Appendix D:
Rapid Field Assessment Sheets

Fluvial Geomorphology Field Key

Table 1 Land Use

1. Forest
2. Pasture
3. Agricultural
4. Industrial
5. Park
6. Institutional
7. Residential
8. Golf Course
9. Commercial

Table 2 Valley Type

1. Unconfined
2. Confined
3. Partially Confined

Table 3 Channel Type

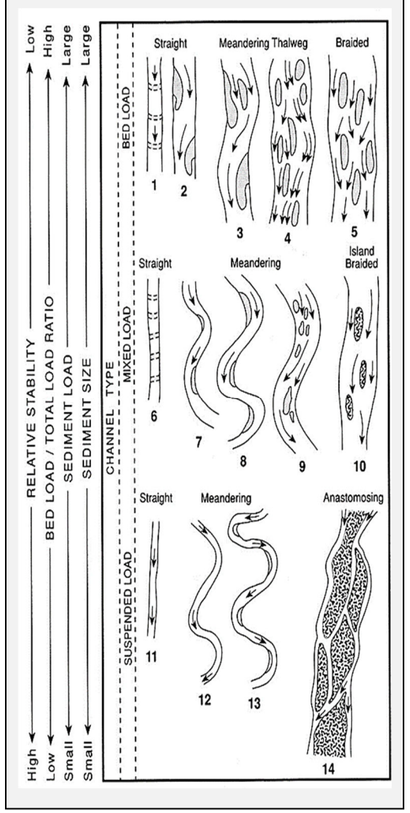


Table 4 Channel Zone

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

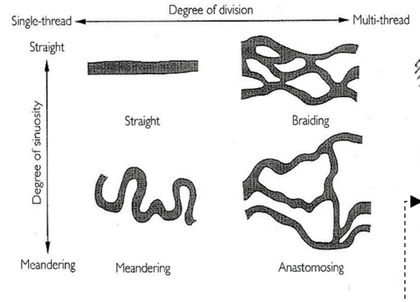
1. None
2. Minimal
3. Moderate
4. Heavy
5. Extreme

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 9 Type of Sinuosity

1. Sinuous
2. Irregular Meanders
3. Regular Meanders
4. Tortuous Meanders
5. Confined pattern (within valley)



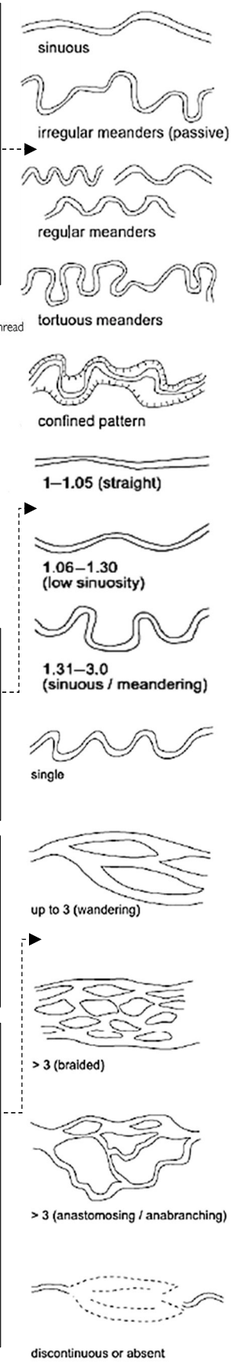


Table 10 Degree of Sinuosity

1. Straight (1 – 1.05)
2. Low sinuosity (1.06–1.30)
3. Meandering (1.31 - 3.0)

Table 11 Gradient

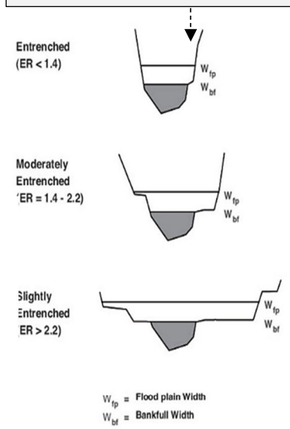
1. Low
2. Moderate
3. High

Table 12 Number of Channels

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

Table 13 Entrenchment

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



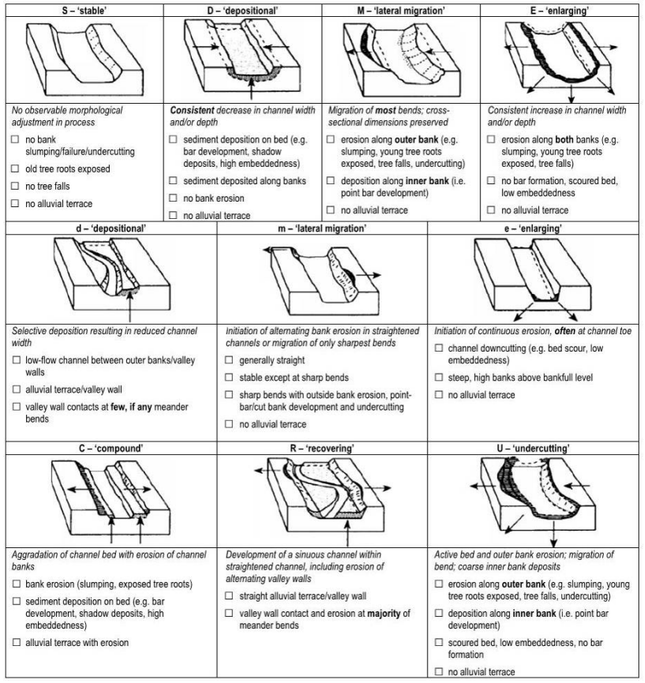
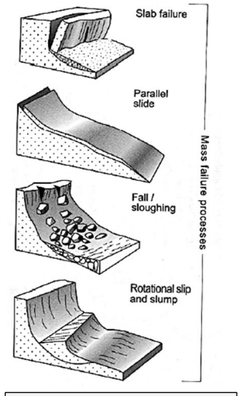


Table 14 Type of Bank Failure

1. Fluvial Entrainment (Hydraulic action)
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 failure)



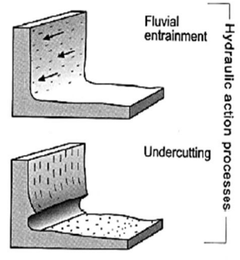


Table 15 Downs's Model of Channel Classification

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. Fishy
3. Petroleum
4. Sewage
5. Chemical
6. Other

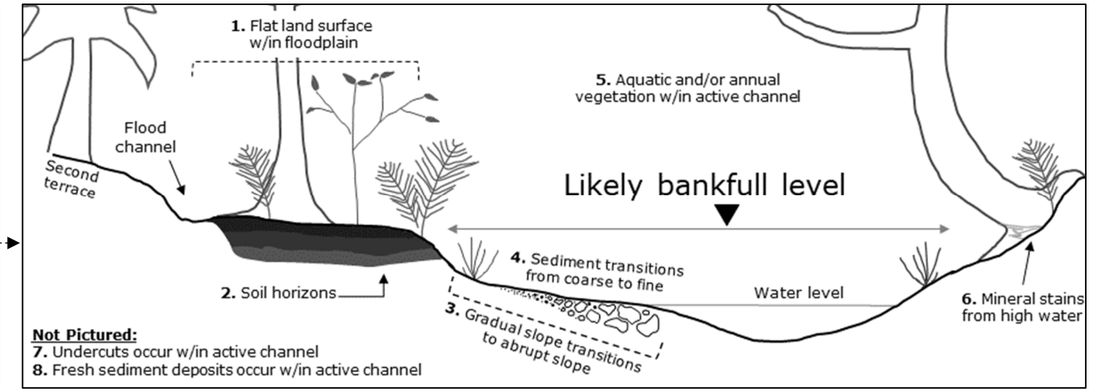
Table 17 Turbidity

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

Fluvial Geomorphology Field Key

Table 18 Bankfull Indicators

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



Note: extend cross-section sketch and survey laterally beyond BF level and capture all terraces if possible.

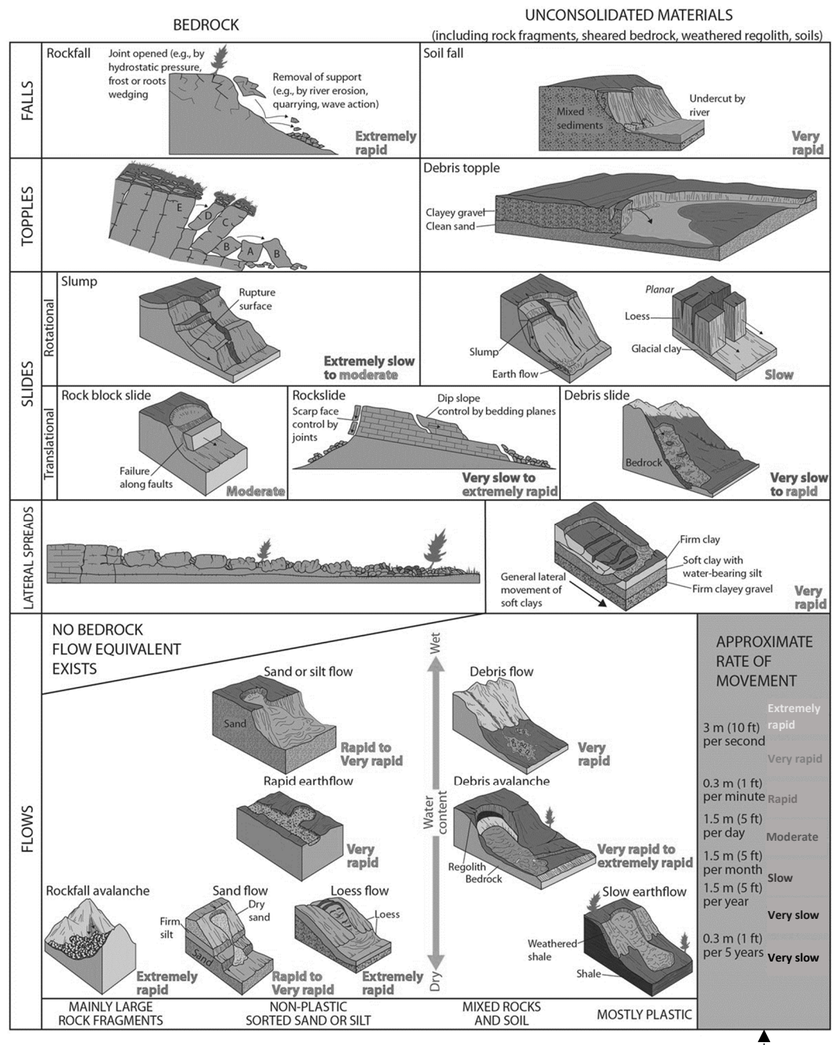
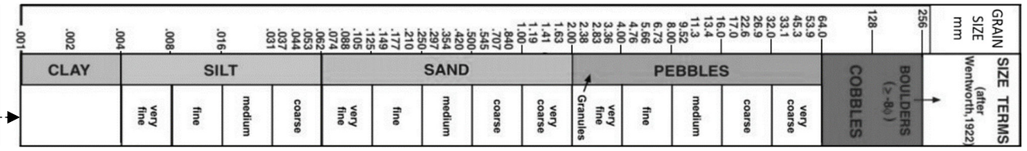
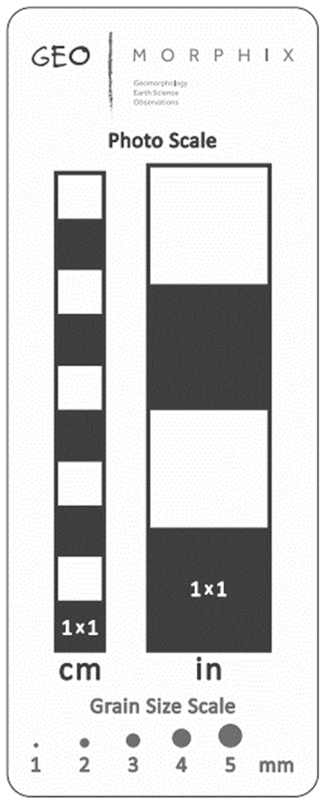


Table 19 Sediment Size





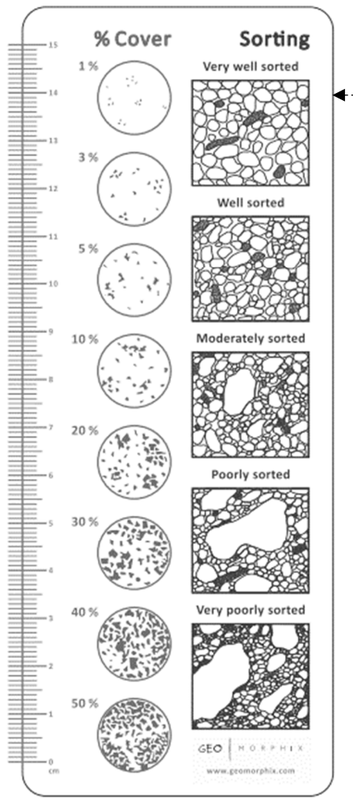


Table 20 Sediment Sorting

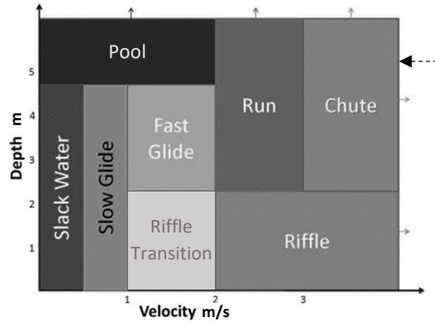


Table 22 Geomorphic Units

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	Size		Measurement	Alluvial
1. Traction	Boulder Cobble	Coarse ↑	Bed Load Trap	Bed
2. Saltation	Gravel Sand			
3. Suspension	Silt Clay	Fine	Water Column Sampler	Bank

