXX Beaver dam WV Vegetated island od= OloSm Flow Type W0=0.11M WW=2:02m H1 Standing water **H1A** Back water **H2** Scarcely perceptible flow amoun **H3** Smooth surface flow **H4** Upwelling **H5** Rippled S Unbroken standing wave **H6** H7 Broken standing wave H<sub>8</sub> Chute **H9** Free fall H9A Dissipates below free fall 53/54 Substrate S1 Silt **S6** Small boulder **S2** Sand **S7** Large boulder **S3** Gravel **S8** Bimodal Small cobble **S4** S9 Bedrock/till **S5** Large cobble Other ВМ Benchmark EP Erosion pin Backsight BS RB Rebar DS Downstream US Upstream tile = 0.45m in dia WDJ Woody debris jam TR Terrace Storts @ a VWC Valley wall contact FC Flood chute He drain BOS Bottom of slope FP Flood plain Photos: TOS Top of slope ΚP Knick point Notes: Colluct

Page \_\_\_\_ of \_\_\_\_



Kapia Geor	norp	hic Assessment	Project Number: 2	4004				M O R P H I )				
Date:	20	24-05-02	Stream:	11	aser	Dro	in					
Time:		9:25 AM	Reach:		200			-				
Weather:	0	unny 18°c	Location:	IN.	100		- d	A11				
Field Staff:	1	DA THE	Watershed/Subwatershed	d.	Lay me	OIC	ady	H1100				
	<del>                                     </del>	G	eomorphological Indicator		NODICE.	) VC	other					
Process	No.		somorphological indicator				sent?	Factor				
	1	Lobate bar				Yes	No	Value				
	2	Coarse materials in riffle	oc ambaddad				V					
Evidence of	3	Siltation in pools	ss embedded				1.	- , ,				
Aggradation	4	Medial bars				~		1/7				
(AI)	5	Accretion on point bars	come how according					///				
	6	Poor longitudinal sorting		)				_				
	7	Deposition in the overba						-				
				Sum of i	ndices =	-	6	0,143				
	1	Exposed bridge footing(s	5)		Tuices	-	7 <i>h</i>	103197				
	2	Exposed sanitary / storn					19	_				
	3	Elevated storm sewer ou		(/)	14	-						
	4	Undermined gabion bask		N	(11)	_						
Evidence of	5		of culverts / storm sewer outlets			7		-				
Degradation (DI)	6	Cut face on bar forms	e de la companya de l			14	7	1 0/5				
, ,	7	Head cutting due to knic	kpoint migration					13				
	8	Terrace cut through olde										
	9	Suspended armour layer	visible in bank				. /					
	10	Channel worn into undist	turbed overburden / bedrock					-				
				Sum of i	ndices =	0	5	0.0				
	1	Fallen / leaning trees / fe	ence posts / etc. (Some Har	(aria)		V						
	2	Occurrence of large orga	nic debris	(1.2)		/		-				
	3	Exposed tree roots					1/	1				
Evidence of	4	Basal scour on inside me					~	21				
Widening	5	Basal scour on both sides of channel through riffle					1	2/8				
(IW)	6	Outflanked gabion basket				N	1	/0				
	7		0% through subject reach				1/					
	8	Exposed length of previously buried pipe / cable / etc.										
	9	Fracture lines along top o					/					
	10	Exposed building foundat	ion			N	A					
				Sum of in	dices =	3	5	0.375				
	1	Formation of chute(s)										
Evidence of	2	Single thread channel to					1					
Planimetric Form	3	Evolution of pool-riffle for	m to low bed relief form				/	12				
Adjustment	4	Cut-off channel(s)					/	17				
(PI)	5	Formation of island(s)					1	/ /				
-			phase with meander form				~					
	/	Bar forms poorly formed ,	reworked / removed					7				
otes:				Sum of in	dices =		6	0.143				
otes.			Stability 1	Index (SI)	= (AI+D)	I+WI+I	PI)/4 =	0.165				
			In Regi		Transitio	n/Stres	s In Ad	ljustment				
			₩ 0.00 -	0.20	□ 0.21 -			0.41				

Rapid Stream Assessment Technique

Date:

Time:

Weather:

Field Staff:

Category

Channel

Stability

Poor

< 50% of bank network</li>

Recent bank sloughing,

slumping or failure

above stream bank

(2.1 m above stream

frequently observed

Stream bend areas highly

Outer bank height 1.2 m

bank for large mainstem

Bank overhang > 0.8-1.0

· Young exposed tree roots

> 6 recent large tree falls

stable

unstable

areas)

abundant

Project Number: 24009 Stream: Reach: Maydreld road, Allsa Location: Watershed/Subwatershed: Fair Good Excellent • 50-70% of bank network 71-80% of bank network > 80% of bank network stable stable stable Recent signs of bank · Infrequent signs of bank No evidence of bank sloughing, slumping or sloughing, slumping or sloughing, slumping or failure fairly common failure failure Stream bend areas Stream bend areas stable · Stream bend areas very Outer bank height 0.6-0.9 unstable stable · Outer bank height 0.9m above stream bank (1.2-1.5 m above stream bank Height < 0.6 m above 1.2 m above stream stream (< 1.2 m above bank for large mainstem areas) stream bank for large (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) bank for large mainstem Bank overhang < 0.6 m</li> areas) Bank overhang 0.8-0.9m · Young exposed tree roots · Exposed tree roots · Exposed tree roots old, common predominantly old and large and woody 4-5 recent large tree falls large, smaller young roots · Generally 0-1 recent large scarce tree falls per stream mile 2-3 recent large tree falls per stream mile · Bottom 1/3 of bank is · Bottom 1/3 of bank is generally highly resistant generally highly resistant plant/soil matrix or material plant/soil matrix or material Channel cross-section is · Channel cross-section is generally V- or U-shaped generally V- or U-shaped □ 5 6 🗆 7 🗆 8 □ 9 □ 10 □ 11 · 25-49% embedded (35-· Riffle embeddedness < 59% embedded for large 25% sand-silt (< 35% mainstem areas) embedded for large mainstem areas) Moderate number of deep · High number of deep pools pools (> 61 cm deep) Pool substrate composition (> 122 cm deep for large 30-59% sand-silt mainstem areas) Pool substrate composition <30% sand-silt · Streambed streak marks Streambed streak marks and/or "banana"-shaped and/or "banana"-shaped sediment deposits sediment deposits absent uncommon Fresh, large sand deposits · Fresh, large sand deposits uncommon in channel rare or absent from channel Small localized areas of No evidence of fresh fresh sand deposits along sediment deposition on top of low banks overbank

per stream mile per stream mile Bottom 1/3 of bank is Bottom 1/3 of bank is highly erodible material generally highly erodible Plant/soil matrix severely material compromised Plant/soil matrix compromised Channel cross-section is Channel cross-section is generally trapezoidallygenerally trapezoidallyshaped shaped Point range 0 0 1 0 2 □ 3 □ 4 > 75% embedded (> 50-75% embedded (60-85% embedded for large 85% embedded for large mainstem areas) mainstem areas) · Few, if any, deep pools Low to moderate number Pool substrate of deep pools composition >81% sand-Pool substrate composition 60-80% sand-silt Streambed streak marks Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped Scouring/ sediment deposits sediment deposits Sediment common common Deposition Fresh, large sand · Fresh, large sand deposits very common in deposits common in channel channel Moderate to heavy sand · Small localized areas of deposition along major fresh sand deposits along portion of overbank area top of low banks · Point bars common, Point bars present at · Point bars small and stable, · Point bars few, small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated unstable with high amount of fresh sand moderate to large and and/or armoured with little armoured with little or no unstable with high fresh sand or no fresh sand amount of fresh sand Point range □ 0 0 1 □ 2 □ 3 □ 5 □ 6 □ 7 □ 8 Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_\_\_ Version #2 Last edited: 10/02/2023



ate: 20	24-05-02	PN: 24009	Location: /	ryticle road, Hillsa
Category	Poor	Fair	Good	Excellent
	Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	Wetted perimeter 40- 60% of bottom channel width (45-65% for large mainstem areas)	Wetted perimeter 61-85%     of bottom channel width     (66-90% for large     mainstem areas)	<ul> <li>Wetted perimeter &gt; 85% of bottom channel width (&gt; 90% for large mainstem areas)</li> </ul>
	Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	<ul> <li>Few pools present, riffles and runs dominant.</li> <li>Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)</li> </ul>	Good mix between riffles, runs and pools     Relatively diverse velocity and depth of flow	<ul> <li>Riffles, runs and pool habitat present</li> <li>Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)</li> </ul>
Physical Instream	Riffle substrate composition: predominantly gravel with high amount of sand     < 5% cobble	Riffle substrate composition: predominantly small cobble, gravel and sand     5-24% cobble	Riffle substrate composition: good mix of gravel, cobble, and rubble material     25-49% cobble	<ul> <li>Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand</li> <li>&gt; 50% cobble</li> </ul>
Habitat	Riffle depth < 10 cm for large mainstem areas	Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	Riffle depth > 20 cm for large mainstem areas
	Large pools generally <     30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure     Large pools generally 30-     46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure     very structure     Large pools generally 46-6-     cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure		Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure	
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in      Moderate amount of channel alteration and/or slight increase in point bar		No channel alteration or significant point bar formation/enlargement
11 10 201	• Riffle/Pool ratio 0.49:1; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
NA	• Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	□ 0 □ 1 □ 2	<b>★3</b> □ 4	□ 5 □ 6	□ 7 □ 8
	• Substrate fouling level: High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	Substrate fouling level:     Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
Water Quality	Objects visible to depth     < 0.15m below surface	Objects visible to depth     0.15-0.5m below surface	/	Objects visible to depth     1.0m below surface
_	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	• No odour
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	<b>△</b> 5 □ 6	□ 7 □ 8
Narrow riparian area of mostly non-woody vegetation  Riparian		Riparian area predominantly wooded but with major localized gaps	Forested buffer generally     31 m wide along major     portion of both banks	Wide (> 60 m) mature forested buffer along both banks
Habitat Conditions	• Canopy coverage: <50% shading (30% for large mainstem areas)	Canopy coverage: 50- 60% shading (30-44% for large mainstem areas)	Canopy coverage:     60-79% shading (45-59% for large mainstem areas)	Canopy coverage:     >80% shading (> 60% for large mainstem areas)
Point range	□ 0 □ 1	<b>≥</b> 2 □ 3	□ 4 □ 5	□ 6 □ 7

Version #2

Last edited: 10/02/2023

Senior staff sign-off (if required): Senior staff sign-off (if required): Checked by: \_\_\_\_\_ Completed by: \_\_\_\_\_

