

APPENDIX 'B'

SOILS INVESTIGATION REPORT



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Date Received: 29-JUL-20
Report Date: 06-AUG-20 07:25 (MT)
Version: FINAL

Client Phone: 204-793-0660

Certificate of Analysis

Lab Work Order #: L2481461
Project P.O. #: NOT SUBMITTED
Job Reference: RETENTION POND @ SOUTH LIMIT OF MAZENOD RD
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2481461-1 TH1 (TEST HOLE 1) Sampled By: DB on 28-JUL-20 @ 12:30 Matrix:							
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	1.63		0.20	mg/kg	05-AUG-20	05-AUG-20	R5174968
Iron (Fe)	30.4		2.0	mg/kg	05-AUG-20	05-AUG-20	R5174968
Manganese (Mn)	3.85		0.050	mg/kg	05-AUG-20	05-AUG-20	R5174968
Zinc (Zn)	1.71		0.20	mg/kg	05-AUG-20	05-AUG-20	R5174968
Available N, P (by Olsen), K and S							
Available Nitrate-N							
Available Nitrate-N	1.7		1.0	mg/kg	04-AUG-20	04-AUG-20	R5174789
Available Phosphate-P by Olsen							
Available Phosphate-P	9.8		1.0	mg/kg	04-AUG-20	04-AUG-20	R5174276
Available Potassium							
Available Potassium	379		20	mg/kg	04-AUG-20	04-AUG-20	R5174317
Available Sulfate-S							
Available Sulfate-S	106		3.0	mg/kg	04-AUG-20	04-AUG-20	R5174783
Detailed Salinity							
% Saturation							
% Saturation	83.5		1.0	%	31-JUL-20	01-AUG-20	R5173414
Ca,K,Mg,Na in Soil (Paste) by ICPOES							
Calcium (Ca)	108		5.0	mg/L		01-AUG-20	R5173486
Magnesium (Mg)	79.5		5.0	mg/L		01-AUG-20	R5173486
Potassium (K)	9.7		5.0	mg/L		01-AUG-20	R5173486
Sodium (Na)	53.9		5.0	mg/L		01-AUG-20	R5173486
Chloride in Soil (Paste) by Colorimetry							
Chloride (Cl)	41		20	mg/L		31-JUL-20	R5173253
Conductivity in Soil (Paste) by Meter							
Conductivity Sat. Paste	1.15		0.010	dS/m		31-JUL-20	R5173264
Sodium Adsorption Ratio (Sat. Paste)							
SAR	0.96		0.10	SAR		02-AUG-20	
Sulphate (SO4)							
Sulfur (as SO4)	440		6.0	mg/L		01-AUG-20	R5173486
pH (1:2 CaCl2)							
pH (1:2 CaCl2)	7.70		0.10	pH		01-AUG-20	R5173574
L2481461-2 TH2 (TEST HOLE 2) Sampled By: DB on 28-JUL-20 @ 12:30 Matrix:							
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	2.30		0.20	mg/kg	05-AUG-20	05-AUG-20	R5174968
Iron (Fe)	25.5		2.0	mg/kg	05-AUG-20	05-AUG-20	R5174968
Manganese (Mn)	6.45		0.050	mg/kg	05-AUG-20	05-AUG-20	R5174968
Zinc (Zn)	3.22		0.20	mg/kg	05-AUG-20	05-AUG-20	R5174968
Available N, P (by Olsen), K and S							
Available Nitrate-N							
Available Nitrate-N	2.6		1.0	mg/kg	04-AUG-20	04-AUG-20	R5174789
Available Phosphate-P by Olsen							
Available Phosphate-P	36.1		1.0	mg/kg	04-AUG-20	04-AUG-20	R5174276
Available Potassium							
Available Potassium	504	DLHC	40	mg/kg	04-AUG-20	04-AUG-20	R5174317
Available Sulfate-S							
Available Sulfate-S	70.5		3.0	mg/kg	04-AUG-20	04-AUG-20	R5174783
Detailed Salinity							
% Saturation							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2481461-2 TH2 (TEST HOLE 2) Sampled By: DB on 28-JUL-20 @ 12:30 Matrix:							
% Saturation % Saturation	81.2		1.0	%	31-JUL-20	01-AUG-20	R5173414
Ca,K,Mg,Na in Soil (Paste) by ICPOES							
Calcium (Ca)	94.4		5.0	mg/L		01-AUG-20	R5173486
Magnesium (Mg)	54.0		5.0	mg/L		01-AUG-20	R5173486
Potassium (K)	22.8		5.0	mg/L		01-AUG-20	R5173486
Sodium (Na)	27.4		5.0	mg/L		01-AUG-20	R5173486
Chloride in Soil (Paste) by Colorimetry							
Chloride (Cl)	69		20	mg/L		31-JUL-20	R5173253
Conductivity in Soil (Paste) by Meter							
Conductivity Sat. Paste	0.902		0.010	dS/m		31-JUL-20	R5173264
Sodium Adsorption Ratio (Sat. Paste)							
SAR	0.56		0.10	SAR		02-AUG-20	
Sulphate (SO4)							
Sulfur (as SO4)	243		6.0	mg/L		01-AUG-20	R5173486
pH (1:2 CaCl2)							
pH (1:2 CaCl2)	7.55		0.10	pH		01-AUG-20	R5173574

