

**Appendix E:
Detailed Geomorphological Assessment Summaries**

DRAFT

Detailed Geomorphological Assessment Summary

Reach AD1

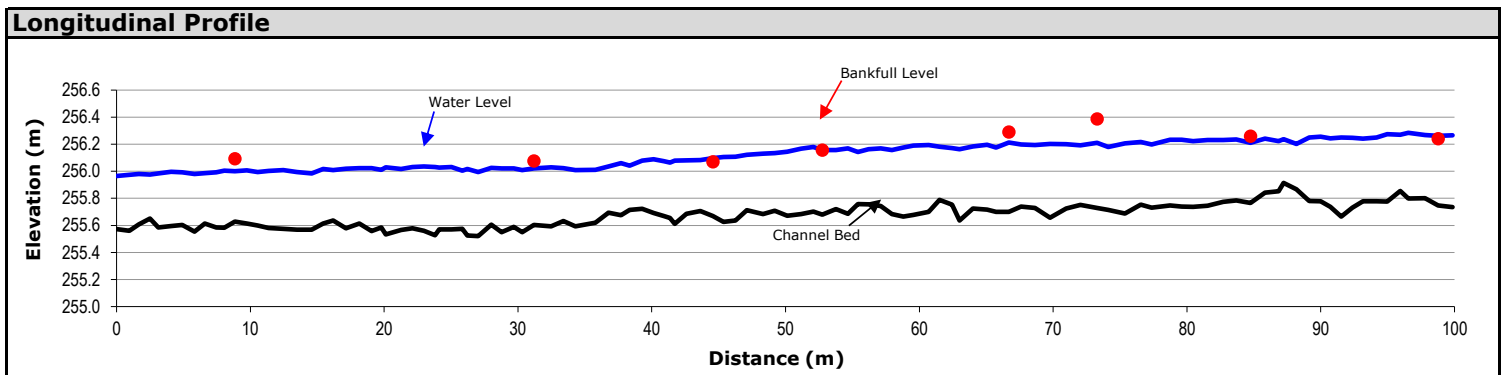
Project Number:	PN24009	Date:	2024-06-03
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	99.9
Location:	Chinguacousy Road, Alloa, Ontario	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	10.18 km ²	Dominant Riparian Vegetation Type:	Grasses
Geology/Soils:	Modern alluvial desposits (clay, silt, gravel, s	Extent of Riparian Cover:	Continuous
Surrounding Land Use:	Agriculture/Pasture	Width of Riparian Cover:	1-4 channel widths
Valley Type:	Confined	Age Class of Riparian Vegetation:	Immature
Dominant Instream Vegetation Type:	Rooted Emergent	Extent of Encroachment into Channel:	Minimal
Portion of Reach with Vegetation:	100%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	0.12	Calculated Bankfull Discharge (m³/s):	0.73
Modelled 2-year Discharge (m³/s):	Not modelled	Calculated Bankfull Velocity (m/s):	0.60
Modelled 2-year Velocity (m/s):	Not modelled		

Profile Characteristics	
Bankfull Gradient (%):	0.29
Channel Bed Gradient (%):	0.25
Riffle Gradient (%):	
Riffle Length (m):	No Riffle Pool Morphology
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.08
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	0.39	0.63	0.52				
Bank Angle (deg):	50	90	81	Torvane Value (kg/cm²):	0.15	0.75	0.4
Root Depth (m):	0.07	0.19	0.13	Penetrometer Value (kg/cm³):	0.50	1.75	1.09
Root Density (%):	75	95	90	Bank Material (range):	Clay silt with dense roots		
Bank Undercut (m):	0.00	0.18	0.04				

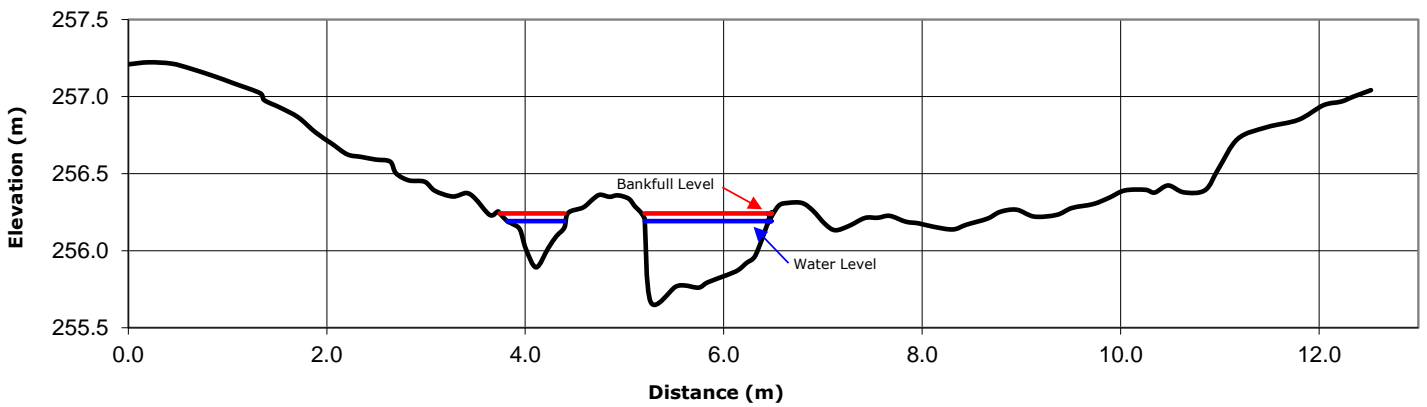
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	1.89	7.52	4.90
Average Bankfull Depth (m):	0.19	0.37	0.25
Bankfull Width/Depth (m/m):	5	33	22
Wetted Width (m):	0.89	2.33	1.59
Average Water Depth (m):	0.14	0.40	0.24
Wetted Width/Depth (m/m):	4	14	7
Entrenchment (m):	Low entrenchment		
Entrenchment Ratio (m/m):	>2.2 m		
Maximum Water Depth (m):	0.31	0.53	0.44
Manning's n :	0.035		



Photograph at cross section 8-M (looking upstream)

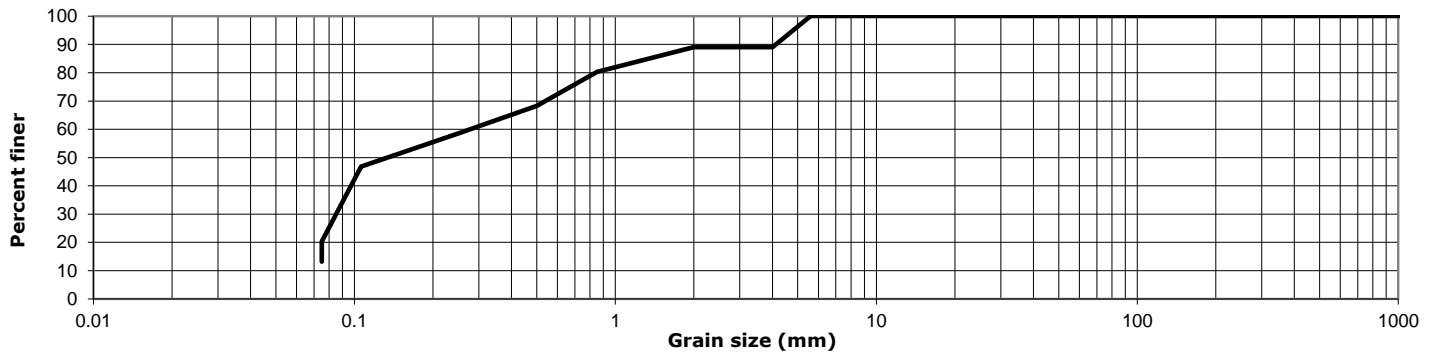
Representative Cross-Section 8-M



Substrate Characteristics

Particle Size (mm)		Subpavement:	Till Plains
D₁₀ :	<0.075	Particle shape:	Fine materials
D₅₀ :	0.1	Embeddedness (%):	100
D₈₄ :	1.3	Particle range (riffle):	No Riffle Pool Morphology
		Particle Range (pool):	

Cumulative Particle Size Distribution



Channel Thresholds			
Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	6.75
for D₅₀:	0.08	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.23	Critical Shear Stress (D₅₀) (N/m²):	0.11
Unit Stream Power at Bankfull (W/m²):	4.01		

General Field Observations

Channel Description

Reach AD1 consisted of a relatively straight channel flowing through agricultural pastures. The reach was run dominant with a lack of riffles and pools identified. The assessment was completed during a rain event which produced saturated banks, suspended sediment transport throughout the channel, and chutes in six of eight cross sections. The riparian zone was dominated by tall grasses, which encroached minimally. Aquatic vegetation was present throughout 100% of reach encroaching heavily on chutes, but had minimal impact on the main channel. Bed and bank materials were homogenous throughout the channel; primarily comprised of silt and clay. Minor undercutting was measured at three cross sections.

Cross Section 5 - Facing Right Bank



Detailed Geomorphological Assessment Summary

Reach AD1-2

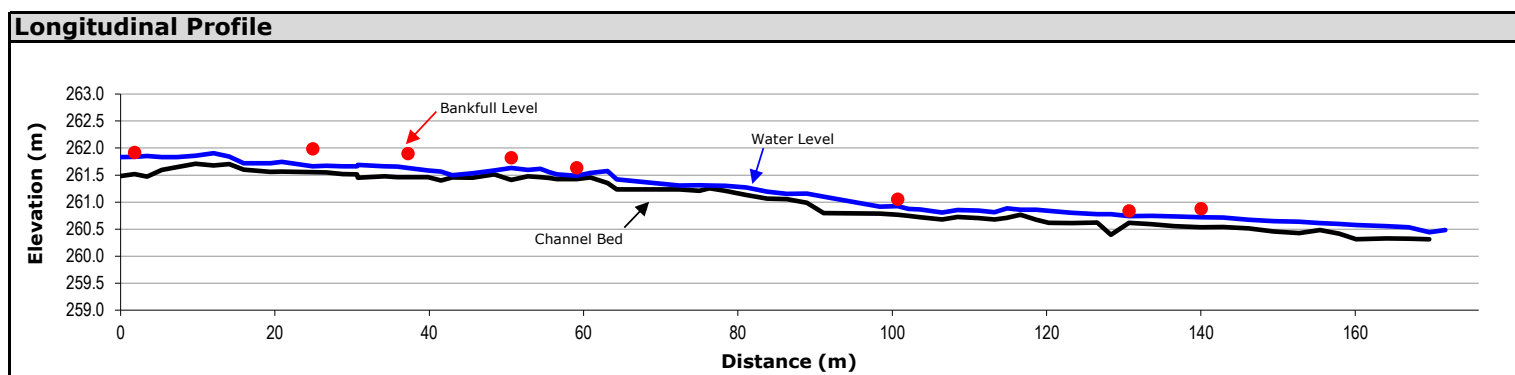
Project Number:	PN24009	Date:	2024-05-29
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	171.7
Location:	Alloa, Ontario	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	0.358 km ²	Dominant Riparian Vegetation Type:	Trees, Shrubs, Grasses
Geology/Soils:	Alluvial deposits of Clay, Silt, Sand	Extent of Riparian Cover:	Fragmented
Surrounding Land Use:	Agricultural	Width of Riparian Cover:	Varied; (1 - >10 Channel Widths)
Valley Type:	Partially Confined	Age Class of Riparian Vegetation:	Varied; (Immature - Established)
Dominant Instream Vegetation Type:	Grasses, Shrubs	Extent of Encroachment into Channel:	Moderate to Heavy
Portion of Reach with Vegetation:	80%	Density of Woody Debris:	Moderate

Hydrology			
Measured Discharge (m³/s):	0.01	Calculated Bankfull Discharge (m³/s):	0.60
Modelled 2-year Discharge (m³/s):	Not modelled	Calculated Bankfull Velocity (m/s):	0.98
Modelled 2-year Velocity (m/s):	Not modelled		

Profile Characteristics	
Bankfull Gradient (%):	0.95
Channel Bed Gradient (%):	0.88
Riffle Gradient (%):	
Riffle Length (m):	No Riffle Pool Morphology
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.06
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	0.27	1.40	0.52				
Bank Angle (deg):	15	60	37	Torvane Value (kg/cm²):	0.25	1.00	0.60
Root Depth (m):	0.05	0.20	0.09	Penetrometer Value (kg/cm³):	0.25	0.75	0.40
Root Density (%):	15	50	29	Bank Material (range):	Clay, Silt, Loam		
Bank Undercut (m):	0.00	0.00	0.00				

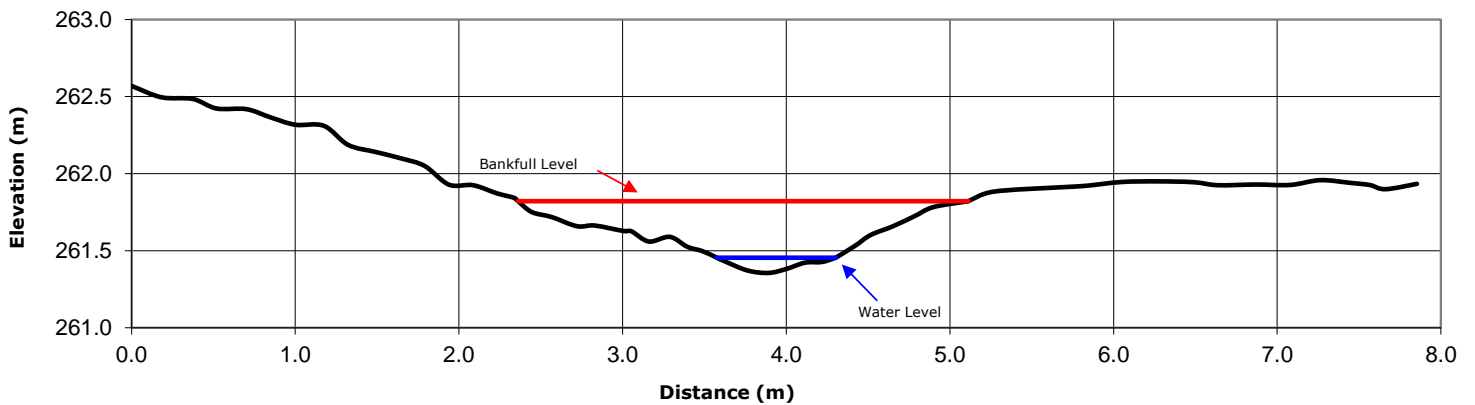
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	2.15	3.60	2.99
Average Bankfull Depth (m):	0.15	0.26	0.21
Bankfull Width/Depth (m/m):	12	23	15
Wetted Width (m):	0.73	2.85	1.40
Average Water Depth (m):	0.04	0.09	0.06
Wetted Width/Depth (m/m):	12	35	22
Entrenchment (m):	Slightly to Moderately		
Entrenchment Ratio (m/m):	Entrenched (1.4 - > 2.2)		
Maximum Water Depth (m):	0.10	0.19	0.14
Manning's n :	0.035		