Reach Characte	eristics Project Nu	mbau 24009					GEC
Date:	2024-05-06	mber:	A NY				MORPHI
Time:	9:25 AM	Stream:	KAT MY	0 .	Watershed/Subwater	shed: Exporce	ole Crak
Weather:	Sunny 199	Reach:	Flaser	Ham	UTM (Upstream):		
Land Use	7 19 10		HUZ		UTM (Downstream):		
(Table 1) 3			Table 4)	Flow Type (Table 5)	/ □ Evidence of Gro	undwater Location:	Photo:
Riparian Vegetat	ion		Aquatic & Ins	tream Vegetation	on	Water Quality	
Dominant Type (Table 6)	Coverage Channel Wi	5 - () )	Type (Table 8)	/ Woody Debris	WD Density	Odour (Table 16)	<b>Turbidíty</b> (Table 17)
Encroachment (Table 7)	☐ 4 - 10 ☐ Continuous ☐ 7 > 10		Reach Coverage %	In Channel  Not Present	□ Mod	1	(Table 17)
Channel Characte	eristics		Possible	grassestrip	arian)		
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)	Bank Angle	Bank Erosion	(Table 19) Bank	Clay/Silt Sand Grav	rel Cobble Boulde	r Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)	□ 30 - 60 ★60 - 90	□ 5 - 30% □ 30 - 60%	Riffle Pool			
Entrenchment (Table 13)	Bank Failure (Table 14)	1 - few □ Undercut	□ 60 - 100%	<b>Bed</b> (if no riffle-pool morphology)			
Down's Model (Table 15)	Bankfull Indicators (Table 18)	5/3/4	Bankfull Width (m)	.53 3.79	295 Wetted Wid	dth (m) 2.02	2.24 2.45
Sed Sorting (Table 20)	Sediment Transport Observed?	☐ Yes X No ☐ Not Visible	Bankfull Depth (m)	65 0.74	O, &\ Wetted Der	oth (m) ().//	0.17 0.26
Transport Mode (Table 21)	% of Bed Active	MA	Undercuts (m)	N/19	Velocity	/ (m/s)	0.131
Geomorphic Units (Table 22)	Mass Movement (Table 23)	1/A 1/m: 75	Pool Depth (m)		Velocity E	stimate Method	ball
Riffle-Pool Spacing (m):	% Riffles:	20 % Pools: 5	Riffle Length (m)		Meander Am	plitude (m)	MA
Notes: >S: //y / > lack d > bonks	sondy bed sur Pools since is stable with a	twas on de	te vian	les. Killi Sour pool	identified)	ed graves	and cothes.
		of the second	5. Od some	mnme,	encoschion	at gruses	in Changel.
Photos:							
-notos;							

Version #4

Last edited: 04/04/2023

Senior staff sign-off (if required): So Checked by: Completed by:

Gen	eral Site Cha	racteristics	Project Number: 2400	
Date:		2024-05-00	Stream:	Lyans Drain
Time:		2:45 pm	Reach:	LDI
Weath	ner:	C /1900	Location:	Manfreld od Allas
Field Staff:		Synny	Watershed/Subwatershed:	Expresse Crek
		Monitoring	Site Sketch	Compass
Featur	Reach break	-oo Long-profile	Site Sketen	
只	Station location	Monumented XS		
××	Cross-section	Monumented photo		
	Flow direction	Monumented photo		
~~ <b>&gt;</b>	Riffle	▼ direction		
	Pool	Sediment sampling		
	Sediment bar	Erosion pins		
#########	Eroded bank/slope	Scour chains		>Generally, SI-S3
	Undercut bank	Additional Symbols		throughout reach
XXXXXX	Bank stabilization			-> 34 ESS at colvert
	Leaning tree			-> WC = cuttercress
xx	Fence			-> Some veg & gravel
	Culvert/outfall			
	Swamp/wetland			-) minimal erosion
WWW	Grasses			
	Tree			
	Instream log/tree			
***	Woody debris			·K1
**************************************	Beaver dam		8	Noch XOI
W	Vegetated island		16 0	JUM-70M BW: 4-10h
Flow 7	Гуре			40.21m WW. 2.050
H1	Standing water H:	LA Back water	384	WO:0.20.
H2	Scarcely perceptible	e flow		7 adi 0.80
НЗ	Smooth surface flow	٧		1.+ch 16 V:0.1818
Н4	Upwelling		3/0	13 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
H5	Rippled		S C K	Osoo field
Н6	Unbroken standing			1/50
H7	Broken standing wa	ve	John John John John John John John John	1 X Soh A X X 70
Н8	Chute	A Birdunton balancian form	1 24	
H9		DA Dissipates below free fa	A TOSC	
Subst		<b>S6</b> Small boulder	The state of the s	65 63
S1 S2	Silt Sand	S7 Large boulder		3 7hm T serci
S3	Gravel	\$8 Bimodal	54 £ 000	2.24 m Jall 02003
S4	Small cobble	S9 Bedrock/till	SS	10.2m
S5	Large cobble	Dour octy till	thanh lon	1:0.74m (a)
Other			Clare V	: 0.388m
BM	Benchmark	<b>EP</b> Erosion pin		1 residential
BS	Backsight	RB Rebar		Parade
DS	Downstream	<b>US</b> Upstream		S
WDJ	Woody debris jam	TR Terrace		
VWC	Valley wall contact	FC Flood chute		
BOS	Bottom of slope	FP Flood plain	Photos:	
TOS	Top of slope	KP Knick point	Notes:	
	. op o. olope	inner ponte		

Version #4 Last edited: 21/02/2023

Senior staff sign-off (if required):  $\underline{550}$ 

\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_\_\_





24009 Project Number: Rapid Geomorphic Assessment yans Stream: Date: Reach: Time: Location: Weather: Field Staff: Watershed/Subwatershed: Geomorphological Indicator Present? Factor Process Value Yes No Description No. Lobate bar 1 Coarse materials in riffles embedded 2 3 Siltation in pools Evidence of Aggradation 4 Medial bars (AI) 5 Accretion on point bars - Minimally Dars Oresent Poor longitudinal sorting of bed materials 6 Deposition in the overbank zone Sum of indices = Exposed bridge footing(s) 1 Exposed sanitary / storm sewer / pipeline / etc. 2 3 Elevated storm sewer outfall(s) Undermined gabion baskets / concrete aprons / etc. Evidence of Scour pools downstream of culverts / storm sewer outlets Degradation 6 Cut face on bar forms (DI) 7 Head cutting due to knickpoint migration Terrace cut through older bar material 8 9 Suspended armour layer visible in bank Channel worn into undisturbed overburden / bedrock 10 0,0 Sum of indices = Fallen / leaning trees / fence posts / etc. 1 2 Occurrence of large organic debris 3 Exposed tree roots Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle Widening NY 6 Outflanked gabion baskets / concrete walls / etc. (WI) 7 Length of basal scour >50% through subject reach Exposed length of previously buried pipe / cable / etc. 8 Fracture lines along top of bank 9 Exposed building foundation 10 Sum of indices = Formation of chute(s) 1 Single thread channel to multiple channel 2 Evidence of Evolution of pool-riffle form to low bed relief form 3 Planimetric Form 4 Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) Thalweg alignment out of phase with meander form 6 Bar forms poorly formed / reworked / removed Sum of indices = Stability Index (SI) = (AI+DI+WI+PI)/4 = Notes: In Regime In Transition/Stress In Adjustment 0.00 - 0.20 □ 0.21 - 0.40 □ 0.41 Senior staff sign-off (if required): SO Checked by: \_\_\_\_\_ Completed by: Version #3 Last edited: 10/02/2023



Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	Stream:		Lyans Oram			
Time:	2:45 pm	Reach:	182	DI			
Weather:	Sunny, 180-	Location:		Manfreld	road, Alloa		
Field Staff:	RAHF	Watershed/Subwater	shed:	Eddicake (	rak		
Category	Poor	Fair		Good	Excellent		
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> </ul>	stable • Infreque	o of bank network ent signs of bank ng, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>		
Channel	Stream bend areas highly unstable Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) Bank overhang > 0.8-1.0 m	<ul> <li>Stream bend areas unstable</li> <li>Outer bank height 0.9-1.2 m above stream bank</li> <li>(1.5-2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang 0.8-0.9m</li> </ul>	<ul> <li>Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas)</li> <li>Bank overhang 0.6-0.8 m</li> <li>stable</li> <li>Height &lt; 0.6 m stream (&lt; 1.2 m stream bank for mainstem areas)</li> </ul>		Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas)     Bank overhang < 0.6 m		
Stability	Young exposed tree roots abundant     > 6 recent large tree falls per stream mile	Young exposed tree roots common     4-5 recent large tree falls per stream mile	predom large, si scarce • 2-3 rece	d tree foots inantly old and maller young roots ent large tree falls eam mile	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile		
111 12 11 11 11 11 11 11 11 11 11 11 11	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	Bottom 1/3 of bank is generally highly erodible material     Plant/soil matrix compromised	general	1/3 of bank is ly highly resistant oil matrix or material	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material		
	Channel cross-section is generally trapezoidally- shaped	<ul> <li>Channel cross-section is generally trapezoidally- shaped</li> </ul>		l cross-section is ly V- or U-shaped	Channel cross-section is generally V- or U-shaped		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4 □ 5	□ 6	7 0 8	□ 9 □ 10 □ 11		
one	> 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	59% en	embedded (35- mbedded for large em areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)		
pool	Few, if any, deep pools     Pool substrate     composition >81% sand- silt	Low to moderate number of deep pools     Pool substrate composition 60-80% sand-silt	Moderate number of deep pools     Pool substrate composition 30-59% sand-silt		High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) Pool substrate composition <30% sand-silt		
Channel Scouring/ Sediment Deposition	Streambed streak marks and/or "banana"-shaped sediment deposits common	Streambed streak marks and/or "banana"-shaped sediment deposits common	and/or ' sedimer	Streambed streak marks and/or "banana"-shaped sediment deposits uncommon      Streambed streak and/or "banana"-s sediment deposits			
Deposition	<ul> <li>Fresh, large sand deposits very common in channel</li> <li>Moderate to heavy sand deposition along major portion of overbank area</li> </ul>	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small local zed areas of fresh sand deposits along top of low banks</li> </ul>	uncomr • Small lo fresh sa	arge sand deposits non in channel ocalized areas of and deposits along ow banks	<ul> <li>Fresh, large sand deposits rare or absent from channel</li> <li>No evidence of fresh sediment deposition on overbank</li> </ul>		
	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand	well-ve	ars small and stable, getated and/or ed with little or no and	Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand		
Point range		□ 3 □ 4	Ĭ Ž	5 🗆 6	□ <b>7</b> □ 8		

Version #2 Last edited: 10/02/2023 Senior staff sign-off (if required): SSO Checked by: \_\_\_\_\_ Completed by: \_\_\_\_\_