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-PASTE-COL-CL	Soil	Chloride in Soil (Paste) by Colorimetry	CSSS, APHA 4500-Cl E
A soil extract produced by the saturated paste extraction procedure is analyzed for Chloride by Colourimetry.			
EC-PASTE-CL	Soil	Conductivity in Soil (Paste) by Meter	CSSS ch.15
This analysis is adapted from the methods outlined in "Soil Sampling and Methods of Analysis" by M. Carter. In summary, 200 to 500 grams of sample is extracted for a minimum of 4 hours with an amount of deionized water as required to create a saturated paste. The sample is then filtered or centrifuged and decanted to produce an extract that is ready for analysis. Conductivity is determined using a conductivity electrode.			
K-AVAIL-SK	Soil	Available Potassium	Comm. Soil Sci. Plant, 25 (5&6)
Plant available potassium is extracted from the soil using Modified Kelowna solution. Potassium in the soil extract is determined by flame emission at 770 nm.			
MET-PASTE-ICP-CL	Soil	Ca,K,Mg,Na in Soil (Paste) by ICPOES	CSSS CH15/EPA 6010D
A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium, Sodium by ICPOES.			
METAL-DTPA-SK	Soil	Available Micronutrients (Cu,Fe,Zn,Mn)	CSSS 1993 (11.3 AND 11.4)
Plant available micronutrients are extracted from soil using 0.005 M DTPA. Cu, Fe, Mn and Zn in the extract are determined by ICP-OES.			
NO3-AVAIL-SK	Soil	Available Nitrate-N	Alberta Ag / APHA 4500 NO3F
Available Nitrate and Nitrite are extracted from the soil using a dilute calcium chloride solution. Nitrate is quantitatively reduced to nitrite by passing of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is measured at colorimetrically at 520nm.			
PH-1:2 CACL2-CL	Soil	pH (1:2 CaCl2)	CSSS 16.3 - 1:2 Extraction w/0.01M CaCl2
Soil and 0.01M CaCl2 solution (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.			
PO4-AVAIL-OLSEN-SK	Soil	Available Phosphate-P by Olsen	CSSS (2008) 8
Plant available phosphorus is extracted from air dried soil using a fixed ratio bicarbonate extraction. Phosphorus is determined by colorimetry.			
SALINITY-INTCHECK-CL	Soil		CSSS 18.4-Calculation
SAR-PASTE-CALC-CL	Soil	Sodium Adsorption Ratio (Sat. Paste)	CSSS 15.4.4-Calculation
Sodium Adsorption Ratio (SAR) is calculated as per "Soil Sampling and Methods of Analysis" by M. Carter.			
SAT-PCNT-N-CL	Soil	% Saturation	CSSS Ch. 15
Saturation Percentage (SP) is the total volume of water present in a saturated paste (in mL) divided by the dry weight of the sample (in grams), expressed as a percentage, as described in "Soil Sampling and Methods of Analysis" by M. Carter.			
SO4-AVAIL-SK	Soil	Available Sulfate-S	REC METH SOIL ANAL - AB. AG(1988)
Plant available sulfate in the soil is extracted using a weak calcium chloride solution. Sulfate in the extract is determined by ICP-OES. This extraction may also produce organic sulfur in the extracts when organic soils are analyzed.			
SO4-PASTE-ICP-CL	Soil	Sulphate (SO4)	CSSS CH15/EPA 6010D
A soil extract produced by the saturated extraction procedure is analyzed for sulfate by ICPOES.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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Chain of Custody Numbers:**GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.