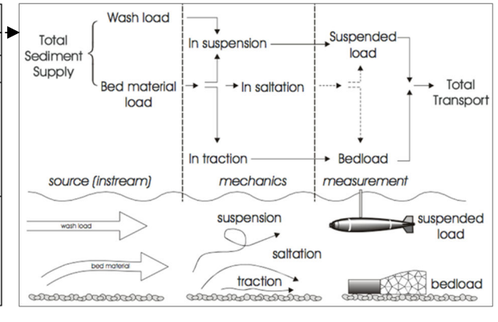


Table 23 Mass Movement

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

GEO MORPHIX

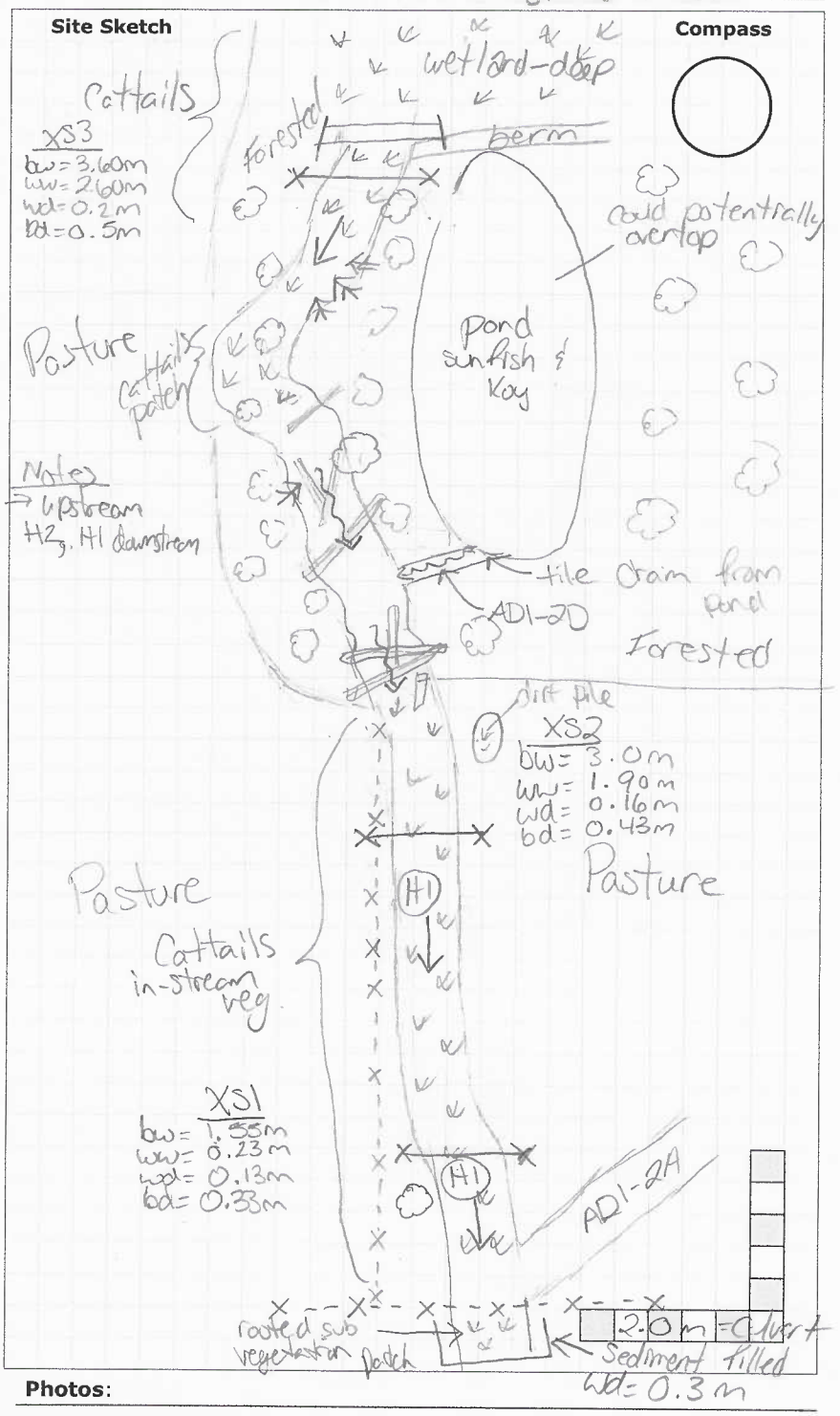
General Site Characteristics

Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	2:00 pm	**Reach:**	AD1-2
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	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

Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX™

Rapid Geomorphic Assessment **Project Number:** 24009

Date:	2024-05-02	**Stream:**	Alloa Drain Tributary
Time:	2:00 PM	**Reach:**	AD1-2
Weather:	Sunny, 18°C	**Location:**	Maydield Road
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	0/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools		✓	
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	0	7	0.0
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		2/8
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	2	6	0.25
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel	✓		
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed		✓	
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.098

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	2:00pm	**Reach:**	AD1-2
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	KA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas) no riffles	• 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☐ 6	☒ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd. Ditch

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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
	N/A • 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
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☒ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Reach Characteristics Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	KA HF	**Watershed/Subwatershed:**	Stobicoke Creek
Time:	2:00pm	**Stream:**	Mimico Creek	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	ADI-2	**UTM (Downstream):**	

Land Use (Table 1): 1/2 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 1/3
Encroachment (Table 7): 4

Coverage	Channel Widths	Age (yrs)
☐ None	☐ 1 - 4	☐ Immature (<5)
☐ Fragmented	☒ 4 - 10 U/S	☒ Established (5-30)
☒ Continuous	☒ > 10 D/S	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1/2
Reach Coverage %: 65

Woody Debris	WD Density
☐ In Cutbank	☒ Low
☒ In Channel	☐ Mod
☐ Not Present	☐ High

WDJ/50m: 1

Water Quality

Odour (Table 16): 1
Turbidity (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1
Gradient (Table 11): 1
Entrenchment (Table 13): 1
Down's Model (Table 15): S
Sed Sorting (Table 20): Well
Transport Mode (Table 21): 3
Geomorphic Units (Table 22): 8/6
Riffle-Pool Spacing (m): N/A

Sinuosity Degree (Table 10): 1
# of Channels (Table 12): 1
Bank Failure (Table 14): N/A
Bankfull Indicators (Table 18): 4/6/1
Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible
% of Bed Active: N/A
Mass Movement (Table 23): N/A % Runs: 95
% Riffles: 5 **% Pools:** 0

Bank Angle	Bank Erosion
☒ 0 – 30	☐ < 5%
☐ 30 – 60	☐ 5 – 30%
☐ 60 – 90	☐ 30 – 60%
☐ Undercut	☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	1.55	3.0	3.66	**Wetted Width (m)**	0.23	1.90	2.66
Bankfull Depth (m)	0.33	0.43	0.50	**Wetted Depth (m)**	0.13	0.16	0.20
Undercuts (m)				**Velocity (m/s)**			
Pool Depth (m)				**Velocity Estimate Method**			
Riffle Length (m)				**Meander Amplitude (m)**			

Notes: → low bank angles making the channel less defined.
→ Cattails heavily encroaching downstream with upstream through forest (fragmented).

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

General Site Characteristics

Project Number: PNJ4009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	1:15pm	**Reach:**	AD2
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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

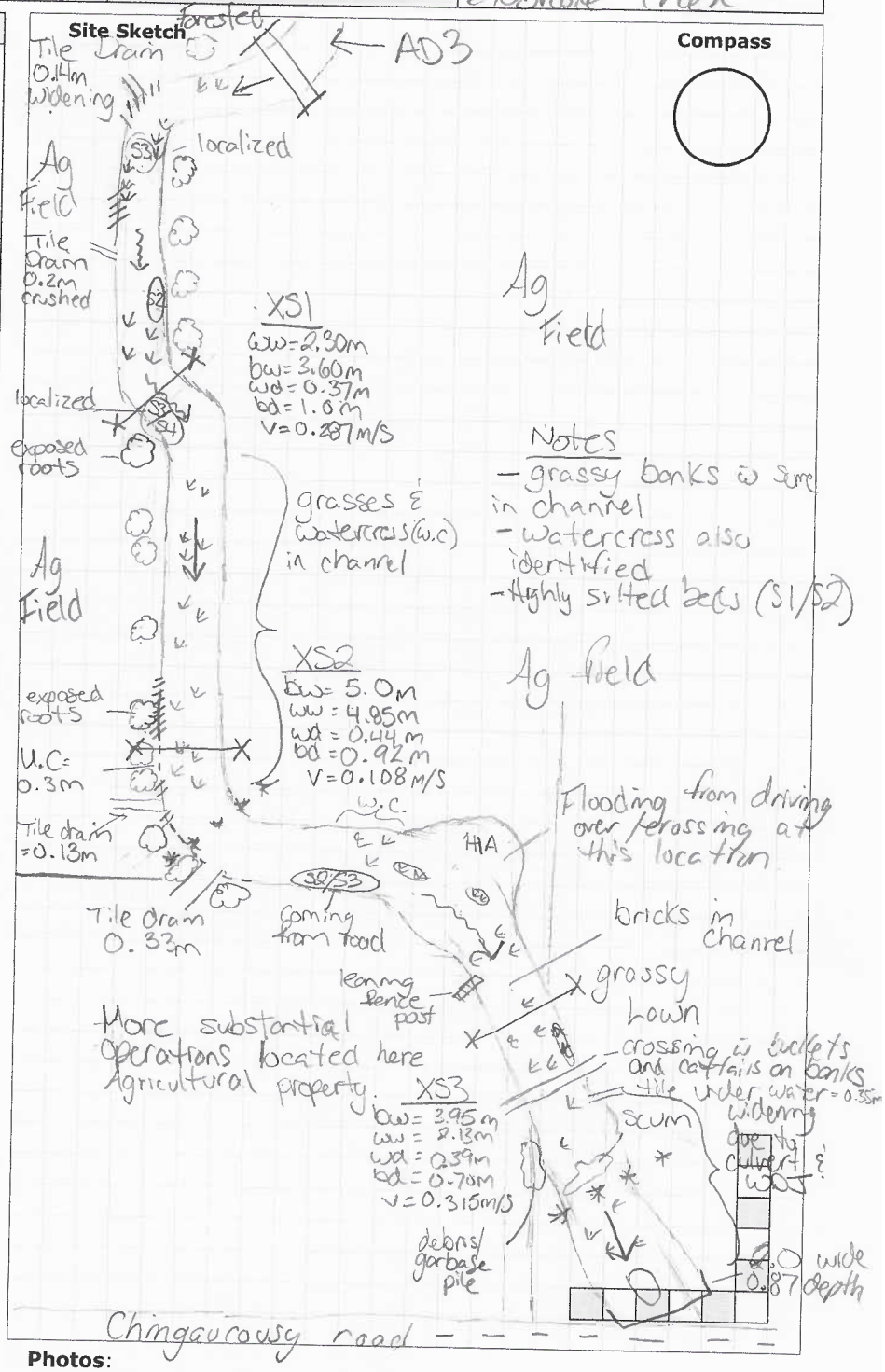
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Site Sketch



Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	1:15 pm	**Reach:**	AD2
Weather:	Sunny, 18°C	**Location:**	Mayfield Road
Field Staff:	RA, HF	**Watershed/Subwatershed:**	Fobicolle Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	2/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials	✓		
	7	Deposition in the overbank zone		✓	
		Sum of indices =	2	5	0.286
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		1/7
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s) (elevated tile drain	✓		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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	6	0.143
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots (only few)		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	7	Length of basal scour >50% through subject reach		✓	
	8	Exposed length of previously buried pipe / cable / etc. (tile drain)	✓		
	9	Fracture lines along top of bank		✓	
	10	Exposed building foundation	N/A		
		Sum of indices =	1	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.174

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	1:15pm	**Reach:**	A02
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA AF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	AR4009	Location:	Mayfield road, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☒ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☒ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

Senior staff sign-off (if required): SSO Checked by: _____ Completed by: [signature]

GEO MORPHIX

Reach Characteristics

Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	1:15 pm	**Stream:**	Alloa Drain	**UTM (Upstream):**	
Weather:	sunny, 18°C	**Reach:**	AD2	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☒ Evidence of Groundwater Location: Watercress Photo: _____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 2

Coverage	Channel Widths	Age (yrs)
☐ None	☒ 1 - 4	☒ Immature (<5)
☐ Fragmented	☐ 4 - 10	☐ Established (5-30)
☒ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 2 | **Reach Coverage %**: 30

Woody Debris	WD Density
☐ In Cutbank	☒ Low
☒ In Channel	☐ Mod
☐ Not Present	☐ High

WDJ/50m: 1

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Gradient** (Table 11): 1 | **Entrenchment** (Table 13): 2 | **Down's Model** (Table 15): S | **Sed Sorting** (Table 20): Well | **Transport Mode** (Table 21): 3 | **Geomorphic Units** (Table 22): 8/6 | **Riffle-Pool Spacing (m):** /

Sinuosity Degree (Table 10): 1 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): 2 | **Bankfull Indicators** (Table 18): 3/5

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: N/A | **Mass Movement** (Table 23): N/A | % runs: 90 | **% Riffles:** 5 | **% Pools:** 5

Bank Angle	Bank Erosion
☐ 0 – 30	☒ < 5%
☐ 30 – 60	☐ 5 – 30%
☒ 60 – 90	☐ 30 – 60%
☐ Undercut	☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☒	☒	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	3.60	5.0	3.95	**Wetted Width (m)**	2.3	4.85	2.13
Bankfull Depth (m)	1.0	0.92	0.70	**Wetted Depth (m)**	0.37	0.44	0.39
Undercuts (m)	0.30	—	—	**Velocity (m/s)**	0.287	0.108	0.515
Pool Depth (m)	0.87	—	—	**Velocity Estimate Method**	Wade	Ball	
Riffle Length (m)	—	—	—	**Meander Amplitude (m)**	—	—	—

Notes: → Straight channel with few riffles. Those few riffles had gravel & cobble but generally the entire reach was composed of runs with clay, silt, & sand (Highly silted).

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

General Site Characteristics

Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	12:25 pm	**Reach:**	AD3
Weather:	sunny, 18°c	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Flow Type

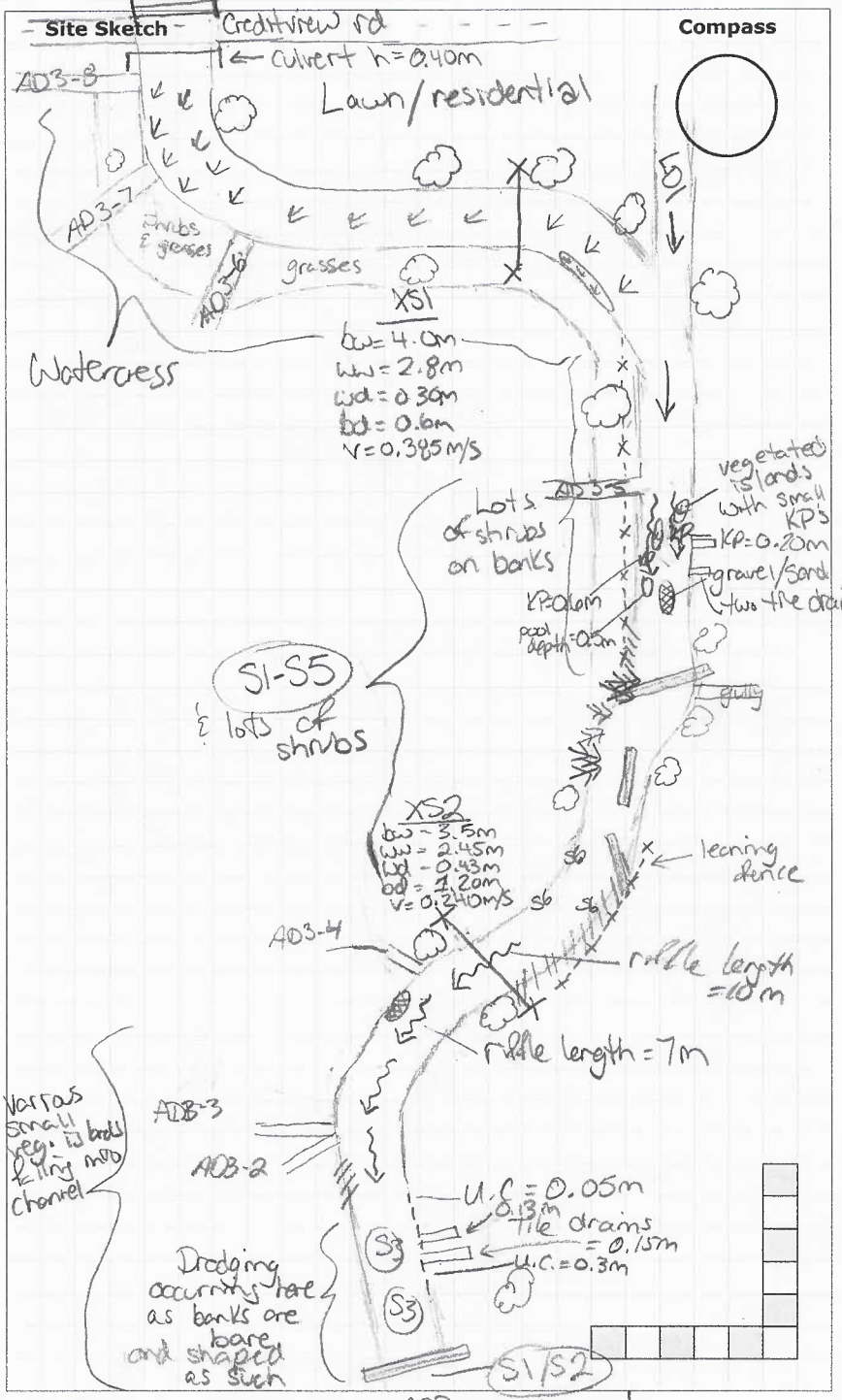
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
H3	Smooth surface flow		
H4	Upwelling		
H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
H8	Chute		
H9	Free fall	**H9A**	Dissipates below free fall

Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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



Photos:

Notes:

GEO MORPHIX

General Site Characteristics

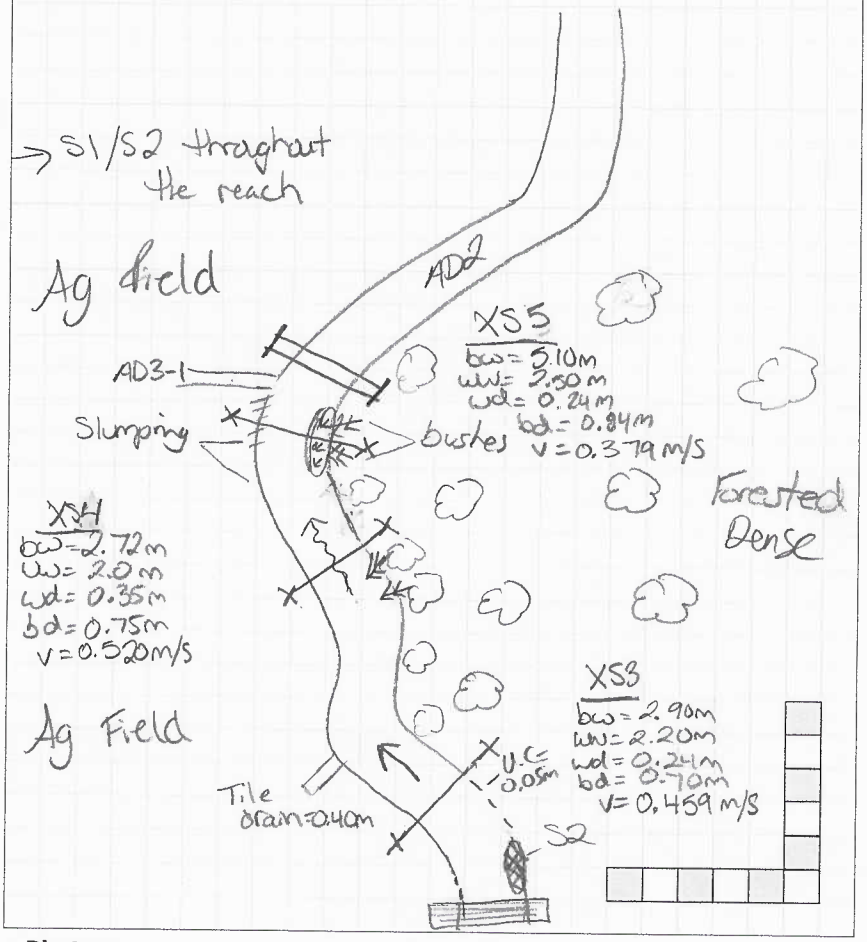
Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	12:25 pm	**Reach:**	AD3
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features	Monitoring
Reach break	Long-profile
Station location	Monumented XS
Cross-section	Monumented photo
Flow direction	Monumented photo direction
Riffle	Sediment sampling
Pool	Erosion pins
Sediment bar	Scour chains
Eroded bank/slope	**Additional Symbols**
Undercut bank	
Bank stabilization	
Leaning tree	
Fence	
Culvert/outfall	
Swamp/wetland	
Grasses	
Tree	
Instream log/tree	
Woody debris	
Beaver dam	
Vegetated island	

Site Sketch

Compass



Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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H5	Rippled		
H6	Unbroken standing wave		
H7	Broken standing wave		
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H9	Free fall	**H9A**	Dissipates below free fall

Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX

Rapid Geomorphic Assessment **Project Number:** 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	12:25 pm	**Reach:**	AD3
Weather:	Sunny, 18°C	**Location:**	Mayfield Road
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	2/9
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials	✓		
	7	Deposition in the overbank zone		✓	
		Sum of indices =	2	5	0.286
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		2/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	2	6	0.25
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.170

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX™

Rapid Stream Assessment Technique Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	12:25pm	**Reach:**	AD3
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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
N/A	• 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
Water Quality	• 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
	• 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 ☒ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☒ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Reach Characteristics

Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	RA ITF	**Watershed/Subwatershed:**	Fishcole Creek
Time:	12:25pm	**Stream:**	Alder Drain	**UTM (Upstream):**	
Weather:	sunny, 18°c	**Reach:**	AD3	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1

☒ Evidence of Groundwater (watercress) Location: _____ Photo: _____

Riparian Vegetation

Dominant Type (Table 6): 2/3
Encroachment (Table 7): 2

Coverage	Channel Widths	Age (yrs)
☐ None	☒ 1 - 4	☐ Immature (<5)
☐ Fragmented	☐ 4 - 10	☒ Established (5-30)
☒ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 2
Reach Coverage %: 10 (watercress)

Woody Debris	WD Density
☐ In Cutbank	☒ Low
☒ In Channel	☐ Mod
☐ Not Present	☐ High

WDJ/50m: 0.5

Water Quality

Odour (Table 16): 6 (Slight: organic)
Turbidity (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 2
Gradient (Table 11): 1
Entrenchment (Table 13): 2
Down's Model (Table 15): S
Sed Sorting (Table 20): Mod
Transport Mode (Table 21): 2/3
Geomorphic Units (Table 22): 5/6/8
Riffle-Pool Spacing (m): N/A

Sinuosity Degree (Table 10): 2
# of Channels (Table 12): 1
Bank Failure (Table 14): 2/6 (localized)
Bankfull Indicators (Table 18): 3/5/1
Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible
% of Bed Active: N/A
Mass Movement (Table 23): 4 % Runs: 65
% Riffles: 25 **% Pools:** 10

Bank Angle	Bank Erosion
☐ 0 - 30	☐ < 5%
☐ 30 - 60	☒ 5 - 30%
☒ 60 - 90	☐ 30 - 60%
☒ Undercut	☐ 60 - 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☒	☒	☒	☐	☐	☐
Pool	☒	☒	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	4.0	3.5	2.90	**Wetted Width (m)**	2.8	2.45	2.20
Bankfull Depth (m)	0.6	1.20	0.70	**Wetted Depth (m)**	0.30	0.43	0.24
Undercuts (m)	0.05	0.30	0.05	**Velocity (m/s)**	0.385	0.240	0.459
Pool Depth (m)	0.50	/	/	**Velocity Estimate Method**	wide bank		
Riffle Length (m)	7	10	/	**Meander Amplitude (m)**	—		

Notes:

XS4
Bw = 2.72 m
ww = 2.0 m
wd = 0.35 m
ba = 0.75 m
v = 0.520 m/s

XS5
bw = 5.10m
ww = 2.50m
wd = 0.24m
ba = 0.84 m
v = 0.379 m/s

→ Various substrate along the bed. Generally clay/silt & sand with coarse sediment in riffles. Pools uncommon, and run dominant
→ generally straight / altered by humans
→ some areas dredged / dug recently.

Photos:

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

GEO MORPHIX

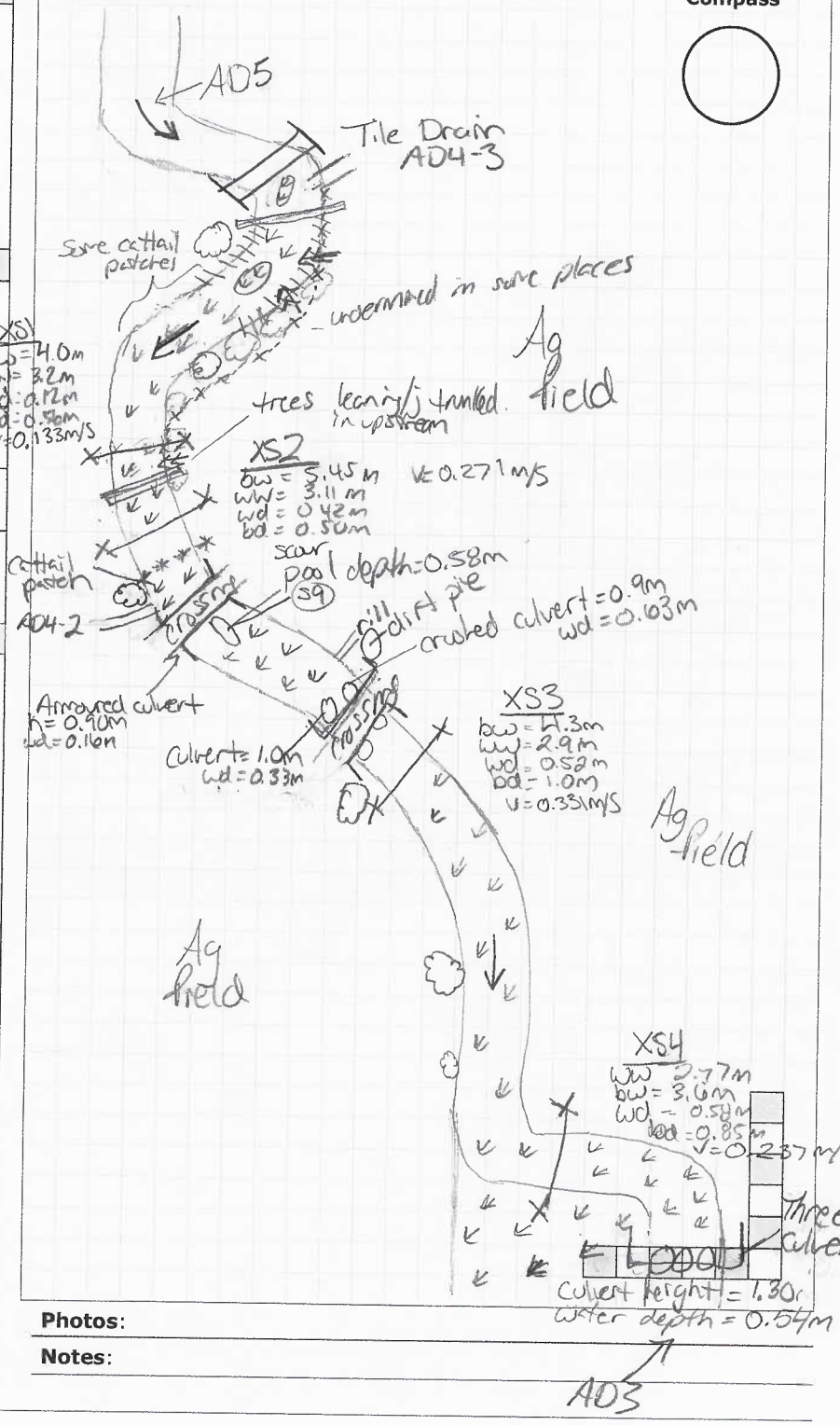
General Site Characteristics

Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	11:30 AM	**Reach:**	AD4
Weather:	sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	11:35 AM	**Reach:**	AD4
Weather:	Sunny, 18°	**Location:**	Mayfield Road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		1/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets	✓		
	6	Cut face on bar forms		✓	
	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	5	0.167
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		2/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	7	Length of basal scour >50% through subject reach		✓	
	8	Exposed length of previously buried pipe / cable / etc. (tiles)	✓		
	9	Fracture lines along top of bank		✓	
	10	Exposed building foundation	N/A		
		Sum of indices =	2	6	0.25
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.176

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	11:30 AM	**Reach:**	AD4
Weather:	sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	no riffles • > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• ~~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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas (No riffles)	• 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 (runs generally)	• 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 (N/A)	• 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
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☒ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Reach Characteristics

Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	RA HF	**Watershed/Subwatershed:**	Fishercole Creek
Time:	11:20 AM	**Stream:**	Alloa Dam	**UTM (Upstream):**	
Weather:	Sunny, 18°c	**Reach:**	AD4	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 4

Coverage	Channel Widths	Age (yrs)
☐ None	☒ 1 - 4	☐ Immature (<5)
☐ Fragmented	☐ 4 - 10	☒ Established (5-30)
☒ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1 | **Reach Coverage %**: 20

Woody Debris	WD Density
☐ In Cutbank	☒ Low
☒ In Channel	☐ Mod
☐ Not Present	☐ High

WDJ/50m: 0.5

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Gradient** (Table 11): 1 | **Entrenchment** (Table 13): 2 | **Down's Model** (Table 15): 5 | **Sed Sorting** (Table 20): well | **Transport Mode** (Table 21): 3 | **Geomorphic Units** (Table 22): 8 | **Riffle-Pool Spacing (m)**: N/A

Sinuosity Degree (Table 10): 1 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): N/A | **Bankfull Indicators** (Table 18): 3/6/5

Bank Angle: ☐ 0 - 30 | ☐ 30 - 60 | ☒ 60 - 90 | ☐ Undercut

Bank Erosion: ☒ < 5% | ☐ 5 - 30% | ☐ 30 - 60% | ☐ 60 - 100%

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: N/A

Mass Movement (Table 23): N/A | % nns: 180

% Riffles: 0 | **% Pools**: 0

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

			XS3	XS4				XS4
Bankfull Width (m)	4.0	5.45	4.3	3.6	**Wetted Width (m)**	3.2	3.11	2.9	2.77
Bankfull Depth (m)	0.56	0.50	1.0	0.85	**Wetted Depth (m)**	0.12	0.42	0.52	0.58
Undercuts (m)					**Velocity (m/s)**	0.133	0.271	0.331	0.237
Pool Depth (m)	0.58				**Velocity Estimate Method**	Riffle Bar			
Riffle Length (m)					**Meander Amplitude (m)**				

Notes:
→ Channel through ag fields, Riparian veg encroaching on channel with lots of instream grasses
→ Multiple crossings and nn dominant
→ silted bed and banks.