Photograph at cross section 5 (looking downstream)

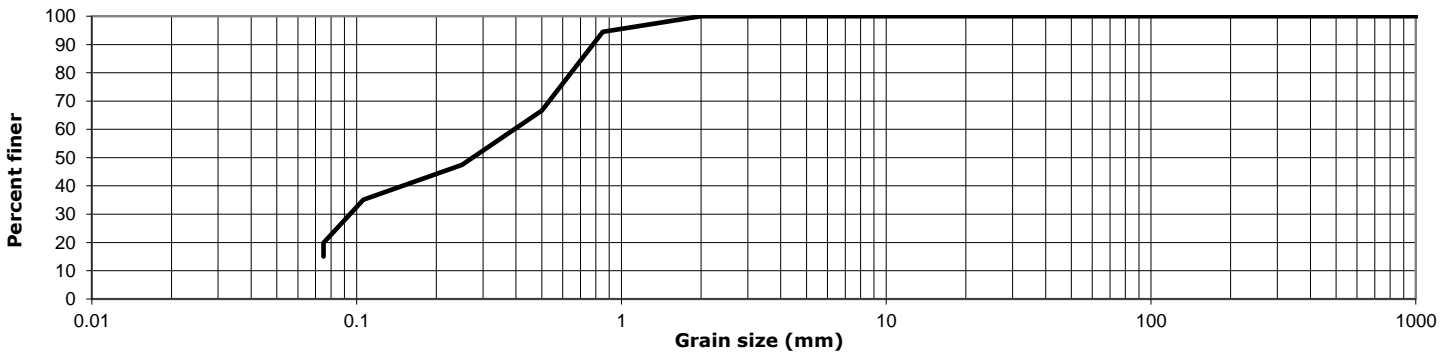
Representative Cross-Section #5



Substrate Characteristics

Particle Size (mm)		Subpavement:	Till Plains (Drumlinized)
D₁₀ :	<0.075	Particle shape:	Fine Materials
D₅₀ :	0.284	Embeddedness (%):	100
D₈₄ :	0.718	Particle range (riffle):	No Riffle Pool Morphology
		Particle Range (pool):	

Cumulative Particle Size Distribution



Channel Thresholds			
Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	19.33
for D₅₀:	0.11	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.17	Critical Shear Stress (D₅₀) (N/m²):	0.21
Unit Stream Power at Bankfull (W/m²):	18.85		

General Field Observations

Channel Description

Reach AD1-2 is a tributary of Etobicoke Creek in Alloo, ON which conveys flow within the agricultural lands south of Old School Rd, between Creditview Rd and Chinguacousy Rd. The subject reach consisted of a straight channel enabling flow within a fragmented deciduous forest, before straightening further at the mid to downstream extent as an agricultural ditch.

Channel bed morphology was notably homogenous, characterized by runs, with channel substrates mainly consisting of silt and clay (D50 = 2.0mm). Fine sediment was observed accumulating within the agricultural ditch, with widening processes evidenced by observations of bank scour, exposed roots, and abundant woody debris within the fragmented forest.

Cross Section 2 - Facing Downstream



Detailed Geomorphological Assessment Summary

Reach AD2

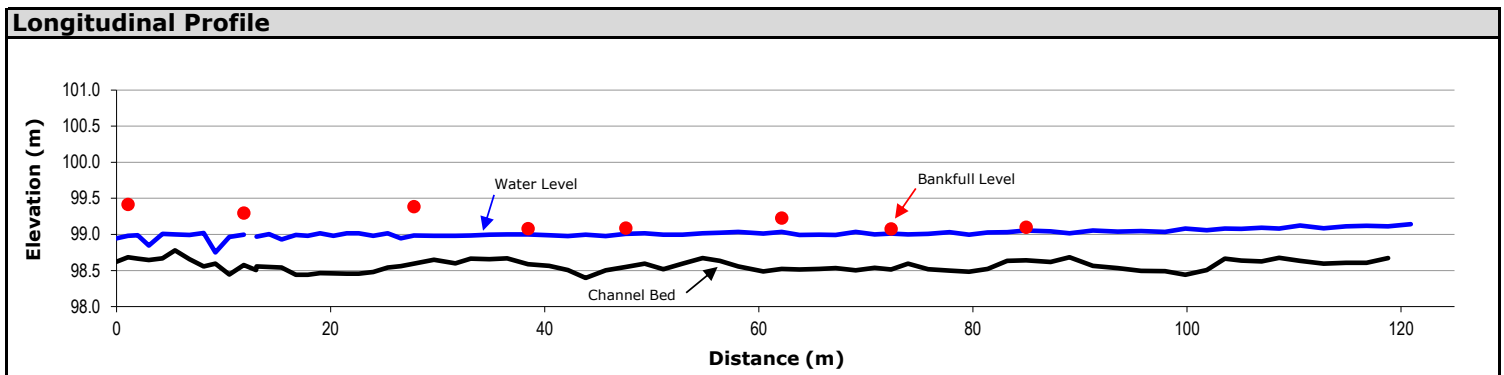
Project Number:	PN24009	Date:	2024-05-27
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	120.9
Location:	Chingaucousy Road, Caledon	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	9.632 km ²	Dominant Riparian Vegetation Type:	Grasses, few trees
Geology/Soils:	Alluvial deposits (clay, silt and sand); till	Extent of Riparian Cover:	Fragmented
Surrounding Land Use:	Agricultural	Width of Riparian Cover:	1-4 channel widths
Valley Type:	Unconfined	Age Class of Riparian Vegetation:	Established (5-30 years)
Dominant Instream Vegetation Type:	Grasses	Extent of Encroachment into Channel:	Minimal
Portion of Reach with Vegetation:	15%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	1.11	Calculated Bankfull Discharge (m³/s):	1.66
Modelled 2-year Discharge (m³/s):	Not modelled	Calculated Bankfull Velocity (m/s):	0.98
Modelled 2-year Velocity (m/s):	Not modelled		

Profile Characteristics	
Bankfull Gradient (%):	0.37
Channel Bed Gradient (%):	0.01
Riffle Gradient (%):	Poor riffle-pool morphology.
Riffle Length (m):	Channel predominately runs
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.03
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	1.20	1.77	1.51				
Bank Angle (deg):	30	65	48	Torvane Value (kg/cm²):	0.5	2.8	1.5
Root Depth (m):	0.10	1.00	0.66	Penetrometer Value (kg/cm³):	0.5	3.0	1.4
Root Density (%):	5	50	28	Bank Material (range):	Clay and silts		
Bank Undercut (m):	0.00	0.00	0.00				

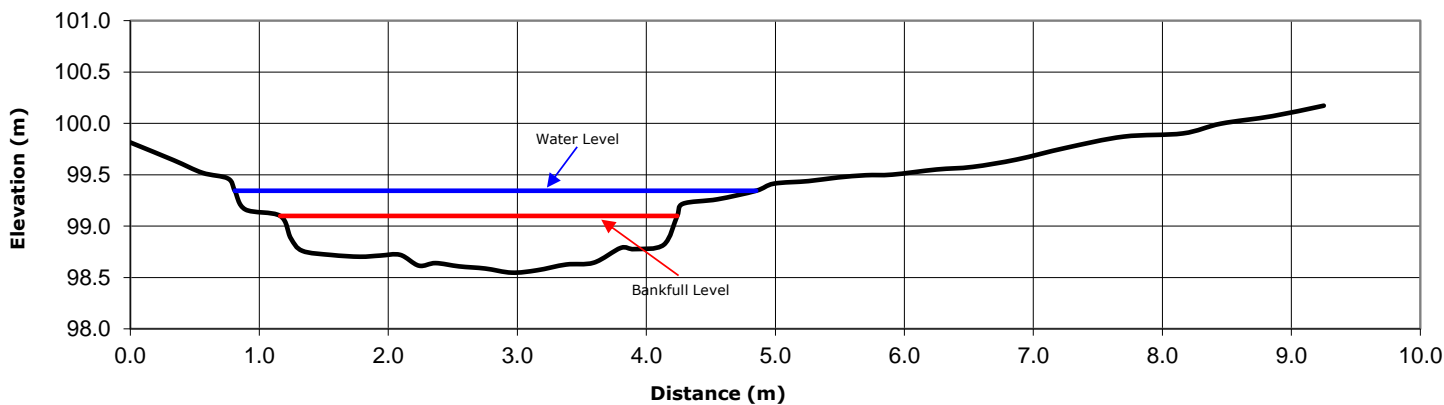
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	3.09	5.35	4.05
Average Bankfull Depth (m):	0.31	0.52	0.42
Bankfull Width/Depth (m/m):	7	14	10
Wetted Width (m):	4.04	7.10	5.75
Average Water Depth (m):	0.50	0.66	0.58
Wetted Width/Depth (m/m):	8	13	10
Entrenchment (m):	Moderately entrenched		
Entrenchment Ratio (m/m):	ER ~1.4-2.2		
Maximum Water Depth (m):	0.80	1.12	1.00
Manning's n :	0.035		



Photograph at cross section 1M (looking upstream)

Representative Cross-Section 1M



Substrate Characteristics

Particle Size (mm): Based on labroatory data

D₁₀ :	<0.0075
D₅₀ :	0.219
D₈₄ :	0.766

Subpavement:

Till Plains

Particle shape:

Sub-angular and sub-rounded

Embeddedness (%):

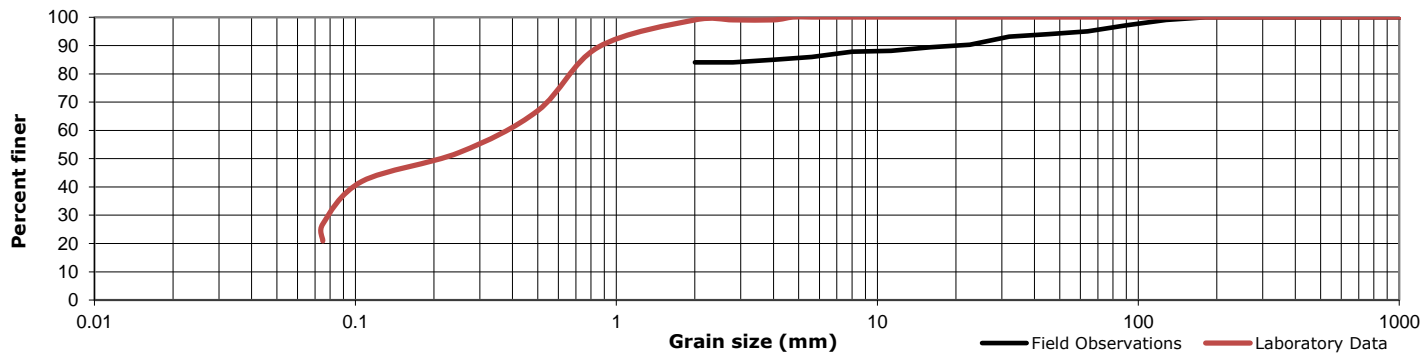
50-80%

Particle range (riffle):

No Riffle Pool Morphology

Particle Range (pool):

Cumulative Particle Size Distribution



Channel Thresholds			
Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	15.26
for D₅₀:	0.10	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.17	Critical Shear Stress (D₅₀) (N/m²):	0.16
Unit Stream Power at Bankfull (W/m²):	14.88		

General Field Observations

Channel Description

The reach is located west of Mississauga Road in Caledon. It is important to note that the channel was surveyed during high flow conditions after a large rain event. Water levels were over bankfull conditions, nearly overtopping the surrounding agricultural area. The channel is unconfined and widens towards the downstream extent of the surveyed portion. The channel is part of the Alloa drain and the portion surveyed was straight. There was poor riffle-pool morphology and the dominate feature was runs. The right bank had greater riparian vegetation than the left bank. The right bank had more dense grasses and mature trees, whereas the left bank was solely grasses. Instream vegetation consisted primarily of sparse grasses. The channel is U-shaped and moderately entrenched. Bed material was composed primarily of silts with some cobble. Sediment transport in the form of siltation was observed due to high flows and intense precipitation.