024-0 Date: PN: Location: Category Poor Fair Good **Excellent**  Wetted perimeter < 40%</li> · Wetted perimeter 40-· Wetted perimeter 61-85% Wetted perimeter > 85% of of bottom channel width 60% of bottom channel of bottom channel width bottom channel width (> (< 45% for large width (45-65% for large (66-90% for large 90% for large mainstem mainstem areas) mainstem areas) mainstem areas) areas) Dominated by one habitat · Few pools present, riffles Good mix between riffles, · Riffles, runs and pool type (usually runs) and and runs dominant. runs and pools habitat present by one velocity and depth Velocity and depth Relatively diverse velocity Diverse velocity and depth of flow present (i.e., slow, condition (slow and generally slow and and depth of flow shallow) (for large shallow (for large fast, shallow and deep mainstem areas, few mainstem areas, runs water) riffles present, runs and and pools dominant, pools dominant, velocity velocity and depth and depth diversity low) diversity intermediate) · Riffle substrate Riffle substrate Riffle substrate Riffle substrate CAFIC composition: composition: composition: good mix of composition; cobble, predominantly small predominantly gravel gravel, cobble, and rubble gravel, rubble, boulder mix with high amount of sand Physical cobble, gravel and sand material with little sand Instream < 5% cobble • 5-24% cobble 25-49% cobble > 50% cobble Habitat Riffle depth < 10 cm for</li> • Riffle depth > 20 cm for · Riffle depth 10-15 cm for · Riffle depth 15-20 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas Large pools generally < Large pools generally 30-· Large pools generally 46-61 Large pools generally > 61 30 cm deep (< 61 cm for 46 cm deep (61-91 cm cm deep (91-122 cm for cm deep (> 122 cm for large mainstem areas) large mainstem areas) with for large mainstem large mainstem areas) with and devoid of overhead areas) with little or no some overhead good overhead overhead cover/structure cover/structure cover/structure cover/structure No channel alteration or Extensive channel · Moderate amount of Slight amount of channel alteration and/or point channel alteration and/or alteration and/or slight significant point bar moderate increase in increase in point bar formation/enlargement formation/enlargement point bar formation/enlargement formation/enlargement Riffle/Pool ratio 0.49:1; Riffle/Pool ratio 0.5- Riffle/Pool ratio 0.7-0.89:1 · Riffle/Pool ratio 0.9-1.1:1 ≥1.51:1 0.69:1; 1.31-1.5:1 ; 1.11-1.3:1 Summer afternoon water Summer afternoon water Summer afternoon water · Summer afternoon water temperature > 27°C temperature 24-27°C temperature 20-24°C temperature < 20°C **2** 5 □ 6 0 0 1 2 □ 3 □ 4 □ 7 □ 8 Point range Substrate fouling level: Substrate fouling level: Substrate fouling level: · Substrate fouling level: High (> 50%) Moderate (21-50%) Very light (11-20%) Rock underside (0-10%) · Slightly grey colour · Brown colour · Grey colour · Clear flow • TDS: 50-10 mg/L TDS: > 150 mg/L TDS: 101-150 mg/L TDS: < 50 mg/L</li> Water Quality · Objects visible to depth Objects visible to depth · Objects visible to depth Objects visible to depth < 0.15m below surface 0.15-0.5m below surface 0.5-1.0m below surface > 1.0m below surface · Moderate to strong · Slight to moderate Slight organic odour No odour organic odour organic odour Point range □ 0 □ 1 □ 2 □ 3 □ 4 5 🛮 6 □ 7 □ 8 Forested buffer generally • Wide (> 60 m) mature · Narrow riparian area of Riparian area mostly non-woody predominantly wooded > 31 m wide along major forested buffer along both but with major localized portion of both banks vegetation banks Riparian Habitat · Canopy coverage: Canopy coverage: 50- Canopy coverage: Canopy coverage: Conditions >80% shading (> 60% for <50% shading (30% for 60% shading (30-44% 60-79% shading (45-59% large mainstem areas) for large mainstem for large mainstem areas) large mainstem areas) □ 0 □ 1 □ 4 □ 5 □ 6 □ 7 Point range

Total overall score (0-42) = 25Good (25-34) Poor (<13) Fair (13-24) Excellent (>35)

Version #2 Last edited: 10/02/2023 Senior staff sign-off (if required): \$50

Checked by: \_\_\_\_\_ Completed by:

**Reach Characteristics Project Number:** -05-02 Date: Watershed/Subwatershed: Field Staff: Dram Time: Stream: **UTM (Upstream):** UTM (Downstream): Weather: Reach: Land Use Valley Type **Channel Type Channel Zone** Flow Type X Evidence of Groundwater Location: Frech Photo: (Table 1) (Table 2) (Table 3) (Table 4) (Table 5) **Aquatic & Instream Vegetation** Riparian Vegetation **Water Quality** Coverage **Channel Widths** Age (yrs) **Woody Debris WD Density** Turbidity **Dominant Type** Odour Type (Table 6) (Table 8) WDJ/50m: (Table 16) (Table 17) X Low □ None X 1 - 4 ☐ Immature (<5) ☐ In Cutbank X Fragmented X In Channel □ 4 - 10 □ Mod ☐ Established (5-30) **Encroachment** Reach ☐ Continuous Mature (>30) □ Not Present □ High □ > 10 (Table 7) Coverage % **Channel Characteristics Bank Angle Bank Erosion** (Table 19) Clay/Silt Sand Gravel Cobble Boulder **Parent** Rootlets Sinuosity Type **Sinuosity Degree** X (Table 9) (Table 10) □ 0 - 30 **X** < 5% Bank M **X** 30 - 60 (AHHKA) Riffle X □ 5 - 30% Gradient # of Channels (Table 11) X (Table 12) X □ 60 - 90 □ 30 - 60% X Pool □ Undercut □ 60 - 100% Bed **Entrenchment Bank Failure** (if no riffle-pool (Table 13) 0 (Table 14) morphology) **Bankfull Width** Down's Model Bankfull Indicators Wetted Width (m) (Table 15) (Table 18) (m) **Sed Sorting Sediment Transport Bankfull Depth** ☐ Yes X No ☐ Not Visible Wetted Depth (m) (Table 20) Observed? (m) Transport % of Bed Active Undercuts (m) Velocity (m/s) Mode (Table 21) Geomorphic **Mass Movement Pool Depth Velocity Estimate** Units (Table 22) (Table 23) Method (m) Riffle-Pool Meander Amplitude % Riffles: Riffle Length (m) % Pools: Spacing (m): Notes: Photos:

Version #4

Last edited: 04/04/2023

Senior staff sign-off (if required):

\_\_ Checked by: \_\_

\_ Completed by:

Project Number: **General Site Characteristics** Stream: -05-07 Date: Reach: Time: 1000 Location: Weather: Watershed/Subwatershed: Field Staff: Compass Site Sketch **Monitoring Features** -o-o-o- Long-profile Reach break 只 Monumented XS Station location Monumented photo 0 Cross-section Flow direction Monumented photo direction Riffle Sediment sampling Pool Erosion pins CONTROL OF THE PARTY OF THE PAR Sediment bar Scour chains HHHHHHHEroded bank/slope **Additional Symbols** Undercut bank XXXXXX Bank stabilization \*\*\* Leaning tree x---x---x Fence Culvert/outfall Swamp/wetland Grasses WWW **3** Tree Instream log/tree 10=0.73m \* \* \* Woody debris ba=0.95~ -XXXXX Beaver dam > Some SI wostnerm WV Vegetated island Flow Type Standing water **H1A** Back water H1 - (scresally Clean Scarcely perceptible flow **H2** 70 0.50 m ders Smooth surface flow Н3 Upwelling **H4** ALO. 66m **H5** Rippled è 1:441 **H6** Unbroken standing wave Broken standing wave W=0.78m H7 Н8 Chute **H9A** Dissipates below free fall Free fall **H9** ucto.3am **Substrate** Small boulder 56 S1 Silt Large boulder **S7** Sand **S2** Bimodal **S8 S3** Gravel Bedrock/till **S9 S4** Small cobble Large cobble **S5** Other Benchmark EP Erosion pin вм Rebar RB BS Backsight US Upstream DS Downstream WDJ Woody debris jam TR Terrace Flood chute FC **VWC** Valley wall contact Photos: Flood plain FD BOS Bottom of slope Notes: KP Knick point Top of slope TOS laken across Senior staff sign-off (if required): 550 \_\_ Checked by: \_\_\_\_\_ Completed by:

Version #4

Last edited: 21/02/2023

Page \_\_\_\_\_ of



24000 **Project Number:** Rapid Geomorphic Assessment ran -05-02 Stream: Date: Reach: Time: 41106 road Location: Weather: Watershed/Subwatershed: Field Staff: Present? Factor Geomorphological Indicator Value Yes No Process Description No. Lobate bar 1 Coarse materials in riffles embedded 2 - only in sour pool Siltation in pools 3 Evidence of Aggradation 4 Medial bars (AI) Accretion on point bars 5 Poor longitudinal sorting of bed materials 6 Deposition in the overbank zone 7 B. 143 Sum of indices = Exposed bridge footing(s) 1 Exposed sanitary / storm sewer / pipeline / etc. 2 Elevated storm sewer outfall(s) 3 Undermined gabion baskets / concrete aprons / etc. Scour pools downstream of culverts / storm sewer outlets Evidence of Degradation Cut face on bar forms (DI) Head cutting due to knickpoint migration Terrace cut through older bar material 8 Suspended armour layer visible in bank 9 Channel worn into undisturbed overburden / bedrock 10 0-161 Sum of indices = Fallen / leaning trees / fence posts / etc. 1 Occurrence of large organic debris 2 3 Exposed tree roots Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle 5 Widening MI Outflanked gabion baskets / concrete walls / etc. 6 (WI) Length of basal scour >50% through subject reach 7 Exposed length of previously buried pipe / cable / etc. 8 9 Fracture lines along top of bank Exposed building foundation 10 Sum of indices = Formation of chute(s) 1 Single thread channel to multiple channel 2 Evidence of Evolution of pool-riffle form to low bed relief form 3 Planimetric Cut-off channel(s) 4 Form Adjustment 5 Formation of island(s) (PI) Thalweg alignment out of phase with meander form 6 Bar forms poorly formed / reworked / removed 7 Sum of indices = Stability Index (SI) = (AI+DI+WI+PI)/4 = Notes: In Adjustment In Transition/Stress In Regime 0.00 - 0.20 □ 0.21 - 0.40 □ 0.41

Version #3 Last edited: 10/02/2023 Senior staff sign-off (if required): 550 Checked by: \_\_\_\_ Completed by: \_\_\_\_