Photos:

Version #4
Last edited: 04/04/2023

Senior staff sign-off (if required): SSO | Checked by: _____ | Completed by: RA

GEO MORPHIX™

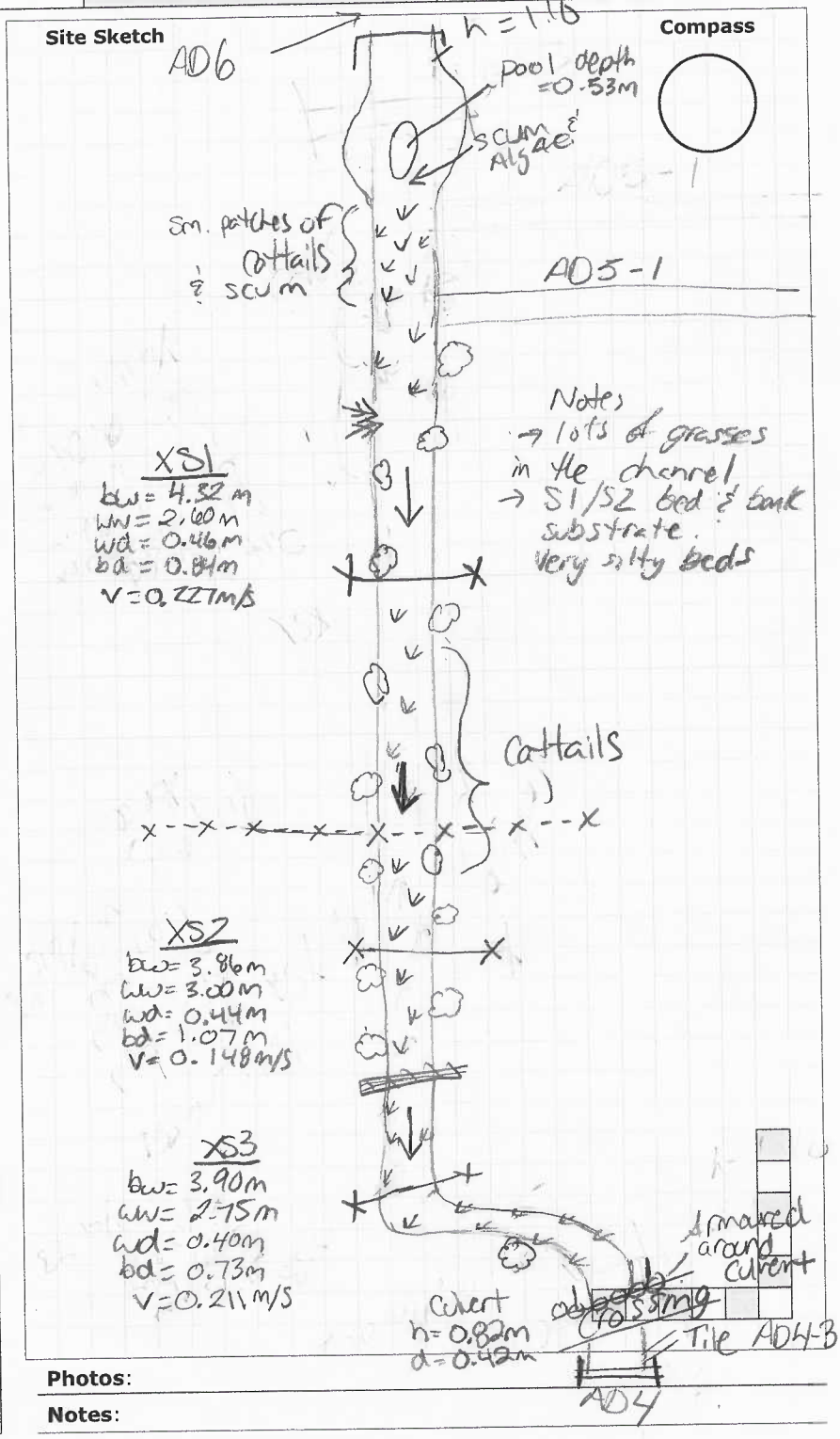
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	11:15 pm	**Reach:**	AD5
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Compass

Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	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

Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX™

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	11:10 AM	**Reach:**	AD5
Weather:	Sunny, 18°C	**Location:**	Mayfield Road, Alloa
Field Staff:	RA, HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)		N/A	1/6
	2	Exposed sanitary / storm sewer / pipeline / etc.		N/A	
	3	Elevated storm sewer outfall(s)		N/A	
	4	Undermined gabion baskets / concrete aprons / etc.		N/A	
	5	Scour pools downstream of culverts / storm sewer outlets	✓		
	6	Cut face on bar forms		✓	
	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	5	0.167
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.		N/A	
	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		N/A	
		Sum of indices =	1	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed			
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.145

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: PN24009

Date:	2024-05-02	**Stream:**	Alma Drain
Time:	11:15 pm	**Reach:**	AD5
Weather:	sunny, 18°c	**Location:**	Mayfield rd, Alma
Field Staff:	RA HF	**Watershed/Subwatershed:**	Fabrcolle Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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 tall banks	• 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
	• 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	• 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 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	• Channel cross-section is generally V- or U-shaped Tall banks	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☐ 8	☒ 9 ☐ 10 ☐ 11
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas) no riffles	• 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks Some sand in channel	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• ~~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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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 (No riffle)
	• 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 runs 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 (N/A)	• 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
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☒ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Reach Characteristics

Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	KA HF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	11:15pm	**Stream:**	Alloa Drain	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	AD5	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 1 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 3

Coverage: ☐ None ☐ Fragmented ☒ Continuous

Channel Widths: ☒ 1 - 4 ☐ 4 - 10 ☐ > 10

Age (yrs): ☐ Immature (<5) ☒ Established (5-30) ☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1 | **Reach Coverage %**: 25

Woody Debris: ☐ In Cutbank ☒ In Channel ☐ Not Present

WD Density: ☒ Low ☐ Mod ☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Sinuosity Degree** (Table 10): 1 | **Gradient** (Table 11): 1 | **# of Channels** (Table 12): 1 | **Entrenchment** (Table 13): 2 | **Bank Failure** (Table 14): N/A | **Down's Model** (Table 15): S | **Bankfull Indicators** (Table 18): 3/5 | **Sed Sorting** (Table 20): Well | **Sediment Transport Observed?** ☐ Yes ☒ No ☐ Not Visible | **Transport Mode** (Table 21): 3 | **% of Bed Active**: N/A | **Geomorphic Units** (Table 22): 8 | **Mass Movement** (Table 23): N/A | % Fines: 100 | **Riffle-Pool Spacing (m):** / | **% Riffles:** 0 | **% Pools:** 0

Bank Angle: ☐ 0 - 30 ☐ 30 - 60 ☒ 60 - 90 ☐ Undercut

Bank Erosion: ☒ < 5% ☐ 5 - 30% ☐ 30 - 60% ☐ 60 - 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	4.32	3.86	3.90	**Wetted Width (m)**	2.60	3.00	2.75
Bankfull Depth (m)	0.84	1.07	0.73	**Wetted Depth (m)**	0.46	0.44	0.40
Undercuts (m)				**Velocity (m/s)**	0.227	0.148	0.211
Pool Depth (m)	0.53			**Velocity Estimate Method**	Wade	Ball	
Riffle Length (m)				**Meander Amplitude (m)**			

Notes: → riparian vegetation encroaching into channel. Very grassy
→ Run dominant with steep banks.

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

General Site Characteristics

Project Number: PN2400a

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:50 AM	**Reach:**	AD6
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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

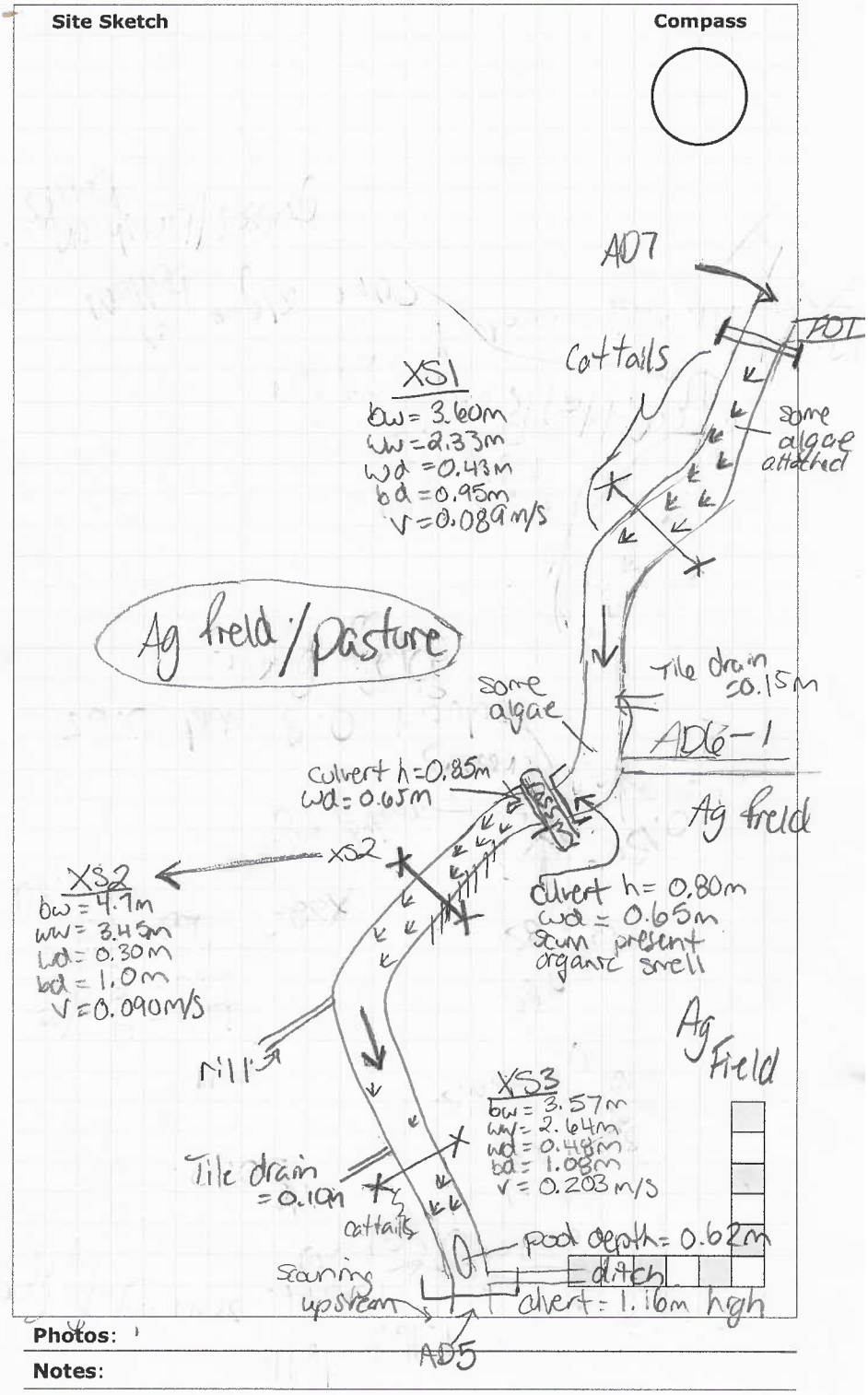
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Site Sketch



Photos:

Notes:

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX™

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:50 AM	**Reach:**	AD6
Weather:	sunny, 18°C	**Location:**	Mayfield Road, Alloa
Field Staff:	RA ITF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	1	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.103

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: PN2409

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:50 AM	**Reach:**	AD6
Weather:	Sunny, 18°c	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8

no riffles

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd, A1/6a

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• ~~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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☒ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics Project Number: PN24009

Date:	2024-05-02	**Field Staff:**	RA MF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	10:50 AM	**Stream:**	Alloa Drain	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	AD6	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 2

Coverage	Channel Widths	Age (yrs)
☐ None	☒ 1 - 4	☐ Immature (<5)
☐ Fragmented	☐ 4 - 10	☒ Established (5-30)
☒ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1/6 | **Reach Coverage %**: 45

Woody Debris	WD Density
☐ In Cutbank	☐ Low
☐ In Channel	☐ Mod
☒ Not Present	☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 2 | **Sinuosity Degree** (Table 10): 2 | **Gradient** (Table 11): 1 | **# of Channels** (Table 12): 1 | **Entrenchment** (Table 13): 2 | **Bank Failure** (Table 14): N/A | **Down's Model** (Table 15): S | **Bankfull Indicators** (Table 18): B/S | **Sed Sorting** (Table 20): Well | **Sediment Transport Observed?** ☐ Yes ☒ No ☐ Not Visible | **Transport Mode** (Table 21): S | **% of Bed Active**: N/A | **Geomorphic Units** (Table 22): 8 | **Mass Movement** (Table 23): N/A | % runs: 100 | **Riffle-Pool Spacing (m)**: N/A | **% Riffles**: 0 | **% Pools**: 0

Bank Angle	Bank Erosion
☐ 0 – 30	☒ < 5%
☐ 30 – 60	☐ 5 – 30%
☒ 60 – 90	☐ 30 – 60%
☐ Undercut	☐ 60 – 100%

(Table 19)

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	3.60	4.7	3.57	**Wetted Width (m)**	2.33	3.45	2.64
Bankfull Depth (m)	0.95	1.0	1.08	**Wetted Depth (m)**	0.43	0.30	0.48
Undercuts (m)				**Velocity (m/s)**	0.089	0.090	0.203
Pool Depth (m)	0.62			**Velocity Estimate Method**	Wade	Ball	
Riffle Length (m)				**Meander Amplitude (m)**			

Notes: → Run dominant reach with some algae along the bed. Cattails were also present in small patches throughout the reach. Grasses (riparian) also encroaching within the channel.
→ Bed silted.