Cross Section 3M - Facing Downstream



Detailed Geomorphological Assessment Summary

Reach AD4

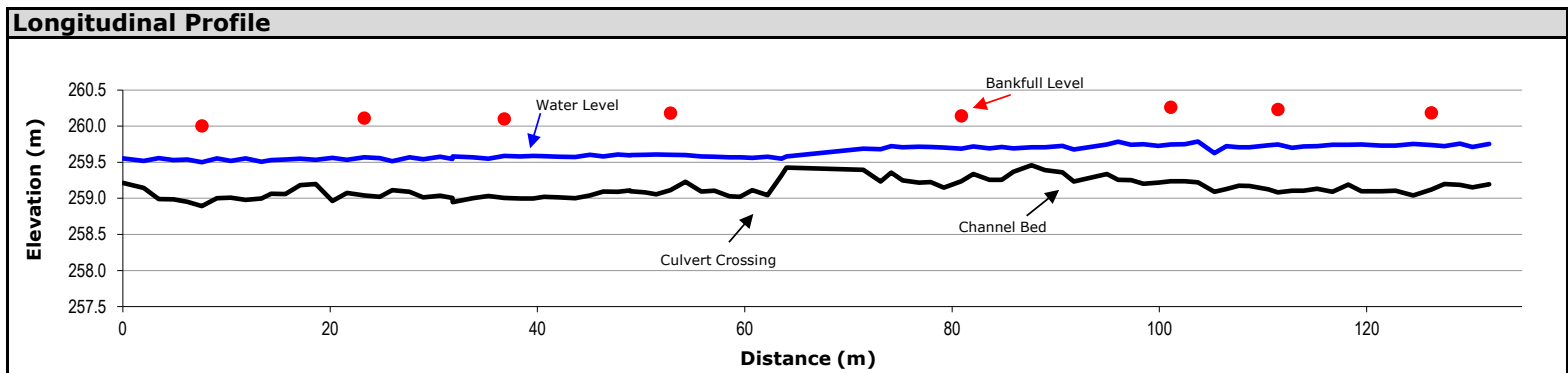
Project Number:	PN24009	Date:	2024-05-31
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	131.8
Location:	Caledon, Ontario	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	5.787 km ²	Dominant Riparian Vegetation Type:	Canary Reed Grass
Geology/Soils:	Alluvial deposits of Clay, Silt, Sand	Extent of Riparian Cover:	Continuous
Surrounding Land Use:	Agricultural	Width of Riparian Cover:	1-4 Channel Widths
Valley Type:	Partially Confined	Age Class of Riparian Vegetation:	Immature (<5 yrs)
Dominant Instream Vegetation Type:	Canary Reed Grass	Extent of Encroachment into Channel:	Moderate
Portion of Reach with Vegetation:	50%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	0.09	Calculated Bankfull Discharge (m³/s):	2.05
Modelled 2-year Discharge (m³/s):	Not modelled	Calculated Bankfull Velocity (m/s):	0.73
Modelled 2-year Velocity (m/s):	Not modelled		

Profile Characteristics	
Bankfull Gradient (%):	0.16
Channel Bed Gradient (%):	0.15
Riffle Gradient (%):	No Riffle Morphology
Riffle Length (m):	No Riffle Morphology
Riffle-Pool Spacing (m):	No Riffle Morphology

Planform Characteristics	
Sinuosity:	1.06
Meander Belt Width (m):	Straightened Channel
Radius of Curvature (m):	Straightened Channel
Meander Amplitude (m):	Straightened Channel
Meander wavelength (m):	Straightened Channel



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	1.50	1.75	1.63				
Bank Angle (deg):	30	50	40	Torvane Value (kg/cm²):	0.5	3.0	1.1
Root Depth (m):	0.30	0.90	0.76	Penetrometer Value (kg/cm³):	0.5	3.0	1.4
Root Density (%):	30	35	34	Bank Material (range):	Clay, Silt, Loam		
Bank Undercut (m):	0.00	0.00	0.00				

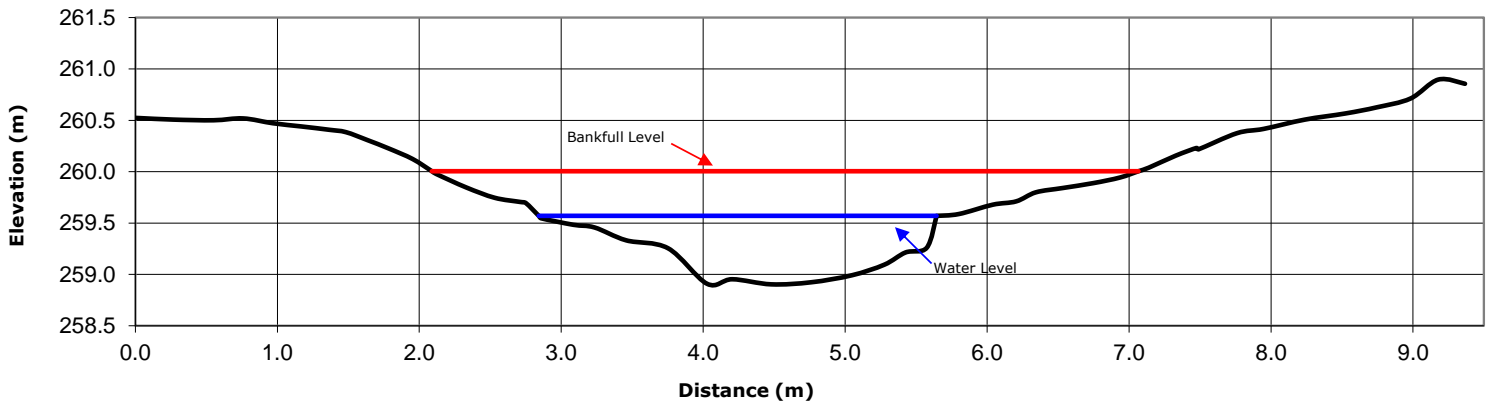
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	4.94	5.78	5.37
Average Bankfull Depth (m):	0.39	0.59	0.52
Bankfull Width/Depth (m/m):	9	14	10
Wetted Width (m):	2.20	3.75	2.88
Average Water Depth (m):	0.24	0.35	0.29
Wetted Width/Depth (m/m):	9	12	10
Entrenchment (m):	Moderately Entrenched		
Entrenchment Ratio (m/m):	(ER: 1.4 - 2.2)		
Maximum Water Depth (m):	0.51	0.67	0.59
Manning's n :	0.035		



Photograph at cross section 1 (looking downstream)

Representative Cross-Section #1



Substrate Characteristics

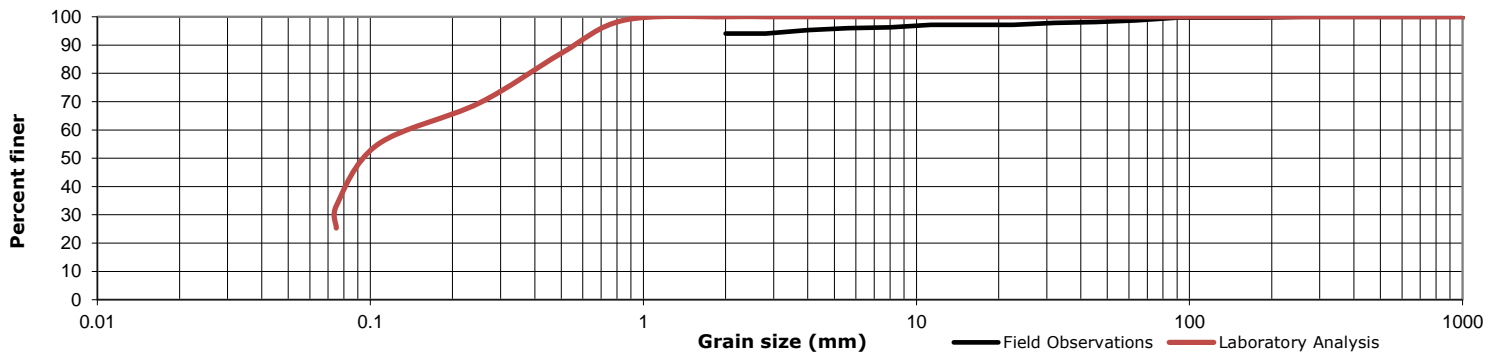
Particle Size (mm): Based on laboratory analysis

D ₁₀ :	<0.075
D ₅₀ :	0.099
D ₈₄ :	0.456

Subpavement:

Particle shape:	Till Plains (Drumlinized)
Embeddedness (%):	Subrounded to Angular (where applicable)
Particle range (riffle):	70-100
Particle Range (pool):	No Riffle Morphology
	No Pool Morphology

Cumulative Particle Size Distribution



Channel Thresholds

Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	7.98
for D₅₀:	1.64	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	3.30	Critical Shear Stress (D₅₀) (N/m²):	72.24
Unit Stream Power at Bankfull (W/m²):	5.83		

General Field Observations

Channel Description

Reach AD4 is a tributary of Etobicoke Creek in Alloo, ON which conveys flows within the agricultural lands north of Mayfield Rd, between Creditview Rd and Mississauga Rd. The subject reach consisted of a straightened agricultural ditch, with a farmer's crossing positioned within the center of the assessed stretch of channel. Channel bed morphology was notably homogenous, characterized by runs, with channel substrates mainly consisting of clay-silt with gravels in sparse amounts ($D_{50} = 2.0$ mm). The channel demonstrated multiple indicators associated with systematic aggradation, with abundant fine materials and organic debris deposited along the entirety of the assessed channel, likely attributed to the expansive encroachment of aquatic vegetation.

Cross Section 5 - Facing Downstream



Detailed Geomorphological Assessment Summary

Reach AD5

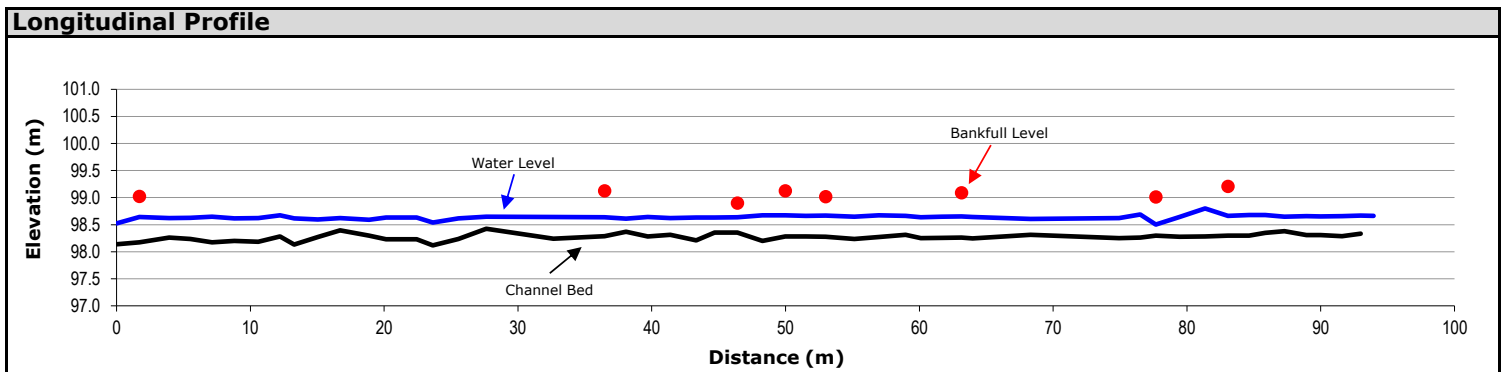
Project Number:	PN24009	Date:	2024-05-24
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	93.9
Location:	Mississauga Road, Caledon	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	3.926 km ²	Dominant Riparian Vegetation Type:	Scattered trees and shrubs immediately adjacent to the channel. Pasture/meadow and agricultural
Geology/Soils:	Glaciolacustrine deposits and alluvial deposits (clay, silt, sand, gravel).	Extent of Riparian Cover:	Fragmented
Surrounding Land Use:	Agricultural	Width of Riparian Cover:	1-4 channel widths
Valley Type:	Unconfined	Age Class of Riparian Vegetation:	Established (5-30 years)
Dominant Instream Vegetation Type:	Grasses, duckweed, algae	Extent of Encroachment into Channel:	Moderate
Portion of Reach with Vegetation:	60%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	Primarily standing water observed.	Calculated Bankfull Discharge (m³/s):	0.89
Modelled 2-year Discharge (m³/s):		Calculated Bankfull Velocity (m/s):	0.53
Modelled 2-year Velocity (m/s):			

Profile Characteristics	
Bankfull Gradient (%):	0.11
Channel Bed Gradient (%):	0.10
Riffle Gradient (%):	Poor Riffle-Pool Morphology.
Riffle Length (m):	Runs were the primary morphological feature observed within the channel.
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.02
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	0.90	1.80	1.29				
Bank Angle (deg):	40	80	63	Torvane Value (kg/cm²):	1.0	2.5	1.4
Root Depth (m):	0.20	0.25	0.22	Penetrometer Value (kg/cm³):	0.1	0.5	0.3
Root Density (%):	10	30	15	Bank Material (range):	Primarily clays and silts		
Bank Undercut (m):	0.00	0.00	0.00				