Rapid Stream Assessment Technique Project Number: 24009

ate:	2024-05-0	) 4	Stream:		Lyans W	V( * *)
ime:	2:50 pm	ll val	Reach:	63	402	1
/eather:	suny 18ec		Location:	Location: Mayfield 10		
ield Staff:	RA HT		Watershed/Subwaters	shed:	Etabreale	Creek
Category	Poor		Fair	TR 12-18	Good	Excellent
< 50% of bank ne stable     Recent bank sloug slumping or failure frequently observed.		hing,	stable	stable Infreque	of bank network ent signs of bank ag, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>
	Stream bend areas highly       unstable		Stream bend areas unstable Outer bank height 0.9- 1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) Bank overhang 0.8-0.9m	Stream bend areas stable     Outer bank height 0.6-0.9     m above stream bank (1.2-     1.5 m above stream bank     for large mainstem areas)     Bank overbang 0.6-0.8 m		Stream bend areas very stable Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) Bank overhang < 0.6 m
Channel Stability	Young exposed trabundant     > 6 recent large to per stream mile	ee roots •	Young exposed tree roots common 4-5 recent large tree falls per stream mile	Exposed tree roots predominantly old and large, smaller young roots scarce     2-3 recent large tree falls per stream mile		Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised		Bottom 1/3 of bank is generally highly erodible material Plant/soil matrix compromised	Bottom	1/3 of bank is lly highly resistant oil matrix or material	
	Channel cross-section is generally trapezoidally- shaped		Channel cross-section is generally trapezoidally-shaped		el cross-section is Ily V- or U-shaped	Channel cross-section is generally V- or U-shaped
Point range		□ 2	□ 3 □ 4 □ 5		5 7 0 8	□ 9 □ 10 □ 11
	• > 75% embedde 85% embedded f mainstem areas)	d (> for large	50-75% embedded (60- 85% embedded for large mainstem areas)	59% er	6 embedded (35- mbedded for large em areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
			Low to moderate number of deep pools Pool substrate composition 60-80% sand-silt	<ul><li>pools</li><li>Pool su</li></ul>	ate number of deep ubstrate composition % sand-silt	<ul> <li>High number of deep pool (&gt; 61 cm deep)</li> <li>(&gt; 122 cm deep for large mainstem areas)</li> <li>Pool substrate composition &lt;30% sand-silt</li> </ul>
Channel Scouring/ Sediment	Streambed strea and/or "banana" sediment deposit common	-shaped	Streambed streak marks and/or "banana"-shaped sediment deposits common	and/or	nbed streak marks "banana"-shaped ent deposits mon	Streambed streak marks and/or "banana"-shaped sediment deposits absent
Deposition	Fresh, large sand deposits very conchannel     Moderate to hear deposition along portion of overball.	mmon in vy sand major	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small localized areas of fresh sand deposits along top of low banks</li> </ul>	<ul> <li>Fresh, large sand deposits uncommon in channel</li> <li>Small localized areas of fresh sand deposits along</li> <li>Fresh, large s rare or absent</li> <li>No evidence of sediment deposits along</li> </ul>		
	Point bars prese most stream ber moderate to larg unstable with hig amount of fresh	nt at nds, je and jh	Point bars common, moderate to large and unstable with high amount of fresh sand	well-ve armou	int bars small and stable, stable, well-vegeta and/or stable, well-vegeta and/or armoured with little or no ssh sand	
Point range	□ 0 □ 1	□ 2	□ 3 □ 4		5 0 6	□ 7 □ 8

Version #2 Last edited: 10/02/2023

Date: Zo	124-05-02	PN: 24009	Location:	Martireld and All	
Category	Poor	Fair	Good	Excellent	
	<ul> <li>Wetted perimeter &lt; 40% of bottom channel width (&lt; 45% for large mainstem areas)</li> </ul>	60% of bottom channel width (45-65% for large mainstem areas)	Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)	
	Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	and runs dominant	Good mix between riffles, runs and pools     Relatively diverse velocity and depth of flow	<ul> <li>Riffles, runs and pool habitat present</li> <li>Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)</li> </ul>	
Physical Instream Habitat	<ul> <li>Riffle substrate composition: predominantly gravel with high amount of sand</li> <li>&lt; 5% cobble</li> </ul>	<ul> <li>Riffle substrate composition: predominantly small cobble, gravel and sand</li> <li>5-24% cobble</li> </ul>	<ul> <li>Riffle substrate composition: good mix of gravel, cobble, and rubble material</li> <li>25-49% cobble</li> </ul>	Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand     > 50% cobble	
Habitat	Riffle depth < 10 cm for large mainstem areas	Riffle depth 10-15 cm for large mainstem areas	Riffle depth 15-20 cm for large mainstem areas	Riffle depth > 20 cm for large mainstem areas	
	Large pools generally < 30 cm deep (< 61 cm for large mainstem areas)     and devoid of overhead cover/structure	Large pools generally 30- 46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure	
	Extensive channel alteration and/or point bar formation/enlargement	Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	No channel alteration or significant point bar formation/enlargement	
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5- 0.69:1; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1	
	Summer afternoon water temperature > 27°C	Summer afternoon water temperature 24-27°C	Summer afternoon water temperature 20-24°C	Summer afternoon water temperature < 20°C	
Point range	□ 0 □ 1 □ 2	<b>3</b> 4	□ 5 □ 6	□ 7 □ 8	
	Substrate fouling level:     High (> 50%)	Substrate fouling level:     Moderate (21-50%)	Substrate fouling level:     Very light (11-20%)	Substrate fouling level:     Rock underside (0-10%)	
Water Quality	Brown colour     TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	Slightly grey colour     TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L	
	Objects visible to depth     < 0.15m below surface	<ul> <li>Objects visible to depth 0.15-0.5m below surface</li> </ul>	Objects visible to depth     0.5-1.0m below surface	Objects visible to depth     1.0m below surface	
	Moderate to strong organic odour	Slight to moderate organic odour	Slight organic odour	No odour	
Point range	<b>0 0 1 0 2</b>	□ 3 □ 4	□ 5 🗡 6	□ 7 □ 8	
Riparian Habitat	Narrow riparian area of mostly non-woody vegetation	<ul> <li>Riparian area predominantly wooded but with major localized gaps</li> </ul>	Forested buffer generally     31 m wide along major     portion of both banks	Wide (> 60 m) mature forested buffer along both banks	
Conditions	Canopy coverage:     <50% shading (30% for large mainstem areas)	<ul> <li>Canopy coverage: 50- 60% shading (30-44% for large mainstem areas)</li> </ul>	Canopy coverage:     60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)	
Point range	0 0 1	□ 2 □ 3	□ 4 □ 5	□ 6 □ 7	

Total overall score (0-42) = 22

Poor (<13)

Fair (13-24)

Good (25-34)

Excellent (>35)

Version #2 Last edited: 10/02/2023

Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:

Reach Characteris	stics Project N	umber: 2400					16	16311. 10	NO KT III X
Date:	2014-05-62	Field Staff	F: RA HT			d/Subwatersh	ed: Eve	orcore in	er
Time:	2:50 pm	Stream:		100	UTM (Ups				
Weather:	Surry Bec	Reach:	LLD		UTM (Dov	vnstream):			
		Table 3)	Channel Zone (Table 4)	Flow Type (Table 5)	1 DE	vidence of Ground	water Locat	tion:I	Photo:
Riparian Vegetation			Aquatic & Instr	eam Vegetation	on	V	Vater Qual	lity	
	Coverage Channel	Widths Age (yrs)	Туре	Woody Debris	WD Density		Odour		arbidity able 17)
Dominant Type (Table 6)	□ None 🗹 1 -		(Table 8)	☐ In Cutbank	`□ Low	WDJ/50m:	(Table 16	7	dbie 17)
	☐ Fragmented ☐ 4 -		5-30)	☐ In Channel	☐ Mod		1		/
Encroachment (Table 7)	Continuous □ > 3	10 □ Mature (>30)	Reach Coverage %	Not Present	☐ High				
Channel Characteris	stics				Olary (City	Sand Gravel	Cobble	Boulder Parent	Rootlets
Sinuosity Type	Sinuosity Degree		le Bank Erosion □ < 5%	(Table 19) Bank	Clay/Silt	Sand Gravel			
(Table 9)	(Table 10)	F 30 60		Riffle			12		
Gradient (Table 11)	# of Channels (Table 12)			Pool					
Entrenchment	Bank Failure	Viladova	. /	Bed (if no riffle-pool					
(Table 13)	(Table 14)	) 🗶		morphology)	1 [	7			
Down's Model (Table 15)	Bankfull Indicators (Table 18)	1/60	Bankfull Width (m)	95 392	3 /	Wetted Widt	h (m)	17 1.76	
Sed Sorting (Table 20)	Sediment Transport Observed?		Visible Bankfull Depth (m)	72 0.9		Wetted Dept	h (m) 0.2	28 0.73	
Transport Mode (Table 21)	% of Bed Active	e	Undercuts (m)	.55 0.30	0.23	Velocity	(m/s) 0,2	87 0.125	
Geomorphic /	Mass Movemen (Table 23		Pool Depth (m)	.60			lethod WA	Mo Wilde	
Riffle-Pool Spacing (m):	% Riffles	:: 36 % Pools:	Riffle Length (m)			Meander Amp	(m)	4 1/14	1114
Notes: - VB (4	0	encel had m	momal different	in dept	ń				
- Scar p	they present	L throughout	reach with gra	ssel over	rhang in	9			
- Lack o	1 Tanopy con	NOS KIPE	righ Consisted	gies					
Photos									
Photos:			0						11.
	4		Conior	ctaff sign-off (	if required):	550 Chec	ked by:	Complete	d by: <u>KA</u>
Version #4			Seriior	stair sign-on (	ii required).		,		

Version #4 Last edited: 04/04/2023

**General Site Characteristics Project Number:** Date: 2024-05-02 Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: **Features** Monitoring Site Sketch Compass Reach break Station location Monumented XS Cross-section 0 Monumented photo Flow direction Monumented photo Riffle direction Pool Sediment sampling > Yools: SI-S2 CCC ( 100 ) Sediment bar Erosion pins 8 HHHHHHH Eroded bank/slope Scour chains **Additional Symbols** Undercut bank XXXXXX Bank stabilization T.O.B. Top of Bonk Leaning tree X----X Fence Culvert/outfall Forested along this Swamp/wetland Grasses WWW Tree Instream log/tree \* \* \* Woody debris MU-2.0 M riller-localized \*XXXXX Beaver dam Wd:0.23m VV Vegetated island m=0.76m Flow Type H1 Standing water **H1A** Back water Scale compar H<sub>2</sub> Scarcely perceptible flow Н3 Smooth surface flow **H4** Upwelling **H5** Rippled Unbroken standing wave **H6** H7 Broken standing wave **H8** Chute **H9** Free fall H9A Dissipates below free fall Substrate S1 Silt **S**6 Small boulder **S2** Sand **S7** Large boulder **S**3 Gravel **S8** Bimodal **S4** Small cobble Bedrock/till **S**5 Large cobble Other ВМ Benchmark Erosion pin BS Backsight RB Rebar 95 DS Downstream US Upstream WDJ Woody debris jam TR Terrace **VWC** Valley wall contact FC Flood chute BOS Bottom of slope FP Flood plain Photos: TOS Top of slope KP Knick point Notes:

Version #4 Last edited: 21/02/2023 Senior staff sign-off (if required): 550

Checked by: \_\_\_\_\_ Completed by:



	2	024-05-02	Stream:		Lyons	Drain	)	
Time:	(	3:00 pm	Reach:		203		****	
Weather:	31	inny 18°C	Location:		Markel	d ro	ad K	11100
Field Staff:		RAHE	Watershed/Sub	watershed:	FTABICO	A	2-An K	. 100
		Geor	morphological Indica		E 10016		ent?	Т
Process	No.	Description	norphological Indica	COI		Yes	No	Factor Value
	1	Lobate bar				703	110	
	2	Coarse materials in riffles	embedded					-
Evidence of	3	Siltation in pools						1/
Aggradation	4	Medial bars					1	1/7
(AI)	5	Accretion on point bars	(Some mainle	1200		7		- /
	6	Poor longitudinal sorting of		, 00)	· · · · · · · · · · · · · · · · · · ·	V	./	+
	7	Deposition in the overbank						-
				Sum	of indices =	1	(0	0.143
	1	Exposed bridge footing(s)	***************************************			1/1/	n	1000
	2	Exposed sanitary / storm s	ewer / pipeline / oto			0//	7	_
	3	Elevated storm sewer outfa			· · · · · · · · · · · · · · · · · · ·	- V/	<u>H</u>	-
	4	Undermined gabion basket		/ otc		///	10	- 0
Evidence of	5	Scour pools downstream of				N	7	- 9//
Degradation (DI)	6	Cut face on bar forms	curveres / Scorm se	wer outlets			-	1/6
(01)	7	Head cutting due to knickp	oint migration					-
	8	Terrace cut through older b						4
	9	Suspended armour layer vi						+
	10	Channel worn into undistur		edrock			1	-
					of indices =	0	6	0.0
	1	Fallen / leaning trees / fend	ce posts / etc.					
	2	Occurrence of large organic	V	1/				
	3	Exposed tree roots - M	./		-			
	4	Basal scour on inside mean		1	01			
Evidence of Widening	5	Basal scour on both sides o		10	2/0			
(WI)	6	Outflanked gabion baskets	N	A	10			
	7	Length of basal scour >50%		1	1			
	8	Exposed length of previous						
-	9	Fracture lines along top of I		1				
	10	Exposed building foundation	n			N/	9	
				Sum	of indices =	2	0	0.25
	1	Formation of chute(s)					V	
Evidence of	2	Single thread channel to m				1		
Planimetric	3	Evolution of pool-riffle form	to low bed relief for	m			/	11
Form Adjustment	4	Cut-off channel(s)		/	77			
(PI)		Formation of island(s)		1	1			
		Thalweg alignment out of p		1				
	7	Bar forms poorly formed / r	eworked / removed					
				Sum	of indices =	/	6	0.143
Notes:	······································			Stability Index	(SI) = (AI +	DI+WI+	PI)/4 =	0.134
				In Regime	In Transit	ion/Stres	s In A	djustmen
(4)				☑ 0.00 - 0.20	□ 0.2:			0.41

Project Number: 24009

**Rapid Geomorphic Assessment** 

**Project Number:** Rapid Stream Assessment Technique

Date: Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: Category Fair Poor Good **Excellent**  < 50% of bank network</li> • 50-70% of bank network 71-80% of bank network > 80% of bank network stable stable stable stable · Recent bank sloughing, Recent signs of bank Infrequent signs of bank No evidence of bank slumping or failure sloughing, slumping or sloughing, slumping or sloughing, slumping or frequently observed failure fairly common failure failure Stream bend areas highly Stream bend areas Stream bend areas very · Stream bend areas stable unstable unstable Outer bank height 0.6-0.9 stable Outer bank height 1.2 m Outer bank height 0.9m above stream bank (1.2- Height < 0.6 m above</li> above stream bank 1.2 m above stream 1.5 m above stream bank stream (< 1.2 m above (2.1 m above stream for large mainstem areas) bank stream bank for large bank for large mainstem (1.5-2.1 m above stream Bank overhang 0.6-0.8 m mainstem areas) areas) bank for large mainstem Bank overhang < 0.6 m Bank overhang > 0.8-1.0 areas) Bank overhang 0.8-0.9m Channel Stability · Young exposed tree roots Exposed tree roots old, · Young exposed tree roots Exposed tree roots abundant common predominantly old and large and woody > 6 recent large tree falls 4-5 recent large tree falls large, smaller young roots Generally 0-1 recent large per stream mile per stream mile scarce tree falls per stream mile 2-3 recent large tree falls per stream mile Bottom 1/3 of bank is · Bottom 1/3 of bank is Bottom 1/3 of bank is Bottom 1/3 of bank is highly erodible material generally highly erodible generally highly resistant generally highly resistant Plant/soil matrix severely material plant/soil matrix or material plant/soil matrix or material compromised Plant/soil matrix compromised Channel cross-section is Channel cross-section is · Channel cross-section is Channel cross-section is generally trapezoidallygenerally trapezoidallygenerally V- or U-shaped generally V- or U-shaped shaped shaped Point range □ 0 □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 **27** 0 8 □ 9 □ 10 □ 11 > 75% embedded (> · 50-75% embedded (60-25-49% embedded (35-• Riffle embeddedness < 85% embedded for large 85% embedded for large 59% embedded for large 25% sand-silt (< 35% mainstem areas) mainstem areas) mainstem areas) embedded for large mainstem areas) · Few, if any, deep pools · Low to moderate number · Moderate number of deep · High number of deep pools · Pool substrate of deep pools (> 61 cm deep) pools composition >81% sand-Pool substrate Pool substrate composition (> 122 cm deep for large silt composition 30-59% sand-silt mainstem areas) 60-80% sand-silt Pool substrate composition <30% sand-silt Streambed streak marks Streambed streak marks · Streambed streak marks Streambed streak marks Channel and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped and/or "banana"-shaped Scouring/ sediment deposits sediment deposits sediment deposits sediment deposits absent Sediment common common uncommon Deposition · Fresh, large sand Fresh, large sand · Fresh, large sand deposits Fresh, large sand deposits deposits very common in deposits common in uncommon in channel rare or absent from channel channel channel · Small localized areas of No evidence of fresh Moderate to heavy sand Small localized areas of fresh sand deposits along sediment deposition on deposition along major fresh sand deposits along top of low banks overbank portion of overbank area top of low banks Point bars present at Point bars common, · Point bars small and stable, Point bars few, small and most stream bends, moderate to large and well-vegetated and/or stable, well-vegetated moderate to large and unstable with high armoured with little or no and/or armoured with little unstable with high amount of fresh sand fresh sand or no fresh sand amount of fresh sand Point range □ 0 □ 1 □ 2 □ 3 □ 4 □ 5 **A** 6 □ 7 □ 8

Version #2

Last edited: 10/02/2023

Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by:





2024-05-02 PN: Location: Date: Excellent Good Category Poor Fair · Wetted perimeter > 85% of Wetted perimeter 61-85% Wetted perimeter < 40%</li> Wetted perimeter 40-60% of bottom channel bottom channel width (> of bottom channel width of bottom channel width 90% for large mainstem width (45-65% for large (66-90% for large (< 45% for large mainstem areas) areas) mainstem areas) mainstem areas) · Riffles, runs and pool · Good mix between riffles, Few pools present, riffles · Dominated by one habitat and runs dominant. runs and pools habitat present type (usually runs) and Diverse velocity and depth Velocity and depth Relatively diverse velocity by one velocity and depth of flow present (i.e., slow, and depth of flow condition (slow and generally slow and fast, shallow and deep shallow (for large shallow) (for large mainstem areas, runs water) mainstem areas, few and pools dominant, riffles present, runs and pools dominant, velocity velocity and depth diversity intermediate) and depth diversity low) Riffle substrate Riffle substrate Riffle substrate Riffle substrate composition: cobble, composition: compositioh: composition: good mix of gravel, cobble, and rubble gravel, rubble, boulder mix predominantly small predominantly gravel with little sand cobble, gravel and sand material with high amount of sand Physical > 50% cobble 5-24% cobble · 25-49% cobble < 5% cobble Instream Habitat • Riffle depth > 20 cm for · Riffle depth 15-20 cm for Riffle depth < 10 cm for</li> · Riffle depth 10-15 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas · Large pools generally 46-61 Large pools generally > 61 Large poois generally < · Large pools generally 30cm deep (> 122 cm for cm deep (91-122 cm for 46 cm deep (61-91 cm 30 cm deep (< 61 cm for large mainstem areas) with large mainstem areas) with large mainstem areas) for large mainstem good overhead and devoid of overhead areas) with little or no some overhead cover/structure cover/structure cover/structure overhead cover/structure Slight amount of channel No channel alteration or Extensive channel Moderate amount of alteration and/or point channel alteration and/or alteration and/or slight significant point bar formation/enlargement increase in point bar moderate increase in har formation/enlargement formation/enlargement point bar formation/enlargement • Riffle/Pool ratio 0.9-1.1:1 Riffle/Pool ratio 0.7-0.89:1 Riffle/Pool ratio 0.49:1; Riffle/Pool ratio 0.5-0.69:1; 1.31-1.5:1 ; 1.11-1.3:1 ≥1.51:1 · Summer afternoon water · Summer afternoon water · Summer afternoon water Summer afternoon water temperature < 20°C temperature 20-24°C temperature 24-27°C temperature > 27°C □ 7 □ 8 □ 5 □ 6 □ 1 □ 2 □ 3 × 4 Point range · Substrate fouling level: Substrate fouling level: · Substrate fouling level: · Substrate fouling level: Rock underside (0-10%) High (> 50%) Moderate (21-50%) Very light (11-20%) · Clear flow Slightly grey colour · Brown colour · Grey colour TDS: < 50 mg/L</li> • TDS: 101-150 mg/L TDS: 50-100 mg/L TDS: > 150 mg/L Water Quality · Objects visible to depth Objects visible to depth · Objects visible to depth · Objects visible to depth 0.5-1.0m below surface > 1.0m below surface 0.15-0.5m below surface < 0.15m below surface Slight organic odour · No odour Slight to moderate · Moderate to strong organic odour organic odour □ 7 □ 8 □ 5 □ 0 □ 1 □ 3 □ 4 □ 2 Point range · Forested buffer generally • Wide (> 60 m) mature Riparian area Narrow riparian area of forested buffer along both predominantly wooded > 31 m wide along major mostly non-woody but with major localized portion of both banks banks vegetation Riparian Habitat · Canopy coverage: · Canopy coverage: Canopy coverage: 50-· Canopy coverage: Conditions >80% shading (> 60% for 60-79% shading (45-59% 60% shading (30-44% <50% shading (30% for large mainstem areas) for large mainstem areas) for large mainstem large mainstem areas) □ 2 × 3 □ 6 □ 7 □ 4 □ 5 □ 0 □ 1 Point range Total overall score (0-42) = Good (25-34) Excellent (>35) Fair (13-24)