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

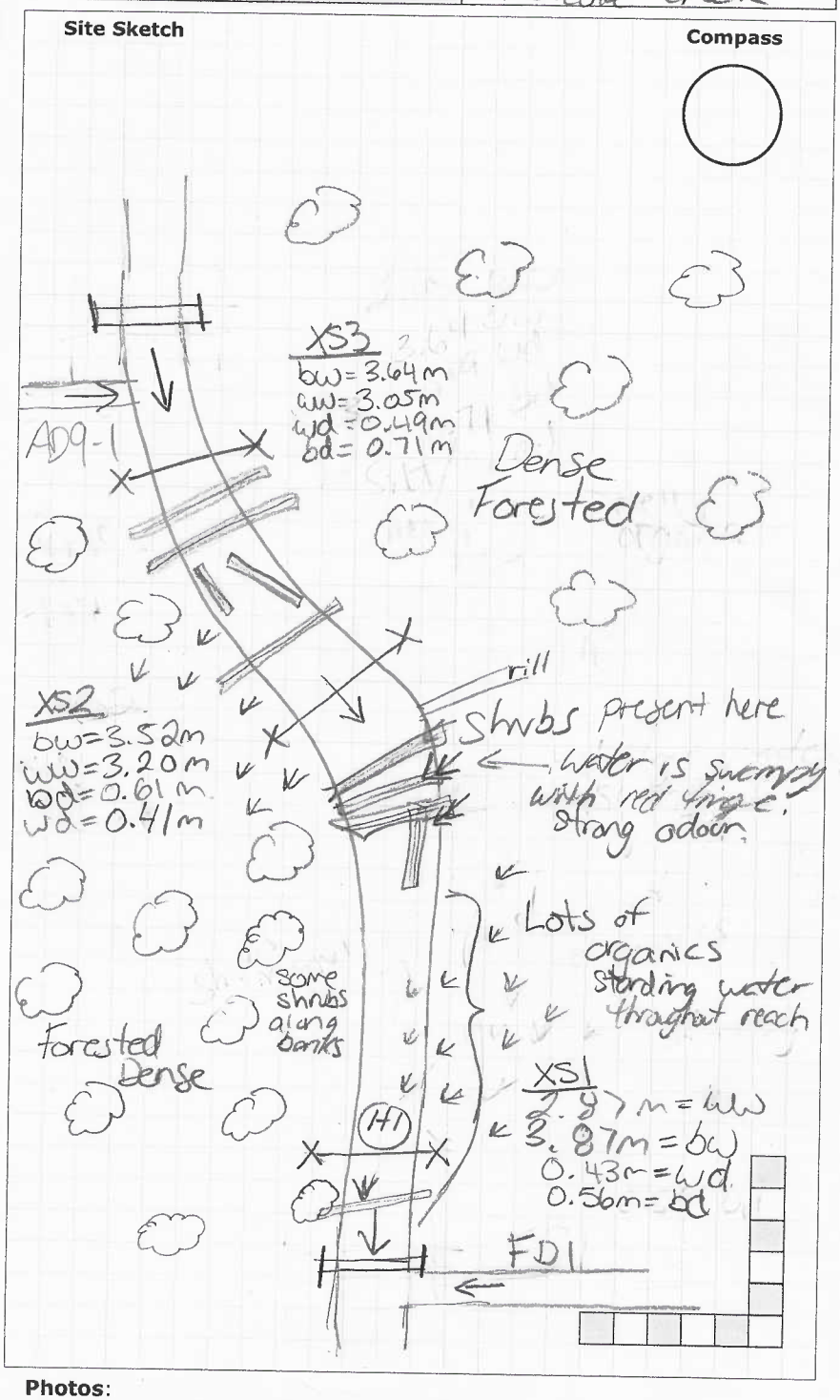
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:25 AM	**Reach:**	AD7
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	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

Photos:

Notes: S1/S2 bed & bank substrate

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:25 AM	**Reach:**	AD7
Weather:	sunny, 18°C	**Location:**	May Field road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/5
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets	N/A		
	6	Cut face on bar forms		✓	
	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 =	0	5	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		3/8
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	3	5	0.375
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.165

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: N2400 9

Date:	2024-05-02	**Stream:**	Alloa Drain
Time:	10:25 AM	**Reach:**	A07
Weather:	Sunny, 18°C	**Location:**	Mayfield rd, Alloa
Field Staff:	RA MF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☐ 6	☒ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	PN24009	Location:	Mayfield rd, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• ~~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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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	☒ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☒ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics

Project Number:

Date:	2024-05-02	**Field Staff:**	KA HF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	10:25 AM	**Stream:**	Alloa Drain	**UTM (Upstream):**	
Weather:	sunny, 18°C	**Reach:**	907	**UTM (Downstream):**	

Land Use (Table 1): 1 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 1/2

Encroachment (Table 7): 2

Coverage: ☐ None; ☐ Fragmented; ☒ Continuous

Channel Widths: ☐ 1 - 4; ☒ 4 - 10; ☒ > 10

Age (yrs): ☐ Immature (<5); ☐ Established (5-30); ☒ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): N/A

Reach Coverage %: 0

Woody Debris: ☐ In Cutbank; ☒ In Channel; ☐ Not Present

WD Density: ☐ Low; ☒ Mod; ☐ High

WDJ/50m: 1

Water Quality

Odour (Table 16): 6 organic

Turbidity (Table 17): 3

Channel Characteristics

Sinuosity Type (Table 9): 1

Gradient (Table 11): 1

Entrenchment (Table 13): 1

Down's Model (Table 15): S

Sed Sorting (Table 20): well

Transport Mode (Table 21): 3

Geomorphic Units (Table 22):

Riffle-Pool Spacing (m): /

Sinuosity Degree (Table 10): 2

# of Channels (Table 12): 1

Bank Failure (Table 14): N/A

Bankfull Indicators (Table 18): 3/5/6

Sediment Transport Observed?: ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: N/A

Mass Movement (Table 23): N/A

% Riffles: 0

Bank Angle: ☐ 0 – 30; ☐ 30 – 60; ☒ 60 – 90; ☐ Undercut

Bank Erosion: ☒ < 5%; ☐ 5 – 30%; ☐ 30 – 60%; ☐ 60 – 100%

% Pools: 0

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	3.87	3.52	3.64	**Wetted Width (m)**	2.87	3.20	3.05
Bankfull Depth (m)	0.56	0.61	0.71	**Wetted Depth (m)**	0.43	0.41	0.49
Undercuts (m)				**Velocity (m/s)**			
Pool Depth (m)				**Velocity Estimate Method**			
Riffle Length (m)				**Meander Amplitude (m)**			

Notes: → Run dominant with highly silted beds.
→ Lots of organics in standing water with scum.

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

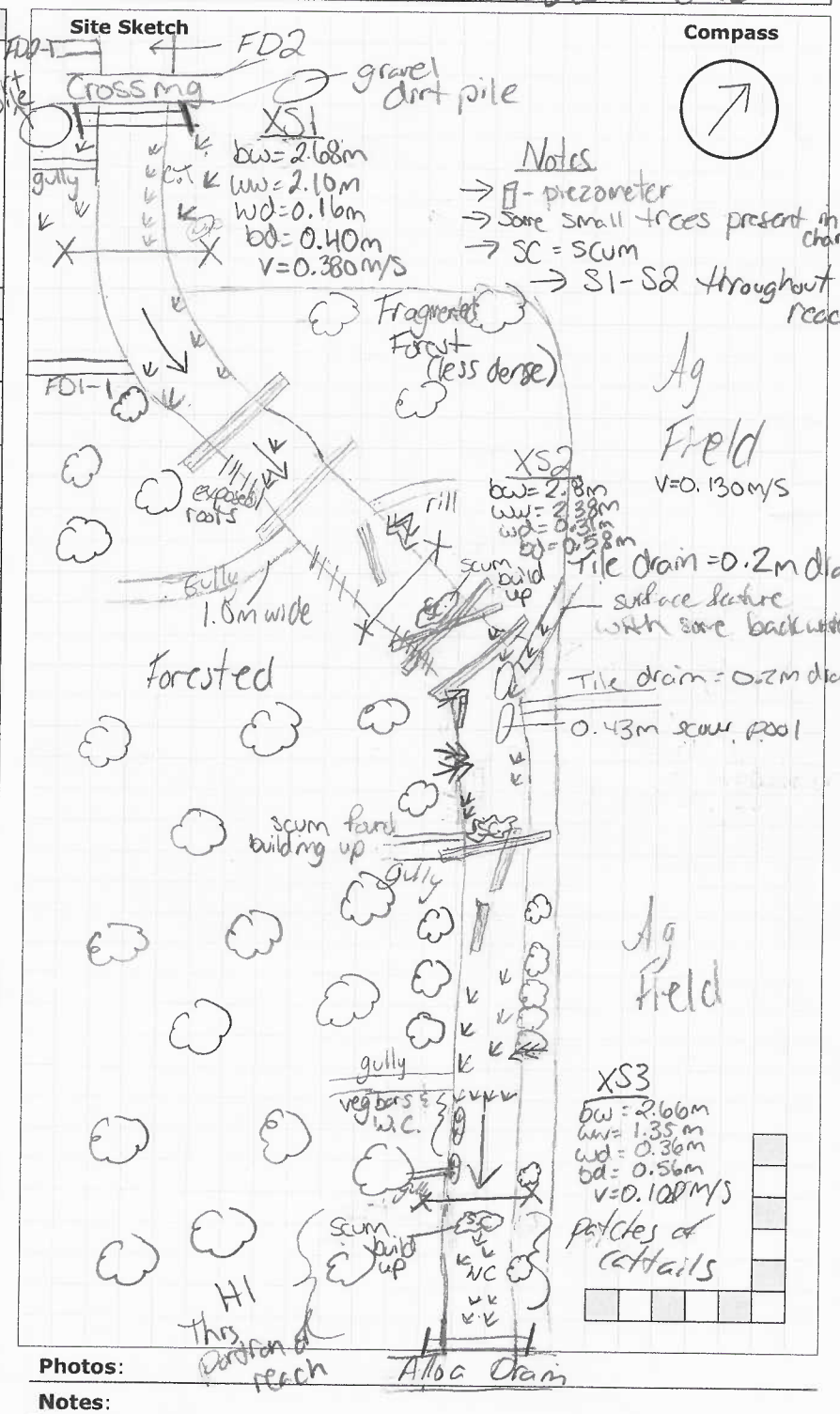
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Fraser Drain
Time:	9:55 AM	**Reach:**	FD1
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Eastbrooke Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch



Photos:

Notes:

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

GEO MORPHIX

Rapid Geomorphic Assessment **Project Number:** 24009

Date:	2024-05-02	**Stream:**	Fraser Drain
Time:	9:55 AM	**Reach:**	FD1
Weather:	sunny, 18°c	**Location:**	Mayfield road
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		4/8
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	4	4	0.50
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.197

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Fraser Drain
Time:	9:55 AM	**Reach:**	FD1
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	24009	Location:	Mayfield road, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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	☐ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☒ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

Total overall score (0–42) = 20	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics

Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA MF	**Watershed/Subwatershed:**	Ethelbicolle Creek
Time:	9:55 AM	**Stream:**	Fraser Dram	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	FD1	**UTM (Downstream):**	

Land Use (Table 1): 1/3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☒ Evidence of Groundwater Location: minimal watercress Photo: _____

Riparian Vegetation

Dominant Type (Table 6): 1/4 | **Encroachment** (Table 7): 2

Coverage: ☐ None ☐ Fragmented ☒ Continuous

Channel Widths: ☒ 1 - 4 ☐ 4 - 10 ☒ > 10

Age (yrs): ☐ Immature (<5) ☒ Established (5-30) ☒ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1/2 | **Reach Coverage %**: 40

Woody Debris: ☐ In Cutbank ☒ In Channel ☐ Not Present

WD Density: ☒ Low ☐ Mod ☐ High

WDJ/50m: 1

Water Quality

Odour (Table 16): b organic

Turbidity (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1

Sinuosity Degree (Table 10): 1

Gradient (Table 11): 1

# of Channels (Table 12): 1

Entrenchment (Table 13): 2

Bank Failure (Table 14): /

Down's Model (Table 15): S

Bankfull Indicators (Table 18): 5/3

Sed Sorting (Table 20): Well

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

Transport Mode (Table 21): 3

% of Bed Active: /

Geomorphic Units (Table 22): 8

Mass Movement (Table 23): /

% Runs: 95

Riffle-Pool Spacing (m): /

% Riffles: 0 **% Pools:** 5

Bank Angle: ☐ 0 - 30 ☒ 30 - 60 ☐ 60 - 90 ☐ Undercut

Bank Erosion: ☐ < 5% ☒ 5 - 30% ☐ 30 - 60% ☐ 60 - 100%

(Table 19)

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	2.68	2.80	2.66	**Wetted Width (m)**	2.10	2.38	1.35
Bankfull Depth (m)	0.40	0.58	0.56	**Wetted Depth (m)**	0.16	0.31	0.36
Undercuts (m)		N/A		**Velocity (m/s)**	0.380	0.130	0.102
Pool Depth (m)	Scour pool 0.43		N/A	**Velocity Estimate Method**	Wiffle Ball		
Riffle Length (m)		N/A		**Meander Amplitude (m)**		N/A	

Notes:

- ☆ On left bank herbaceous vegetation that is established and narrow wide treed mature on R.B.
- → Scum was observed at some woody debris pile ups
- → Gullies and rill commonly observed (multiple)
- → Few bars were also present with sand deposited
- → Bed heavily silted with sand.
- → Possible lateral migration at some point however not evident currently

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Fraser Drain
Time:	9:25 AM	**Reach:**	FD2
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Elbow Creek

Features
- 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
- Woody debris
- Beaver dam
- Vegetated island

Monitoring
- Long-profile
- Monumented XS
- Monumented photo
- Monumented photo direction
- Sediment sampling
- Erosion pins
- Scour chains

Additional Symbols

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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

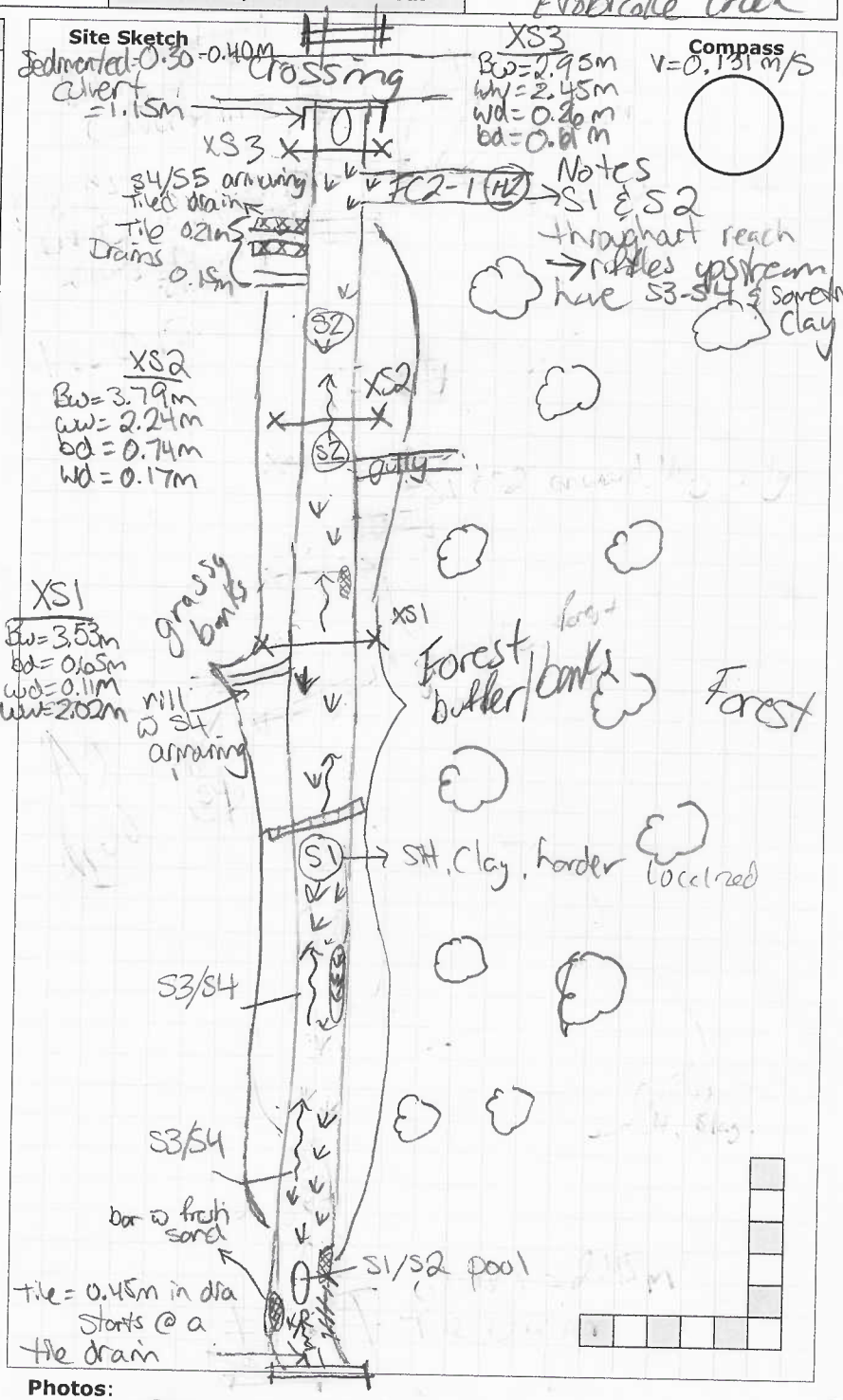
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Site Sketch



Photos:

Notes: KP right after drain

→ Sand common in channel. Also silty throughout reach.