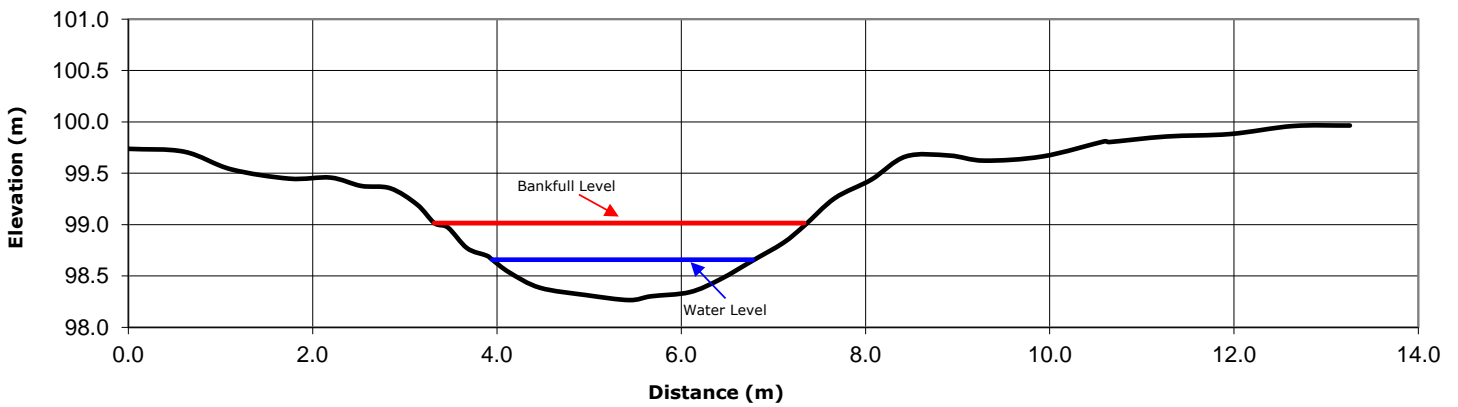
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	2.92	4.34	3.97
Average Bankfull Depth (m):	0.26	0.50	0.42
Bankfull Width/Depth (m/m):	9	11	10
Wetted Width (m):	2.43	2.97	2.80
Average Water Depth (m):	0.11	0.23	0.19
Wetted Width/Depth (m/m):	13	23	16
Entrenchment (m):	Moderately entrenched		
Entrenchment Ratio (m/m):	ER~1.4-2.2		
Maximum Water Depth (m):	0.24	0.47	0.37
Manning's n :	0.035		



Photograph at cross section 5 (looking downstream)

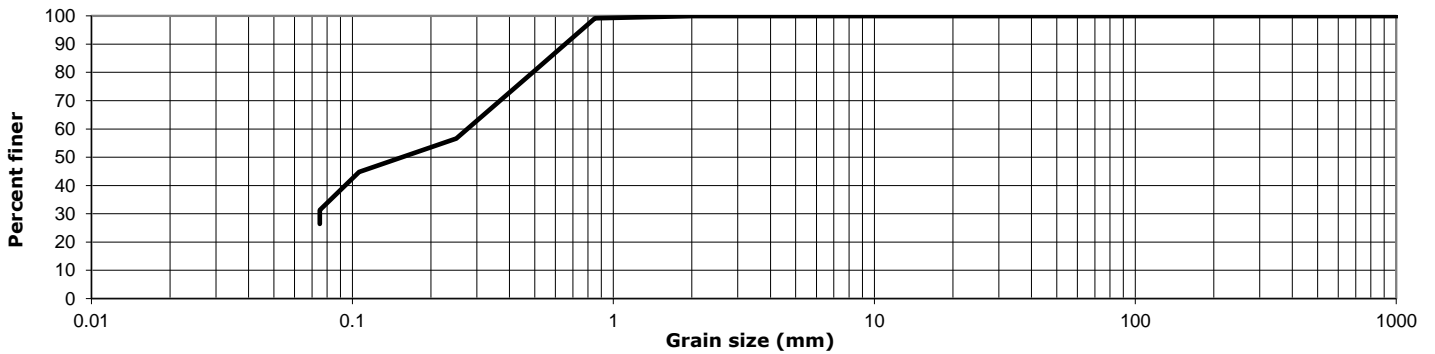
Representative Cross-Section 4



Substrate Characteristics

Particle Size (mm)		Subpavement:	Till Plains
D₁₀ :	<0.075	Particle shape:	Fine materials
D₅₀ :	0.169	Embeddedness (%):	100
D₈₄ :	0.564	Particle range (riffle):	No Riffle Pool morphology
		Particle Range (pool):	

Cumulative Particle Size Distribution



Channel Thresholds

Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	4.55
for D₅₀:	0.09	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.16	Critical Shear Stress (D₅₀) (N/m²):	0.12
Unit Stream Power at Bankfull (W/m²):	1.57		

General Field Observations

Channel Description

The reach is generally located east of Mississauga Road in Caledon. The surrounding land is composed of agricultural land to the north and meadow to the south. The riparian vegetation spans only immediately adjacent to the channel (approximately 1-4 channel widths) and is fragmented with some trees and many grasses and shrubs. The instream vegetation consists primarily of reeds, grasses, and some duckweed and algae. Vegetation was noted to be encroaching throughout most of the channel. The banks were, for the most part, well vegetated along the top 2/3rd portion. The bottom 1/3rd bank material was primarily clay and silt with some exposed grass roots in the soil matrix. A few exposed tree roots were also observed near the upstream extent of the survey. In addition, the channel is part of the Alloa drain and the portion surveyed was straight. There was poor riffle-pool morphology and the dominate feature was runs. Smooth surface or scarcely perceptible flows were observed. The channel was U-shaped and moderately entrenched, with top of slope heights exceeding 2 m in some areas. Bed material was composed of silts and organic matter.

Cross Section 3M - Facing Upstream



Detailed Geomorphological Assessment Summary

Reach: AD5-1

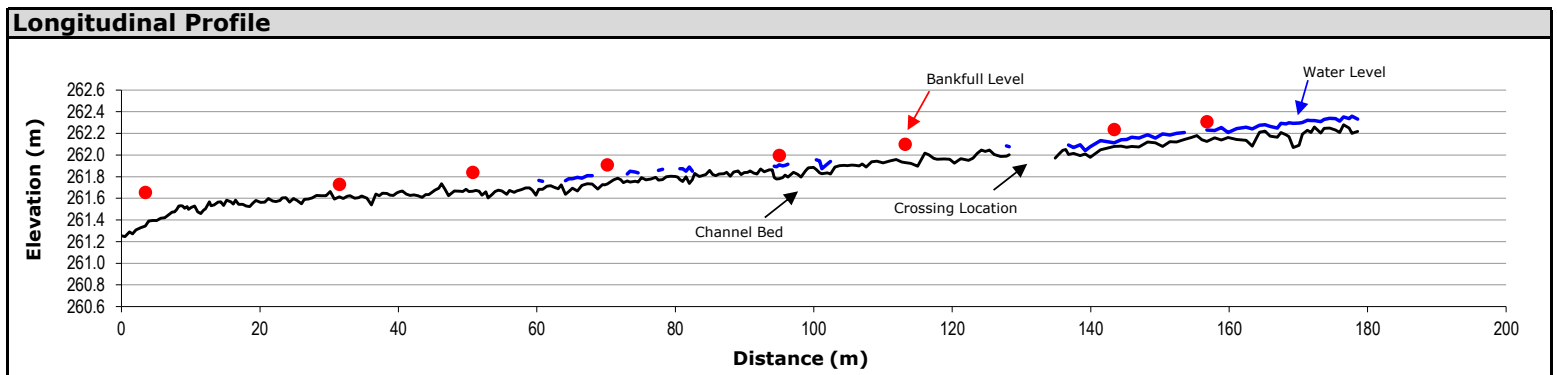
Project Number:	PN24009	Date:	2024-05-24
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	178.6
Location:	Mississauga Road, Caledon	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	To be updated	Dominant Riparian Vegetation Type:	Grasses
Geology/Soils:	Glaciolacustrine silt and clay	Extent of Riparian Cover:	Continuous
Surrounding Land Use:	Agricultural	Width of Riparian Cover:	1-4 channel widths
Valley Type:	Unconfined	Age Class of Riparian Vegetation:	Established (5-30 years)
Dominant Instream Vegetation Type:	Rooted emergent	Extent of Encroachment into Channel:	Extreme
Portion of Reach with Vegetation:	5%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	Primarily standing water observed.	Calculated Bankfull Discharge (m³/s):	0.11
Modelled 2-year Discharge (m³/s):		Calculated Bankfull Velocity (m/s):	0.39
Modelled 2-year Velocity (m/s):			

Profile Characteristics	
Bankfull Gradient (%):	0.43
Channel Bed Gradient (%):	0.49
Riffle Gradient (%):	
Riffle Length (m):	No Riffle Pool Morphology
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.07
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	0.19	0.38	0.26				
Bank Angle (deg):	10	70	28	Torvane Value (kg/cm²):	0.5	1.0	0.8
Root Depth (m):	0.05	0.50	0.13	Penetrometer Value (kg/cm³):	0.25	1.5	0.6
Root Density (%):	80	85	84	Bank Material (range):	Clayey sand material with dense roots		
Bank Undercut (m):	0.00	0.00	0.00				

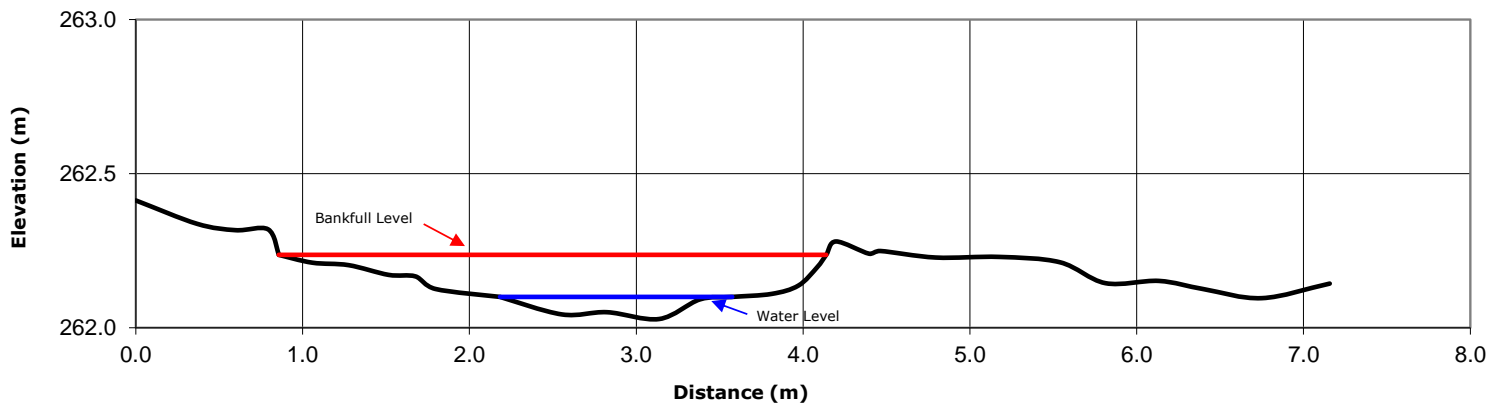
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	1.82	3.71	2.87
Average Bankfull Depth (m):	0.06	0.13	0.10
Bankfull Width/Depth (m/m):	14	46	32
Wetted Width (m):	0.92	2.03	1.48
Average Water Depth (m):	0.01	0.06	0.03
Wetted Width/Depth (m/m):	32	138	73
Entrenchment (m):	Low entrenchment		
Entrenchment Ratio (m/m):	>2.2 m		
Maximum Water Depth (m):	0.02	0.19	0.09
Manning's n :	0.035		



Photograph at cross section 7 (facing downstream)

Representative Cross-Section #7



Substrate Characteristics

Particle Size (mm)

D ₁₀ :	<0.075
D ₅₀ :	0.169
D ₈₄ :	0.659

Subpavement:

Till Plains

Particle shape:

Fine materials

Embeddedness (%):

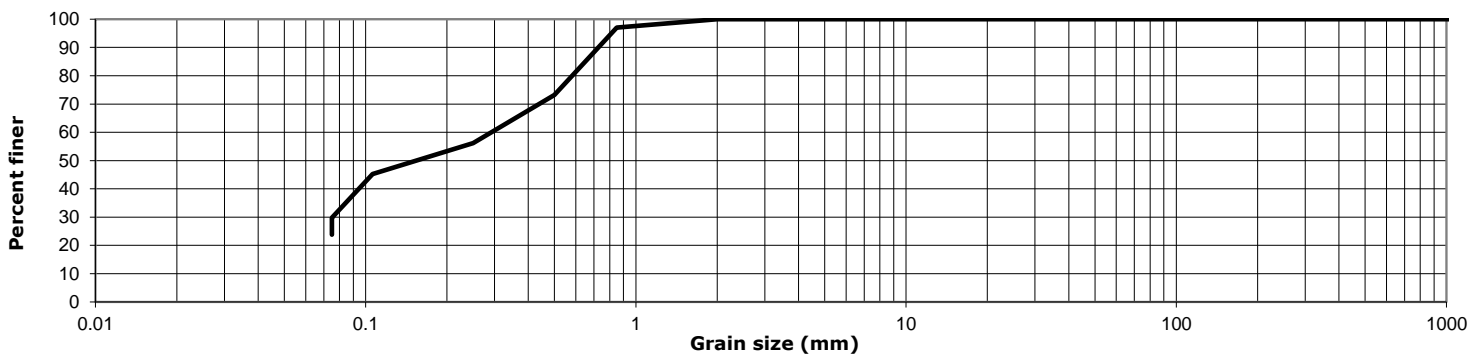
100

Particle range (riffle):

No Riffle Pool Morphology

Particle Range (pool):

Cumulative Particle Size Distribution



Channel Thresholds			
Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	4.02
for D₅₀:	0.09	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.16	Critical Shear Stress (D₅₀) (N/m²):	0.12
Unit Stream Power at Bankfull (W/m²):	1.57		

General Field Observations

Channel Description

Reach AD5-1 consisted of a highly vegetated straight channel flowing between two agricultural fields. The riparian vegetation was extremely encroaching into the channel with tall established grasses throughout the entirety of the feature. Channel bed morphology was homogenous, characterized by runs, with channel substrates mainly consisting of sand and clay. During the site assessment the downstream portion of the reach ranging from being saturated to dry in localized areas, while standing water was identified in the upstream portion of the reach. Due to the minimal definition identified bankfull ranged from 1.82 - 3.71 metres wide. Erosion and downcutting was observed at the confluence with the Alloa Drain and within the Alloa Drain's narrow riparian buffer. Erosion was not observed elsewhere in the reach.