Version #2 Last edited: 10/02/2023 Senior staff sign-off (if required):  $\underline{550}$ 

Poor (<13)

Checked by: \_\_\_\_ Completed by: \_

Reach Character		t Numbe	r: 240	0 9		13 200						. / /	4	MORPHI
Date:	2024-05-1	02	Field S	staff:	LA LA	HF		Water	shed/Sub	watersh	ed: E	taheca	16 C	eck
'ime:	3.00pm	) = [	Stream	n:	Lyans	Dra	m	UTM (	Upstream	):				
Weather:	Snry, 18		Reach	:	203			UTM (	Downstre	am):				
Table 1)	Valley Type (Table 2)	Channe (Table 3	1	/	hannel Zone able 4)		Flow Type (Table 5)		Evidence	of Ground	water Lo	cation:	[	Photo:
Riparian Vegetatio	n				Aquatic 8	Instrea	m Vegetat	ion			/ater Qu	ality		
(Table 6)	∠ □ None	nnel Widths	Age (yrs)	, ,	Type (Table 8)		<b>Woody Debris</b> □ In Cutbank	Low	WDJ/50	)m:	Odo (Table	ur		arbidity able 17)
Encroachment (Table 7)	□ Continuous (□	(4 - 10 □ > 10 Stream	☐ Establishe  Mature (>		Reach Coverage %	15	ՃIn Channel ☐ Not Present		0.5		/			d
Channel Character	istics Y	porten												
(Table 9)	Sinuosity Deg (Table		Bank A □ 0 - 3	30	Bank Erosion □ < 5%		(Table 19) Bank	Clay/Sil	t Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Gradient (Table 11)	# of Chani (Table		X 30 − □ 60 −			Caliced Oreas Cros	Riffle Pool				⊠ □			
(Table 13)	Bank Fail (Table	14)	Mulmal	1. / /	□ 60 - 100%		Bed (if no riffle-pool morphology)	×	×					
Oown's Model (Table 15)	Bankfull Indicat (Table	ors   3/5/	7 21		Bankfull Wid (1	th 4,5	3.50	6.	90 Wet	ted Width	(m)	31	2.0	3,90
Sed Sorting (Table 20)	Sediment Transp Observe	oort ed?	s XNo □ No	ot Visible	Bankfull Dep (1	oth n) 0.66	0.76	0.0	3 Wet	ted Depth	(m) (), i	15	),23	0.36
Transport ode (Table 21)	% of Bed Act	tive			Undercuts (r	n) (),5	4		/	Velocity (n	n/s) (), (	036	0.266	0.175
Geomorphic 5/6/	Mass Movem (Table		% rus:	80	Pool Dep (r	th n)			/ ve	elocity Estir Me	nate thod	W148	e Be	211
Riffle-Pool Spacing (m):	% Riffl		% Pools:	5	Riffle Length (r	n)			Mean	der Amplit	ude (m)			
etes: > fec	K upstram		rnoted	at	the beng	mi	d-real		reroll	y ren	don	many	4.	
) sustrate	straight and	pool	- 4	on pi	- 1	c ho	werey	not Ut	le dur	int a	Her	bends	(melude	ng Unde
otos:														

Last edited: 04/04/2023

**General Site Characteristics** Project Number: 24009 Date: 2024-05-02 Stream: Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: **Features** Monitoring Site Sketch Compass Reach break -o-o-o- Long-profile Station location Monumented XS Cross-section 0 Monumented photo Flow direction Monumented photo Riffle direction Pool Sediment sampling WITTEN Sediment bar Erosion pins HHHHHHEroded bank/slope 8 Scour chains Undercut bank **Additional Symbols** XXXXXX Bank stabilization Leaning tree x---x---x Fence Culvert/outfall 3.3m = 00 Swamp/wetland 0.86m= (ND) WWW Grasses 0.26m = wcl € Tree 0.53m=bN Instream log/tree 0.298m/s=V \* \* \* Woody debris \*\*\*\* Beaver dam W Vegetated island Flow Type H1 Standing water H1A Back water Scarcely perceptible flow H2 **H3** Smooth surface flow **H4** Upwelling **H5** Rippled **H6** Unbroken standing wave **H7** Broken standing wave **H8** Chute H9 Free fall H9A Dissipates below free fall Substrate S1 Silt **S6** Small boulder S2 Sand **S7** Large boulder **S**3 Gravel **S8** Bimodal **S4** Small cobble **S9** Bedrock/till **S5** Large cobble Other BM Benchmark EP Erosion pin BS Backsight RB Rebar

Version #4 Last edited: 21/02/2023

Downstream

Woody debris jam

Valley wall contact

Bottom of slope

Top of slope

US

TR

FC

FP

KP

Upstream

Flood chute

Flood plain

Knick point

Terrace

DS

WDJ

**VWC** 

**BOS** 

TOS

Senior staff sign-off (if required): SSO Checked by: \_\_\_\_\_ Completed by:

Photos:

Notes:

Very Stort reach





Date:	2	024-05-02	Project Number: Stream:	240	1		A							
Time:		3.20 tm	Reach:		Lyons	000	Vin_							
Weather:	1	may 10°C			LDH		- /	21.71						
Field Staff:		DA 11/2	Location:		Maytre	la 1	gad, 1	41/00						
ricia Stair.		KN HI	Watershed/Subwaters	shed:	Etabica	Q 1	reek	_						
Process			omorphological Indicator			Pr	resent?	Fact						
	No.	Description				Yes	No	Valu						
	1	Lobate bar					V							
	2	Coarse materials in riffle	s embedded				V							
Evidence of	3	Siltation in pools				V								
Aggradation (AI)	4	Medial bars						7 1/-						
(7.12)	5	Accretion on point bars					1	7 /						
	6	Poor longitudinal sorting					V							
	7	Deposition in the overba	nk zone				V							
	<del></del>			Su	m of indices =	1	6	0.14						
	1	Exposed bridge footing(s				n/	IA							
	2	Exposed sanitary / storm				/ /	NA							
	3	Elevated storm sewer out	fall(s)			n / .	10							
Evidence of	4		ets / concrete aprons / etc.			- / //	IA							
Degradation	5	Scour pools downstream of culverts / storm sewer outlets												
(DI)	6	Cut face on bar forms												
	7	Head cutting due to knickpoint migration												
	8	Terrace cut through older					1							
	9	Suspended armour layer					1	/						
	10	Channel worn into undistu	urbed overburden / bedrock				V							
	T			Sur	n of indices =	0	0	0.0						
	1	Fallen / leaning trees / fer	nce posts / etc.			/								
	2	Occurrence of large organ	ic debris			- V		-						
	3	Exposed tree roots		1/	-									
Evidence of	4	Basal scour on inside mea		1	-									
Widening	5	Basal scour on both sides		/	1/									
(WI)	6	Outflanked gabion baskets	h	119	1 /8									
	7	Length of basal scour >50		/	1 1									
	8	Exposed length of previou		/	1									
	9	Fracture lines along top of		1										
	10	Exposed building foundation	on			N	1h							
				Sum	of indices =	1	7	0.12						
		Formation of chute(s)					./							
Evidence of	2	Single thread channel to m	nultiple channel				1/	1						
Planimetric		Evolution of pool-riffle form	n to low bed relief form											
Form Adjustment		Cut-off channel(s)						1/-						
(PI)		Formation of island(s)					×/	//						
	6	Thalweg alignment out of p		1	,									
	7	Bar forms poorly formed /	reworked / removed				9197							
				Sum	of indices =	1	6	0-14						
otes:			Stabili	ty Index	(SI) = (AI+[	)I+WT	-PT)/4 -	011						
				egime	In Transitio			djustmer						
				0 - 0.20		- 0.40		0.41						
					L VICE	U.4U		1 11.41						

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	Stream:		Lyans	Dram		
Time:	3:30 pm	Reach:	148	404			
Weather:	Sunny 18°c	Location:	en neven bari	May field	road, Alloa		
Field Staff:	RA HE	Watershed/Subwate	ershed:	Etobroke			
Category	Poor	Fair		Good	Excellent		
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	<ul> <li>50-70% of bank network stable</li> <li>Recent signs of bank sloughing, slumping or failure fairly common</li> </ul>	stable • Infreque	of bank network ent signs of bank ng, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>		
Channel Stability	<ul> <li>Stream bend areas highly unstable</li> <li>Outer bank height 1.2 m above stream bank</li> <li>(2.1 m above stream bank for large mainstem areas)</li> <li>Bank overhang &gt; 0.8-1.0 m</li> </ul>	Stream bend areas unstable  Outer bank height 0.9- 1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) Bank overhang 0.8-0.9m	Outer batter	Stream bend areas stable Outer bank height 0.6-0.9 m above stream bank (1.2- 1.5 m above stream bank for large mainstem areas) Bank overhang 0.6-0.8 m  Stream ben stable Height < 0 stream (< stream ban mainstem a Bank overh			
	<ul> <li>Young exposed tree roots abundant</li> <li>&gt; 6 recent large tree falls per stream mile</li> </ul>	Young exposed tree roots common     4-5 recent large tree falls per stream mile	predomi large, sn scarce	tree roots nantly old and naller young roots nt large tree falls am mile	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile		
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	<ul> <li>Bottom 1/3 of bank is generally highly erodible material</li> <li>Plant/soil matrix compromised</li> </ul>	Bottom 1     generally	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or materia			
	Channel cross-section is generally trapezoidally- shaped	Channel cross-section is generally trapezoidally- shaped		cross-section is V- or U-shaped	Channel cross-section is generally V- or U-shaped		
Point range		□ 3 □ 4 □ 5	□ 6	D 7 0 8	□ 9 □ 10 □ 11		
ralla	> 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	• 25-49% 59% emb mainsten	embedded (35- bedded for large n areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)		
	Pool substrate composition >81% sand-silt	<ul> <li>Low to moderate number of deep pools</li> <li>Pool substrate composition</li> <li>60-80% sand-silt</li> </ul>	pools	number of deep strate composition sand-silt	High number of deep pools     (> 61 cm deep)     (> 122 cm deep for large mainstem areas)     Pool substrate composition     <30% sand-silt		
Channel Scouring/ Sediment Deposition	and/or "banana"-shaped sediment deposits common	<ul> <li>Streambed streak marks and/or "banana"-shaped sediment deposits common</li> </ul>	<ul> <li>Streamber and/or "b sediment uncommo</li> </ul>		• Streambed streak marks and/or "banana"-shaped sediment deposits absent		
	deposits very common in channel  Moderate to heavy sand deposition along major portion of overbank area	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small localized areas of fresh sand deposits along top of low banks</li> </ul>	<ul> <li>Small loca</li> </ul>	ge sand deposits in in channel alized areas of d deposits along banks	Fresh, large sand deposits rare or absent from channe     No evidence of tresh sediment deposition on overbank		
	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	Point bars common, moderate to large and unstable with high amount of fresh sand	well-veget	small and stable, tated and/or with little or no	Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4		5 🗆 6	7 0 8		