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Fraser Drain
Time:	9:25 AM	**Reach:**	FD2
Weather:	sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA, HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars (one bar accretion)		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/5
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets	N/A		
	6	Cut face on bar forms		✓	
	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 =	0	5	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc. (some leaning)	✓		3/8
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	3	5	0.375
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.165

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX™

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Fraser Dam
Time:	9:25 AM	**Reach:**	FD2
Weather:	Sunny, 18°C	**Location:**	Mayfield Road, Alba
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	24009	Location:	Mayfield Road Alley

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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 N/A	• 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
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☒ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

Total overall score (0–42) = 20	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics

Project Number: 24009

Date:	2024-05-02	**Field Staff:**	KA AF	**Watershed/Subwatershed:**	E Fabricola Creek
Time:	9:25 AM	**Stream:**	Fraser Drain	**UTM (Upstream):**	
Weather:	sunny, 18°C	**Reach:**	FD2	**UTM (Downstream):**	

Land Use (Table 1): 1/3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 1 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 1/3 | **Encroachment** (Table 7): 2

Coverage: ☐ None; ☒ Fragmented; ☒ Continuous

Channel Widths: ☒ 1 - 4; ☐ 4 - 10; ☒ > 10

Age (yrs): ☐ Immature (<5); ☒ Established (5-30); ☒ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1/2 | **Reach Coverage %**: 20

Woody Debris: ☐ In Cutbank; ☒ In Channel; ☐ Not Present

WD Density: ☒ Low; ☐ Mod; ☐ High

WDJ/50m: 0

Possible grasses (riparian)

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Gradient** (Table 11): 1 | **Entrenchment** (Table 13): 2 | **Down's Model** (Table 15): S | **Sed Sorting** (Table 20): Mod | **Transport Mode** (Table 21): 3 | **Geomorphic Units** (Table 22): 6/8 | **Riffle-Pool Spacing (m):** /

Sinuosity Degree (Table 10): 1 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): 1 few | **Bankfull Indicators** (Table 18): 5/3/4

Bank Angle: ☐ 0 - 30; ☐ 30 - 60; ☒ 60 - 90; ☐ Undercut

Bank Erosion: ☒ < 5%; ☐ 5 - 30%; ☐ 30 - 60%; ☐ 60 - 100%

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: N/A

Mass Movement (Table 23): N/A | % rms: 75

% Riffles: 20 | **% Pools:** 5

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☒	☒	☐	☐	☐
Pool	☒	☒	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	3.53	3.79	2.95	**Wetted Width (m)**	2.02	2.24	2.45
Bankfull Depth (m)	0.65	0.74	0.61	**Wetted Depth (m)**	0.11	0.17	0.26
Undercuts (m)	—	N/A	—	**Velocity (m/s)**	/	/	0.131
Pool Depth (m)	—	—	—	**Velocity Estimate Method**	Wade	Bank	
Riffle Length (m)	—	—	—	**Meander Amplitude (m)**	—	N/A	—

Notes:
→ Silty/sandy bed substrate with few riffles. Riffles upstream had gravel and cobbles.
→ lack of pools since it was run dominant (1 scour pool identified)
→ banks stable with 60% of vegetation
→ Forested on R.B with grassy L.B. and some minimal encroachment of grasses in channel.

Photos:

Version #4
Last edited: 04/04/2023

Senior staff sign-off (if required): SSO | Checked by: _____ | Completed by: KA

GEO MORPHIX

General Site Characteristics

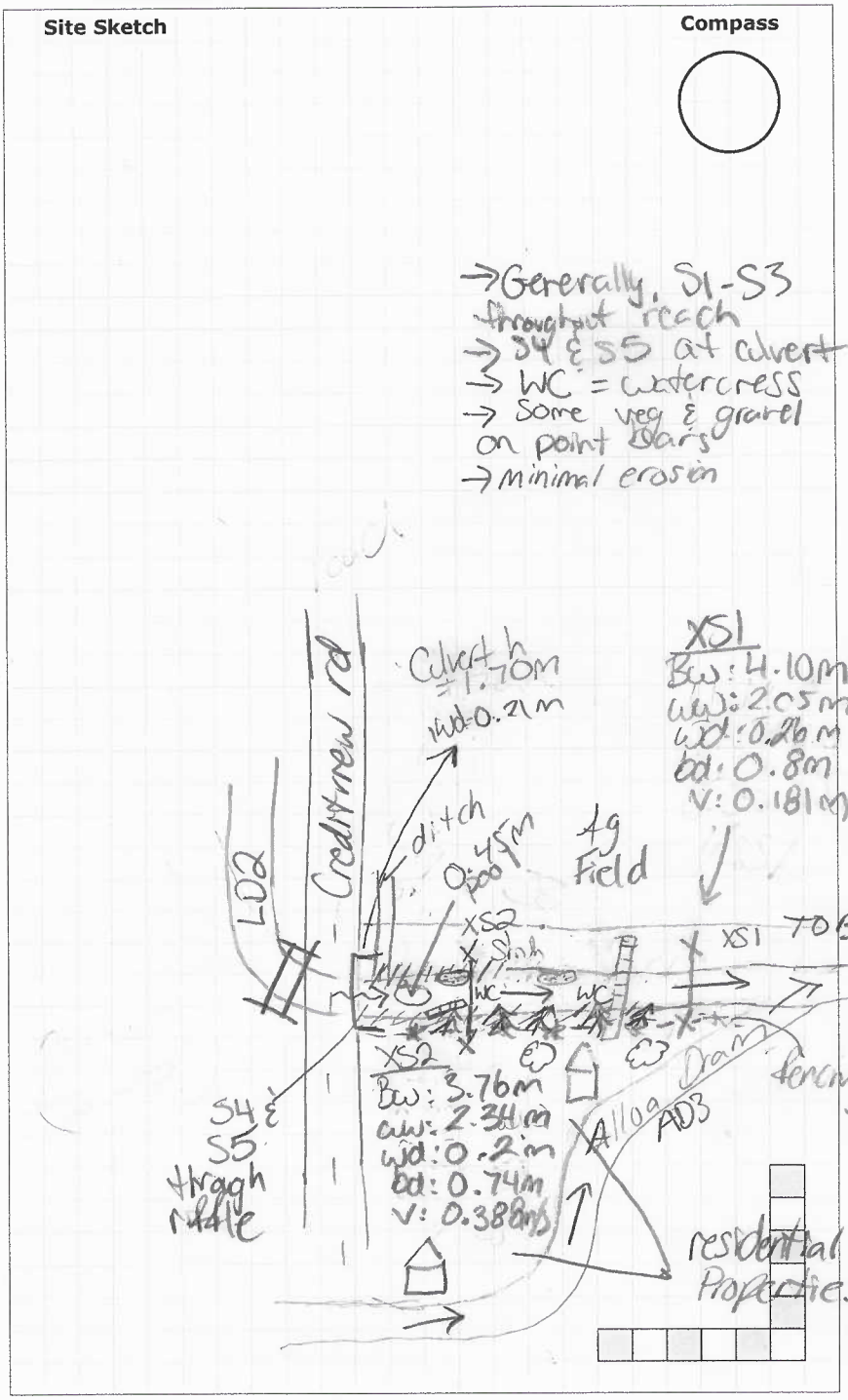
Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:45 pm 18°c	**Reach:**	LD1
Weather:	Sunny	**Location:**	Mayfield rd, Alloa
Field Staff:	LA HF	**Watershed/Subwatershed:**	Elbow Creek

Features		Monitoring	
	Reach break		Long-profile
	Station location		Monumented XS
	Cross-section		Monumented photo
	Flow direction		Monumented photo direction
	Riffle		Sediment sampling
	Pool		Erosion pins
	Sediment bar		Scour chains
	Eroded bank/slope	**Additional Symbols**	
	Undercut bank		
	Bank stabilization		
	Leaning tree		
	Fence		
	Culvert/outfall		
	Swamp/wetland		
	Grasses		
	Tree		
	Instream log/tree		
	Woody debris		
	Beaver dam		
	Vegetated island		

Site Sketch

Compass



Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	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

Photos:

Notes:

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:45 pm	**Reach:**	LD1
Weather:	Sunny, 18°C	**Location:**	Mayfield Road, Alloa
Field Staff:	RA, HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools		✓	
	4	Medial bars		✓	
	5	Accretion on point bars - minimally bars present	✓		
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	1	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	0/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed		✓	
		Sum of indices =	0	7	0.0

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.067

In Regime	In Transition/Stress	In Adjustment
☑ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:45 pm	**Reach:**	D1
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Bobcaygeon Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 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	• 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

Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8

GEO MORPHIX

Date:	2024-05-02	PN:	24009	Location:	Mayfield road A100

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	One riffle ← • 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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
	One pool • 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 N/A
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☒ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA HF	**Watershed/Subwatershed:**	Ettbrooke Creek
Time:	2:45pm	**Stream:**	Lyons Drain	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	LD1	**UTM (Downstream):**	

Land Use (Table 1): 4/7 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 3 | **Flow Type** (Table 5): 1 | ☒ Evidence of Groundwater Location: Central of reach Photo: 144617 E 144835

Riparian Vegetation

Dominant Type (Table 6): 1/2
Encroachment (Table 7): 2

Coverage: ☐ None ☒ Fragmented ☐ Continuous
Channel Widths: ☒ 1 - 4 ☐ 4 - 10 ☐ > 10
Age (yrs): ☐ Immature (<5) ☐ Established (5-30) ☒ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 2
Reach Coverage %: 20

Woody Debris: ☐ In Cutbank ☒ In Channel ☐ Not Present
WD Density: ☒ Low ☐ Mod ☐ High
WDJ/50m: 0

Water Quality

Odour (Table 16): 1
Turbidity (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1
Gradient (Table 11): 1
Entrenchment (Table 13): 2
Down's Model (Table 15): S
Sed Sorting (Table 20): Mod
Transport Mode (Table 21): 2.
Geomorphic Units (Table 22): 8
Riffle-Pool Spacing (m): N/A

Sinuosity Degree (Table 10): 1
# of Channels (Table 12): 1
Bank Failure (Table 14): N/A
Bankfull Indicators (Table 18): 6/3/5
Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible
% of Bed Active: N/A
Mass Movement (Table 23):
% Riffles: 5 **% Pools:** 5

Bank Angle: ☐ 0 - 30 ☒ 30 - 60 ☐ 60 - 90 ☐ Undercut
Bank Erosion: ☒ < 5% ☐ 5 - 30% ☐ 30 - 60% ☐ 60 - 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank (Artifical)	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☒	☒	☐	☐	☐
Pool	☒	☒	☒	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☒	☐	☐	☐	☐

Bankfull Width (m)	4.10	3.76		**Wetted Width (m)**	2.05	2.34
Bankfull Depth (m)	0.8	0.74		**Wetted Depth (m)**	0.26	0.20
Undercuts (m)				**Velocity (m/s)**	0.181	0.388
Pool Depth (m)	0.45			**Velocity Estimate Method**	Wade	Wade
Riffle Length (m)				**Meander Amplitude (m)**		

% runs: 90

Notes:
→ There was are pool/riffle sequence observed at the culvert
→ Leaning trees & shrubs were observed on right bank while grasses (restablished) dominantes the left bank.
→ Small reach (reach break @ road)
→ Silty/Sandy bed with some bar formation (sand, gravel, vegetation on bars)
→ Minimal erosion throughout depite leaning trees on right bank.

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX™

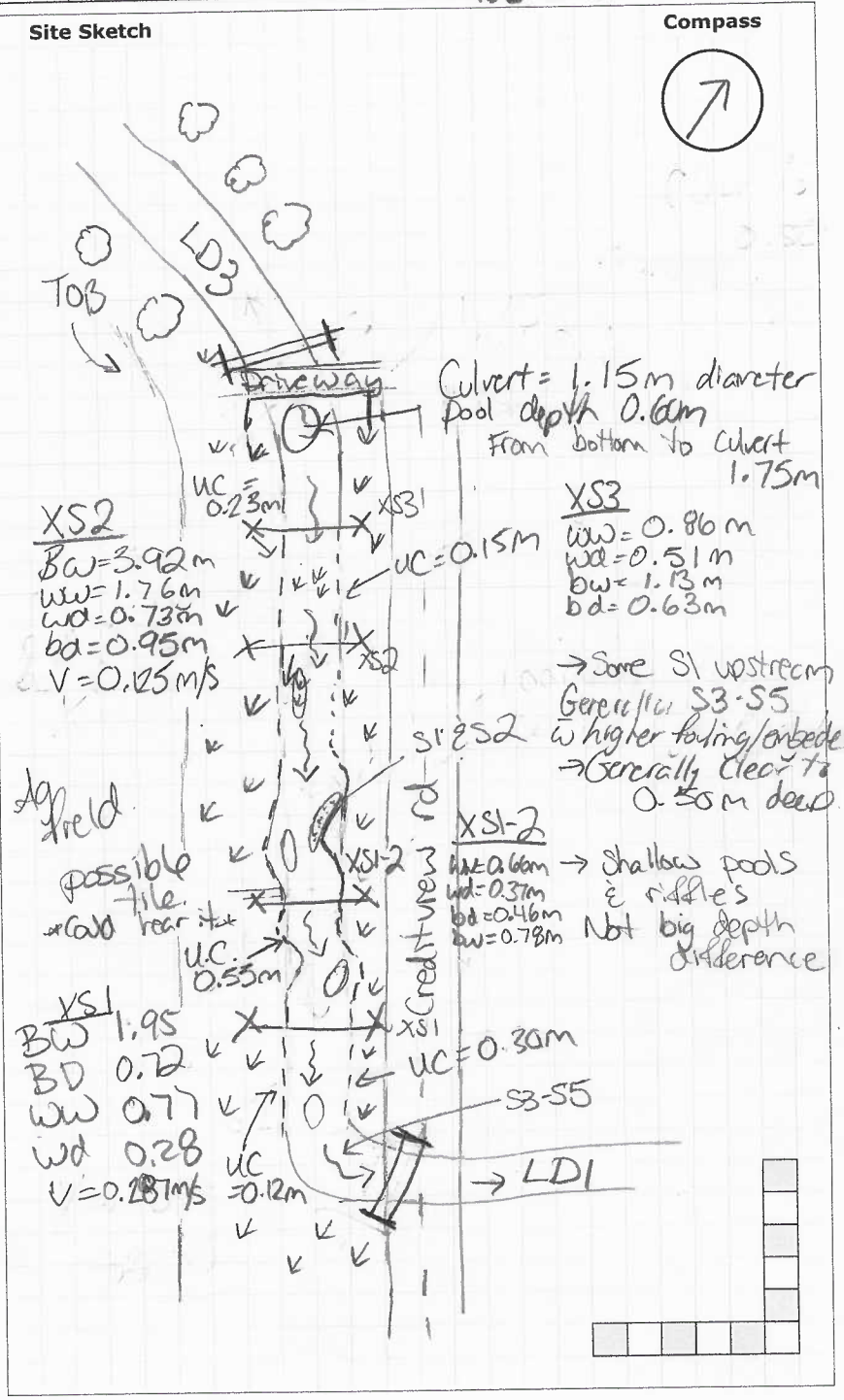
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:50 pm	**Reach:**	LD2
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Ellbrook Creek

Features	Monitoring
Reach break	Long-profile
Station location	Monumented XS
Cross-section	Monumented photo
Flow direction	Monumented photo direction
Riffle	Sediment sampling
Pool	Erosion pins
Sediment bar	Scour chains
Eroded bank/slope	**Additional Symbols**
Undercut bank	
Bank stabilization	
Leaning tree	
Fence	
Culvert/outfall	
Swamp/wetland	
Grasses	
Tree	
Instream log/tree	
Woody debris	
Beaver dam	
Vegetated island	

Site Sketch



Flow Type			
H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other			
BM	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

Photos:

Notes: Multi-flow paths mid-reach

XS2 taken across multiple flow paths (other XS's taken across single pathways).