Cross Section 2 - Facing Upstream



Detailed Geomorphological Assessment Summary

Reach: LD2

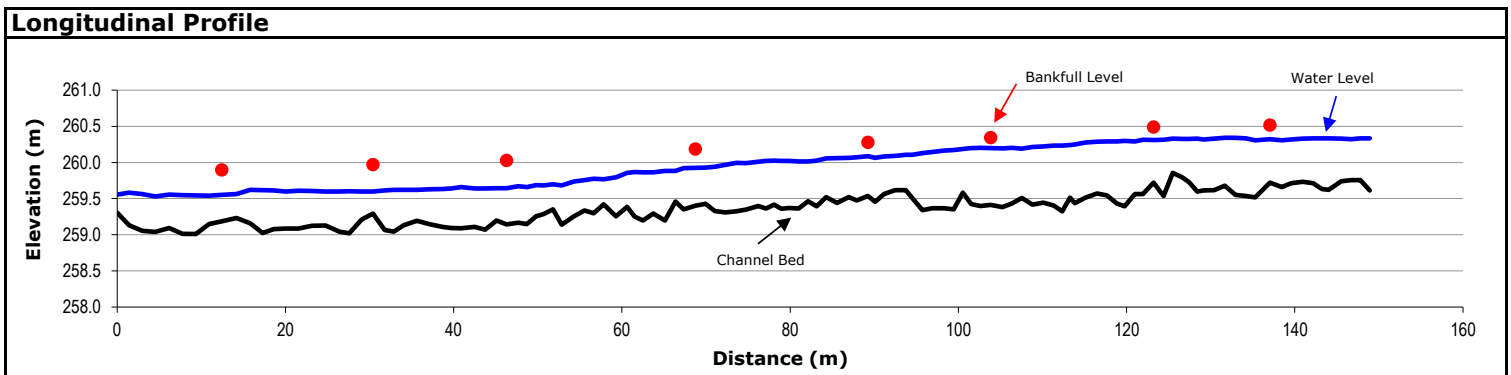
Project Number:	PN24009	Date:	2024-05-28
Client:	Alloa Landowners Group c/o GSAI	Length Surveyed (m):	156.4
Location:	Creditview Road, Alloa, Ontario	# of Cross-Sections:	8

Reach Characteristics			
Drainage Area:	2.02 km ²	Dominant Riparian Vegetation Type:	Grasses
Geology/Soils:	Glaciolacustrine deposits of silt & clay	Extent of Riparian Cover:	Continuous
Surrounding Land Use:	Agriculture	Width of Riparian Cover:	4-10 channel widths
Valley Type:	Confined	Age Class of Riparian Vegetation:	<5 years
Dominant Instream Vegetation Type:	Grasses	Extent of Encroachment into Channel:	Heavy
Portion of Reach with Vegetation:	90%	Density of Woody Debris:	Low

Hydrology			
Measured Discharge (m³/s):	0.26	Calculated Bankfull Discharge (m³/s):	2.66
Modelled 2-year Discharge (m³/s):	Not modelled	Calculated Bankfull Velocity (m/s):	1.08
Modelled 2-year Velocity (m/s):	Not modelled		

Profile Characteristics	
Bankfull Gradient (%):	0.52
Channel Bed Gradient (%):	0.38
Riffle Gradient (%):	
Riffle Length (m):	No Riffle Pool Morphology
Riffle-Pool Spacing (m):	

Planform Characteristics	
Sinuosity:	1.04
Meander Belt Width (m):	Not applicable
Radius of Curvature (m):	Not applicable
Meander Amplitude (m):	Not applicable
Meander wavelength (m):	Not applicable



Bank Characteristics							
	Minimum	Maximum	Average		Minimum	Maximum	Average
Bank Height (m):	1.13	2.00	1.73				
Bank Angle (deg):	15	80	33	Torvane Value (kg/cm²):	0.5	1.5	1.0
Root Depth (m):	0.05	0.40	0.19	Penetrometer Value (kg/cm³):	0.25	1.5	0.7
Root Density (%):	50	85	71	Bank Material (range):	Clay / Silt / Sand		
Bank Undercut (m):	0.00	0.13	0.01				

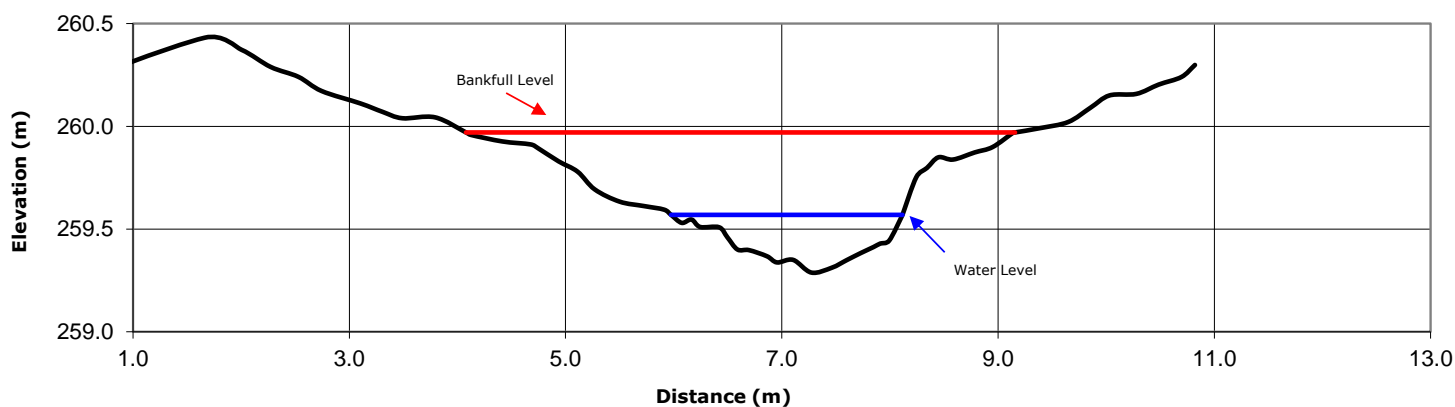
Cross-Sectional Characteristics

	Minimum	Maximum	Average
Bankfull Width (m):	4.89	7.76	6.47
Average Bankfull Depth (m):	0.34	0.39	0.38
Bankfull Width/Depth (m/m):	12	21	17
Wetted Width (m):	2.14	4.29	3.15
Average Water Depth (m):	0.13	0.36	0.22
Wetted Width/Depth (m/m):	7	24	15
Entrenchment (m):	Moderately Entrenched		
Entrenchment Ratio (m/m):	(ER: 1.4 - 2.2)		
Maximum Water Depth (m):	0.28	0.72	0.55
Manning's n :	0.035		



Photograph at cross section 7 (looking downstream)

Representative Cross-Section 2



Substrate Characteristics

Particle Size (mm): Based on laboratory analysis

D₁₀ :	<0.075
D₅₀ :	0.084
D₈₄ :	0.534

Subpavement:

Till Plains

Particle shape:

Sub-angular to Sub-Rounded

Embeddedness (%):

65%

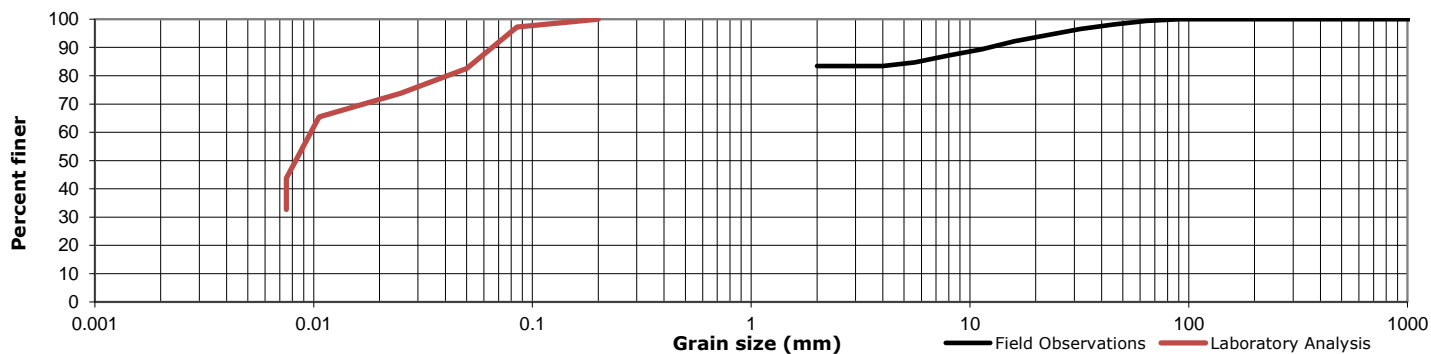
Particle range (riffle):

No Riffle Morphology

Particle Range (pool):

No Pool Morphology

Cumulative Particle Size Distribution



Channel Thresholds			
Flow Competency (m/s):		Tractive Force at Bankfull (N/m²):	19.47
for D₅₀:	0.06	Tractive Force at 2-year flow (N/m²):	Not modelled
for D₈₄:	0.15	Critical Shear Stress (D₅₀) (N/m²):	0.06
Unit Stream Power at Bankfull (W/m²):	21.08		

General Field Observations

Channel Description

Reach LD2 is a tributary of Etobicoke Creek in Alloo, ON which conveys flows within the agricultural lands north of Mayfield Rd between Creditview Rd and Mississauga Rd. Nearing the downstream extent of Lyon's Drain, the subject reach consists of a straightened roadside ditch that runs parallel to Creditview Rd with culverts at the upstream and downstream extent. Channel bed morphology was notably homogenous, characterized by run and pool features, with a distinct scour pool at the upstream extent. Channel substrates predominantly consisted of fine materials including clay, silt and sand ($D_{50} < 0.2 \text{ mm}$). The channel demonstrated indicators of systematic aggradation as fine sediment deposits were observed along the entirety of the channel bed, likely as a consequence of the heavily encroaching aquatic vegetation which slows incoming flows and promotes sediment settling.

Cross Section 5 - Facing Upstream













**Appendix F:
Baseline Surface Water Quality Sampling Locations and
Results**

DRAFT

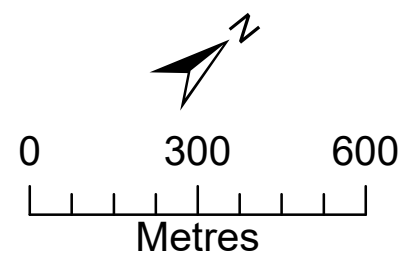
Baseline Surface Water Quality Sampling Locations
Alloa Secondary Plan Area
 Caledon, Ontario

DRAFT

Legend

-  Reach Break and ID
-  Surface Water Quality Monitoring Station
-  Headwater Drainage Feature
-  Tile Drain
-  Watercourse
-  Not Field Assessed
-  Detailed Assessment Location
-  Wetlands
-  Woodlands
-  OHN Waterbody
-  Participating Properties
-  Non-Participating Properties, Access
-  Non-Participating Property, No Access
-  Phase 1 Lands
-  Phase 2 Lands
-  Alloa Secondary Plan Area and Primary Study Area

DRAFT



Imagery: Google Earth, 2022. Waterbody, Watercourse: MNR, 2023. Alloa Phase 1 & 2 Lands, Alloa Secondary Plan Area: Crozier, 2024. HDFs, Watercourse, Surface Water Quality Monitoring Station: GEO Morphix Ltd., 2024. Participating Properties, Wetlands, Dripline, Woodland: Crozier, 2024. Print Date: June 2024. PN24009. Drawn By: R.A., M.O., S.S.O., K.W.





TESTMARK Laboratories Ltd.

Committed to Quality and Service

CERTIFICATE OF ANALYSIS

Client: Patrick Padovan
Company: Geo Morphix
Address: 36 Main St. N. P.O. Box 205
Campbellville, ON, L0P 1B0
Phone: (905) 699-1580
Email: patrickp@geomorphix.com

Work Order Number: 536161
PO #: PN24009m
Regulation: PWQO
Project #: PN24009m
DWS #:
Sampled By: AH RC

Date Order Received: 5/28/2024
Arrival Temperature: 9.1 C

Analysis Started: 5/28/2024
Analysis Completed: 6/5/2024

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
PN24009 - ASW1 - AL	2011065	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/27/2024	1:45 PM
PN24009 - ASW2 - AL	2011066	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/27/2024	1:32 PM
PN24009 - ASW3 - AL	2011067	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/27/2024	1:00 PM
PN24009 - ASW4 - AL	2011068	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/27/2024	12:20 PM
PN24009 - ASW5 - AL	2011069	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/27/2024	12:40 PM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Alkalinity (A1.0)	Mississauga	Determination of Alkalinity by Titration	Modified from APHA-2320B
Ammonia Water (A42)	Kirkland Lake	Determination of Ammonia/Ammonium in Water	Modified from EPA 350.1
Anions Water (mg/L by IC) (A5)	Mississauga	Determination of Anions in Water by Ion Chromatography	Modified from SW846-9056A
BOD (A3)	Mississauga	Determination of Biochemical Oxygen Demand (BOD) 5-Day	Modified from SM-5210 B
ICPMS Tot. Water (A13.2)	Garson	Determination of Total Metals in Water by ICP/MS with Digestion	Modified from SW846-6020A
PAH Water SIM (A41.4)	Garson	Determination of PAH in Water by GC/MS	Modified from SW846-8270D
pH of Water (A2.0)	Mississauga	Determination of Water pH by Ion Selective Electrode	Modified from APHA-4500H+ B



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Method	Lab	Description	Reference
TKN Water Dig. (A58)	Garson	Determination of Total Kjeldahl Nitrogen in Waters with Block Digestion.	Modified from SM-4500 NORG-D
TP Water (A23.2)	Kirkland Lake	Determination of Total Phosphorus in Water.	Modified from EPA 365.3 and ESS 310.2,
TSS (A27)	Mississauga	Determination of Total Suspended Solids in water by gravimetry	Modified from SM-2540

This report has been approved by:

Marc Creighton
Laboratory Director

WORK ORDER RESULTS

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Anions	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Bromide	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	mg/L	~
Chloride	104.0	0.2	86.7	0.2	42.6	0.2	27.3	0.2	mg/L	~
Fluoride	0.10	0.05	0.15	0.05	0.14	0.05	0.17	0.05	mg/L	~
Nitrate (as N)	4.55	0.05	30.40	0.05	22.60	0.05	6.64	0.05	mg/L	~
Nitrite (as N)	0.84	0.05	0.73	0.05	0.29	0.05	0.09	0.05	mg/L	~
Sulphate	25.0	0.5	52.5	0.5	19.1	0.5	11.1	0.5	mg/L	~



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Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
Anions	Result	MDL	Units	Criteria: PWQO
Bromide	<0.05	0.05	mg/L	~
Chloride	27.1	0.2	mg/L	~
Fluoride	0.06	0.05	mg/L	~
Nitrate (as N)	0.39	0.05	mg/L	~
Nitrite (as N)	<0.05	0.05	mg/L	~
Sulphate	6.5	0.5	mg/L	~

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
General Chemistry	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	3.10	0.01	1.91	0.01	1.96	0.01	0.74	0.01	mg/L	~
M-Alkalinity (pH 4.5)	132	2	117	2	74	2	65	2	mg/L as CaCO3	~
pH	7.55	N/A	7.37	N/A	7.36	N/A	7.37	N/A	pH	~
Total Kjeldahl Nitrogen	2.2	0.2*	0.5	0.2*	0.6	0.2*	0.3	0.2*	mg/L	~
Total Phosphorus (as P)	0.443	0.002	1.210	0.006*	2.27	0.04*	4.52	0.04*	mg/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
General Chemistry	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	0.05 [0.05]	0.01	mg/L	~
M-Alkalinity (pH 4.5)	118	2	mg/L as CaCO3	~
pH	7.77	N/A	pH	~
Total Kjeldahl Nitrogen	0.5	0.2*	mg/L	~
Total Phosphorus (as P)	0.229	0.002	mg/L	~

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Aluminum	3640	10*	4550	10*	18000	10*	33100	10*	ug/L	75
Total Antimony	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	ug/L	20
Total Arsenic	3	1	4	1	5	1	6	1	ug/L	5
Total Barium	54	1	82	1	172	10*	247	10*	ug/L	~
Total Beryllium	<0.5	0.5	<0.5	0.5	0.7	0.5	1.5	0.5	ug/L	11
Total Bismuth	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Boron	43	2	59	2	39	2	45	2	ug/L	200
Total Cadmium	0.12	0.02	0.13	0.02	0.39	0.02	0.51	0.02	ug/L	0.1
Total Calcium	58500	500*	87400	500*	72800	500*	47300	50	ug/L	~
Total Cerium	6	1	6	1	26	1	38	1	ug/L	~
Total Cesium	<1	1	<1	1	<1	1	2	1	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Chromium	5	1	5	1	20	1	44	1	ug/L	~
Total Cobalt	2.0	0.1	2.5	0.1	7.8	0.1	16.4	0.1	ug/L	0.9
Total Copper	10	1	19	1	38	1	35	1	ug/L	1
Total Europium	<1	1	<1	1	<1	1	1	1	ug/L	~
Total Gallium	3	1	4	1	11	1	18	1	ug/L	~
Total Iron	4610	200*	6180	200*	24200	200*	45600	200*	ug/L	300
Total Lanthanum	3	1	3	1	14	1	17	1	ug/L	~
Total Lead	3.5	0.1	12.8	0.1	13.6	0.1	20.7	0.1	ug/L	1
Total Lithium	7	5	9	5	24	5	48	5	ug/L	~
Total Magnesium	14700	4	19200	4	13600	4	17700	4	ug/L	~
Total Manganese	102	1	213	1	425	10*	730	10*	ug/L	~
Total Mercury	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	1	1	<1	1	<1	1	ug/L	40
Total Nickel	7	1	11	1	23	1	42	1	ug/L	25
Total Niobium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Phosphorus	516	50	865	50	996	50	1310	50	ug/L	~
Total Potassium	8620	100	15100	100	9610	100	13400	100	ug/L	~
Total Rhodium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Rubidium	6	1	8	1	20	1	41	1	ug/L	~
Total Scandium	6	1	8	1	21	1	33	1	ug/L	~
Total Selenium	0.5	0.2	0.6	0.2	0.7	0.2	0.5	0.2	ug/L	100
Total Silicon	7390	600	9300	600	25000	6000*	42000	6000*	ug/L	~
Total Silver	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.1



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Sodium	22200	100	36300	100	11600	100	9060	100	ug/L	~
Total Strontium	315	1	413	1	222	1	249	1	ug/L	~
Total Sulphur	10700	800	15500	800	3800	800	<800	800	ug/L	~
Total Tellurium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Thallium	<0.1	0.1	<0.1	0.1	0.1	0.1	0.3	0.1	ug/L	0.3
Total Thorium	<1	1	<1	1	1	1	4	1	ug/L	~
Total Tin	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Titanium	63	1	81	1	179	1	343	10*	ug/L	~
Total Tungsten	<1	1	<1	1	<1	1	<1	1	ug/L	30
Total Uranium	1	1	<1	1	1	1	1	1	ug/L	5
Total Vanadium	8	1	9	1	27	1	58	1	ug/L	6
Total Yttrium	3	1	3	1	17	1	17	1	ug/L	~
Total Zinc	29	1	39	1	105	1	148	1	ug/L	20
Total Zirconium	<1	1	<1	1	2	1	2	1	ug/L	4
Sample Description	PN24009 - ASW5 - AL									
Sample Date	5/27/2024 12:40 PM									
Lab ID	2011069									
Metals (Total)	Result	MDL	Units	Criteria: PWQO						
Total Aluminum	285	1	ug/L	75						
Total Antimony	<0.5	0.5	ug/L	20						
Total Arsenic	2	1	ug/L	5						



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Barium	24	1	ug/L	~
Total Beryllium	<0.5	0.5	ug/L	11
Total Bismuth	<1	1	ug/L	~
Total Boron	33	2	ug/L	200
Total Cadmium	0.05	0.02	ug/L	0.1
Total Calcium	42500	50	ug/L	~
Total Cerium	<1	1	ug/L	~
Total Cesium	<1	1	ug/L	~
Total Chromium	<1	1	ug/L	~
Total Cobalt	0.3	0.1	ug/L	0.9
Total Copper	4	1	ug/L	1
Total Europium	<1	1	ug/L	~
Total Gallium	<1	1	ug/L	~
Total Iron	534	20	ug/L	300
Total Lanthanum	<1	1	ug/L	~
Total Lead	0.5	0.1	ug/L	1
Total Lithium	<5	5	ug/L	~
Total Magnesium	6830	4	ug/L	~
Total Manganese	59	1	ug/L	~
Total Mercury	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	ug/L	40
Total Nickel	1	1	ug/L	25
Total Niobium	<1	1	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Phosphorus	230	50	ug/L	~
Total Potassium	5210	100	ug/L	~
Total Rhodium	<1	1	ug/L	~
Total Rubidium	2	1	ug/L	~
Total Scandium	2	1	ug/L	~
Total Selenium	0.3	0.2	ug/L	100
Total Silicon	2800	600	ug/L	~
Total Silver	<0.1	0.1	ug/L	0.1
Total Sodium	17400	100	ug/L	~
Total Strontium	136	1	ug/L	~
Total Sulphur	<800	800	ug/L	~
Total Tellurium	<1	1	ug/L	~
Total Thallium	<0.1	0.1	ug/L	0.3
Total Thorium	<1	1	ug/L	~
Total Tin	<1	1	ug/L	~
Total Titanium	7	1	ug/L	~
Total Tungsten	<1	1	ug/L	30
Total Uranium	<1	1	ug/L	5
Total Vanadium	1	1	ug/L	6
Total Yttrium	<1	1	ug/L	~
Total Zinc	21	1	ug/L	20
Total Zirconium	<1	1	ug/L	4



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Oxygen Demand	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	<7	7	<7	7	6.2	1	4.5	1	mg/L	~

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
Oxygen Demand	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	5.4	1	mg/L	~

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
1+2-Methylnaphthalene (Calc.)	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
1-Methylnaphthalene	<0.03	0.03	<0.04	0.04	<0.03	0.03	<0.03	0.03	ug/L	2
2-Methylnaphthalene	<0.02	0.02	<0.03	0.03	<0.02	0.02	<0.02	0.02	ug/L	2
3,3'-Dichlorobenzidine	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	0.6
Acenaphthene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
Acenaphthylene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
Anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Benzo(b)fluoranthene	<0.07	0.07	<0.08	0.08	<0.07	0.07	<0.07	0.07	ug/L	~
Benzo(ghi)perylene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.00002
Benzo(k)fluoranthene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.0002
Biphenyl	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Chrysene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	0.0001
Dibenz(a,h)anthracene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.002
Fluoranthene	<0.03	0.03	<0.04	0.04	<0.03	0.03	<0.03	0.03	ug/L	0.0008
Fluorene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.2
Fluorobiphenyl (Surr.)	77	N/A	74.2	N/A	66.6	N/A	76.8	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.03	0.03	<0.04	0.04	<0.03	0.03	<0.03	0.03	ug/L	~
Naphthalene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	7
Phenanthrene	<0.03	0.03	<0.04	0.04	<0.03	0.03	<0.03	0.03	ug/L	0.03
p-Terphenyl-d14 (Surr.)	71.9	N/A	56.7	N/A	93.7	N/A	66.7	N/A	% Rec	~
Pyrene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	~
Sample Description	PN24009 - ASW5 - AL									
Sample Date	5/27/2024 12:40 PM									
Lab ID	2011069									
PAH	Result	MDL	Units	Criteria: PWQO						
1+2-Methylnaphthalene (Calc.)	<0.05	0.05	ug/L	~						
1-Methylnaphthalene	<0.04	0.04	ug/L	2						
2-Methylnaphthalene	<0.02	0.02	ug/L	2						



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW5 - AL			
Sample Date	5/27/2024 12:40 PM			
Lab ID	2011069			
PAH	Result	MDL	Units	Criteria: PWQO
3,3'-Dichlorobenzidine	<0.06	0.06	ug/L	0.6
Acenaphthene	<0.05	0.05	ug/L	~
Acenaphthylene	<0.05	0.05	ug/L	~
Anthracene	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	ug/L	~
Benzo(b)fluoranthene	<0.07	0.07	ug/L	~
Benzo(ghi)perylene	<0.05	0.05	ug/L	0.00002
Benzo(k)fluoranthene	<0.05	0.05	ug/L	0.0002
Biphenyl	<0.1	0.1	ug/L	0.2
Chrysene	<0.06	0.06	ug/L	0.0001
Dibenz(a,h)anthracene	<0.05	0.05	ug/L	0.002
Fluoranthene	<0.04	0.04	ug/L	0.0008
Fluorene	<0.05	0.05	ug/L	0.2
Fluorobiphenyl (Surr.)	71.5	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.04	0.04	ug/L	~
Naphthalene	<0.06	0.06	ug/L	7
Phenanthrene	<0.04	0.04	ug/L	0.03
p-Terphenyl-d14 (Surr.)	66.7	N/A	% Rec	~
Pyrene	<0.06	0.06	ug/L	~



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CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

Sample Description	PN24009 - ASW1 - AL		PN24009 - ASW2 - AL		PN24009 - ASW3 - AL		PN24009 - ASW4 - AL			
Sample Date	5/27/2024 1:45 PM		5/27/2024 1:32 PM		5/27/2024 1:00 PM		5/27/2024 12:20 PM			
Lab ID	2011065		2011066		2011067		2011068			
Solids	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Suspended Solids	136.0	3.6	152	4	630	10	1740	20	mg/L	~
Sample Description	PN24009 - ASW5 - AL									
Sample Date	5/27/2024 12:40 PM									
Lab ID	2011069									
Solids	Result	MDL	Units	Criteria: PWQO						
Total Suspended Solids	18.00	0.67	mg/L	~						



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CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536161

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

[]: Results for laboratory replicates are shown in square brackets immediately below the associated sample result for ease of comparison.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Organic Soil Analysis: Data reported for organic analysis in soils samples are corrected for moisture content.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

Reproduction of Report: Report shall not be reproduced, except in full, without the approval of Testmark Laboratories Ltd.

ICPMS Dustfall Insoluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.

Regulation Comparisons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

Dilution: In the MDL column an asterisk () indicates a sample dilution was performed.



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CERTIFICATE OF ANALYSIS

Client: Patrick Padovan
Company: Geo Morphix
Address: 36 Main St. N. P.O. Box 205
Campbellville, ON, L0P 1B0
Phone: (905) 699-1580
Email: patrickp@geomorphix.com

Work Order Number: 536381
PO #: PN24009m
Regulation: PWQO
Project #: PN24009m
DWS #:
Sampled By: SH CM

Date Order Received: 5/29/2024
Arrival Temperature: 20.9 C

Analysis Started: 5/30/2024
Analysis Completed: 6/10/2024

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
PN24009 - ASW1 - RL	2011725	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/28/2024	9:25 AM
PN24009 - ASW2 - RL	2011726	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/28/2024	9:01 AM
PN24009 - ASW3 - RL	2011727	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/28/2024	9:15 AM
PN24009 - ASW4 - RL	2011728	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/28/2024	8:48 AM
PN24009 - ASW5 - RL	2011729	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	5/28/2024	8:37 AM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Alkalinity (A1.0)	Mississauga	Determination of Alkalinity by Titration	Modified from APHA-2320B
Ammonia Water (A42)	Kirkland Lake	Determination of Ammonia/Ammonium in Water	Modified from EPA 350.1
Anions Water (mg/L by IC) (A5)	Mississauga	Determination of Anions in Water by Ion Chromatography	Modified from SW846-9056A
BOD (A3)	Mississauga	Determination of Biochemical Oxygen Demand (BOD) 5-Day	Modified from SM-5210 B
ICPMS Tot. Water (A13.2)	Garson	Determination of Total Metals in Water by ICP/MS with Digestion	Modified from SW846-6020A
PAH Water SIM (A41.4)	Garson	Determination of PAH in Water by GC/MS	Modified from SW846-8270D
pH of Water (A2.0)	Mississauga	Determination of Water pH by Ion Selective Electrode	Modified from APHA-4500H+ B



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Method	Lab	Description	Reference
TKN Water Dig. (A58)	Garson	Determination of Total Kjeldahl Nitrogen in Waters with Block Digestion.	Modified from SM-4500 NORG-D
TP Water (A23.2)	Kirkland Lake	Determination of Total Phosphorus in Water.	Modified from EPA 365.3 and ESS 310.2,
TSS (A27)	Mississauga	Determination of Total Suspended Solids in water by gravimetry	Modified from SM-2540

This report has been approved by:

Marc Creighton
Laboratory Director

WORK ORDER RESULTS

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Anions	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Bromide	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	mg/L	~
Chloride	42.7	0.2	68.4	0.2	45.3	0.2	58.5	0.2	mg/L	~
Fluoride	0.21	0.05	0.18	0.05	0.13	0.05	0.16	0.05	mg/L	~
Nitrate (as N)	13.60	0.05	15.80	0.05	27.00	0.05	19.10	0.05	mg/L	~
Nitrite (as N)	0.40	0.05	0.62	0.05	0.33	0.05	0.56	0.05	mg/L	~
Sulphate	30.6	0.5	34.7	0.5	37.4	0.5	35.5	0.5	mg/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
Anions	Result	MDL	Units	Criteria: PWQO
Bromide	<0.05	0.05	mg/L	~
Chloride	35.6	0.2	mg/L	~
Fluoride	0.13	0.05	mg/L	~
Nitrate (as N)	4.89	0.05	mg/L	~
Nitrite (as N)	0.35	0.05	mg/L	~
Sulphate	14.4	0.5	mg/L	~

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
General Chemistry	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	1.14	0.01	0.74	0.01	0.18	0.01	1.08	0.01	mg/L	~
M-Alkalinity (pH 4.5)	198	2	182	2	210	2	181	2	mg/L as CaCO3	~
pH	7.56	N/A	7.54	N/A	7.68	N/A	7.59	N/A	pH	~
Total Kjeldahl Nitrogen	1.6	0.2*	1.6	0.2*	<0.4	0.4*	0.7	0.4*	mg/L	~
Total Phosphorus (as P)	0.326	0.002	0.333	0.002	0.103	0.002	0.289	0.002	mg/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
General Chemistry	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	0.07	0.01	mg/L	~
M-Alkalinity (pH 4.5)	160	2	mg/L as CaCO3	~
pH	7.71	N/A	pH	~
Total Kjeldahl Nitrogen	1.0	0.2*	mg/L	~
Total Phosphorus (as P)	0.139	0.002	mg/L	~

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Aluminum	1470	10*	1160	10*	281	1	2280	10*	ug/L	75
Total Antimony	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	ug/L	20
Total Arsenic	1	1	1	1	1	1	2	1	ug/L	5
Total Barium	52	1	59	1	77	1	71	1	ug/L	~
Total Beryllium	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	ug/L	11
Total Bismuth	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Boron	47	2	57	2	43	2	56	2	ug/L	200
Total Cadmium	0.05	0.02	0.04	0.02	0.03	0.02	0.05	0.02	ug/L	0.1
Total Calcium	118000	500*	97000	500*	119000	500*	107000	500*	ug/L	~
Total Cerium	1	1	1	1	<1	1	2	1	ug/L	~
Total Cesium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Chromium	2	1	2	1	<1	1	2	1	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Cobalt	0.7	0.1	0.7	0.1	0.5	0.1	0.9	0.1	ug/L	0.9
Total Copper	7	1	8	1	6	1	7	1	ug/L	1
Total Europium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Gallium	1	1	2	1	2	1	2	1	ug/L	~
Total Iron	1200	20	1110	20	515	20	1910	20	ug/L	300
Total Lanthanum	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Lead	0.6	0.1	0.5	0.1	0.2	0.1	0.8	0.1	ug/L	1
Total Lithium	<5	5	<5	5	7	5	6	5	ug/L	~
Total Magnesium	18700	4	18700	4	21300	4	19600	4	ug/L	~
Total Manganese	122	1	65	1	46	1	93	1	ug/L	~
Total Mercury	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	1	1	<1	1	<1	1	ug/L	40
Total Nickel	4	1	4	1	2	1	6	1	ug/L	25
Total Niobium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Phosphorus	370	50	400	50	170	50	350	50	ug/L	~
Total Potassium	11100	100	14300	100	4170	100	10200	100	ug/L	~
Total Rhodium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Rubidium	3	1	4	1	1	1	4	1	ug/L	~
Total Scandium	3	1	4	1	4	1	5	1	ug/L	~
Total Selenium	0.7	0.2	0.8	0.2	0.6	0.2	0.7	0.2	ug/L	100
Total Silicon	6980	600	7200	600	7430	600	7510	600	ug/L	~
Total Silver	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.1
Total Sodium	15900	100	34300	100	20200	100	27800	100	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Strontium	352	1	375	1	378	1	401	1	ug/L	~
Total Sulphur	16700	800	20200	800	21300	800	20100	800	ug/L	~
Total Tellurium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Thallium	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.3
Total Thorium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Tin	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Titanium	18	1	20	1	9	1	33	1	ug/L	~
Total Tungsten	<1	1	<1	1	<1	1	<1	1	ug/L	30
Total Uranium	<1	1	1	1	1	1	1	1	ug/L	5
Total Vanadium	3	1	2	1	1	1	4	1	ug/L	6
Total Yttrium	<1	1	<1	1	<1	1	1	1	ug/L	~
Total Zinc	10	1	8	1	3	1	8	1	ug/L	20
Total Zirconium	1	1	2	1	<1	1	1	1	ug/L	4

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Aluminum	438	1	ug/L	75
Total Antimony	<0.5	0.5	ug/L	20
Total Arsenic	1	1	ug/L	5
Total Barium	38	1	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Beryllium	<0.5	0.5	ug/L	11
Total Bismuth	<1	1	ug/L	~
Total Boron	33	2	ug/L	200
Total Cadmium	0.03	0.02	ug/L	0.1
Total Calcium	82900	500*	ug/L	~
Total Cerium	<1	1	ug/L	~
Total Cesium	<1	1	ug/L	~
Total Chromium	<1	1	ug/L	~
Total Cobalt	0.4	0.1	ug/L	0.9
Total Copper	4	1	ug/L	1
Total Europium	<1	1	ug/L	~
Total Gallium	<1	1	ug/L	~
Total Iron	638	20	ug/L	300
Total Lanthanum	<1	1	ug/L	~
Total Lead	0.3	0.1	ug/L	1
Total Lithium	<5	5	ug/L	~
Total Magnesium	11000	4	ug/L	~
Total Manganese	56	1	ug/L	~
Total Mercury	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	ug/L	40
Total Nickel	2	1	ug/L	25
Total Niobium	<1	1	ug/L	~
Total Phosphorus	200	50	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Potassium	5330	100	ug/L	~
Total Rhodium	<1	1	ug/L	~
Total Rubidium	2	1	ug/L	~
Total Scandium	3	1	ug/L	~
Total Selenium	0.5	0.2	ug/L	100
Total Silicon	6470	600	ug/L	~
Total Silver	<0.1	0.1	ug/L	0.1
Total Sodium	20000	100	ug/L	~
Total Strontium	203	1	ug/L	~
Total Sulphur	10200	800	ug/L	~
Total Tellurium	<1	1	ug/L	~
Total Thallium	<0.1	0.1	ug/L	0.3
Total Thorium	<1	1	ug/L	~
Total Tin	<1	1	ug/L	~
Total Titanium	16	1	ug/L	~
Total Tungsten	<1	1	ug/L	30
Total Uranium	<1	1	ug/L	5
Total Vanadium	2	1	ug/L	6
Total Yttrium	<1	1	ug/L	~
Total Zinc	4	1	ug/L	20
Total Zirconium	<1	1	ug/L	4



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Oxygen Demand	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	3.6	1	3.8	1	<1	1	1.2	1	mg/L	~

Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
Oxygen Demand	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	1	1	mg/L	~

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
1+2-Methylnaphthalene (Calc.)	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
1-Methylnaphthalene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.03	0.03	ug/L	2
2-Methylnaphthalene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	2
3,3'-Dichlorobenzidine	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	0.6
Acenaphthene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
Acenaphthylene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
Anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Benzo(b)fluoranthene	<0.07	0.07	<0.07	0.07	<0.07	0.07	<0.07	0.07	ug/L	~
Benzo(ghi)perylene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.00002
Benzo(k)fluoranthene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.0002
Biphenyl	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Chrysene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	0.0001
Dibenz(a,h)anthracene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.002
Fluoranthene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.03	0.03	ug/L	0.0008
Fluorene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.2
Fluorobiphenyl (Surr.)	99.2	N/A	91.5	N/A	85.7	N/A	50.8	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.03	0.03	ug/L	~
Naphthalene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	7
Phenanthrene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.03	0.03	ug/L	0.03
p-Terphenyl-d14 (Surr.)	111	N/A	115	N/A	80.7	N/A	52.2	N/A	% Rec	~
Pyrene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	~
Sample Description	PN24009 - ASW5 - RL									
Sample Date	5/28/2024 8:37 AM									
Lab ID	2011729									
PAH	Result	MDL	Units	Criteria: PWQO						
1+2-Methylnaphthalene (Calc.)	<0.05	0.05	ug/L	~						
1-Methylnaphthalene	<0.04	0.04	ug/L	2						
2-Methylnaphthalene	<0.03	0.03	ug/L	2						



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Sample Description	PN24009 - ASW5 - RL			
Sample Date	5/28/2024 8:37 AM			
Lab ID	2011729			
PAH	Result	MDL	Units	Criteria: PWQO
3,3'-Dichlorobenzidine	<0.06	0.06	ug/L	0.6
Acenaphthene	<0.05	0.05	ug/L	~
Acenaphthylene	<0.05	0.05	ug/L	~
Anthracene	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	ug/L	~
Benzo(b)fluoranthene	<0.08	0.08	ug/L	~
Benzo(ghi)perylene	<0.05	0.05	ug/L	0.00002
Benzo(k)fluoranthene	<0.05	0.05	ug/L	0.0002
Biphenyl	<0.1	0.1	ug/L	0.2
Chrysene	<0.06	0.06	ug/L	0.0001
Dibenz(a,h)anthracene	<0.05	0.05	ug/L	0.002
Fluoranthene	<0.04	0.04	ug/L	0.0008
Fluorene	<0.05	0.05	ug/L	0.2
Fluorobiphenyl (Surr.)	76.5	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.04	0.04	ug/L	~
Naphthalene	<0.06	0.06	ug/L	7
Phenanthrene	<0.04	0.04	ug/L	0.03
p-Terphenyl-d14 (Surr.)	69.8	N/A	% Rec	~
Pyrene	<0.06	0.06	ug/L	~



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Work Order Number: 536381

Sample Description	PN24009 - ASW1 - RL		PN24009 - ASW2 - RL		PN24009 - ASW3 - RL		PN24009 - ASW4 - RL			
Sample Date	5/28/2024 9:25 AM		5/28/2024 9:01 AM		5/28/2024 9:15 AM		5/28/2024 8:48 AM			
Lab ID	2011725		2011726		2011727		2011728			
Solids	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Suspended Solids	23.5	1	17.5	1	5.00	0.67	38.0 [36.0]	1.3	mg/L	~
Sample Description	PN24009 - ASW5 - RL									
Sample Date	5/28/2024 8:37 AM									
Lab ID	2011729									
Solids	Result	MDL	Units	Criteria: PWQO						
Total Suspended Solids	6.30	0.67	mg/L	~						



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CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 536381

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

[]: Results for laboratory replicates are shown in square brackets immediately below the associated sample result for ease of comparison.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Organic Soil Analysis: Data reported for organic analysis in soils samples are corrected for moisture content.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

Reproduction of Report: Report shall not be reproduced, except in full, without the approval of Testmark Laboratories Ltd.

ICPMS Dustfall Insoluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.

Regulation Comparisons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

Dilution: In the MDL column an asterisk () indicates a sample dilution was performed.



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CERTIFICATE OF ANALYSIS

Client: Patrick Padovan
Company: Geo Morphix
Address: 36 Main St. N. P.O. Box 205
Campbellville, ON, L0P 1B0
Phone: (905) 699-1580
Email: patrickp@geomorphix.com

Work Order Number: 538145
PO #: PN24009m
Regulation: PWQO
Project #: PN24009m
DWS #:
Sampled By: AH SC

Date Order Received: 6/14/2024
Arrival Temperature: 14.1 C

Analysis Started: 6/14/2024
Analysis Completed: 6/21/2024

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
PN24009 - ASW1	2017739	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	6/12/2024	9:17 AM
PN24009 - ASW2	2017740	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	6/12/2024	9:40 AM
PN24009 - ASW3	2017741	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	6/12/2024	9:55 AM
PN24009 - ASW4	2017742	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	6/12/2024	10:22 AM
PN24009 - ASW5	2017743	Surface Water	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	6/12/2024	10:11 AM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Alkalinity (A1.0)	Mississauga	Determination of Alkalinity by Titration	Modified from APHA-2320B
Ammonia Water (A42)	Kirkland Lake	Determination of Ammonia/Ammonium in Water	Modified from EPA 350.1
Anions Water (mg/L by IC) (A5)	Mississauga	Determination of Anions in Water by Ion Chromatography	Modified from SW846-9056A
BOD (A3)	Mississauga	Determination of Biochemical Oxygen Demand (BOD) 5-Day	Modified from SM-5210 B
ICPMS Tot. Water (A13.2)	Garson	Determination of Total Metals in Water by ICP/MS with Digestion	Modified from SW846-6020A
PAH Water SIM (A41.4)	Garson	Determination of PAH in Water by GC/MS	Modified from SW846-8270D
pH of Water (A2.0)	Mississauga	Determination of Water pH by Ion Selective Electrode	Modified from APHA-4500H+ B



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Geo Morphix

Work Order Number: 538145

Method	Lab	Description	Reference
TKN Water Dig. (A58)	Garson	Determination of Total Kjeldahl Nitrogen in Waters with Block Digestion.	Modified from SM-4500 NORG-D
TP Water (A23.2)	Kirkland Lake	Determination of Total Phosphorus in Water.	Modified from EPA 365.3 and ESS 310.2,
TSS (A27)	Mississauga	Determination of Total Suspended Solids in water by gravimetry	Modified from SM-2540

This report has been approved by:

Marc Creighton
Laboratory Director

WORK ORDER RESULTS

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Anions	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Bromide	<0.05	0.05	0.19	0.05	0.17	0.05	0.11	0.05	mg/L	~
Chloride	70.3	0.2	63.6	0.2	57.5	0.2	62.3	0.2	mg/L	~
Fluoride	0.13	0.05	0.12	0.05	0.06	0.05	0.12	0.05	mg/L	~
Nitrate (as N)	4.86	0.05	5.32	0.05	5.02	0.05	4.99	0.05	mg/L	~
Nitrite (as N)	0.80	0.05	0.33	0.05	0.19	0.05	0.26	0.05	mg/L	~
Sulphate	42.2	0.5	47.0	0.5	48.2	0.5	50.9	0.5	mg/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
Anions	Result	MDL	Units	Criteria: PWQO
Bromide	0.27	0.05	mg/L	~
Chloride	37.1	0.2	mg/L	~
Fluoride	0.10	0.05	mg/L	~
Nitrate (as N)	0.07	0.05	mg/L	~
Nitrite (as N)	<0.05	0.05	mg/L	~
Sulphate	4.5	0.5	mg/L	~

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
General Chemistry	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	0.25	0.01	0.03	0.01	0.06	0.01	0.08	0.01	mg/L	~
M-Alkalinity (pH 4.5)	261	2	298	2	261	2	268	2	mg/L as CaCO3	~
pH	7.49	N/A	7.47	N/A	7.72	N/A	7.75	N/A	pH	~
Total Kjeldahl Nitrogen	0.7	0.2*	0.7	0.2*	<0.2	0.2*	0.2	0.2*	mg/L	~
Total Phosphorus (as P)	0.118 [0.117]	0.002	0.231	0.002	0.029	0.002	0.131	0.002	mg/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
General Chemistry	Result	MDL	Units	Criteria: PWQO
Ammonia (as N)	0.03	0.01	mg/L	~
M-Alkalinity (pH 4.5)	270	2	mg/L as CaCO3	~
pH	7.78	N/A	pH	~
Total Kjeldahl Nitrogen	0.6	0.2*	mg/L	~
Total Phosphorus (as P)	0.092	0.002	mg/L	~

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Aluminum	23	1	54	1	23	1	888	10*	ug/L	75
Total Antimony	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	ug/L	20
Total Arsenic	1	1	1	1	3	1	2	1	ug/L	5
Total Barium	51	1	64	1	119	1	96	1	ug/L	~
Total Beryllium	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	ug/L	11
Total Bismuth	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Boron	37	2	51	2	44	2	50	2	ug/L	200
Total Cadmium	<0.02	0.02	<0.02	0.02	<0.02	0.02	0.03	0.02	ug/L	0.1
Total Calcium	124000	500*	135000	500*	112000	500*	119000	500*	ug/L	~
Total Cerium	<1	1	<1	1	<1	1	2	1	ug/L	~
Total Cesium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Chromium	<1	1	<1	1	<1	1	1	1	ug/L	~



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Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Cobalt	0.3	0.1	0.4	0.1	0.2	0.1	0.7	0.1	ug/L	0.9
Total Copper	2	1	3	1	3	1	3	1	ug/L	1
Total Europium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Gallium	1	1	2	1	3	1	3	1	ug/L	~
Total Iron	211	20	287	20	387	20	1530	20	ug/L	300
Total Lanthanum	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Lead	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.7	0.1	ug/L	1
Total Lithium	<5	5	6	5	12	5	11	5	ug/L	~
Total Magnesium	26300	4	30100	4	29600	4	30100	4	ug/L	~
Total Manganese	193	1	189	1	51	1	125	1	ug/L	~
Total Mercury	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	<1	1	<1	1	<1	1	ug/L	40
Total Nickel	1	1	2	1	2	1	3	1	ug/L	25
Total Niobium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Phosphorus	150	50	130	50	<50	50	120	50	ug/L	~
Total Potassium	5080	100	4660	100	1830	100	3030	100	ug/L	~
Total Rhodium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Rubidium	1	1	1	1	<1	1	2	1	ug/L	~
Total Scandium	1	1	1	1	3	1	2	1	ug/L	~
Total Selenium	0.6	0.2	0.8	0.2	0.5	0.2	0.7	0.2	ug/L	100
Total Silicon	2900	600	2500	600	6900	600	4700	600	ug/L	~
Total Silver	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.1
Total Sodium	25500	100	30600	100	23200	100	26800	100	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Metals (Total)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Strontium	490	1	664	1	578	1	654	1	ug/L	~
Total Sulphur	17900	800	20700	800	19400	800	20300	800	ug/L	~
Total Tellurium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Thallium	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.3
Total Thorium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Tin	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Titanium	2	1	2	1	2	1	18	1	ug/L	~
Total Tungsten	<1	1	<1	1	<1	1	<1	1	ug/L	30
Total Uranium	1	1	2	1	<1	1	1	1	ug/L	5
Total Vanadium	1	1	<1	1	<1	1	2	1	ug/L	6
Total Yttrium	<1	1	<1	1	<1	1	<1	1	ug/L	~
Total Zinc	4	1	7	1	4	1	6	1	ug/L	20
Total Zirconium	<1	1	<1	1	<1	1	<1	1	ug/L	4

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Aluminum	290	1	ug/L	75
Total Antimony	<0.5	0.5	ug/L	20
Total Arsenic	4	1	ug/L	5
Total Barium	53	1	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Beryllium	<0.5	0.5	ug/L	11
Total Bismuth	<1	1	ug/L	~
Total Boron	89	2	ug/L	200
Total Cadmium	0.02	0.02	ug/L	0.1
Total Calcium	78200	500*	ug/L	~
Total Cerium	<1	1	ug/L	~
Total Cesium	<1	1	ug/L	~
Total Chromium	<1	1	ug/L	~
Total Cobalt	0.4	0.1	ug/L	0.9
Total Copper	2	1	ug/L	1
Total Europium	<1	1	ug/L	~
Total Gallium	2	1	ug/L	~
Total Iron	648	20	ug/L	300
Total Lanthanum	<1	1	ug/L	~
Total Lead	0.3	0.1	ug/L	1
Total Lithium	12	5	ug/L	~
Total Magnesium	20700	4	ug/L	~
Total Manganese	249	1	ug/L	~
Total Mercury	<0.1	0.1	ug/L	0.2
Total Molybdenum	<1	1	ug/L	40
Total Nickel	2	1	ug/L	25
Total Niobium	<1	1	ug/L	~
Total Phosphorus	110	50	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
Metals (Total)	Result	MDL	Units	Criteria: PWQO
Total Potassium	2310	100	ug/L	~
Total Rhodium	<1	1	ug/L	~
Total Rubidium	1	1	ug/L	~
Total Scandium	4	1	ug/L	~
Total Selenium	1.0	0.2	ug/L	100
Total Silicon	7540	600	ug/L	~
Total Silver	<0.1	0.1	ug/L	0.1
Total Sodium	28100	100	ug/L	~
Total Strontium	643	1	ug/L	~
Total Sulphur	2800	800	ug/L	~
Total Tellurium	<1	1	ug/L	~
Total Thallium	<0.1	0.1	ug/L	0.3
Total Thorium	<1	1	ug/L	~
Total Tin	<1	1	ug/L	~
Total Titanium	7	1	ug/L	~
Total Tungsten	<1	1	ug/L	30
Total Uranium	<1	1	ug/L	5
Total Vanadium	1	1	ug/L	6
Total Yttrium	<1	1	ug/L	~
Total Zinc	5	1	ug/L	20
Total Zirconium	<1	1	ug/L	4



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Oxygen Demand	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	1.5	1	3	1	1.1	1	1.4	1	mg/L	~

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
Oxygen Demand	Result	MDL	Units	Criteria: PWQO
BOD (5 day)	2	1	mg/L	~

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
1+2-Methylnaphthalene (Calc.)	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	~
1-Methylnaphthalene	<0.03	0.03	<0.03	0.03	<0.03	0.03	<0.03	0.03	ug/L	2
2-Methylnaphthalene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	2
3,3'-Dichlorobenzidine	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.6
Acenaphthene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	~
Acenaphthylene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	~
Anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
PAH	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Benzo(b)fluoranthene	<0.06	0.06	<0.06	0.06	<0.06	0.06	<0.06	0.06	ug/L	~
Benzo(ghi)perylene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	0.00002
Benzo(k)fluoranthene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	0.0002
Biphenyl	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	ug/L	0.2
Chrysene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	0.0001
Dibenz(a,h)anthracene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	0.002
Fluoranthene	<0.03	0.03	<0.03	0.03	<0.03	0.03	<0.03	0.03	ug/L	0.0008
Fluorene	<0.04	0.04	<0.04	0.04	<0.04	0.04	<0.04	0.04	ug/L	0.2
Fluorobiphenyl (Surr.)	93	N/A	89.9	N/A	89.8	N/A	87.6	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.03	0.03	<0.03	0.03	<0.03	0.03	<0.03	0.03	ug/L	~
Naphthalene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	7
Phenanthrene	<0.03	0.03	<0.03	0.03	<0.03	0.03	<0.03	0.03	ug/L	0.03
p-Terphenyl-d14 (Surr.)	101	N/A	104	N/A	107	N/A	97	N/A	% Rec	~
Pyrene	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	ug/L	~
Sample Description	PN24009 - ASW5									
Sample Date	6/12/2024 10:11 AM									
Lab ID	2017743									
PAH	Result	MDL	Units	Criteria: PWQO						
1+2-Methylnaphthalene (Calc.)	<0.04	0.04	ug/L	~						
1-Methylnaphthalene	<0.03	0.03	ug/L	2						
2-Methylnaphthalene	<0.02	0.02	ug/L	2						



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW5			
Sample Date	6/12/2024 10:11 AM			
Lab ID	2017743			
PAH	Result	MDL	Units	Criteria: PWQO
3,3'-Dichlorobenzidine	<0.05	0.05	ug/L	0.6
Acenaphthene	<0.04	0.04	ug/L	~
Acenaphthylene	<0.04	0.04	ug/L	~
Anthracene	<0.02	0.02	ug/L	0.0008
Benzo(a)anthracene	<0.02	0.02	ug/L	0.0004
Benzo(a)pyrene	<0.01	0.01	ug/L	~
Benzo(b)fluoranthene	<0.06	0.06	ug/L	~
Benzo(ghi)perylene	<0.04	0.04	ug/L	0.00002
Benzo(k)fluoranthene	<0.04	0.04	ug/L	0.0002
Biphenyl	<0.1	0.1	ug/L	0.2
Chrysene	<0.05	0.05	ug/L	0.0001
Dibenz(a,h)anthracene	<0.04	0.04	ug/L	0.002
Fluoranthene	<0.03	0.03	ug/L	0.0008
Fluorene	<0.04	0.04	ug/L	0.2
Fluorobiphenyl (Surr.)	87.2	N/A	% Rec	~
Indeno(1,2,3-c,d)pyrene	<0.03	0.03	ug/L	~
Naphthalene	<0.05	0.05	ug/L	7
Phenanthrene	<0.03	0.03	ug/L	0.03
p-Terphenyl-d14 (Surr.)	93.1	N/A	% Rec	~
Pyrene	<0.05	0.05	ug/L	~



CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

Sample Description	PN24009 - ASW1		PN24009 - ASW2		PN24009 - ASW3		PN24009 - ASW4			
Sample Date	6/12/2024 9:17 AM		6/12/2024 9:40 AM		6/12/2024 9:55 AM		6/12/2024 10:22 AM			
Lab ID	2017739		2017740		2017741		2017742			
Solids	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: PWQO
Total Suspended Solids	3.30	0.67	6.00	0.67	3.00	0.67	29.00	0.67	mg/L	~
Sample Description	PN24009 - ASW5									
Sample Date	6/12/2024 10:11 AM									
Lab ID	2017743									
Solids	Result	MDL	Units	Criteria: PWQO						
Total Suspended Solids	11.70	0.67	mg/L	~						



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CERTIFICATE OF ANALYSIS

Geo Morphix

Work Order Number: 538145

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

[]: Results for laboratory replicates are shown in square brackets immediately below the associated sample result for ease of comparison.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Organic Soil Analysis: Data reported for organic analysis in soils samples are corrected for moisture content.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

Reproduction of Report: Report shall not be reproduced, except in full, without the approval of Testmark Laboratories Ltd.

ICPMS Dustfall Insoluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.

Regulation Comparisons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

Dilution: In the MDL column an asterisk () indicates a sample dilution was performed.