Last edited: 10/02/2023

Location: 000 2024-05-02 PN: Date: Excellent Good Fair Poor Category Wetted perimeter > 85% of • Wetted perimeter 61-85% Wetted perimeter < 40% Wetted perimeter 40bottom channel width (> of bottom channel width 60% of bottom channel of bottom channel width 90% for large mainstem (66-90% for large width (45-65% for large (< 45% for large areas) mainstem areas) mainstem areas) mainstem areas) Riffles, runs and pool · Good mix between riffles, Dominated by one habitat Few pools present, riffles habitat present runs and pools type (usually runs) and and runs dominant. Diverse velocity and depth Relatively diverse velocity by one velocity and depth Velocity and depth of flow present (i.e., slow, and depth of flow generally slow and condition (slow and fast, shallow and deep shallow (for large shallow) (for large water) mainstem areas, runs mainstem areas, few and pools dominant, riffles present, runs and velocity and depth pools dominant, velocity diversity intermediate) and depth diversity low) · Riffle substrate Riffle substrate · Riffle substrate Riffle substrate composition: cobble, composition: good mix of composition: composition: gravel, rubble, boulder mix gravel, cobble, and rubble predominantly small predominantly gravel with little sand material with high amount of sand cobble, gravel and sand Physical > 50% cobble 25-49% cobble 5-24% cobble < 5% cobble</p> Instream • Riffle depth > 20 cm for Riffle depth 10-15 cm for · Riffle depth 15-20 cm for Habitat • Riffle depth < 10 cm for large mainstem areas large mainstem areas large mainstem areas large mainstem areas refles = Large pools generally > 61 Large pools generally 46-61 Large pools generally 30-Large pools generally < cm deep (> 122 cm for cm deep (91-122 cm for 30 cm deep (< 61 cm for 46 cm deep (61-91 cm large mainstem areas) with large mainstem areas) with for large mainstem large mainstem areas) good overhead some overhead areas) with little or no and devoid of overhead cover/structure cover/structure overhead cover/structure cover/structure No channel alteration or Slight amount of channel Moderate amount of Extensive channel significant point bar channel alteration and/or alteration and/or slight alteration and/or point formation/enlargement increase in point bar moderate increase in bar formation/enlargement point bar formation/enlargement formation/enlargement Riffle/Pool ratio 0.9-1.1:1 Riffle/Pool ratio 0.7-0.89:1 · Riffle/Pool ratio 0.49:1; Riffle/Pool ratio 0.5-0.69:1; 1.31-1.5:1 ; 1.11-1.3:1 ≥1.51:1 Summer afternoon water Summer afternoon water Summer afternoon water Summer afternoon water temperature < 20°C temperature 20-24°C temperature 24-27°C temperature > 27°C □ 7 □ 8 □ 5 □ 6 □ 3 □ 4 □ 0 □ 1 ¤ 2 Point range Substrate fouling level: Substrate fouling level: Substrate fouling level: Substrate fouling level: Rock underside (0-10%) Very light (11-20%) Moderate (21-50%) High (> 50%) · Clear flow Slightly grey colour · Grey colour Brown colour . TDS: < 50 mg/L • TDS: 50-100 mg/L TDS: 101-150 mg/L TDS: > 150 mg/L · Objects visible to depth Water Quality Objects visible to depth Objects visible to depth · Objects visible to depth > 1.0m below surface 0.5-1.0m below surface 0.15-0.5m below surface < 0.15m below surface · No odour Slight organic odour · Slight to moderate Moderate to strong organic odour organic odour □ 7 □ 8 □ 5 □ 3 □ 4 O O I 1 O 2 Point range Wide (> 60 m) mature · Forested buffer generally Riparian area Narrow riparian area of forested buffer along both > 31 m wide along major predominantly wooded mostly non-woody banks portion of both banks but with major localized vegetation Riparian gaps · Canopy coverage: Canopy coverage: Habitat · Canopy coverage: 50-Canopy coverage: >80% shading (> 60% for Conditions 60-79% shading (45-59% <50% shading (30% for 60% shading (30-44% large mainstem areas) for large mainstem areas) for large mainstem large mainstem areas) areas) □ 6 □ 7 □ 4 □ 5 0 🗆 1 2 3

Good (25-34) Excellent (>35) Total overall score (0-42) = 23Fair (13-24) Poor (<13)

Version #2 Last edited: 10/02/2023

Point range

Senior staff sign-off (if required):

Checked by: \_\_\_\_\_ Completed by: \_



Reach Characteris		29009				MORPHI
Date:	2024-05-02	Field Staff:	MAHF		Watershed/Subwatershe	d: Hobroke Creek
Time:	3:30 pm	Stream:	Lyons Drain	h	UTM (Upstream):	2700,000 (788X
Weather:	Shry 1800	Reach:	404		UTM (Downstream):	
	Table 2) Channel (Table 3)		annel Zone ble 4)	Flow Type (Table 5)	Evidence of Groundw	vater Location: Photo:
Riparian Vegetation			Aquatic & Instr			ater Quality
Dominant Type (Table 6) 1/3  Encroachment (Table 7) 3	□ None	ge (yrs) Immature (<5) Established (5-30) Mature (>30)	(Table 8)	Woody Debris  ☐ In Cutbank  ☐ In Channel ☐ Not Present	WD Density  ★ Low WD3/50m:  □ Mod	Odour Turbidity (Table 16) (Table 17)
Channel Characterist			Coverage %	] = Not I resent		
Sinuosity Type /		Dank A				
(Table 9)	Sinuosity Degree (Table 10)	Bank Angle  □ 0 - 30	Bank Erosion	(Table 19) Bank		Cobble Boulder Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)	<b>3</b> 30 − 60 □ 60 − 90	□ 5 - 30% □ 30 - 60%	Riffle Pool		
Entrenchment (Table 13)	Bank Failure (Table 14)	□ Undercut	□ 60 - 100%	Bed (if no riffle-pool morphology)	Ø Ø O	
Down's Model (Table 15)	Bankfull Indicators (Table 18)		Bankfull Width (m)	3 3.3	Wetted Width (	m) 2.21 0.86
Sed Sorting (Table 20)	Sediment Transport Observed?	No □ Not Visible	Bankfull Depth (m)	9 0.53	Wetted Depth (	
Transport Mode (Table 21)	% of Bed Active		Undercuts (m)		Velocity (m/	(s) 0.196 0.298
Geomorphic Units (Table 22)	Mass Movement (Table 23)	7. Runs: 100	Pool Depth (m)		Velocity Estima Meth	
Riffle-Pool Spacing (m):	% Riffles:	% Pools:	iffle Length (m)		Meander Amplitue	de n)
	reach with a lack	of rifle 10	bol memphologi	2 .		
-> westercress	within reach					
7 grasses along	Early worth tree		encroacting	f		
Small Ensetty	count with stey	witer relea	song motor as	der		
Photos:						
/ersion #4 ast edited: 04/04/2023			Senior sta	iff sign-off (if re	equired): <u>SSO</u> Checked b	y: Completed by:

General Site Characteristics Project Number: 24009 Date: Stream: Lyans Time: Reach: Weather: Location: Field Staff: Watershed/Subwatershed: **Features** Monitoring Site Sketch Compass Reach break -∽-∽ Long-profile Station location Ag freld → Monumented XS Cross-section Monumented photo Flow direction Monumented photo Riffle direction Pool Sediment sampling WILLIAM . Sediment bar Erosion pins ######## Eroded bank/slope Scour chains Undercut bank **Additional Symbols XXXXXX** Bank stabilization Leaning tree x---x---x Fence Culvert/outfall Swamp/wetland WWW Grasses Tree Instream log/tree \* \* \* Woody debris \*\*\*\*\* Beaver dam W Vegetated island Flow Type H1 Standing water H1A Back water H2 Scarcely perceptible flow **H3** Smooth surface flow **H4** Upwelling graduent drop from 19 freld **H5** Rippled **H6** Unbroken standing wave H7 Broken standing wave Н8 Chute **H9** Free fall H9A Dissipates below free fall Substrate S1 Silt **S6** Small boulder S2 Sand **S7** Large boulder **S**3 Gravel **S8** Bimodal **S4** Small cobble Bedrock/till **S5** Large cobble Other 1 straghast reach -SH present along bed with \$3 present in sonks form (no related pool sequences) BM Benchmark EP Erosion pin

Photos: Notes:

Version #4

BS

DS

WDJ

VWC

BOS

TOS

Last edited: 21/02/2023

Backsight

Downstream

Woody debris jam

Valley wall contact

Bottom of slope

Top of slope

RB

US

TR

FC

FP

KP

Rebar

Upstream

Flood chute

Flood plain

Knick point

Terrace

Senior staff sign-off (if required): 550

\_ Checked by: \_\_\_\_\_ Completed by:





24009 Project Number: Rapid Geomorphic Assessment Date: Stream: Time: Reach: Weather: eld road Allos Location: Field Staff: Watershed/Subwatershed: Geomorphological Indicator Present? Factor Process No. Description Value Yes No Lobate bar Coarse materials in riffles embedded 2 3 Siltation in pools Evidence of Aggradation 4 Medial bars (AI) 5 Accretion on point bars Some poor sorter Poor longitudinal sorting of bed materials Deposition in the overbank zone Sum of indices = Exposed bridge footing(s) 2 Exposed sanitary / storm sewer / pipeline / etc. 3 Elevated storm sewer outfall(s) Undermined gabion baskets / concrete aprons / etc. Evidence of Scour pools downstream of culverts / storm sewer outlets Degradation Cut face on bar forms (DI) 7 Head cutting due to knickpoint migration 8 Terrace cut through older bar material 9 Suspended armour layer visible in bank Channel worn into undisturbed overburden / bedrock 10 Sum of indices = Fallen / leaning trees / fence posts / etc. 1 2 Occurrence of large organic debris 3 Exposed tree roots Basal scour on inside meander bends Evidence of Basal scour on both sides of channel through riffle Widening Outflanked gabion baskets / concrete walls / etc. (WI) 7 Length of basal scour >50% through subject reach 8 Exposed length of previously buried pipe / cable / etc. Fracture lines along top of bank 9 10 Exposed building foundation Sum of indices = 375 1 Formation of chute(s) 2 Single thread channel to multiple channel Evidence of 3 Evolution of pool-riffle form to low bed relief form Planimetric Form 4 Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) 6 Thalweg alignment out of phase with meander form Bar forms poorly formed / reworked / removed Sum of indices = 0 Notes: Stability Index (SI) = (AI+DI+WI+PI)/4 =