Version #4
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GEO MORPHIX™

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:50 pm	**Reach:**	LD2
Weather:	sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded	✓		
	3	Siltation in pools - only in scour pool		✓	
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		1/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets	✓		
	6	Cut face on bar forms		✓	
	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	5	0.167
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	1	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	2/7
	2	Single thread channel to multiple channel	✓		
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	2	5	0.286

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.180

In Regime	In Transition/Stress	In Adjustment
☑ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Notes:

Version #3
Last edited: 10/02/2023

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GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	2:50 pm	**Reach:**	LO2
Weather:	sunny 18°C	**Location:**	Mayfield rd, Alton
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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 minimal undercutting	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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 few pools not too deep	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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GEO MORPHIX

Date:	2024-05-02	PN:	24009	Location:	Mayfield rd, Alton

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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 N/A
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☒ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☒ 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): SSO Checked by: _____ Completed by: [illegible]

GEO MORPHIX

Reach Characteristics

Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA MF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	2:50 pm	**Stream:**	Lyons Drain	**UTM (Upstream):**	
Weather:	Sunny, 16°C	**Reach:**	LD2	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 12 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 3 | **Encroachment** (Table 7): 2

Coverage	Channel Widths	Age (yrs)
☐ None	☑ 1 - 4	☐ Immature (<5)
☐ Fragmented	☐ 4 - 10	☑ Established (5-30)
☑ Continuous	☐ > 10	☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 2 | **Reach Coverage %**: 5

Woody Debris	WD Density
☐ In Cutbank	☐ Low
☐ In Channel	☐ Mod
☒ Not Present	☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 1

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Sinuosity Degree** (Table 10): 1 | **Gradient** (Table 11): 1 | **# of Channels** (Table 12): 1 | **Entrenchment** (Table 13): 1 | **Bank Failure** (Table 14): 2 | **Down's Model** (Table 15): m | **Bankfull Indicators** (Table 18): T/S/B | **Sed Sorting** (Table 20): Mod | **Sediment Transport Observed?** ☐ Yes ☑ No ☐ Not Visible | **Transport Mode** (Table 21): ~~Traction~~ ~~but not observed~~ | **% of Bed Active** | **Geomorphic Units** (Table 22): 5, 6, 8 | **Mass Movement** (Table 23) | % runs: 60 | **Riffle-Pool Spacing (m):** | **% Riffles:** 30 | **% Pools:** 10

Bank Angle	Bank Erosion
☐ 0 – 30	☐ < 5%
☐ 30 – 60	☐ 5 – 30%
☐ 60 – 90	☐ 30 – 60%
☑ Undercut	☒ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☑	☐	☑	☐	☐	☐	☐
Riffle	☑	☐	☑	☑	☐	☐	☐
Pool	☑	☐	☑	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☐	☐	☐	☐	☐	☐	☐

				Wetted Width (m)			
Bankfull Width (m)	1.95	3.92			0.77	1.76	
Bankfull Depth (m)	0.72	0.95		Wetted Depth (m)	0.28	0.73	
Undercuts (m)	0.55	0.30	0.23	Velocity (m/s)	0.281	0.125	
Pool Depth (m)	0.60			Velocity Estimate Method	wading	wading	
Riffle Length (m)				Meander Amplitude (m)	N/A	N/A	N/A

Notes:
- Very short reach.
- riffles & pools observed had minimal different in depth.
- Scour pool measured at the downstream side of culvert
- Undercutting present throughout reach with grasses overhanging
- Lack of canopy cover as riparian consisted of grasses.

Photos:

Senior staff sign-off (if required): SSO | Checked by: _____ | Completed by: RA

Version #4
Last edited: 04/04/2023

GEO MORPHIX

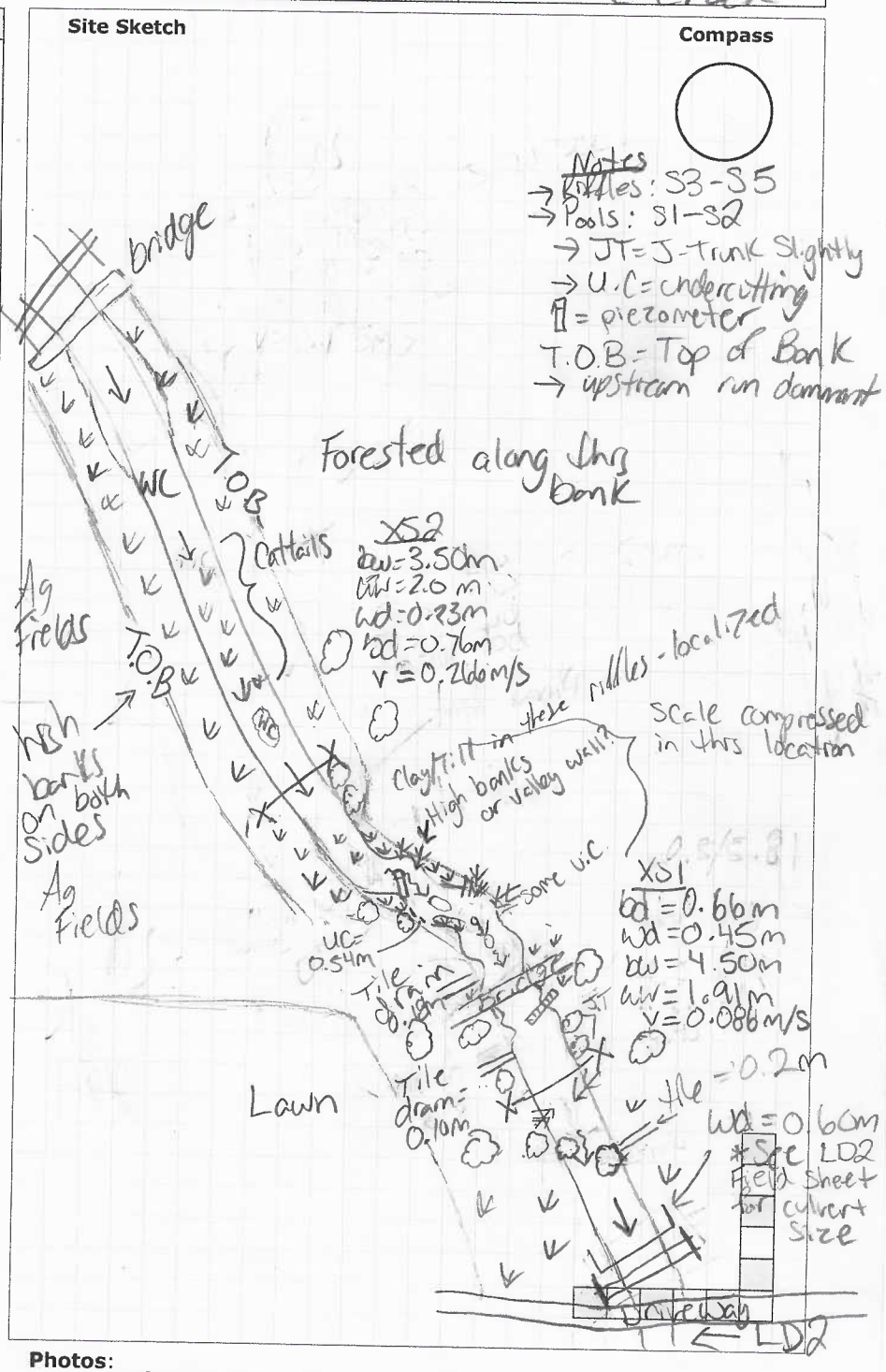
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:00 pm	**Reach:**	LD3
Weather:	sunny, 18°C	**Location:**	Mayfield road, Alton
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Features	Monitoring
Reach break	Long-profile
Station location	Monumented XS
Cross-section	Monumented photo
Flow direction	Monumented photo direction
Riffle	Sediment sampling
Pool	Erosion pins
Sediment bar	Scour chains
Eroded bank/slope	**Additional Symbols**
Undercut bank	
Bank stabilization	
Leaning tree	
Fence	
Culvert/outfall	
Swamp/wetland	
Grasses	
Tree	
Instream log/tree	
Woody debris	
Beaver dam	
Vegetated island	

Site Sketch



Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Photos:

Notes: → Both bridges failing, however there are no footings so not due to the watercourse.

→ grassy banks with Forest on L.B. & Ag fields on R.B.

Version #4
Last edited: 21/02/2023

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

GEO MORPHIX™

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:00 pm	**Reach:**	LD3
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Fishcreek Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools		✓	
	4	Medial bars		✓	
	5	Accretion on point bars (Some mainly DS)	✓		
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		2/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots - minimal	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	2	6	0.25
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.134

In Regime	In Transition/Stress	In Adjustment
☑ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:00 pm	**Reach:**	L03
Weather:	sunny, 18°c	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
High over banks	• 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	• 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
	• 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	• 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 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☒ 6	☐ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Date:	2024-05-02	PN:	24009	Location:	Mayfield Road, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• 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	☐ 3 ☒ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• 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
	• 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 ☒ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☒ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

Total overall score (0–42) = 26	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Reach Characteristics

Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA HF	**Watershed/Subwatershed:**	Estabrooke Creek
Time:	3:00pm	**Stream:**	Lyons Drain	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	203	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 7 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1

☒ Evidence of Groundwater Location: Watercress Photo: _____

Riparian Vegetation

Dominant Type (Table 6): 1/2

Encroachment (Table 7): 2

Coverage: ☐ None ☒ Fragmented ☐ Continuous

Channel Widths: ☒ 1 - 4 ☒ 4 - 10 ☐ > 10 (upstream portion)

Age (yrs): ☐ Immature (<5) ☐ Established (5-30) ☒ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1

Reach Coverage %: 15

Woody Debris: ☐ In Cutbank ☒ In Channel ☐ Not Present

WD Density: ☒ Low ☐ Mod ☐ High

WDJ/50m: 0.5

Water Quality

Odour (Table 16): 1

Turbidity (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1

Gradient (Table 11): 1

Entrenchment (Table 13): 2

Down's Model (Table 15): S

Sed Sorting (Table 20): Mod

Transport Mode (Table 21): 2

Geomorphic Units (Table 22): 5/6/8

Riffle-Pool Spacing (m): /

Sinuosity Degree (Table 10): 2

# of Channels (Table 12): 1

Bank Failure (Table 14): 2 (minimal localized)

Bankfull Indicators (Table 18): 3/5/7

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: /

Mass Movement (Table 23): N/A % runs: 80

% Riffles: 15 **% Pools:** 5

Bank Angle: ☐ 0 – 30 ☒ 30 – 60 ☐ 60 – 90 ☒ Undercut localized

Bank Erosion: ☐ < 5% ☒ 5 – 30% localized areas of erosion ☐ 30 – 60% ☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☒	☒	☐	☐	☐
Pool	☒	☒	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	4.50	3.50	6.90	**Wetted Width (m)**	1.91	2.0	3.90
Bankfull Depth (m)	0.66	0.76	0.93	**Wetted Depth (m)**	0.45	0.23	0.36
Undercuts (m)	0.54	/	/	**Velocity (m/s)**	0.086	0.266	0.175
Pool Depth (m)	/	/	/	**Velocity Estimate Method**	Wattle		Ball
Riffle Length (m)	/	/	/	**Meander Amplitude (m)**	—		—

Notes:
→ Few riffles & shallow pools at the bend mid-reach. Generally run dominant.
→ Left bank upstream is forested while R.B. is agr. field.
→ generally straight and little erosion present. Erosion generally present @ the bends (including undercuts)
→ Substrate of riffles & pools documented above however not the dominant morphology.

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

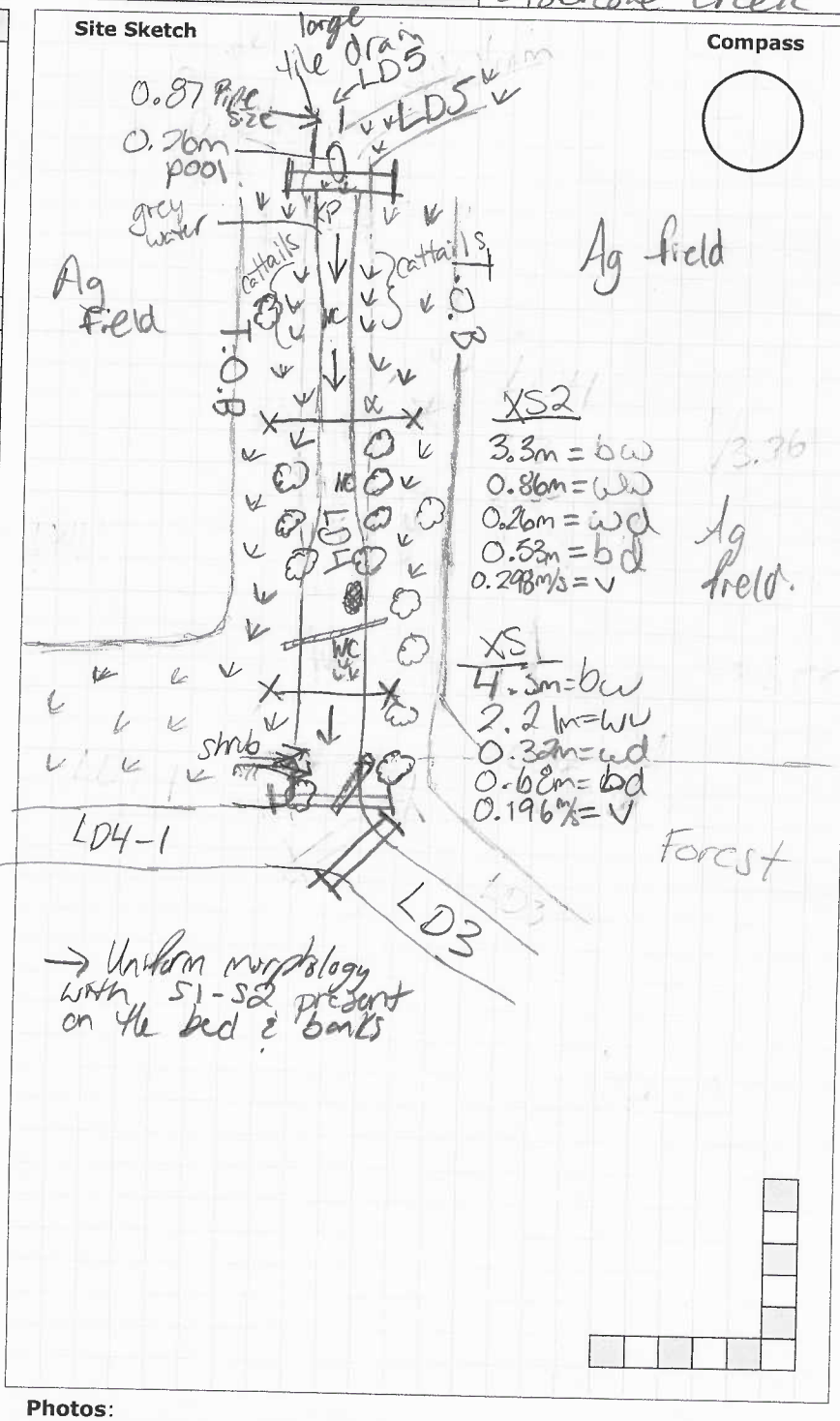
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:30pm	**Reach:**	LD4
Weather:	Sunny, 19°C	**Location:**	Mayfield road Alloa
Field Staff:	KA HE	**Watershed/Subwatershed:**	Esbrcake Creek

Features		Monitoring	
Reach break		Long-profile	
Station location		Monumented XS	
Cross-section		Monumented photo	
Flow direction		Monumented photo direction	
Riffle		Sediment sampling	
Pool		Erosion pins	
Sediment bar		Scour chains	
Eroded bank/slope		**Additional Symbols**	
Undercut bank			
Bank stabilization			
Leaning tree			
Fence			
Culvert/outfall			
Swamp/wetland			
Grasses			
Tree			
Instream log/tree			
Woody debris			
Beaver dam			
Vegetated island			

Site Sketch



Compass

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

Photos:

Notes: Very start reach

GEO MORPHIX

Rapid Geomorphic Assessment

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:30 pm	**Reach:**	LD4
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator: Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools	✓		
	4	Medial bars		✓	
	5	Accretion on point bars		✓	
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone		✓	
		Sum of indices =	1	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	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 =	0	6	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		1/8
	2	Occurrence of large organic debris		✓	
	3	Exposed tree roots		✓	
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	✓	7	0.125
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed	✓		
		Sum of indices =	1	6	0.143

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.103

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Dram
Time:	3:30 pm	**Reach:**	L04
Weather:	Sunny, 18°c	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 generally highly resistant plant/soil matrix or materia	• 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	• 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
Channel Scouring/ Sediment Deposition	• > 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☐ 6	☒ 7 ☐ 8

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX

Date:	2024-05-02	PN:	24009	Location:	Maytrell rd, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas (no riffles)	• 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 (lack of bars)	• 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 (N/A)	• 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
Water Quality	• 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
	• 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 ☒ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☒ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

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

Version #2
Last edited: 10/02/2023

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

GEO MORPHIX™

Reach Characteristics Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	3:30pm	**Stream:**	Lyons Drain	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	L04	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 1 | **Flow Type** (Table 5): 1 | ☒ Evidence of Groundwater Location: Watercress Photo: _____

Riparian Vegetation

Dominant Type (Table 6): 1/3 | **Encroachment** (Table 7): 3

Coverage: ☐ None ☒ Fragmented ☐ Continuous

Channel Widths: ☒ 1 - 4 ☐ 4 - 10 ☐ > 10

Age (yrs): ☒ Immature (<5) ☒ Established (5-30) ☐ Mature (>30)

Aquatic & Instream Vegetation

Type (Table 8): 1/2 | **Reach Coverage %**: 35 total

Woody Debris: ☐ In Cutbank ☒ In Channel ☐ Not Present

WD Density: ☒ Low ☐ Mod ☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1 | **Turbidity** (Table 17): 2

Channel Characteristics

Sinuosity Type (Table 9): 1 | **Gradient** (Table 11): 1 | **Entrenchment** (Table 13): 2 | **Down's Model** (Table 15): S | **Sed Sorting** (Table 20): Well | **Transport Mode** (Table 21): 3 | **Geomorphic Units** (Table 22): 8 | **Riffle-Pool Spacing (m)**: N/A

Sinuosity Degree (Table 10): 1 | **# of Channels** (Table 12): 1 | **Bank Failure** (Table 14): N/A | **Bankfull Indicators** (Table 18): 3/5/1

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

% of Bed Active: N/A | **Mass Movement** (Table 23): N/A | % Runs: 100 | **% Riffles**: 0 | **% Pools**: 0

Bank Angle: ☐ 0 – 30 ☒ 30 – 60 ☐ 60 – 90 ☐ Undercut

Bank Erosion: ☒ < 5% ☐ 5 – 30% ☐ 30 – 60% ☐ 60 – 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☐	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	4.3	3.3		**Wetted Width (m)**	2.21	0.86	
Bankfull Depth (m)	0.68	0.53		**Wetted Depth (m)**	0.32	0.26	
Undercuts (m)				**Velocity (m/s)**	0.196	0.298	
Pool Depth (m)				**Velocity Estimate Method**	wadable		
Riffle Length (m)				**Meander Amplitude (m)**			

Notes:
→ Short reach with a lack of riffle/pool morphology.
→ watercress within reach
→ grasses along banks with trees present & encroaching
→ small knickpoint with grey water releasing into water
→

Photos:

Version #4
Last edited: 04/04/2023

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

GEO MORPHIX

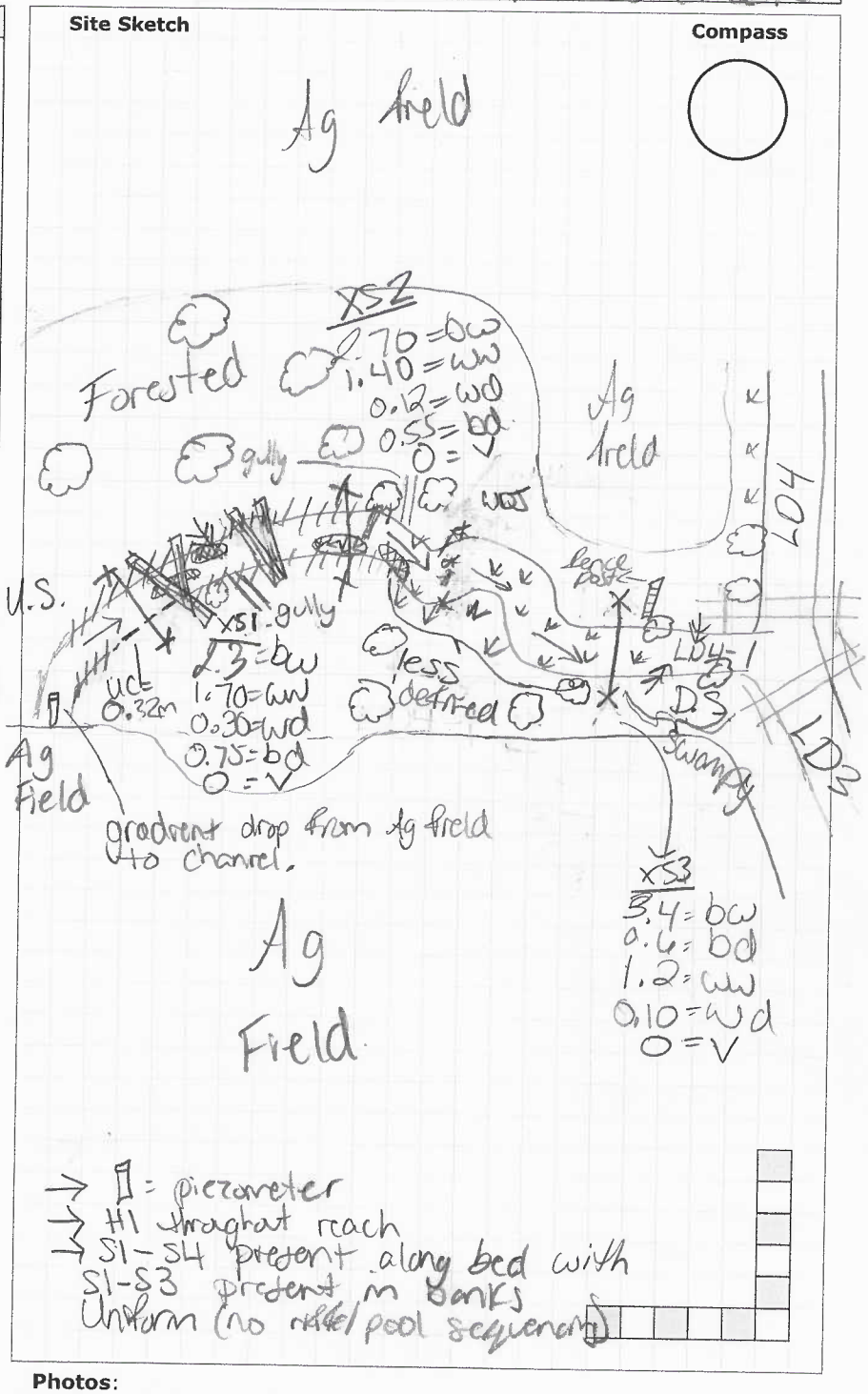
General Site Characteristics

Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:50 pm	**Reach:**	LD4-1
Weather:	sunny, 18°c	**Location:**	Mayfield road Alliso
Field Staff:	KA HF	**Watershed/Subwatershed:**	Robicole Creek

Features		Monitoring	
Reach break		Long-profile	
Station location		Monumented XS	
Cross-section		Monumented photo	
Flow direction		Monumented photo direction	
Riffle		Sediment sampling	
Pool		Erosion pins	
Sediment bar		Scour chains	
Eroded bank/slope		**Additional Symbols**	
Undercut bank			
Bank stabilization			
Leaning tree			
Fence			
Culvert/outfall			
Swamp/wetland			
Grasses			
Tree			
Instream log/tree			
Woody debris			
Beaver dam			
Vegetated island			

Site Sketch



Photos:

Notes:

Flow Type

H1	Standing water	**H1A**	Back water
H2	Scarcely perceptible flow		
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
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	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

GEO MORPHIX™

Rapid Geomorphic Assessment **Project Number:** 24009

Date:	2024-05-02	**Stream:**	Lyons Drain
Time:	3:50 pm	**Reach:**	LD4-1
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Etobicoke Creek

Process	No.	Geomorphological Indicator	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	1/7
	2	Coarse materials in riffles embedded		✓	
	3	Siltation in pools		✓	
	4	Medial bars		✓	
	5	Accretion on point bars	✓		
	6	Poor longitudinal sorting of bed materials Some poor sorting DS	✓		
	7	Deposition in the overbank zone		✓	
		Sum of indices =	2	6	0.143
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	N/A		0/5
	2	Exposed sanitary / storm sewer / pipeline / etc.	N/A		
	3	Elevated storm sewer outfall(s)	N/A		
	4	Undermined gabion baskets / concrete aprons / etc.	N/A		
	5	Scour pools downstream of culverts / storm sewer outlets	N/A		
	6	Cut face on bar forms		✓	
	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 =	0	5	0.0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.	✓		3/8
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.	N/A		
	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	N/A		
		Sum of indices =	3	5	0.375
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		✓	0/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed		✓	
		Sum of indices =	0	7	0.0

Notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.130

In Regime	In Transition/Stress	In Adjustment
☒ 0.00 - 0.20	☐ 0.21 - 0.40	☐ 0.41

Version #3
Last edited: 10/02/2023

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

GEO MORPHIX

Rapid Stream Assessment Technique Project Number: 24009

Date:	2024-05-02	**Stream:**	Lyons Dam
Time:	3:50 pm	**Reach:**	LD4-1
Weather:	Sunny, 18°C	**Location:**	Mayfield road, Alloa
Field Staff:	RA HF	**Watershed/Subwatershed:**	Fishcreek Creek

Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• 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	• 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
	• 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	• 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 (dam Stem)	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material (upstream)	• 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	• 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
Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas) (No riffles)	• 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	• 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
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • 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 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	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☒ 5 ☐ 6	☐ 7 ☐ 8

Version #2
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GEO MORPHIX

Date:	2024-05-02	PN:	2409	Location:	Mayfield road, Alloa

Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• 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)	• 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	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• 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	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas (N/A no riffles)	• 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 (N/A)	• 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
Water Quality	• 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
	• 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 ☐ 6	☐ 7 ☐ 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% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☒ 3	☐ 4 ☐ 5	☐ 6 ☐ 7

Total overall score (0–42) = 20	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Version #2
Last edited: 10/02/2023

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GEO MORPHIX™

Reach Characteristics Project Number: 24009

Date:	2024-05-02	**Field Staff:**	RA AF	**Watershed/Subwatershed:**	Etobicoke Creek
Time:	3:50pm	**Stream:**	Lyons Dam	**UTM (Upstream):**	
Weather:	Sunny, 18°C	**Reach:**	LD4-1	**UTM (Downstream):**	

Land Use (Table 1): 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 7 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Evidence of Groundwater Location:_____ Photo:_____

Riparian Vegetation

Dominant Type (Table 6): 1/3

Coverage: ☐ None ☒ Fragmented ☐ Continuous

Channel Widths: ☐ 1 - 4 ☒ 4 - 10 ☐ > 10

Age (yrs): ☐ Immature (<5) ☐ Established (5-30) ☒ Mature (>30)

Encroachment (Table 7): 4 (for grasses only)

Aquatic & Instream Vegetation

Type (Table 8): N/A

Reach Coverage %: /

Woody Debris: ☒ In Cutbank ☐ In Channel ☐ Not Present

WD Density: ☒ Low ☐ Mod ☐ High

WDJ/50m: 0.5

Water Quality

Odour (Table 16): 1

Turbidity (Table 17): 4

Channel Characteristics

Sinuosity Type (Table 9): 1

Sinuosity Degree (Table 10): 2

Gradient (Table 11): 1

# of Channels (Table 12): 1

Entrenchment (Table 13): 2

Bank Failure (Table 14): 2 minimal

Down's Model (Table 15): M

Bankfull Indicators (Table 18): 6/2/1/5

Sed Sorting (Table 20): Well

Sediment Transport Observed? ☐ Yes ☒ No ☐ Not Visible

Transport Mode (Table 21): 3

% of Bed Active: /

Geomorphic Units (Table 22): 8

Mass Movement (Table 23): N/A % Mvt: 100

Riffle-Pool Spacing (m): N/A

% Riffles: 0 **% Pools**: 0

Bank Angle: ☒ 0 - 30 ☐ 30 - 60 ☒ 60 - 90 ☐ Undercut

Bank Erosion: ☐ < 5% ☐ 5 - 30% ☒ 30 - 60% ☐ 60 - 100%

(Table 19)	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Bank	☒	☒	☒	☐	☐	☐	☐
Riffle	☐	☐	☐	☐	☐	☐	☐
Pool	☐	☐	☐	☐	☐	☐	☐
Bed (if no riffle-pool morphology)	☒	☒	☒	☒ some	☐	☐	☐

Bankfull Width (m)	2.3	2.70	3.40	**Wetted Width (m)**	1.70	1.40	1.20
Bankfull Depth (m)	0.75	0.55	0.60	**Wetted Depth (m)**	0.30	0.12	0.10
Undercuts (m)	0.32	/	/	**Velocity (m/s)**			
Pool Depth (m)				**Velocity Estimate Method**			
Riffle Length (m)				**Meander Amplitude (m)**			

Notes:
→ erosion upstream with minimal undercutting
→ lack of riffle/pool morphology & only standing water
→ downstream section becomes less defined and more grassy (loses forested vegetation, etc)
→ bank angles downstream are also lower.

Photos:

Version #4
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