Version #3 Last edited: 10/02/2023 Senior staff sign-off (if required): So Checked by: Completed by:

In Regime

**Ø** 0.00 - 0.20

In Transition/Stress

□ 0.21 - 0.40



In Adjustment

□ 0.41

Rapid Stream Assessment Technique Project Number: 24009

Date:	1024-05-02	Stream:		Lyons bram			
Time:	3:50 pm	Reach:	Fair	204-1			
Weather: Sunny 18°C		Location:		Maybold raid, Allsa			
ield Staff:	RA HF	Watershed/Subwate	rshed:	Etabralle	1 4		
Category	Poor	Fair		Good	Excellent		
	<ul> <li>&lt; 50% of bank network stable</li> <li>Recent bank sloughing, slumping or failure frequently observed</li> </ul>	50-70% of bank network stable     Recent signs of bank sloughing, slumping or failure fairly common	stable Infreque	of bank network nt signs of bank g, slumping or	<ul> <li>&gt; 80% of bank network stable</li> <li>No evidence of bank sloughing, slumping or failure</li> </ul>		
Channel	Stream bend areas highly unstable  Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas)  Bank overhang > 0.8-1.0 m	Stream bend areas unstable  Outer bank height 0.9- 1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas)  Bank overhang 0.8-0.9m	Outer ba m above     1.5 m ab for large	pend areas stable ink height 0.6-0.9 stream bank (1.2- bove stream bank mainstem areas) erhang 0.6-0.8 m	Stream bend areas very stable Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) Bank overhang < 0.6 m		
Stability	Young exposed tree roots abundant     > 6 recent large tree falls per stream mile	Young exposed tree roots common     4-5 recent large tree falls per stream mile	large, sm scarce	nantly old and naller young roots nt large tree falls	Exposed tree roots old, large and woody     Generally 0-1 recent large tree falls per stream mile		
	Bottom 1/3 of bank is highly erodible material     Plant/soil matrix severely compromised	Bottom 1/3 of bank is generally highly erodible material     Plant/soi matrix compromised	generally	./3 of bank is highly resistant matrix or material	Bottom 1/3 of bank is generally highly resistant plant/soil matrix or mater		
	Channel cross-section is generally trapezoidally-shaped	Channel cross-section is generally trapezoidally- shaped		cross-section is V- or U-shaped	Channel cross-section is generally V- or U-shaped		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4 × 5	□ 6	□ <b>7</b> □ 8	□ 9 □ 10 □ 11		
No	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60- 85% embedded for large mainstem areas)	• 25-49% o 59% emb mainsten	embedded (35- pedded for large n areas)	Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)		
	Few, if any, deep pools Pool substrate composition >81% sand- silt	composition 30-59% s 60-80% sand-silt  • Streambed streak marks		strate composition	High number of deep pool (> 61 cm deep) (> 122 cm deep for large mainstem areas) Pool substrate composition <30% sand-silt		
Channel Scouring/ Sediment Deposition	Streambed streak marks and/or "banana"-shaped sediment deposits common				Streambed streak marks and/or "banana"-shaped sediment deposits absent		
	deposits very common in channel	<ul> <li>Fresh, large sand deposits common in channel</li> <li>Small localized areas of fresh sand deposits along top of low banks</li> </ul>	small loca	ge sand deposits on in channel alized areas of d deposits along banks	<ul> <li>Fresh, large sand deposits rare or absent from chann</li> <li>No evidence of fresh sediment deposition on overbank</li> </ul>		
7 E	Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	moderate to large and well-veg		s small and stable, tated and/or with little or no d	<ul> <li>Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand</li> </ul>		
Point range	□ 0 □ 1 □ 2	□ 3 □ 4	X	5 🗆 6	□ 7 □ 8		



Location: PN: Date: Excellent Good Fair **Poor** Category Wetted perimeter > 85% of Wetted perimeter 61-85% · Wetted perimeter 40- Wetted perimeter < 40%</li> bottom channel width (> of bottom channel width 60% of bottom channel of bottom channel width (66-90% for large 90% for large mainstem (< 45% for large width (45-65% for large areas) mainstem areas) mainstem areas) mainstem areas) · Good mix between riffles, Riffles, runs and pool · Few pools present, riffles Dominated by one habitat habitat present and runs dominant. runs and pools type (usually runs) and · Diverse velocity and depth Relatively diverse velocity by one velocity and depth Velocity and depth and depth of flow of flow present (i.e., slow, generally slow and condition (slow and shallow (for large fast, shallow and deep shallow) (for large water) mainstem areas, runs mainstem areas, few and pools dominant, riffles present, runs and pools dominant, velocity velocity and depth diversity intermediate) and depth diversity low) Riffle substrate Riffle substrate Riffle substrate Riffle substrate composition: cobble, composition: good mix of composition: composition: gravel, rubble, boulder mix gravel, cobble, and rubble predominantly small predominantly gravel with little sand material cobble, gravel and sand with high amount of sand Physical 25-49% cobble > 50% cobble 5-24% cobble < 5% cobble Instream • Riffle depth > 20 cm for Habitat • Riffle depth 15-20 cm for Riffle depth < 10 cm for · Riffle depth 10-15 cm for large mainstem areas large mainstem areas large mainstem areas no Maller large mainstem areas Large pools generally > 61 Large pools generally 30-· Large pools generally 46-61 Large pools generally < cm deep (> 122 cm for 46 cm deep (61-91 cm cm deep (91-122 cm for 30 cm deep (< 61 cm for large mainstem areas) with large mainstem areas) with for large mainstem large mainstem areas) good overhead some overhead and devoid of overhead areas) with little or no overhead cover/structure cover/structure cover/structure cover/structure No channel alteration or Moderate amount of Slight amount of channel Extensive channel significant point bar channel alteration and/or alteration and/or slight alteration and/or point increase in point bar formation/enlargement moderate increase in har formation/enlargement point bar formation/enlargement formation/enlargement • Riffle/Pool ratio 0.9-1.1:1 • Riffle/Pool ratio 0.7-0.89:1 Riffle/Pool ratio 0.5-· Riffle/Pool ratio 0.49:1; ; 1.11-1.3:1 0.69:1; 1.31-1.5:1 >1.51:1 Summer afternoon water · Summer afternoon water Summer afternoon water · Summer afternoon water temperature 24-27°C temperature 20-24°C temperature < 20°C temperature > 27°C □ 7 □ 8 □ 5 □ 6 0 0 1 2 2 □ 3 □ 4 Point range Substrate fouling level: Substrate fouling level: · Substrate fouling level: Substrate fouling level: Rock underside (0-10%) Very light (11-20%) High (> 50%) Moderate (21-50%) Slightly grey colourTDS: 50-100 mg/L · Clear flow Brown colour · Grey colour • TDS: < 50 mg/L • TDS: 101-150 mg/L TDS: > 150 mg/L Water Quality Objects visible to depth · Objects visible to depth Objects visible to depth · Objects visible to depth > 1.0m below surface 0.15-0.5m below surface 0.5-1.0m below surface < 0.15m below surface No odour · Slight to moderate · Slight organic odour · Moderate to strong organic odour organic odour □ 8 5 🗆 6 **D** 7 □ 3 □ 4 □ 0 □ 1 □ 2 Point range Wide (> 60 m) mature · Forested buffer generally Riparian area Narrow riparian area of forested buffer along both predominantly wooded > 31 m wide along major mostly non-woody portion of both banks banks but with major localized vegetation Riparian Habitat · Canopy coverage: · Canopy coverage: · Canopy coverage: 50-· Canopy coverage: Conditions >80% shading (> 60% for 60-79% shading (45-59% for large mains em areas) 60% shading (30-44% <50% shading (30% for large mainstem areas) for large mainstem large mainstem areas) areas) □ 6 □ **7** 4 5 2 □ 0 □ 1 Point range Good (25-34) Excellent (>35) Fair (13-24) Total overall score (0-42) = Poor (<13)

Version #2 Last edited: 10/02/2023 Senior staff sign-off (if required): \_\_\_\_\_ Checked by: \_\_\_\_\_ Completed by: \_\_\_\_\_



Reach Characteris		29009			MORPHIX
Date:	2024-05-02	Field Staff:	A HF	Watershed/Subwatershed:	Etobicolle Creek
Time:	3:50pm	Stream:	Lyons Eram	UTM (Upstream):	
Weather:	Sunny, 18°C	Reach:	10204-1	UTM (Downstream):	
	Table 2) Channel 1 (Table 3)		annel Zone Flow Type (Table 5)	☐ Evidence of Groundwat	er Location:Photo:
Riparian Vegetation		y-zet xezjilit III	Aquatic & Instream Vegetat	ion Wate	er Quality
Dominant Type (Table 6)  Encroachment (Table 7)	None □ 1 - 4 □ □ □	Immature (<5) Established (5-30) (Mature (>30)	Type (Table 8) Woody Debris  In Cutbank  Reach Coverage % Not Presen	X-Low WDJ/50m: (	Odour Turbidity (Table 16) (Table 17)
Channel Characteris	tics				
Sinuosity Type (Table 9)	Sinuosity Degree (Table 10)	Bank Angle	Bank Erosion         (Table 19)           □ < 5%         Bank		bble Boulder Parent Rootlets
Gradient (Table 11)	# of Channels (Table 12)		□ 5 - 30% Riffle ★30 - 60% Pool		
Entrenchment (Table 13)	Bank Failure (Table 14)	□ Undercut	□ 60 - 100%  Bed  (if no riffle-pool morphology)	X X X S	are a a
Down's Model (Table 15)	Bankfull Indicators (Table 18)	15	Bankfull Width 2.3	0 340 Wetted Width (m)	1.70 1.40 1.20
(Table 20)	Sediment Transport Observed?	No □ Not Visible	Bankfull Depth 0.75	O, 60 Wetted Depth (m)	0.30 0.12 0.10
Transport Mode (Table 21)	% of Bed Active		Undercuts (m) 0.32	Velocity (m/s)	
Geomorphic Units (Table 22)	Mass Movement (Table 23)	1/2 NOS: 100	Pool Depth (m)	Velocity Estimate Method	
Riffle-Pool Spacing (m):	% Riffles:	% Pools:	Riffle Length (m)	Meander Amplitude (m)	
Notes: > erosi > lack of r > dannirem > bank and	Allo Poel memphology Serven becomes	less delin	Standing water ed and wore go over.	asy loses fores	tal regetedin, etc)
Photos:					

Version #4 Last edited: 04/04/2023

Senior staff sign-off (if required): So Checked by: Completed by:

