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Committed to Leadership in Our Industry

May 13, 2022

Manitoba Conservation and Climate Environmental Approvals Branch 1007 Century Street Winnipeg, MB R3H 0W4

Attn: James Capotosto – Director, Environmental Approvals Branch

Dear Mr. Capotosto:

RE: Leachate Crop Irrigation Pilot Project Proposal

Please accept this as Miller Environmental Corporation's proposal to implement a leachate crop irrigation pilot project at Miller's processing facility for 2022. We had an opportunity to present the project on March 15, 2022 to Manitoba Conservation and Climate representatives, including representatives from the Environmental Approvals Branch. Through their comments and suggestions, and with the support of Crocus Environmental Ltd., the provided document explains the details of the pilot project. We look forward to the department's review and approval in the 2-week time period indicated to us during our meeting on March 15<sup>th</sup>.

If you have any questions, please feel free to contact me at 204-925-9604 or by email at <u>daveh@millerenvironmental.mb.ca</u>.

Sincerely yours, Miller Environmental Corporation

Dave Howes Director of Regulatory Affairs

CC: Tyler Kneeshaw – Manitoba Conservation and Climate
 Paul Bauer – Vice President/General Manager, Miller Environmental Corporation
 Yolo Ortiz – Operations Manager, Miller Environmental Corporation



# **CROCUS ENVIRONMENTAL LTD.**

May 13, 2022 Manitoba Environment, Climate and Parks Environmental Approvals Branch 123 Main Street, Suite 160 Winnipeg, Manitoba R3C 1 A5

Attention: Mr. James Capotosto, Director

Re:

Dear Mr. Capotosto,

On behalf of Miller Environmental Corpoartion (MEC), Crocus Environmental is pleased to submit a proposal for a pilot study at the Vaughn Bullough Environmental Center Licence (VBEC), for the implementation of a Pilot Leachate Irrigation Crop.

Currently leachate at the Vaughn Bullough Environmental Centre is treated through leachate evaporation via passive evaporation. Crop irrigation is being proposed as a sustainable alternative leachate treatment methodology to the current enhanced mechanical evaporation technique employed by MEC. Crop irrigation is proposed to reduce gas and odour emission produced through traditional evaporation. Additionally, Miller Environmental has expressed interest in harvesting the crop biomass in order to utilize the material as a bulking agent in other waste treatment processes. Therefore, leachate irrigation will provide a cradle to grave treatment process for leachate.

In the winter of 2020, Crocus Environmental carried out bench scale leachate-phytoremediation treatment experiments on the behalf of Miller Environmental. The findings of this study (presented in the attached report) provide preliminary results that suggest leachate crop irrigation treatment will provide sufficiently sustainable leachate treatment (for Miller Environmental specific leachate). However, a pilot scale project is needed to provide site specific design parameters and field data to assess the full-scale feasibility of this project.

The attached document contains a detailed description of the proposed pilot study and seeks authorization from Manitoba Conservation and Climate (MCC) to implement a field study at the Miller Environmental Vaughn Bullough Environmental Centre.

We would like to request that we here back from the province on this proposal by the end of May.

Given the results found in our bench scale experiments, our teams experience in waste treatment, environmental engineering and agriculture, and Miller Environmental experience in waste management, we are confident that the proposed and sustainable field scale pilot project will provide invaluable results for informing future leachate irrigation projects.

We look forward to hearing from you.

Thank you for your time and consideration.

Sincerely,

Crocus Environmental

CEO

Kenton McCorquodale-Bauer

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# 1. Background

#### **1.1. Miller Environmental Corporation Facility**

Miller Environmental Corporation (MEC) operates a licensed hazardous waste treatment facility (VBEC) that is located 70km south of Winnipeg. MEC provides environmentally sustainable hazardous waste management solutions for industry and residential customers. In the treatment and disposal of hazardous waste, approximately 10,000 m<sup>3</sup> of leachate can be produced annually at the MEC's facility. The treatment of leachate can be costly and resource heavy. Additionally, leachate treatment methods often require high energy and chemical inputs.

# **1.2.** Preliminary Research – Feasibility study on the application of crop irrigation for leachate management

In 2020, Crocus Environmental Ltd. (Crocus) was retained to conduct a feasibility study on the application of an innovative crop irrigation plan for leachate management at the MEC's facility. Leachate crop irrigation is basically a method for reusing the leachate and provides a cost effective and environmentally friendly alternative to traditional leachate treatment methods. This is in line with MEC's reputation as an environmental process leader. MEC's location and abundance of land makes leachate crop irrigation a potential solution for large volume leachate treatment.

Crocus research team worked closely with MEC's staff from August 2020 to May 2021 and conducted a series of experiments. Leachate characterization was done by taking multiple samples from different spots in the leachate pond and on different dates. A wide range of crops were studied and eventually two common forage crops, tall wheat grass and alfalfa were selected for bench-scale experiments. The crops were planted in soil, collected from the proposed crop location at the VBEC. Cylindrical planters (7in x 6 in) were used to grow the plants and the irrigation was done over two growth periods (each ~30 days) with various dilutions of leachate collected from the VBEC leachate pond on October 20th, 2020.

The results of the experiment suggested that the use of tall wheatgrass for the treatment of MEC's leachate through crop irrigation, is potentially an appropriate and effective phytoremediation method. Wheatgrass outperformed alfalfa in every measured parameter. Wheatgrass did not appear to be negatively affected by any concentration of leachate. Based on the soil analysis results, it was concluded that the use of 100% leachate, assuming leachate parameters remain consistent with those tested in this report, was sustainable for wheatgrass crop irrigation treatment. The majority of total metals examined in experiments were below CCME agricultural guidelines. The total uptake of the majority of examined metals by wheatgrass appeared to outstrip the amount of metals that would be delivered to the crop suggesting that significant metal accumulation in soil would not occur over time. The methodology and results of the bench experiment are discussed in detail in section 5.

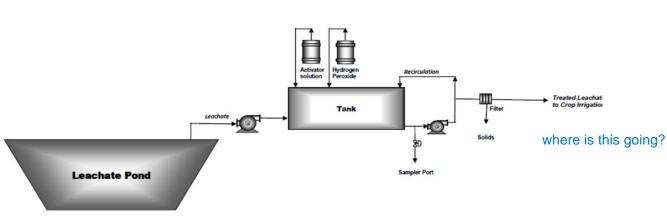
# 2. Project Methodology

#### 2.1. Overview

The field study will be carried out at the Miller Environmental Vaughn Bullough Center and will involve Crocus Environmental personnel and Miller Environmental employees. Leachate will be pumped from the leachate pond (shown in fig 1.) to pre-treatment tanks. Inside the tanks a chemical pre-treatment will be applied to the leachate to treat odour and sulfides. From the pre-treatment tanks, leachate will be pumped onto the leachate pilot crop. As a part of the proposed field study, pre-treatment-aeration retention time will be determined by measuring the required electroconductivity equilibration time within the aeration tank. From the aeration tanks, leachate will be pumped to the pilot crops and delivered through perforated soaker hoses. Soaker hoses will be used for crop irrigation rather than sprinklers to reduce leachate odor release.

#### 2.2. Leachate Pre-Treatment

Miller Environmental has worked with Orin Remediation to develop a chemical pre-treatment of their leachate. The pre-treatment is a low dose addition of Orin Activator Solution catalyst and hydrogen peroxide. Lab scale results have shown that the addition of this chemical treatment significantly reduces leachate odour and sulfate concentration. Leachate will be pumped to a pre-treatment tank where it will be chemically pretreated for a time duration to be determined from the results of the proposed pilot scale study. Lastly the leachate will be filtered to remove solids. Figure 1, illustrated the pre-treatment design. Lab scale analysis has shown that with the addition of the chemical pre-treatment, filtration clear leachate. It is expected that after the pre-treatment process has been applied that the leachate will have improved parameters from the non-pretreated leachate parameters outlined in this report. From the aeration tanks the leachate will be delivered to the treatment crop through soaker hoses.



Leachate odor treatment by advanced oxidation process (AOP)

#### **Figure 1 – Pre-Treatment System**

Treated leachate will be available as required for the crop irrigation project

#### **2.3.** Crop Type

Tall wheatgrass has been selected as the crop type to be used in the proposed pilot study. It was chosen based on its salt resistance, pH tolerance, water uptake, and growth rate. Additionally, tall wheatgrass outperformed alfalfa (a commonly used leachate treatment crop) in bench scale tests performed by Crocus Environmental (discussed in section 6) which evaluated the performance of each plant for the phytoremediation of Miller Environmental specific leachate.

Tall wheatgrass cultivation generally consists of two harvesting events. It is proposed to have two planting/harvesting events to test the feasibility of using the leachate for crop irrigation under different weather conditions. The proposed periods are May 15, 2022 to June 15, 2022 and July 1, 2022 to August 1, 2022. The four weeks growth periods are suggested based on the results of the phase I of the project and are subject to change based on the observations during the growth periods.

#### 2.4. Crop Location

The pilot crop will be planted on a strip of land west of the leachate pond and east of the outer west drainage ditch. This location seems favorable due to its proximity to the leachate pond. Additionally, the land is sheltered from surface water accumulation by the west drainage ditch. For the pilot experiments, an area of 30m×35m (approximately 0.5 acres) will be used.



**Figure 2 – Proposed Crop Location** 

Figure 2. illustrates the approximate proposed location of the proposed pilot crop area (shown in orange). The crop area has been drawn to approximately 35m by 30m to illustrate the expected area of the pilot crop.

#### 2.5. Mitigation

The crop will be bordered by clay berms (1m) to ensure containment. The existing site drainage will be used to collect storm water and divert it from the crop. The crop area will be stripped the insitu clay and compacted to achieve containment. Site soil reports and hydrology is included in the appendix, along with the site drainage plan, elevation points, and existing monitoring wells.

#### 2.6. Irrigation Volume

Past leachate irrigation projects and studies in and near Manitoba have applied leachate at rates generally between 90-100  $L/m^2$ . KGS Group conducted research with the University of Manitoba where they tested municipal leachate at irrigation rates between 79  $L/m^2$  to 170  $L/m^2$  in green house conditions. Additionally, KGS Group conducted a pilot test in Saskatchewan, where leachate was applied at an estimated rate of 100  $L/m^2$ . In Hallock (Minnesota, USA) irrigates aerated landfill leachate at a maximum rate of 93  $L/m^2$ . An estimated volume of 600 m<sup>3</sup> of leachate will be applied to the 0.5 acre crop area annually. Total leachate irrigation volume will depend on annual precipitation.

#### 2.7. Analysis

The Crocus research team will monitor the leachate, crops, and the soil throughout the pilot project. The leachate characteristics will be assessed prior to application at each seeding event. Every second week pre-treated leachate will be sampled and analysed for total metals, conductivity, pH, chloride, sulphate, sodium, potassium, PAH's, COD and BOD at a CALA accredited lab. Soil and plant material will be assessed for contaminant attenuation through digestion and ICP analysis. Background soil analysis for total metals, leachable metals, and pH will be done prior to leachate application. Plant and soil samples will be taken after the first and second harvesting events. One plant and soil sample will be taken for every 100 m<sup>2</sup> (20 samples per harvest period, 40 samples per season) and analysed at a CALA accredited lab. Plant growth will be evaluated based on qualitative assessment and total net biomass change. Ground water will be measured at the drainage collection point. Well monitoring will be used to measure groundwater and ensure containment is effective.

#### 2.7. System Performance Evaluation

Data collected will be used to evaluate the treatment performance and sustainability of the leachate irrigation system. Metal uptake of the crop (mg/kg) of total dry biomass will be compared to the mass of delivered metals in leachate (mg/L) by a mass balance shown in the equation below:

*Biomass dry weight(kg)\*Plant<sub>conc</sub> (mg/kg) > Irrigation volume (L)\* Leachate<sub>conc</sub> (mg/L)* 

If the left side of the equation (metal uptake) is larger than the right side the system is then removing metal and treating it rather than accumulating it in soil and is therefore effectively treating the leachate and operating in a sustainable manner. Additionally, total metals and leachable metals in the crop soil will also be evaluated to determine project sustainability. Metal translocation factors (between the plant root and upper plant) will be measured to ensure that crop harvest is an effective method to remove metals from the treatment system.

# 3. Crop Implementation

# **3.1.** Task 1 – Site preparation

The site preparation will include surveying, grading, supplying and assembling the required equipment, installing required signage, plowing & tilling, and providing required power. The site preparation will be done in early spring (April 15, 2022 – May 15, 2022).

Figure 3. illustrates the proposed drip irrigation design. Leachate from the leachate pond will be pumped through the drip irrigation hoses as shown.

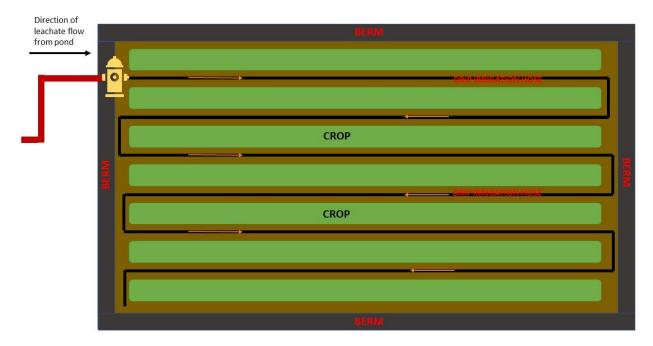


Figure 3 – Leachate Drip Irrigation

By implementing drip irrigation, odour will be controlled by limiting leachate volatilization and trapping odours in the ground. Additionally, drip irrigation will prevent surface run and control the distribution of leachate.

#### 3.2. Task 2 – Planting

It is proposed to have two planting/harvesting events to test the feasibility of using the leachate for crop irrigation under different weather conditions. The proposed periods are June 15, 2022 to July 15, 2022 and July 15, 2022 to August 15, 2022. The four weeks growth periods are suggested based on the results of the phase I of the project and are subject to change based on the observations during the growth periods.

# 3.3. Task 3 – Harvesting and biomass management

At the end of each growth period, the crops will be harvested. The resulting biomass may be used by MEC as a bulking/bio enhancement additive in current MEC treatment activities. Additionally, the Crocus research team is currently investigating other full life cycle biomass condition solutions. The research on the biomass treatment is ongoing and will continue throughout the project. Bench scale experiments for the selected methodologies will be conducted after harvesting.

# 3.4. Task 4 – In depth analysis of data

After the completion of two growth periods and bench scale biomass treatment experiments, the collected data will be thoroughly analyzed. The results will be compared to the data of similar studies and phase I of the project.

#### 3.5. Task 5 – Lifecycle cost analysis of crop irrigation for leachate management

The lifecycle cost analysis of the crop irrigation by leachate will be done for a period of 30 years. In addition to the capital and operational costs, the potential social and environmental impacts of the project will be identified.

#### 3.6. Task 6 – Reporting

A draft report will be prepared after the completion of the project. Crocus team will schedule a meeting with MEC staff to discuss the draft. Applicable changes will be made by Crocus and the final report will be submitted to Manitoba Conservation and Climate.

# 4. Contingency Measures

#### 4.1. Flood Management

Surface water will be diverted from the crop area through 1m clay berms and the existing ditches on site (specifically the west drainage ditch). In the event of flooding within the crop area it is proposed that irrigation treatment is stopped and the growth area is allowed to dry. In the event of crop loss due to flooding the crop will be replanted to re-establish the treatment system. It is should also be noted that tall wheatgrass is flood resistant and is a fallow crop, meaning that once established the crop will grow back without seeding.

#### 4.2. Metal Accumulation

Based on the results provided by the preliminary experiment discussed in section 6 and the data presented in table 8, it is expected that plant-metal uptake will outstrip metal accumulation. Soil will, however be monitored, to ensure that metal accumulation does not result in contaminated and unsustainable soil conditions. In the event that soil is contaminated over a period of time top soil will either be stripped and put back into the repository cell or will be left in place with the existing crop continuing to grow with leachate irrigation to achieve remediated soil. The compacted insitu clay liner will provide containment to ensure any metals in the top soil will not leach to the water table.

# **5. Schedule**

Proposed detailed schedule for the project is presented in Appendix A. The following table outlines the key project dates:

Table 1 – Project schedule	
Milestone / Task	Completion Date
Task 1 – Designing the crop plot, the crop irrigation system and a drainage plan	May. 30, 2022
Task 2 – Preliminary analysis of leachate and soil	June 6, 2022
Task 3 – Site preparation	June 30, 2022
Task 4 – Planting	July 8, 2022
Task 5 – Leachate, crop and soil monitoring	Aug. 30, 2022
Task 6 – Harvesting and biomass management	Sep. 30, 2022
Task 7 – In depth analysis of data	Oct. 31, 2022
Task 8 – Lifecycle cost analysis of crop irrigation for leachate management	Nov. 15, 2022
Task 9 – Reporting	Nov. 30, 2022

#### . . . . .

# 6. Completed Preliminary Bench Scale Research

The results of the discussed bench scale analysis have informed the design of the proposed pilot scale project. Bench scale analysis was conducted in the winter of 2020. Bench-scale experiments were performed to examine the effectiveness of two common forage crops, tall wheat grass and alfalfa, for the uptake of metals in the leachate. The crops were planted in soil, collected from the proposed crop location at the VBEC. Cylindrical planters (7in x 6 in) were used to grow each plot sample in.

#### 6.1. Experiment methodology

#### **6.1.2. Experiment Design**

Each plant crop was irrigated over 2 growth periods (each ~30 days) with various dilutions of leachate collected from the VBEC leachate pond on October 20<sup>th</sup>, 2020. The experiment design was laid out as shown in table 2.

Sample	Irrigation Solution	Replication
ALFALFA CONTROL	WATER	2
ALFALFA 25%	25% LEACHATE / 75% WATER	3
ALFALFA 50%	50% LEACHATE /50% WATER	3
ALFALFA 75%	75% LEACHATE / 25% WATER	3
ALFALFA 100%	100% LEACHATE	3
WHEAT GRASS CONTROL	WATER	2
WHEAT GRASS 25%	25% LEACHATE / 75% WATER	3
WHEAT GRASS 50%	50% LEACHATE /50% WATER	3
WHEAT GRASS 75%	75% LEACHATE / 25% WATER	3
WHEAT GRASS 100%	100% LEACHATE	3

**Table 2. Experiment Design** 

**Planter Layout:** 

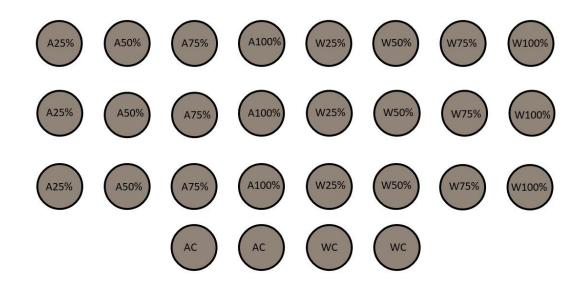


Figure 4 – Planter Layout

Two plantings were examined of each crop. Over the first growth period, the crop was planted in a high crop density, and over the second growth period the crops were planted sparsely. The same soil was used in both plantings to examine the effect of soil previously exposed to leachate on seeding and plant emergence. The double planting also mimicked mid-summer harvesting commonly used in agriculture for both crops.

LED grow lights were used as a light source. For the first growth period the lights were kept on for 24 hours a day and over the second growth period the lights were on a 12 hour timer.

#### 6.1.2. Leachate Sampling and characterization

Sampling of the Miller Environmental leachate pond was carried out on August 25<sup>th</sup>, 2020. Samples were taken from a total of four locations within the pond. An additional 5<sup>th</sup> sample was taken from by Miller Environmental earlier this spring and was also taken by Crocus for analysis.

A description of each sample location is provided below:

Sample 1 -Sample was taken from the bottom of the pond on the center of the east toe.

Sample 2 – Sample was taken from the surface of the pond (approximately 10 cm below the pond surface) on the centre of the east toe.

**Sample 3** – Sample was taken from the middle (depth) of the pond (approximately 100 cm below pond surface) on the centre of the south toe.

**Sample 4** – Sample was taken from the bottom of the pond from the west evaporator pump.

**Sample 5** – Was taken from the leachate pond by Miller Environmental Earlier this past spring. An image with labelled sample points is provided below:

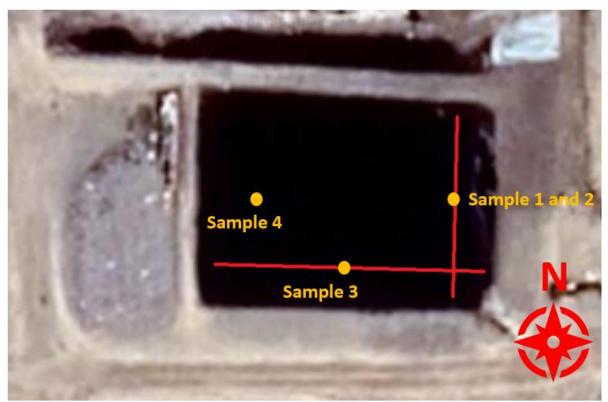


Figure 5 – Location of Leachate Sample Collection Points

#### 6.1.3 Lab analysis

Water chemistry parameters were measured at the University of Manitoba. Nutrients and COD were examined through flourospectroscopy. pH and temperature were measured using a standard lab grade and calibrated pH meter. Total Suspended Solids (TSS) was measured through a standard filter weight analysis.

Soil was analysed for metals at a certified third party lab. Total metals was measured through CRC ICP-MS. Leachable metals were measured through O.Reg 347 methodology.

Plant tissue was also measured by a certified third party lab. CRC ICP-MS was used for tissue metals detection of cleaned dry plant tissue.

#### **6.2. Experiment Results**

#### 6.2.1. Leachate analysis

Table 3. presents basic chemistry parameters for each leachate sample. The sample numbers refer to the samples described in section 4.2.

	COD (MG/L)	TP	REACTIVE PHOSPHORUS	TKN	<b>F.O.G</b>	TSS	TEMPERATURE	РН
		(MG/L)	(MG/L)	(MG/L)	(MG/L)	(MG/L)	(C)	
SAMPLE 1	2132	4.23	4.54	N/A	N/A	29.58	N/A	N/A
SAMPLE 2	2082	4.30	4.73	N/A	N/A	27.27	20.5	8.5
SAMPLE 3	2477	N/A	N/A	16	81	73.05	N/A	N/A
SAMPLE 4	3396	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE 5	2291	2.93	2.03	N/A	N/A	N/A	N/A	N/A

#### **Table 3. Leachate Chemistry Parameters**

Table 4. presents metal concentrations (mg L<sup>-1</sup>) detected in each sample of leachate collected from the VBEC leachate pond. The sample numbers refer to the samples described in section 4.2. CCME guidelines for agriculture irrigation water are provided for metals where applicable and concentrations that exceed the guidelines in the leachate are highlighted in orange.

Table 4. Mictals	Table 4. Metals (ing L) in reachate i on the VDLC reachate point					
METALS	CCME	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
LEACHATE	MAX	1	2	3	4	5
	CONC.					
AL	5	0.869	0.862	4.09	0.154	0.0073

#### Table 4. Metals (mg L<sup>-1</sup>) in leachate from the VBEC leachate pond

SB		0.00388	0.00397	0.00391	0.00358	0.00323
AS	0.1	0.0925	0.0923	0.116	0.0828	0.0846
BA		0.0547	0.0562	0.112	0.032	0.0398
BE	0.1	0.00047	0.0005	0.00058	0.00044	0.00046
BI		0.000054	0.000061	0.000133	< 0.000050	< 0.00050
В		14.5	14.1	16.2	14.2	15
CD	0.0051	0.0142	0.0144	0.0187	0.0146	0.0158
CA		159	154	186	152	128
CS		0.0785	0.0796	0.0834	0.0746	0.0989
CR		0.0155	0.0167	0.0323	0.011	0.0163
СО	0.05	0.11	0.114	0.188	0.0808	0.0826
CU	Var	0.0343	0.0398	0.0601	0.0466	0.0265
FE	5	4.3	4.29	10.6	4.27	4.26
РВ	0.2	0.00519	0.00608	0.0109	0.00329	0.00391
LI	2.5	0.465	0.435	0.468	0.426	0.511
MG		190	181	174	185	195
MN	0.2	1.78	1.79	2.16	1.61	1.2
МО	Nar	69.9	68.8	62.1	72.7	80.2
NI	0.2	2.79	2.81	3.7	2.47	2.59
K		173	170	192	172	169
Р		27.5	27	35.6	26.1	17.6
RB		0.0486	0.048	0.0557	0.0464	0.0503
SE		0.00984	0.00982	0.0106	0.01	0.0101
SI		14.8	14	24	12.3	12.8
AG		0.000266	0.000107	0.000518	0.000056	0.000115

NA		2130	2200	1990	2210	2310
SR		0.82	0.836	0.855	0.778	0.751
S		553	564	458	568	583
ТЕ		< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
TL		0.000042	0.000042	0.000114	0.000022	0.000023
ТН		0.00011	0.00015	0.00055	< 0.00010	< 0.00010
SN		0.00162	0.00195	0.0041	0.00138	0.00013
TI		0.0506	0.0557	0.15	0.0358	0.0356
W		1.81	2.33	1.69	2.77	3.1
U	0.01	0.0125	0.0123	0.0126	0.0116	0.0126
V	0.1	8.89	8.88	9.27	7.49	9.34
ZN		0.128	0.138	0.239	0.0764	0.0464
ZR		0.00516	0.00523	0.00729	0.00421	0.00435

\*CCME Canadian Environmental Quality Guidelines (agriculture irrigation water)

#### 5.2.2. Plant growth

The growth of the two crop types were observed throughout the experiment for each leachate treatment. In both growth periods it was observed that wheatgrass outperformed alfalfa over every leachate concentration. Alfalfa completely died off in both experiments across leachate concentrations 25%-100%. Alfalfa died off quicker under stronger leachate concentrations. Wheat grass however showed no adverse effects under high leachate concentrations. In the first growth period, die off did occur after 30 days of growth, however, die off occurred uniformly across all leachate concentrations and the control, indicating that an uncontrolled variable was the cause of die off rather than leachate concentration as is discussed in section 6. No die off occurred during the second growth period.



Figure 6 – First Growth Wheatgrass and Alfalfa

Wheatgrass treated with 100% leachate is shown closest at the front of the image and decreases towards 25% at the back row. Control pots are shown on the left hand side. Alfalfa pots are shown at the back of the photo.



Figure 7 – First Growth Wheatgrass and Alfalfa (2)

Uniform wheatgrass growth is shown. It can be seen that wheat grass growth is far out pacing alfalfa growth.

#### 6.2.3. Soil metals accumulation

Table 5. presents metal concentrations (mg  $L^{-1}$ ) detected in soil irrigated with 100%, 25%, and 0% (water control) leachate. Only the samples treated with wheatgrass growth were analyzed due to the poor alfalfa growth performance. CCME metal concentration guidelines for agriculture soil are provided for metals where applicable and concentrations that exceed the guidelines in the leachate are highlighted in orange.

METALS (SOIL)	CCME MAX CONC.*	100%	25%	CONTROL(NATIVE SOIL)
ALUMINUM (AL)		19700	17700	18100
ANTIMONY (SB)	20	0.32	0.28	0.31
ARSENIC (AS)	12	7.68	6.61	7.50
BARIUM (BA)	750	225	179	168
BERYLLIUM (BE)		0.71	0.66	0.65
<b>BISMUTH (BI)</b>		< 0.20	< 0.20	<0.20
BORON (B)	2	69.2	28.0	22.3
CADMIUM (CD)	1.4	0.551	0.453	0.457
CALCIUM (CA)		64000	55200	42100
CHROMIUM (CR)	64	31.5	28.3	29.4
COBALT (CO)	40	9.65	7.53	7.91
COPPER (CU)	63	23.9	21.2	23.7
IRON (FE)		21500	18700	20000
LEAD (PB)	70	10.1	9.01	10.1
LITHIUM (LI)		20.5	18.8	15.7
MAGNESIUM (MG)		24800	20200	18300
MANGANESE (MN)		743	513	575
MOLYBDENUM (MO)	5	242	24.3	1.15
NICKEL (NI)	50	32.2	22.7	23.8

 Table 5. Total metals in leachate irrigated soil (mg/kg)

PHOSPHORUS (P)		776	705	808
POTASSIUM (K)		4400	3770	4140
SELENIUM (SE)	1	0.38	0.33	0.38
SILVER (AG)	20	0.10	< 0.10	<0.10
SODIUM (NA)		6400	1260	443
STRONTIUM (SR)		143	121	95.7
SULFUR (S)	500	2700	<1000	<1000
THALLIUM (TL)	1	0.263	0.225	0.249
TIN (SN)	5	<2.0	<2.0	<2.0
TITANIUM (TI)		300	256	236
TUNGSTEN (W)		5.82	0.67	<0.50
URANIUM (U)	23	2.11	1.67	1.16
VANADIUM (V)	130	73.9	60.4	62.3
ZINC (ZN)	200	66.8	61.0	63.7
ZIRCONIUM (ZR)		3.8	3.4	3.4

\**CCME Canadian Environmental Quality Guidelines (Agriculture soil)* Table 6. presents the leachable metals in the soil irrigated with 100% leachate and treated with

wheatgrass..

Tuble 0. Deachable metals (ing D	m son migatea with
METAL (LEACHABLE)	CONC.
ALUMINUM (AL)-TOTAL	<0.50
ANTIMONY (SB)-TOTAL	<0.25
ARSENIC (AS)	<0.050
BARIUM (BA)	0.99
BERYLLIUM (BE)-TOTAL	<0.050
<b>BISMUTH (BI)-TOTAL</b>	<0.050

# Table 6. Leachable metals (mg L<sup>-1</sup>) in soil irrigated with 100% leachate

BORON (B)	<2.5
CADMIUM (CD)	<0.0050
CALCIUM (CA)-TOTAL	1140
CHROMIUM (CR)	<0.050
COBALT (CO)-TOTAL	<0.025
COPPER (CU)-TOTAL	<0.50
IRON (FE)-TOTAL	<2.5
LEAD (PB)	<0.025
LITHIUM (LI)-TOTAL	<5.0
MAGNESIUM (MG)-TOTAL	213
MANGANESE (MN)-TOTAL	1.40
MOLYBDENUM (MO)-TOTAL	0.348
NICKEL (NI)-TOTAL	<0.10
PHOSPHORUS (P)-TOTAL	<2.5
POTASSIUM (K)-TOTAL	<50
SELENIUM (SE)	<0.025
SILVER (AG)	< 0.0050
STRONTIUM (SR)-TOTAL	2.99
THALLIUM (TL)-TOTAL	<5.0
TIN (SN)-TOTAL	<0.050
TITANIUM (TI)-TOTAL	<0.10
URANIUM (U)	<0.25
VANADIUM (V)-TOTAL	< 0.050
ZINC (ZN)-TOTAL	<1.0

The final pH of the soil irrigated with 100% leachate was found to be 9.47. Chloride levels were found to be 2970, 2440, 3320 mg/kg for soil irrigated with 100%, 25%, and control (0%) leachate, indicating that leachate did not increase the chloride in soil.

#### 6.2.4. Plant-water uptake

The volume of water delivered to each pot was measured over both growth periods. The soil moisture level was measured with a soil hydrometer. Soil pH was also measured. It was found that wheatgrass water uptake was higher than alfalfa, even when comparing control plots. Leachate was found to have little to no effect on soil pH.

#### 6.2.5. Plant-metal uptake

Table 7. presents metal concentrations detected in plant tissue irrigated with 100% leachate and with water (control). Uptake is presented as the difference between metal concentration in the plants irrigated with 100% leachate and with water.

Table 7. Metal col	iccnit at	1011 (111g/11g/0	r plant tissu
METALS	100%	CONTROL	UPTAKE
(PLANT TISSUE)			
ALUMINUM (AL)	2480	266	2214.00
ANTIMONY (SB)	0.043	0.033	0.01
ARSENIC (AS)	1.14	0.299	0.84
BARIUM (BA)	54.7	53.9	0.80
BERYLLIUM (BE)	0.104	<0.010	0.10
<b>BISMUTH (BI)</b>	0.029	0.023	0.01
BORON (B)	55.4	16.9	38.50
CADMIUM (CD)	0.206	0.120	0.09
CALCIUM (CA)	11600	11100	500.00
CHROMIUM (CR)	0.313	0.0395	0.27
COBALT (CO)	5.96	4.50	1.46
COPPER (CU)	1.42	0.144	1.28
IRON (FE)	10.4	10.7	-0.30
LEAD (PB)	2570	376	2194.00
LITHIUM (LI)	1.53	0.265	1.27
MAGNESIUM (MG)	11.5	6.81	4.69

Table 7. Metal concentration (mg/kg) of plant tissue

MANGANESE (MN)	10100	7580	2520.00
MOLYBDENUM (MO)	150	51.4	98.60
NICKEL (NI)	224	4.89	219.11
PHOSPHORUS (P)	16.9	2.41	14.49
POTASSIUM (K)	5440	7390	-1950.00
SELENIUM (SE)	35100	58200	-23100.00
SILVER (AG)	33.6	24.4	9.20
SODIUM (NA)	0.293	0.266	0.03
STRONTIUM (SR)	14900	5830	9070.00
SULFUR (S)	51.8	56.3	-4.50
THALLIUM (TL)	<0.020	< 0.020	0.00
TIN (SN)	0.0415	0.0068	0.03
TITANIUM (TI)	0.41	0.66	-0.25
TUNGSTEN (W)	0.222	0.0343	0.19
URANIUM (U)	11.2	0.94	10.26
VANADIUM (V)	73.4	80.5	-7.10
ZINC (ZN)	3.57	3.23	0.34

#### 6.3. Discussion

#### 6.3.1. Leachate analysis

Table 2. presents the general water chemistry parameters for the leachate from the VBEC. The results suggest that the leachate contains sufficient nutrients for microbial and plant growth. While the pH is alkaline it is within the range of tolerable wheatgrass and alfalfa growth. The results indicate that the leachate has high COD and low dissolved oxygen, however, these factors should not affect plant growth after irrigation.

Table 3. presents metal concentrations in leachate and associated CCME guidelines for agriculture irrigation for each metal where applicable. The metals arsenic, cadmium, cobalt, nickel, uranium, and vanadium exceed the CCME guidelines. The average of the 5 samples  $(0.094 \text{ mg } \text{L}^{-1})$  falls below the guidelines for arsenic  $(0.1 \text{ mg } \text{L}^{-1})$ . The average concentration of

uranium between the 5 samples (0.0123 mg L<sup>-1</sup>) falls marginally above the recommended guidelines (0.01 mg L<sup>-1</sup>) by 23%. Cadmium, cobalt and nickel all exceeded the guidelines by large margins. It is expected that the metal concentrations will be reduced after the pre-treatment and filtration process. However, given that these guidelines are meant for agriculture crops intended for human or livestock consumption, the maximum concentration of metals in leachate used for irrigation in treatment crops depends on plant viability and resulting soil metal concentration. These parameters are discussed in section 6.3 and 6.4.

#### 6.3.3. Selection of crop type

In both growth periods it was observed that wheatgrass outperformed alfalfa in terms of biomass production, plant health, rate of growth and water uptake. Alfalfa appeared to be negatively affected by increasing leachate concentration. Wheatgrass on the other hand was observed to not be negatively affected by any concentration of leachate. Wheatgrass also showed healthy plant emergence after seeding in previously leachate irrigated soil. Based on these observations it is concluded that wheatgrass is the preferred crop choice for leachate treatment over alfalfa.

#### 6.3.4. Wheatgrass uptake and performance

The metal uptake of wheat grass (Table 5.), the total metals in soils (Table 3.) and the leachable metals in soil (Table 4.) was analyzed. After two growth periods and a total leachate volume delivery of 2.3 L to each pot, the total metals were analyzed in the control, 25% leachate and 100% leachate pots. It was found that arsenic, barium, boron, calcium, lithium, molybdenum, sodium, strontium, sulfur, titanium, tungsten, uranium, and vanadium all showed positive increase in soil in relation to leachate concentration used for irrigation. The rest of the metal concentrations were observed to have no correlation to leachate concentration. The majority of metals that increased with leachate concentration, were observed to have only moderate increases. Molybdenum was found to have the greatest increase in soil concentration. Only molybdenum and sulfur concentrations were found to exceed the CCME guidelines for metals in agriculture soil. Molybdenum, in soil irrigated with 100% leachate, also exceeds the CCME guidelines for industrial soil as well, while soil irrigated with 25% leachate was under the CCME guidelines for commercial molybdenum in soil. No guidelines are set for sulfur in industrial soil. Leachable metal concentrations in soil irrigated with 100% percent leachate were extremely low across the board. The majority of leachable metals were below detectable limits. These results suggest that most of the environmentally available metals in the leachate is either taken up by the wheatgrass or bound to the soil.

Table 6. presents the metal contents of wheat grass irrigated with 100% leachate and tap water (control). The difference between the metal concentration in the two crops is also shown. It is assumed that the difference in metal contents is an indication of total metal uptake by the plant. The results between the metal contents in the two treatments was examined through a paired Willcoxon test. The results are shown below:

Wilcoxon signed rank test with continuity correction data: Concentration by Irrigation Type V = 415, **p-value = 0.002445** alternative hypothesis: true location shift is greater than 0 for metal concentration in plant tissue irrigated with 100% leachate compared to control The resulting p-value of the paired Wilcoxon test is 0.002445, indicating that the total metal concentration in wheatgrass tissue irrigated with 100% leachate is significantly higher than metal concentration in the control, indicating that there is a high probability that metal from leachate was treated through wheat grass uptake. For this analysis, the majority of the tissue examined was in the green emergent leaf and shoot section of the grass suggesting that significant translocation of metals within the grass occurred.

#### 6.3.5. Estimated total metal uptake

Based on the estimated dry biomass of an acre of tall wheat grass and the calculated metal uptake reported in table 7, the total metal uptake of a 1 acre crop can be estimated. The dry biomass weight of wheatgrass per acre is estimated to be 3 tonnes. Table 8 contains the estimated metal uptake per acre of wheatgrass, the total estimated weight of each metal delivered to 1 acre (1214 m<sup>3</sup>) of wheatgrass (assuming 300 mm of leachate is used annually for irrigating 1 acre of wheatgrass), and the resulting metal left to accumulate in soil.

	ESTIMATED PLANT UPTAKE	METAL MASS IN LEACHATE PER ACRE	ESTIMATED SOIL ACUMULATION
METALS			
ALUMINUM (AL)- TOTAL	6642	1.452502	-6640.55
ANTIMONY (SB)- TOTAL	0.03	0.004509	-0.02549
ARSENIC (AS)- TOTAL	2.52	0.113679	-2.40632
BARIUM (BA)- TOTAL	2.4	0.071553	-2.32845
BERYLLIUM (BE)- TOTAL	0.3	0.000595	-0.29941
BISMUTH (BI)- TOTAL	0.03	0.0001	-0.0299
BORON (B)-TOTAL	115.5	17.9672	-97.5328
CADMIUM (CD)- TOTAL	0.27	0.018866	-0.25113
CALCIUM (CA)- TOTAL	1500	189.1412	-1310.86
CESIUM (CS)- TOTAL	0.81	0.100762	-0.70924

#### Table 8. Estimated metal uptake, delivery, and accumulation (kilograms) per acre

CHROMIUM (CR)- TOTAL	4.38	0.022289	-4.35771
COBALT (CO)- TOTAL	3.84	0.139707	-3.70029
COPPER (CU)- TOTAL	0	0.050332	0.050332
IRON (FE)-TOTAL	6582	6.730416	-6575.27
LEAD (PB)-TOTAL	3.81	0.007131	-3.80287
LITHIUM (LI)- TOTAL	14.07	0.559654	-13.5103
MAGNESIUM (MG)-TOTAL	7560	224.59	-7335.41
MANGANESE (MN)-TOTAL	295.8	2.073512	-293.726
MOLYBDENUM (MO)-TOTAL	657.33	85.87836	-571.452
NICKEL (NI)- TOTAL	43.47	3.486608	-39.9834
PHOSPHORUS (P)- TOTAL	0	32.48664	32.48664
POTASSIUM (K)- TOTAL	0	212.6928	212.6928
RUBIDIUM (RB)- TOTAL	27.6	0.060457	-27.5395
SELENIUM (SE)- TOTAL	0.09	0.012227	-0.07777
SODIUM (NA)- TOTAL	27210	2631.952	-24578
STRONTIUM (SR)- TOTAL	0	0.980912	0.980912
TELLURIUM (TE)- TOTAL	0	0	0
THALLIUM (TL)- TOTAL	0.09	5.9E-05	-0.08994
TIN (SN)-TOTAL	0	0.002229	0.002229
URANIUM (U)- TOTAL	0.57	0.014956	-0.55504
VANADIUM (V)- TOTAL	30.78	10.65164	-20.1284

ZINC (ZN)-TOTAL	0	0.15243	0.15243
ZIRCONIUM (ZR)- TOTAL	1.02	0.006371	-1.01363

Table 8. indicates that metal uptake of one planted acre of wheatgrass outstrips metal accumulation in soil for most metals. Copper and zinc are expected to accumulate in small concentration, while phosphorus and potassium is expected to accumulate in larger numbers. Given these results it is expected that crop irrigation will be an effective and sustainable treatment method for VBEC leachate. These results are preliminary and need further field and pilot experiments to confirm the indicated results.

#### **6.4. Experiment Summary**

The results of the experiment presented in this report suggest that the use of tall wheatgrass for the treatment of Miller Environmental leachate, through crop irrigation, is potentially an appropriate and effective phytoremediation treatment method. As discussed, wheatgrass outperformed alfalfa in every measured parameter and therefore the use of wheatgrass is recommended over alfalfa for leachate crop irrigation. Wheatgrass did not appear to be negatively affected by any concentration of leachate. Based on the soil analysis results, it is concluded that the use of 100% leachate, assuming leachate parameters remain consistent with those tested in this report, is sustainable for wheatgrass crop irrigation treatment. The majority of total metals examined in this experiment were below CCME agricultural guidelines. Molybdenum is significantly above both the agriculture and commercial soil guidelines. The concentration of molybdenum in soil should be closely examined in the phase 2 component of this project. However, based on the leachable metals in the soil examined and the estimated plant uptake, it is believed that the molybdenum concentrations in soil may not be of environmental concern. The total uptake of the majority of examined metals by wheatgrass appears to outstrip the amount of metals that would be delivered to the crop suggesting that significant metal accumulation in soil should not occur over time.

#### 7. Project Team

The Project Team will be led by Kenton McCorquodale-Bauer M.Sc.., Project Manager. A multidisciplinary project team is assembled who understands the challenges of the project, who have superior project management skills, and who will ensure a focused, efficient approach through to the completion of this project. The team members for this project have significant depth of experience in environmental engineering and innovative projects similar in nature to this assignment. The following table illustrates role and certifications of our key team members:

#### Table 9 – Project team

Team member	Role	Certifications
Kenton McCorquodale- Bauer	Project Manager/Biosystems Scientist	M.Sc., PhD Candidate
Arman Vahedi Dennis Antony	Senior Environmental Engineer Senior Project Manager	PhD, P.Eng. B.Sc.

#### Kenton McCorquodale-Bauer, M.Sc. EIT. - Project Manager

Kenton is an environmental consultant and laboratory expert at Crocus Engineering. He holds his M.Sc. in Biosystems Engineering from the University of Manitoba. Kenton has experience in site management, surveying, and wastewater treatment design. He is currently a PhD student studying biological wastewater treatment and phytoremediation at the University of Manitoba.

#### Arman Vahedi, PhD, P.Eng. - Senior Environmental Engineer

Arman Vahedi is a senior environmental engineer as well as a technical team lead at Crocus Engineering. Arman holds PhD. in Environmental Engineering and MA in Economics both from University of Manitoba and is a registered professional engineer in Manitoba. Dr. Vahedi has experience in planning, designing, and development of water, wastewater, and waste management facilities. Dr. Vahedi is also a Faculty Member at Red River College in Winnipeg and has several years of applied research experience.

#### **Dennis Antony – Senior Reviewer**

Mr. Antony is senior project manager at Crocus Engineering. Mr. Antony has a Bachelor of Science degree in Environmental Science (B.Sc.) and a Renewable Resource Diploma (R.R. D.). He is also a certified professional in Erosion and Sediment Control (CPESC). Mr. Antony has twenty years of environmental, construction project management, and resource management experience. He is proficient in a wide variety of soil, water and biomass field sampling techniques. Mr. Antony has comprehensive knowledge of the general operating practices, procedures and policies of federal, provincial and territorial environmental programs and management of environmental remediation projects involving different substances including petroleum hydrocarbons, polychlorinated biphenyls (PCBs), asbestos, metals and other hazardous materials. Additionally, Mr. Antony has experience in farming, seeding and harvesting.

# 8. Conclusion

We look forward to working on this pilot scale project with Miller Environmental. We are confident that we can meet the challenges ahead and provide a sustainable project. We look forward to hearing from Manitoba Conservation and Climate.

Thank you for your consideration.

# 9. Appendices

Appendix A- Drawing of the site

Appendix B – Geology and other site information

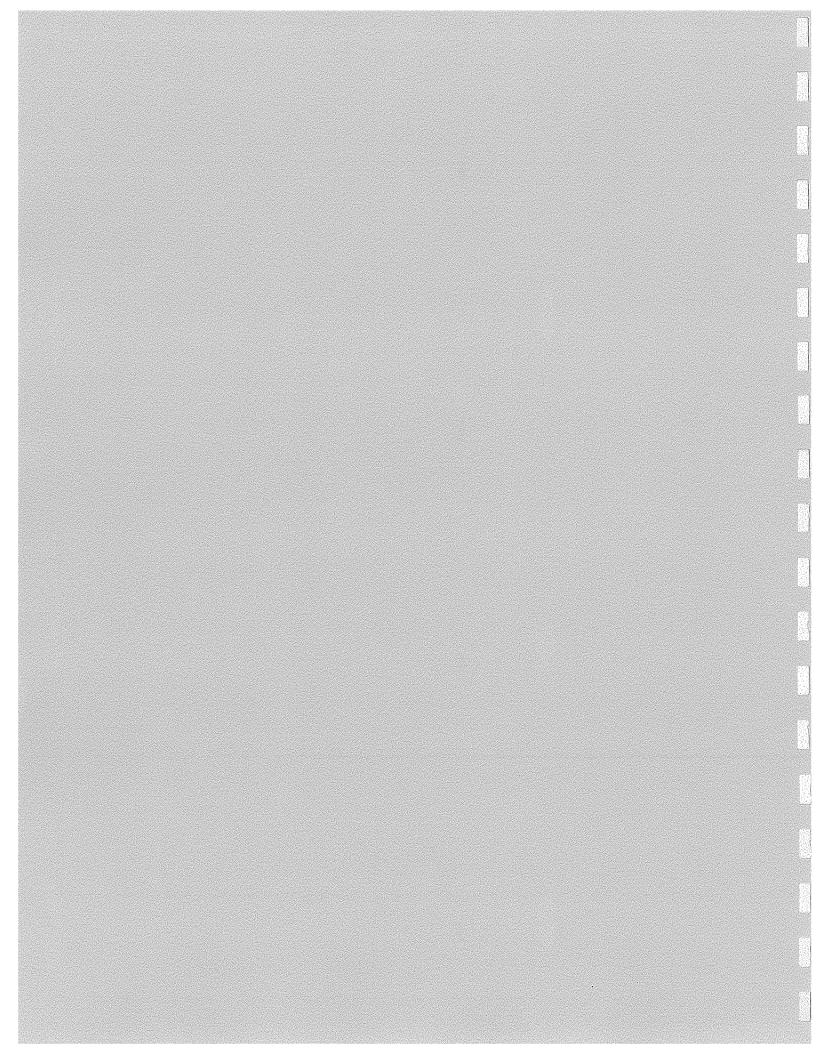


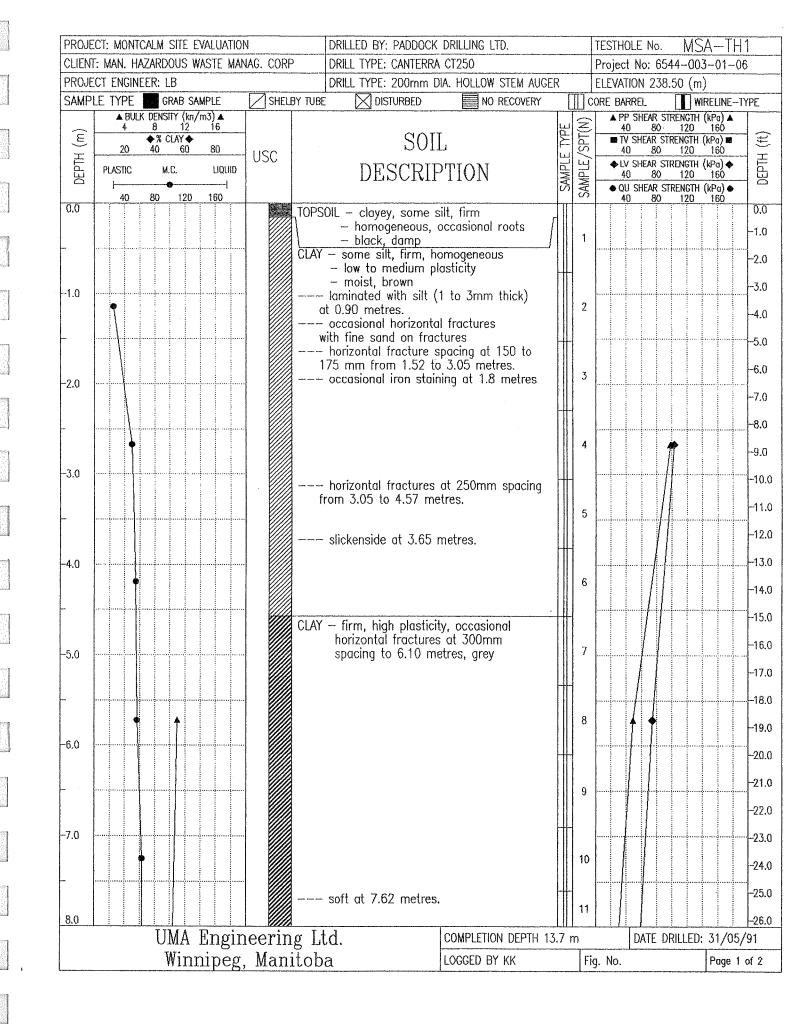
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APPENDIX B SITE INVESTIGATION METHODOLOGY





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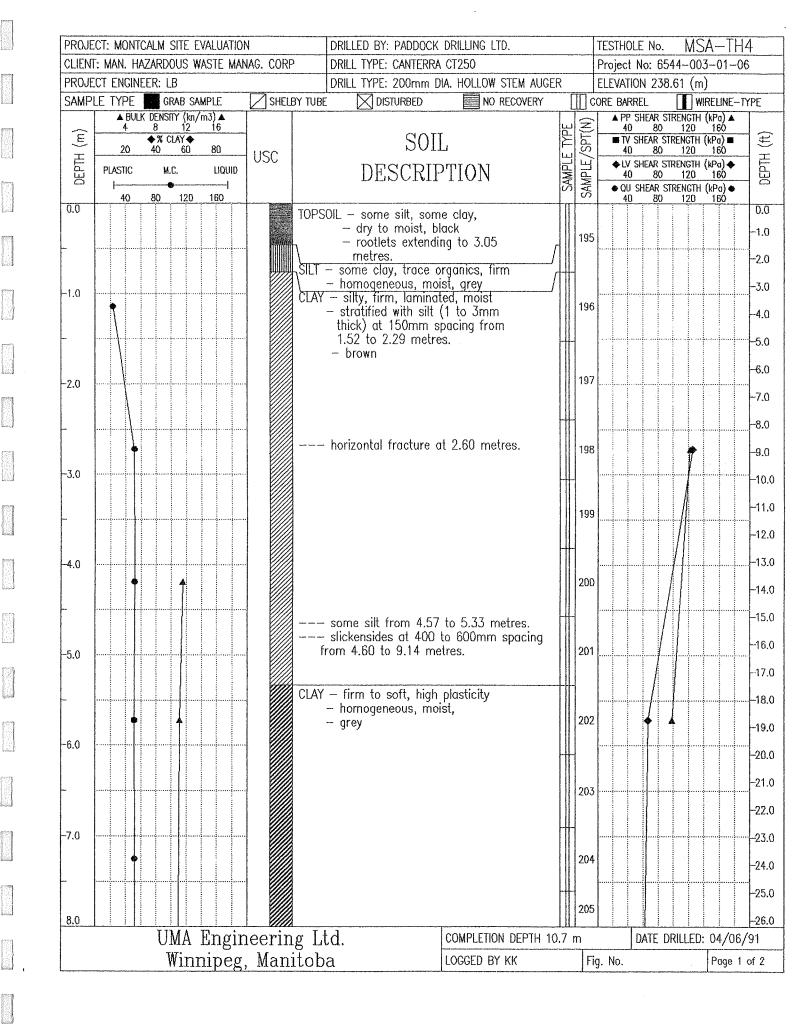
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(e	4	K DENSITY (kn/ 8 12 ♦% CLAY♦	16	-	COLL	·	TYPE	T(N)	40	) 80	120 1 STRENGTH (kF	160	
DEPTH (m)	20	◆% CLAY ◆ 40 60	80	USC	SOII		1. I	-/SP	40	) 80	120 1	160	Н (ft)
EPT	PLASTIC	M.C.	LIQUID		DESCRIP	TION	SAMPLE	SAMPLE/SPT(N	40	) 80		160	DEPTH
ص	40	80 120	160		المراجع المتناط المحلو	TTOT,	₹¥	SAN		SHEAR S	strength (ki		L.
0			100		***************************************			A7					
							Щ	47	1				-27.0
					horizontal fracture at	+ 8 53 metres		1					28.0
					HUHZUNTUI ITUUTUI -	10.00 HIGGES.		48					-29.0
0								1					-23.0
-					slickensides at 250m	nm spacing from	- HH-I	1					-30.0
		•			9.14 to 9.91 metres.			.					31.0
	1							49					
							Ш						-32.0
.0									1				-33.0
		•						50					-34.0
							₩	1					-35.0
.0								51					36.0
.0								51					
							μ	-					-37.0
		1			slickenside at 11.58	matres							-38.0
						1104.00.		52					-39.0
2.0							'						
							HH !	1					-40.0
								53					-41.0
								00					
3.0					1		Ŧ						-42.0
).U					two horizontal fractu 12.95 and 13.72 metr	ires at							-43.(
	•							54					-44.(
				E	ND OF HOLE AT 13.72 ME	TRES IN CLAY.	+44						-45.0
4.0							1						<sup></sup> 46.(
				N	NOTES: TEST HOLE DRY UP	YON COMPLETION.							-47.(
		ļļļ					1						
							'						-48.(
- <b>n</b>							'						-49.0
5.0							1						
							1						-50.0
							'						
6.0						·····	'	1		<u>,    </u>			-52.(
		UMA	Engi	neering	, Ltd.	COMPLETION DEPTH 13	<u>3.7</u> r		!	DATE	DRILLED: 3	31/05/	/91
		Wir	ininec	g, Manito	oba	Logged by KK		Fi	ig. No.	_	- I'	Page 2	of 2

	ECT: MONTCALM SITE EVALUATION		DRILLED BY: PADDOCK					SA-TH	
	T: MAN. HAZARDOUS WASTE MAN	AG. CORP	DRILL TYPE: CANTERRA		······		Project No: 6544-00		; 
	ECT ENGINEER: LB		DRILL TYPE: 200mm DI				ELEVATION 238.51 (m		/05
	PLE TYPE ■ GRAB SAMPLE	SHELBY TUBE	E DISTURBED	NO RECOVERY	L L	SPT(N)	DRE BARREL ▲ PP SHEAR STRENGTH 40 80 120 ■ TV SHEAR STRENGTH 40 80 120	160	(++)
DEPTH (m)	PLASTIC M.C. LIQUID 40 80 120 160	USC	DESCRIP	TION		SAMPLE/	<ul> <li>◆ LV SHEAR STRENGTH</li> <li>40 80 120</li> <li>◆ QU SHEAR STRENGTH</li> <li>40 80 120</li> </ul>	160	NEDTH
0.0		CLAY	OIL — some silt and c — dry to moist, blo — silty, firm, homoge — dry to moist, brown	neous,		55			0. 1. 2.
1.0		 t	laminated from 0.90 stratified with fine so hick) at 25mm spacin 2.29 metres.	nd (1 to 3mm		56			-3.
2.0			iron staining at 1.83 occasional limestone			57			-6. -7.
3.0			2.13 to 6.86 metres occasional gypsum ir omm dia.) from 2.28 slickensides at 420m 2.44 to 3.96 metres. frequent gypsum incl dia.) from 3.05 to 6.8	clusions (2 to o 3.05 metres. m spacing from		58			8. 9. 1(
4.0		3	slickensides at 150m 3.96 to 6.86 metres. rootlets from 0.15 to – firm to soft, high	4.20 metres. /		59 60			-1; -1; -1;
5.0			– homogeneous, mois	st, grey		61			-15
6.0						62			-19
7.0			horizontal fracture a			63			-2
U. 1			occasional gypsum ir Jia.) fram 6.86 to 9.1	1 metres.`		64			-2: -2: -2!
8.0						65			-26
	UMA Engir			COMPLETION DEPTH 10	.7 n	<b>T</b>	DATE DRILLED		<b>′</b> 91
	Winnipeg	<u>, Manitob</u>	a	logged by KK		Fig	g. No.	Page 1	of 2

t

	ECT: MONTC/				DRILLED BY: PADDOCK				TESTHOLE No.		
	T: MAN, HAZ		VASTE MAR	NAG. CURP	DRILL TYPE: CANTERRA				Project No: 6 ELEVATION 23	38 51 (m)	06
	ECT ENGINEE	ER: LB GRAB SA		SHELBY		IA. HOLLOW STEM AUGE			CORE BARREL	WIRELINE-	TYPF
AME		GRAB SA DENSITY (kri/		T T			ΤŤ	T	A PP SHEAR	STRENGTH (kPa)	
(u	4	8 12 • % CLAY •	16	-	SOL	ſ	γpΕ	(SPT(N)	40 80	) 120 160 STRENGTH (kPo) 📾	
4) F		♦% CLAY 40 60	80	- USC	SOII	<b>ل</b> ـ				) 120 160	
DEPTH (m)	PLASTIC	M.C.	LIQUID		DESCRIP	TION	SAMPLI	SAMPLE/	◆LV SHEAR S 40 80		
ò		80 120	160			I I O I I	45	SAN	● QU SHEAR 40 80	STRENGTH (kPa) •	
8.0	40	80 125						-			
							Ш	65			-27.0
				. /// -	soft						-28.0
					· · · · · · · · · · · · · · · · · · ·	1070 Jac		66			-29.0
9.0					horizontal fracture a	t 8.78 metres.					-23.0
								1			-30.0
								1			-31.0
					horizontal fracture a	+ a RA metres.		67			
					occasional silt inclus	sions (2 to 6mm	Ш'				-32.0
10.0					dia.) from 9.75 to 10.	.67 metres.					-33.0
					70mm dia oilt indu	tion at 117 76		68	,		-34.0
-					30mm dia. silt inclus metres.	sion at 10.00					
							-+-11-1				-35.0
-11.0					END OF TEST HOLE AT 10.	67 MEIRES IN ULAI.					-36.0
11.0											
											-37.0
-					NOTES: TEST HOLE DRY UP	PON COMPLETION.					-38.0
											-39.0
-12.0											
										, , ,	-40.(
											41.(
-											
											-42.0
-13.0											-43.0
											-44.0
-	-										
											-45.
-14.0										·	-46.
•••											
											-47.
-											-48.
											-49.
-15.0											
							ł				-50.
											-51
16.0						···					-52.
		UMA	Engi	neering	ø Ltd.	COMPLETION DEPTH 1	10.7	m	DATE	E DRILL'ED: 31/0	J5/91
				g, Mani		LOGGED BY KK		F	Fig. No.	Page	e 2 of 2

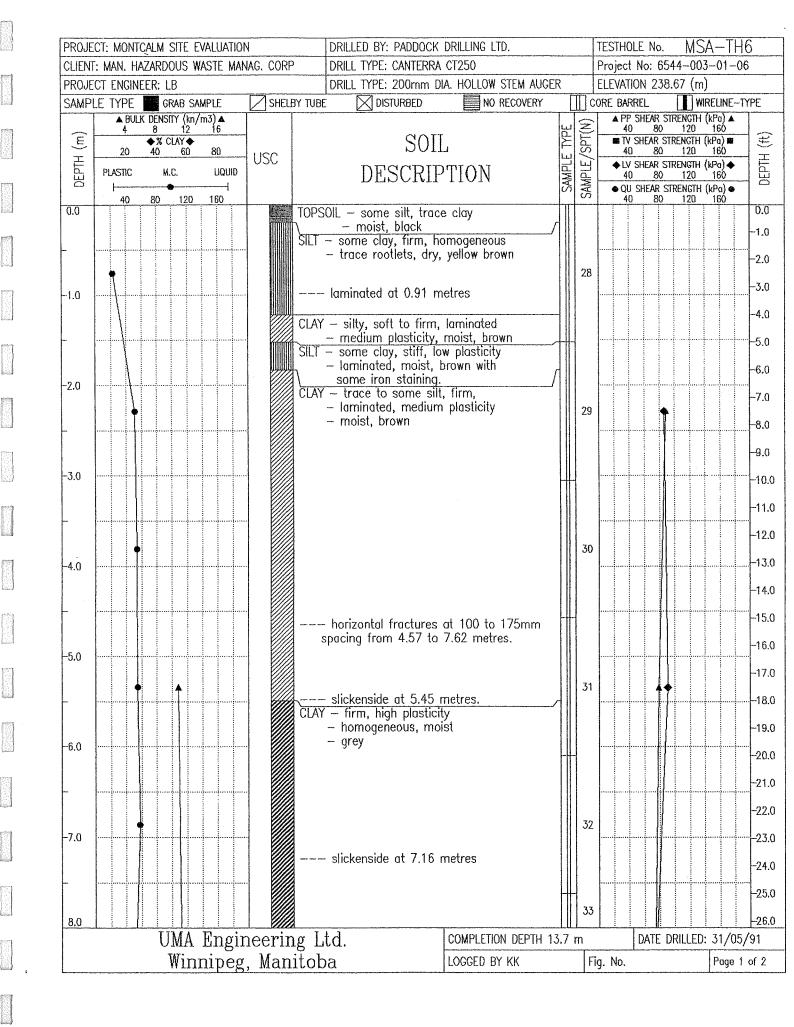
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ROJE	CT: MONTC/	alm site e	VALUATIO	N	DRILLED BY: PADDOC	K DRILLING LTD.		TESTHOLE N	o. MSA-T	H4
	: MAN. HAZ				DRILL TYPE: CANTERR	RA CT250			6544-003-01-	
	CT ENGINEE					DIA. HOLLOW STEM AUGE		ELEVATION 2		
MPL		GRAB SA			Y TUBE X DISTURBED	NO RECOVERY	<u>Щ</u>	CORE BARREL	WIRELINE	
$\sim$	▲ BULK 4	DENSITY (kn/ 8 12	m3)▲ 16		~~		щ (Z	A PP SHEAU 40 E	R STRENGTH (kPa) ▲ 30 120 160	
<u></u>		♦% CLAY ◆ 40 60	80		S0]		SPT(N)	TV SHEAF	R STRENGTH (kPa) <b>=</b> 30 120 160	E)
DEPIH (m)	PLASTIC	м.с.	LIQUID	USC	DESCRI	DΨΙΛΝ			R STRENGTH (kPa) �	DEPTH
러		·····			DEPONI	PIIUN	SAMPLE SAMPLE	40 € ● QU SHEAI	30 120 160 R STRENGTH (kPa) ●	, H B
0	40	80 120	160					40 8	30 120 160	
J							20	5		-27.0
							+++			
									(······)	-28.0
	•	Å					20	6 🔶		-29.0
3										
										-30.0
							20	7		-31.0
								1		70.0
							44			-32.0
.0										-33.0
							20	8		74.0
										-34.0
							-+44-			-35.0
					END OF TEST HOLE AT 10	0.67 METRES IN CLAY,				-36.0
.0										
										-37.0
					NOTES: TEST HOLE DRY	LIPON COMPLETION				-38.0
					NOILS, ILST HOLL DIVE	STON COMPLETION.				-50.0
.0										-39.0
										-40.0
										10.0
									+	-41.0
										-42.0
.0										ļ
										-43.0
										-44.0
									1	
										-45.0
.0										-46.0
										-47.6
										-48.0
										10
0.0										-49.(
										-50.0
										-51.(
5.O										-52.0
1.0		TIMA	Engi	neerin	a Itd	COMPLETION DEPTH 1	 10.7 m		E DRILLED: 04/0	∴ 〕6/91
				g, Mani						

		CALM SITE E			DRILLED BY: PADDOC			TESTHOL		MSA-TH	
		ZARDOUS V	vaste man	IAG. CORP	DRILL TYPE: CANTER			+		003-01-0	)6
	CT ENGIN					DIA. HOLLOW STEM AUGER			DN 238.91		
SAMP		GRAB SA			Y TUBE X DISTURBED	NO RECOVERY		CORE BARF	REL.		T
(m)	4	8 12 ◆% CLAY ◆ 40 60	16 80	USC	SO	IL	E TYPE /SPT(N)	40 ■ TV 5 40	80 12 SHEAR STRENG 80 12	20 160 GTH (kPa)∎ 20 160	1 10/1
DEPTH	PLASTIC	M.C.	Liquid	030	DESCR	PTION	SAMPLE SAMPLE /9	♦LV : 40 ●QU	SHEAR STRENG 80 12 SHEAR STRENG	20 160	
0.0	40	80 120	160		TOPSOIL – some silt, dr	v black		40	80 12	20 160	
						,					-1
					SILT — clayey, trace fine — homogeneous, m	noist r					
	•				<ul> <li>yellow brown</li> <li>horizontal fracture</li> <li>0.50 metres.</li> </ul>	s at 0.40 and	19				-2 -3
-1.0					CLAY — silty, soft to firm — laminated, moist	, brown					-4
-					occasional sand ir from 1.37 to 1.52 r SILT - clayey, soft to fi	nclusions (5mm dia.) netres/ rm_laminated					-5
-2.0					– dry to moist, bi	rown					-6
2.0					stratified with fine thick) at 25 to 100 1.83 to 4.88 metres	mm spacing from	20	)			-7
											-8
-3.0											 1
-					frequent gypsum i 3.35 to 4.60 metres	nclusions from					-1
					5.55 to 4.60 metres		2	1			-1  -1
-4.0					CLAY — silty, firm, medi — laminated, moist	um plasticity , brown					
											1
5.0					trace to some silt	from 5.03 to					
-					6.10 metres. horizontal fracture spacing from 5.03 f		2	2			1   1
<u> </u>					slickenside at 5.79						-1
6.0					CLAY -firm to soft, high - homogeneous, n	n plasticity					-2
					- grey - slickensides at 3	500 to 600mm					2
7.0	•				spacing from 6.1	0 to 10.67 metres.	2	3			
											-2
8.0							2	4			-2
0.0	L	[]MA	Engir	eerin	g Ltd.	COMPLETION DEPTH 13		- <u>I</u>	date drill	.ED: 30/05	
				, Mani		Logged by KK		Fig. No.		Page	

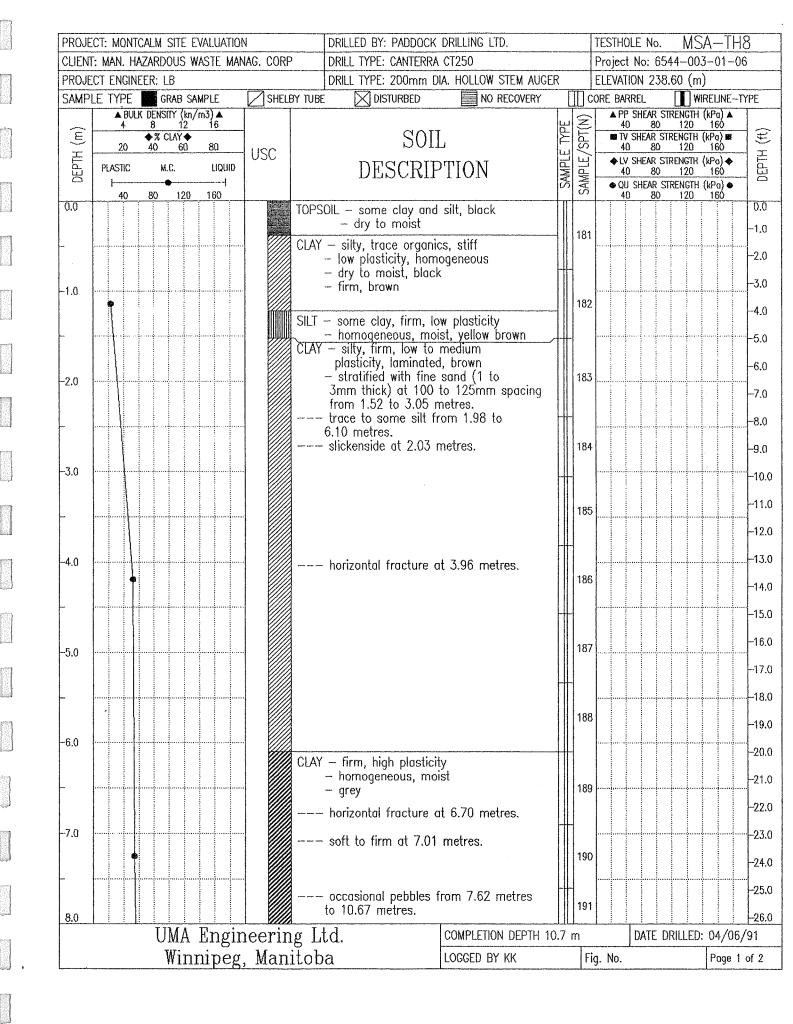
	ECT: MONTCALM SITE EVALUAT T: MAN. HAZARDOUS WASTE N		DRILLED BY: PADDOCK I DRILL TYPE: CANTERRA			TESTHOLE No. MSA-T Project No: 6544-003-01-	
	ECT ENGINEER: LB		DRILL TYPE: 200mm DI/			ELEVATION 238.91 (m)	
	LE TYPE GRAB SAMPLE	SHELBY T		NO RECOVERY		ORE BARREL WIRELINE	-TYPE
	▲ BULK DENSITY (kn/m3) ▲				T	▲ PP SHEAR STRENGTH (kPa) ▲	
(E)	4 8 12 16 ♦% CLAY ♦	-	SOIL	<u>γpe</u>	SPT(N)	40 80 120 16Ó ■ TV SHEAR STRENGTH (kPa)	(£)
Ĕ	20 40 60 80	- USC		البا		40 80 120 160 ◆LV SHEAR STRENGTH (kPa) ◆	- E
DEPTH	PLASTIC M.C. LIQUI	}	DESCRIP	TION	SAMPLE/	40 80 120 160	DEPTH
	40 80 120 160			<u>ر</u> م	SAI	● QU SHEAR STRENGTH (kPa) ● 40 80 120 160	
3.0							-27.0
							<b>_</b> 27.X
					24		-28.0
							-29.0
ð.0							
					]		-30.0
							31.(
							-32.0
0.0					25		
							-33.0
							-34.(
					4		-35.0
11.0					1		36.(
			horizontal fractures c	t 100mm			-37.
			spacing from 11.28 to		26		-38.0
12.0							-39.0
				-  -  -  -  -  -  -  -  -  -  -  -  -	-		-40.0
			1				
17.0					27		-42.0
13.0					<b>_</b> _′		-43.0
			111 / A <sup>m</sup> / · · ·	7.70			-44.(
			silty from 13.41 to 1	3.72 metres.			
		FN	D OF TEST HOLE AT 13.7	2 METRES IN CLAY	-		-45.0
14.0			DTES: TEST HOLE DRY UP				-46.0
							-47.0
							-48.
15.0							-49.
							-50.
							-51.0
16.0							-52.
16.0	ΠΜΔ Εησ	ineering	Ltd	COMPLETION DEPTH 13.7	 m	DATE DRILLED: 30/C	5/91
	Um ning	moormg	TINO.			Since Shirees, OU/C	~, ~ .



	ECT: MONTCALM SITE EVALUATIO		PADDOCK DRILLING LTD.			TESTHOL		MSA-TH	
	T: MAN. HAZARDOUS WASTE MAI		CANTERRA CT250			· · · · · · · · · · · · · · · · · · ·		4-003-01-0	)6
	ECT ENGINEER: LB		200mm DIA. HOLLOW STEM AUG TURBED IN RECOVERY			ORE BAR	ON 238.6	WIRELINE-	
AMP	LE TYPE GRAB SAMPLE ▲ BULK DENSITY (kn/m3) ▲	SHELBY TUBE DIST		<u> </u>	T T			ENGTH (kPa)	
(m)	4 8 12 16 ◆% CLAY ◆		SOIL	TYPE	/SPT(N)	40	80	120 16Ó ENGTH (kPa) ■	-  (¥)
) H	20 40 60 80	USC	JIVG	- li. i	/SF	40		120 160	- <del>-</del>
DEPTH	PLASTIC M.C. LIQUID	DES	SCRIPTION	SAMPLE	SAMPLE/	40	80	ENGTH (kPa) ♦ 120 160	DEPTH
	40 80 120 160			Ś	SAN	● QU 40	SHEAR STR 80	ENGTH (kPa) � 120 160	
3.0					1				07.0
			ractures at 8.23 and						-27.0
		8.84 metres.	at 8.53 metres.		33				
									-29.0
0.0									
									-30.0
									31.(
									-32.0
0.0	•				34				
0.0									-33.(
									-34.0
				Щ	4		1		-35.0
11.0									
									-37.
	• • • • • • • • • • • • • • • • • • •				35		•		-38.
		—— horizontal 1	fracture at 11.73 metres.						
12.0									-39.
		horizontal	fractures at 100mm spacing	┝╫	-				-40.
			to 12.5 metres.						
13.0					36				-42.
13.0		horizontal	fracture at 13.11 metres.						-43.
									-44.
		FND OF TEST HO	LE AT 13.72 METRES IN CLAY	/U	1				-45.
14.0			E DRY UPON COMPLETION.						-46.
									-47.
									-48.
15.0									-49.
									-50.
									-51.
16.0									-52.
	UMA Engi	neering Ltd.	COMPLETION DEPTH	13.7	m	- <u>t</u>	DATE DF	RILLED: 31/0	5/91
		, Manitoba	LOGGED BY KK		F	ig. No.	L		2 of 2
		,	L		l	J			

	CT: MONTO	ZARDOUS W			DRILLED BY: PADDOCK DRILLING LTD. DRILL TYPE: CANTERRA CT250		TESTHOLE No.	MSA-TH	
	CT ENGINE		ASTE MAT	NAG. LUKP	DRILL TYPE: 200mm DIA. HOLLOW ST		Project No: 654 ELEVATION 238.		6
		GRAB SA			Y TUBE DISTURBED NO REG		CORE BARREL	WIRELINE-T	
SHINFL		DENSITY (kn/			I TOBE UISTORBED INO REA		A DD SUCAD STO		T
(m)	4	8 12 • % CLAY •	16		COLL	<u>SPT(N)</u>	40 80	120 160	
<u>-</u> н	20	40 60	80	USC	SOIL			120 160	
DEPTH	PLASTIC	M.C.	LIQUID	050	DESCRIPTION	SAMPLE	LV SHEAR STR 40 80	120 160 €	-
	40	80 120	 160			SAM	QU SHEAR STI 40 80		1
0.0			160		TOPSOIL – some silt, dry to moist,		40 80	120 160	1
					- black				-
-					SILT – some clay, firm, homogeneous – moist, yellow brown		-		,
							в		F
-1.0									;
					lessingly of 1.00				
_					laminated at 1.22 metres.				
					stratified with fine sand (1 to 3m	m			
					thick) at 100 to 150mm spacing fr 1.52 to 2.44 metres.	om			4
-2.0							-		
	٩				clayey from 2.13 to 2.44 metres.	11!	9		
-					CLAY - silty, firm to soft, laminated				+8
					— medium plastic, moist				Ļ
-3.0					- brown				
									-
_									-
								••••••	
						12	0		
-4.0					trace to some silt and brown				1
					from 3.96 to 5.18 metres.	n			-1
-					4.27 to 5.18 metres.				  1
					horizontal fractures at 300 to 40 spacing from 4.57 to 5.18 metres.	Jmm			
-5.0					sprong non nor to one metros.				[-1
					CLAV trace cit firm to the				-
_	<b>†</b>	<b>†</b>			CLAY - trace silt, firm, medium to high plasticity, homogeneous	12	1	Þ	1
					<ul> <li>moist, grey</li> <li>slickenside at 5.49 metres.</li> </ul>				
					slickenside at 5.49 metres.				-1
-6.0									/
-									2
									-2
-7.0						122	۲ 		
_									-2
-									
8.0						123	3		-2
	<u> </u>	ŢJMΔ	Engir	eerin	or I.t.d. COMPLETION D	LILI IEPTH 10.7 m	DATE DR	ILLED: 03/06/	
			nipeg,			······	ig. No.		of

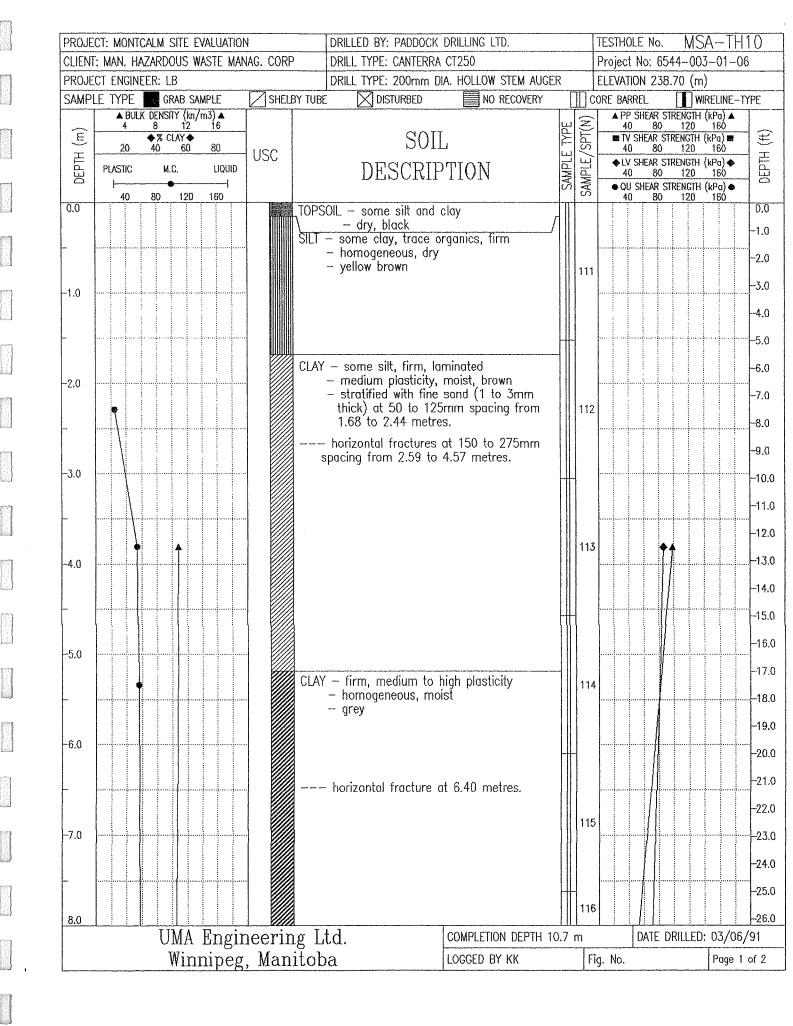
ROJE	CT: MONTC	ALM SITE E	EVALUATION	N	DRILLED BY: PADDOCK	DRILLING LTD.			resthole N		SA-TH	
			NASTE MAN	NAG. CORP					Project No:			6
	CT ENGINE					DIA. HOLLOW STEM AUGI			ELEVATION 2			
		GRAB SA			BY TUBE DISTURBED	NO RECOVERY	<u> </u>		RE BARREL	المستكليسة	VIREUNE-	IYPE
	▲ BULN 4	DENSITY (kn/ 8 12	/m3)▲ 16		0.01	<b>~</b>	TYPE	$\widehat{z}$	▲ PP SHEAL 40 {	0 120	160	
DEPTH (m)	20	♦% CLAY 40 60	80		SOI		⊥	/SPT(N)	the second s	0 120	160	T (E)
HI4	PLASTIC	M.C.	LIQUID	USC	DESCRI	OTION	SAMPLE	SAMPLE/	♦ LV SHEAL 40 &	STRENGTH	I (kPa) ♦ 160	DEPTH
Ъ	<u>⊢</u>						SAM	SAM	• QU SHEA	R STRENGT	l (kPa) 🛛	- 5
.0	40	80 120	160			· · · · · · · · · · · · · · · · · · ·	╶┼╓┼		40 8	0 120	160	
					slickensides at 300	to 400mm spacing						-27.0
					from 8.22 to 8.74 me	etres.		123				-28.0
					horizontal fractures 8.53 metres.	at 8.43 and		123				
.0					0.00 110000							-29.0
U					soft at 9.14 metres							-30.0
					SUIL UL J. 17 INCLISA							71 (
					slickensides at 9.60	- + 10.76 motron						31.0
					slickensides at 9.00	and 10.56 metres						-32.0
0.0		<u>*                                    </u>						124	<b>A </b>			
										ļļ		-34.0
							- Щ					-35.0
					END OF TEST HOLE AT 10	.67 METRES IN CLAY.						36.(
1.0					NOTES: TEST HOLE DRY U	PUN COMPLETION.						30.1
												-37.0
												 38.(
2.0												39.0
												-40.0
												41.0
												-42.0
5.0												-43.0
												44.(
												-45.0
4.0												AE /
t.U												-46.
												-47.0
												-48.0
5.0												49.0
												-50.
												-51.0
5.0												-52.0
0.0	1	ΙΜΔ	Engi	neerin	lg Ltd.	COMPLETION DEPTH 1	 10.7 r	n	DAT	e drille	 D: 03/06	5/91
				g, Mani		LOGGED BY KK			g. No.		Page 2	·



		calm site i			DRILLED BY: PADDOCK				IOLE No.	MSA-	
		AZARDOUS V	VASTE MAI	NAG. CORP	DRILL TYPE: CANTERRA			+		44-003-01	-06
	CT ENGIN				DRILL TYPE: 200mm D				TION 238		
MP1	E TYPE	GRAB S/ K DENSITY (kn,			TUBE DISTURBED	NO RECOVERY		CORE B		WIRELIN TRENGTH (kPa)	
-	4	8 12 ♦% CLAY ♦	16	4	COL		TYPE (SPT(N)		40 80	120 160 TRENGTH (kPa)	1
-	20	♦% CLAY ♦ 40 60	80	USC	SOII				40 80	120 160	
UEPIH (m)	PLASTIC	M.C.	UQUID		DESCRIF	TION	SAMPLE SAMPLE	<b>\$</b> 1	V SHEAR S 40 80	TRENGTH (kPa) 120 160	
2	40	80 120			DECOLUI	11010	SAN		U SHEAR S	TRENGTH (kPa) 120 160	•
5	40	00 120							+0 00	120 100	
					horizontal fractures		19	'			-27.
					spacing from 8.22 to	10.21 metres.					
							19	2			-29.
											-30.
	м.,			. ///			1	ζ			31.
											-32.
0											
U											-33.
							19	4			-34.
											-35.
					ND OF TEST HOLE AT 10.						
0				N	OTES: TEST HOLE DRY UP	ON COMPLETITION.					36.
											-37
											-38
0		ļļļ									-39
											-40
.0											-42
.0											-43
											-44
											-45
											-45
0											-46
											-47
											-48
0											-49
											-50
											-51
.0											-52
	L	UMA	Engi	neering	Ltd.	COMPLETION DEPTH 1	0.7 m		DATE	DRILLED: 04,	/06/91
		TAT:		, Manit	aha	LOGGED BY KK		Fig. No			je 2 of 2

	CT: MONTCALM SITE E		DRILLED BY: PADDOG P DRILL TYPE: CANTER			TESTHOLE No. MSA-7 Project No: 6544-003-01	
	CT ENGINEER: LB	MANAG, CUK		DIA. HOLLOW STEM AUGER		ELEVATION 238.70 (m)	-00
	LE TYPE GRAB SA		BY TUBE DISTURBED	NO RECOVERY		DRE BARREL	TYPE
DEPTH (m)	▲ BULK DENSITY (kn/ 4 8 12 ◆% CLAY ◆ 20 40 60 PLASTIC M.C.	2 16 80 ⊔QUID 	DESCR	IL	SAMPLE TYPE SAMPLE/SPT(N)	▲ PP SHEAR STRENGTH (kPg) 40 80 120 160 ■ TV SHEAR STRENGTH (kPg) 40 80 120 160 ↓ LV SHEAR STRENGTH (kPg) 40 80 120 160 ● QU SHEAR STRENGTH (kPg)	
0.0	40 80 120	160	TOPSOIL — some clay a	nd silt, dry, black		40 80 120 180	
-			SILT — some clay, trace — firm, laminated — yellow brown		69		-1 -2
-1.0	•		moist from 1.22 t	to 2.29 metres.	70		-3
-2.0			stratified with fine thick) at 100mm sp 2.29 metres.		71		-5
-			CLAY — silty, firm, medi — laminated, moist — stratified with fir	t, brown ne sand (3 to	72		-7 -8
-3.0			10mm thick) at from 2.29 to 5.4 occasional gypsun 3.05 to 4.10 metres	40 to 100mm spacing 19 metres. n inclusions from	73		-1
-4.0			some silt from 3.				-1
-	<b>1</b>		slickenside at 4.1	i metres.	74		T
-5.0					75		T T
-6.0			CLAY — firm, high plast — moist, grey ——— slickenside at 5.5	icity, homogeneous 8 metres.	76		
					77		
-7.0			horizontal fracture spacing from 6.71 firm to soft from 10.67 metres.	es at 150 to 200mm to 7.12 metres. 6.82 to	78		
-					79		
8.0	ΙΙΝΑ	Engineeri	a ng Itd	COMPLETION DEPTH 10	.7 m	DATE DRILLED: 03/	<u>   -2</u> 06/91
		nipeg, Mar		LOGGED BY KK			= 1 of

		ALM SITE I			DRILLED BY: PADDOCK					A-THS	
			NASIE MAI	NAG. CORP	DRILL TYPE: CANTERRA				Project No: 6544-00.		
	CT ENGINE			Zaurinur		DIA. HOLLOW STEM AUGE			LEVATION 238.70 (m	·	
SAMP		GRAB SA DENSITY (kn)		SHELBY T	UBE 🔀 DISTURBED	NO RECOVERY	<u>[][</u>	JCO	ليت السا	RELINE-TY	'PE
(m) H	4 20	8 12 ◆% CLAY ◆ 40 60	16		SOL	L	TYPE	SF1(N)	▲ PP SHEAR STRENGTH 40 80 120 ■ TV SHEAR STRENGTH 40 80 120	160	(ff)
DEPTH	PLASTIC	M.C.	Liquid I	USC	DESCRIF	PTION	SAMPLE	DAMPLE/SP1(N)	◆LV SHEAR STRENGTH 40 80 120 ◆QU SHEAR STRENGTH	(kPa) <b>*</b> 160	DEPTH
8.0	40	80 120	160		slickenside at 8.08 ı	metres.	┼╖┼╴	79	40 80 120	<u>160</u>	
											27.0 28.0
					horizontal fracture c	+ 0.01 motors	8	80			-29.0
9.0						it 0.04 meters.		.			-30.0
							8	31			-31.0
10.0											32.0
0.0	•				<b>N N N N N N N N N N</b>		8	32			33.0 34.0
					slickenside at 10.36			ŀ			-35.0
1.0					ID OF TEST HOLE AT 10. DTES: TEST HOLE DRY UF						-36.0
											37.0
								ŕ			-38.0
2.0											39.0 40.0
											-41.0
7.0				~							-42.0
3.0											-43.0
											-44.0
4.0											-45.0 46.0
											-47.0
			1								-48.0
5.0											-49.0
											-50.0 -51.0
6.0											-51.0
210	ii	UMA	Engir	ieering	Ltd.	COMPLETION DEPTH 10	).7 m		DATE DRILLED:	03/06/9	<del>)</del> 1
				, Manito		Logged by KK	r		No.	Page 2 o	



	CT: MONTC			N NAG. CORP	DRILLED BY: PADDOCI DRILL TYPE: CANTERR				TESTHOLE N Project No:		SA-TH	
	CT ENGINE					DIA. HOLLOW STEM AUG	FR		ELEVATION 2			
	E TYPE	GRAB S	AMPLE	SHELB		NO RECOVERY			ORE BARREL		URELINE-T	YPE
	▲ BULK	DENSITY (kn,	/m3) <b>▲</b>		- Kanana - K		<b>`</b>		▲ PP SHEA	R STRENGTH	(kPa) ▲	T
(m)	4	8 12 • % CLAY •	16		SOI	T	TYPE	/SPT(N)	TV SHEA	80 120 R STRENGTH		− (£)
~   프	20	40 60	80	USC			ب	E/S		80 120 R STRENGTH	<u>160</u>	
DEPTH	PLASTIC	М.С.	LIQUID		DESCRI	P'I'ION	SAMPLE	SAMPLE/	40	80 120	160	DEPTH
	40	80 120	160					SA		r strength 80 120	(KPa) • 160	
0												-27.0
	•	<b>A</b>				4						21.0
								116				-28.0
					——— horizontal fracture ——— horizontal fracture							-29.0
0						ut 0.04 metres.						
												-30.0
					horizontal fracture	at 9.45 metres.						31.0
												-32.0
1.0	•							117				
.0												-33.0
												-34.0
												-35.0
					END OF TEST HOLE AT 10							-00.0
.0					NOTES: TEST HOLE DRY U	IPON COMPLETION.						36.0
												-37.0
											· · · · · · · · · · · · · · · · · · ·	
												-38.0
2.0												-39.0
												-40.0
												-41.0
												-42.0
i.0												
												-43.0
												44.(
												-45.0
.0												
.0												<sup></sup>  -46.0
												-47.0
												LADO
												-48.0
.D												49.0
												-50.0
												"-51.0
0												-52.0
i.0		TIMA	Engir	neering	r Itd	COMPLETION DEPTH	10.7	L m		e drilled	1 1 1 1 D3/06	
					toba		10.1		UAI			J

		CALM SITE E			DRILLED BY: PADDOCK				ESTHOLE No.	MSA-		
	I: MAN. HA	ZARDOUS V	VASIL MAP	HAG. CURP		IA. HOLLOW STEM AUGE	Ŕ		roject No: 65 LEVATION 238		1-00	)
		GRAB SA	MPIF		BY TUBE DISTURBED	NO RECOVERY			RE BARREL	WIRELI	NF-T	/PF
JAIVI		DENSITY (kn/						<u> </u>	A PP SHEAR ST 40 80			T
DEPTH (m)	4 20	8 12 ♦% CLAY ♦ 40 60	16 80	USC	SOI		SAMPLE TYPE	/SPT(h	TV SHEAR ST 40 80	RENGTH (kPa) 120 16(		(17)
DEPTI	PLASTIC	M.C.	LIQUID 	000	DESCRII	PTION	SAMPL	SAMPLE/SPT(N)	<ul> <li>♦ LV SHEAR ST 40 80</li> <li>♦ QU SHEAR ST</li> </ul>	120 160 RENGTH (kPa	) ) <b>•</b>	DEDTU
0.0	40	80 120	160		TOPSOIL — silty, some clo	v	$+\pi$		40 80	120 160	)	0.
					– dry, black	-	41	125				-1.
-					SILT – trace clay, trace c – firm, homogeneou	S						-2.
					- dry to moist, brow yellow brown from (	n 161 to 2.29 metres						
-1.0	•				laminated from 0.9	to 2.29 metres.		 126				<u></u> -3.
								120				-4.
-	<u> </u>				stratified with fine s thick) at 100mm spa	and ( 2 to 4mm						-5.
					1.37 to 2.29 metres.	à						-6.
-2.0					some clay from 1.8	5 to 2.29 metres.		127				-7
-					CLAY — silty, firm, — laminated, moist,	brown	T	.				-8
	•				<ul> <li>stratified with fine</li> </ul>	sand (2 to		128			A	-9
-3.0					4mm thick) at 10 2.29 to 3.05 metr	nnin spacing from es.						-1
					horizontal fracture							-1
-					slickenside at 3.35	metres.		129				
					trace silt from 3.66	to 5.33 metres.						-1:
-4.0					frequent gypsum in 3.81 to 5.18 metres.	ciusions from						1
								130				-1
-												1
-5.0					slickenside at 5.03	metres		131				-1 
												-1
					CLAY — trace silt, firm, h — laminated, moist,	igh plasticity						1
	•				- Idministed, moist, slickenside at 5.59	metres.		132				-1
-6.0												-2
					slickenside at 6.25	metres		]				
								133				2
					slickenside at 6.55 horizontal fracture							-2
-7.0												2
								134				-2
-		ļļļ		. ///	slickenside at 7.32	metres.						
							ΓĦ	135				-2
8.0					T + 1	<b>T</b>						-2
					ng Ltd.	COMPLETION DEPTH 1	0.7		l	ORILLED: 04		
		Win	nipeg	, Man	itoba	LOGGED BY KK		Fig	. No.	Po	ige 1	of

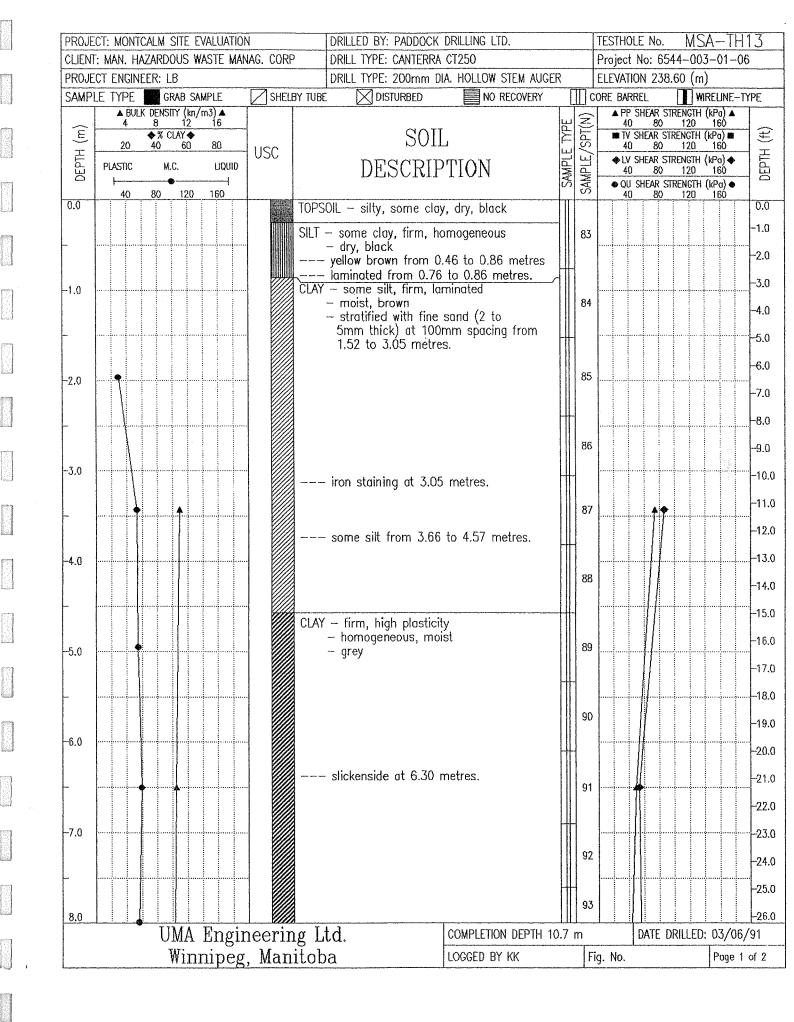
		ALM SITE E			DRILLED BY: PADDOCK	DRILLING LTD.			TESTHOLE No.	MSA-TH	111
		ZARDOUS W	VASTE MAN	VAG. CORP	······································				Project No: 654		)6
	CT ENGINE					DIA. HOLLOW STEM AUGER			ELEVATION 238.8		) 
SAMPI		GRAB SA			BY TUBE DISTURBED	NO RECOVERY	$\frac{1}{1}$		ORE BARREL	WIRELINE-	IYPE
(m)	4	8 12 ◆% CLAY ◆ 40 60	16 80		SOI	L	TYPE	SPT(N)	▲ PP SHEAR STR 40 80 ■ TV SHEAR STR 40 80	120 160 ENGTH (kPa) 120 160	- (£)
DEPTH	PLASTIC	M.C.	LIQUID	USC	DESCRII	PTION	SAMPLE .	SAMPLE/SPT(N)	<ul> <li>♦ LV SHEAR STR</li> <li>40 80</li> <li>♦ QU SHEAR STR</li> </ul>	ENGTH (kPa) � 120 160	DEPTH
8.0	40	80 120	160		7.90 to 8.23 metres			5	40 80	120 160	
0.0					homogeneous from			135			-27.0
-											-28.0
-9.0	•				slickenside at 8.69	metres.		136			-29.0
											-30.0
•					slickenside at 9.45	metres.		137			-31.0
10.0							┝╫╸				-32.0
					slickenside at 10.06	metres.		138			-33.0
											-35.0
11.0					END OF TEST HOLE AT 10 NOTES: TEST HOLE DRY U						36.0
											-37.0
											-38.0
12.0											-39.0
											-40.0
13.0											-42.0
											-43.0
											-44.0
14.0				,							-46.0
											-47.0
											-48.0
15.0											49.0
											-50.0
											51.0
16.0		TTF = 4	<u> </u>		T J 3	T					-52.0
					g Ltd.	COMPLETION DEPTH 10	.7 I			LLED: 04/06	
		Wini	nipeg	, Mani	toba	LOGGED BY KK		Fi	g. No.	Page 2	of 2

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		alm site e Zardous w			DRILLED BY: PADDOCH DRILL TYPE: CANTERR				ESTHOLE No Project No: (		SA-TH )3-01-(	
	CT ENGINE		MUTL MAD			dia. Hollow stem augef	2		LEVATION 2	· · · · · · · · · · · · · · · · · · ·		
		GRAB SA	MPLE	SHELL	BY TUBE DISTURBED	NO RECOVERY			RE BARREL	· ·	NIRELINE-	TYPF
		DENSITY (kn/	m3) ▲	<u>k</u> ,			Г		▲ PP SHEAR	STRENGT	I (kPa)▲	1
(m)	4	8 12 ♦% CLAY♦	16		SOI	T	SAMPLE TYPE	SAMPLE/SPT(N)	40 80	) 120 STRENGTH	160	(#)
) H	20	40 60	80	USC	IVG	<u></u>	н- LLI	S	40 80	) 120	160	
DEPTH	PLASTIC	M.C.	LIQUID	000	DESCRI	PTION	MPI	E E	◆LV SHEAR 40 80	STRENGT	I (kPa)♠ 160	
	40	80 120	 160				\$S	SAN	QU SHEAR     40 8		I (kPa) ● 160	
0.0			100			clay, dry, black				1 120		0.
					TOPSOIL - some silt and SILT - some clay, firm, I	nomogeneous		167				-1.
-					<ul> <li>moist, black</li> <li>yellow brown from</li> </ul>	151 to 160 motros		10/				
					,							-2.
1.0					laminated from 0.7	6 to 1.68 metres.						-3.
-1.0	٠							168				
												-4.
-												
					CLAY — silty, firm, lamina	nted	1					-6.
-2.0	,  ,				— moist, brown			169				
					<ul> <li>stratified with fine</li> <li>2mm thick) at 10</li> </ul>	e sand (1 to						7.
					2mm thick) at 10 from 1.68 to 2.74	metres.						-8
												~~ <sup>0</sup>
	•		4		stratified with fine	sand (4 to 7mm		170	•			-9
3.0			<b>.</b>		<ul> <li> stratified with fine thick) at 100 to 125 2.74 to 3.35 metres</li> </ul>	mm spacing from						11
					2.74 to 3.35 metres	S.					/	
_			ļ,					171				-1
					trace silt from 3.66	s to 1.88 motros						12
							+					
-4.0					slickenside at 3.66	metres.				1		1.
	1							172		/		-1.
•												 -1:
										/		
-5.0					CLAY — firm, high plastic	ity	-	173				-11
7.0					– homogeneous, m	pist				1		-1
					- grey		#					
-												18
		4						174	<b>* *</b>			-19
6.0												
					firm to soft from 6	20 to 10 67	Ħ					-2(
-					metres.			175 ·				-2
					slickenside at 6.50	metres.		173				-2
												-2
-7.0												
	•				slickenside at 7.16	metres.		176				-2-
-			ļļ.									
					occasional silt inclu	usions (2mm dia.)						-2
8.0					from 7.62 to 10.67	metres.		177				-2
0.0	<u>i:</u>	ŢΙΜΔ	Engir	eerir	ig Ltd.	COMPLETION DEPTH 10	 ).7 i	ևև n	DATE	DRILLEI	D: 04/06	
						LOGGED BY KK					Page	
		¥¥ 111.	nipeg	, wall	πυμα			Ing	. No.		ruge	

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		:alm site e Zardous v			DRILLED BY: PADDOC DRILL TYPE: CANTER				STHOLE oiect N			<u>A-TH</u> i-01-06	
	CT ENGINE					DIA. HOLLOW STEM AU	GER		EVATION				
	E TYPE	GRAB S		SHELBY T		NO RECOVERY		-	E BARRE			RELINE-T	YPE
		( DENSITY (kn, 8 12							A PP SH	EAR ST	RENGTH (	(kPa) ▲	1
<u>e</u>		🗢 🕷 CLAY 🔶			SO	TT	SAMPLE TYPE		40 # TV SH	80 EAR STI	120 RENGTH (		(£)
E	20	40 60	80	USC			- UN	$\geq$	40	08 EAD ST	120 RENGTH (	160	
	PLASTIC	M.C.	LIQUID		DESCRI	PTION	SAMPLE		40	80	120	160	DEPTH
	40	80 120	160				SA SA	5	● QU SH 40	IEAR ST 80	RENGTH ( 120	(kPa) 👁 160	
)							17	7					07.0
													-27.0
													-28.0
	e	Å					17	8	•				-29.0
								ļ					27.0
													-30.0
													-31.0
							17	9					
							Ш						-32.0
0													-33.0
							18	0					740
													-34.0
													-35.0
<u>^</u>					id of test hole at 1 )tes: test hole dry		ſ.						-36.0
.0					TES. TEST HOLE DIVI	OF ON COMILLION.		1					
													-37.0
													-38.0
.0											ļļ		-39.0
													-40.0
													-41.0
				**									-41.0
													-42.0
.0													-43.0
											ļ		-44.0
													-45.0
.0													
.0													-46.0
													-47.0
									-				-48.0
.0											ļļ		49.0
													-50.0
													-51.0
~													-52.0
.0_		TIMA	Fnair	neering	Itd	COMPLETION DEPTH	10.7 m					04/06/	
		OWIH	ப்பதாட	neermg	LIUL.		10.7 11		U			07/00/	J



										<u> </u>		14 7
		ALM SITE E			DRILLED BY: PADDOCK	*****			ESTHOLE N		SA-TH	
• • • • • •	·····	ZARDOUS W	ASIE MAI	NAG. CORP	DRILL TYPE: CANTERR	A CT250 DIA. HOLLOW STEM AUGE			roject No: LEVATION 2			16
	CT ENGINE			SHELBY T		NO RECOVERY			RE BARREL		MIRELINE-	TYDE
411171									▲ PP SHEA	R STRENGTI	H (kPa) ▲	
Ē	4	DENSITY (kn/ 8 12 \$% CLAY \$	16	-	GUI	T	CDT(M)		40 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	30 120	160	- €
DEPTH (m)	20	40 60	80	USC	SOI	L			40 8	30 120	160	- <u>-</u> <u>-</u>
EPT	PLASTIC	М.С.	LIQUID		DESCRII	PTION	SAMPLE			30 120	160	DEPTH
	40	80 120	160				5	5	● QU SHEA 40 8	r strengti 30 120		
0							9	3				-27.0
							$\left  + \right  + \left  - \right $					
								4				
^							9	4				-29.0
)												-30.0
1								_				
	¢	*					9	5	* *			
					slickenside at 9.75	metres.						-32.0
.0				· / ////	horizontal fractures							-33.0
					spacing from 10.05 t	o 10.24 metres.	9	6				-34.0
	(·····						Ш					-35.0
					ID OF TEST HOLE AT 10							
.0			·		DTES: TEST HOLE DRY U	FUN COMPLETION.						36.(
												-37.(
												-38.(
												-39.0
.0												
												-40.(
												-42.(
.0			<u></u>									-43.(
												-44.(
												-45.(
0												-46.(
												-47.(
			<u></u>									48.0
.0												49.(
												-50.0
												-51.0
												-52.0
<u>6.0</u>		TTM A	Fnair	neering	Itd	COMPLETION DEPTH 1	07m				D: 03/06	
				, Manito		LOGGED BY KK	0.7 11		UAI		u. vu/vu	1/31

	CT: MONT		EVALUATION WASTE MAN		DRILLED BY: PADDOCK DRILL TYPE: CANTERRA				ESTHOLE No.	<u>ASA-TH</u>	
	ECT ENGINI		WAUL WAI			DIA. HOLLOW STEM AUGER	2		ELEVATION 238.56		
		GRAB S	SAMPLE	SHELL	BY TUBE DISTURBED	NO RECOVERY				WIRELINE-	TYPF
		C DENSITY (ki	n/m3)▲					<u></u>	▲ PP SHEAR STREN	STH (kPa) ▲	
(m)	4	8 12 • % CLAY •	•		SOI	T	TYPE	/SPT(N)	▲ PP SHEAR STREM 40 80 12 ■ TV SHEAR STREM	160 160 TH (kPa) 📾	
н	20	40 60	80	USC		1t	Ш	E/S	40 80 12	0 160	-
DEPTH	PLASTIC	M.C.	LIQUID		DESCRII	PTION	SAMPLE	SAMPLE/	40 80 12 • QU SHEAR STREN	160	_
0.0	40	80 120	160		TOPSOIL - some clay and	l oilt	+	S 	40 80 12	<u>160 160 1</u>	+
					- dry to moist, b	lack					-1
					CLAY — silty, trace organ — homogeneous, ma	cs, firm		97			
											F2
-1.0					SILT – some clay, firm, l	aminated					;
1.0	•				<ul> <li>moist, yellow brow</li> <li>stratified with final</li> </ul>	n sand (2 to		98			-4
					SILT - some clay, firm, k - moist, yellow brow - stratified with fine 9mm thick) at 25 from 0.81 to 2.29	to 74mm spacing					
-					from 0.81 to 2.29	metres.		ľ			···  {
											+0
-2.0					1 5 0 4 7 1	2.00		99			
					clayey from 2.13 to CLAY - silty, firm, mediu		Ш				
**					- laminated, moist,	brown					
	•				<ul> <li>stratified with fine</li> </ul>	sond (1mm		100			-(
-3.0					thick) at 100 to 1 from 2.29 to 3.66	metres.				~~	
					vertical sand lense 2.29 to 2.74 metres.	(2mm thick) from					
-					2.29 10 2.74 metres.			101			
					some silt from 3.99	to 4.57 metres.					-1
-4.0											1
					slickenside at 4.11	metres.		102			
_											
-					CLAY — firm, high plastic	itv	$\left  \right $	ľ			
					<ul> <li>homogeneous, ma</li> </ul>	ist		103			-1
-5.0					– grey			103			]  -1
							$\left  \downarrow \downarrow$				
-								-			
								104			-1
-6.0							Щ	.			  -1
-								105 ·			2
											-2
-7.0							Ħ				
					slickenside at 7.16	metres.		106			
~											
							H	107			-2
8.0								107			-í
		UMA	Engir	leerin	g Ltd.	COMPLETION DEPTH 10	.7 n	n	date drill	ED: 03/06	/91
			nipeg			LOGGED BY KK		Fig	. No.	Page 1	of

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4 8	: LB GRAB SA NSTTY {kn/ 12 % CLAY ♠ 0 60 M.C.	MPLE	USC	DRILL TYPE: CANTERRA CT25 DRILL TYPE: 200mm DIA. HC TUBE DISTURBED SOIL DESCRIPTIC	DILLOW STEM AUGER	PT(N)	Project No:         6544-003           ELEVATION         238.56 (m)           ORE         BARREL         Image: Wife           APP         SHEAR STRENGTH ( 40         80         120           TV         SHEAR STRENGTH ( 40         80         120           LV         SHEAR STRENGTH ( 40         80         120           OU         SHEAR STRENGTH ( 40         80         120           OU         SHEAR STRENGTH ( 40         80         120	) RELINE-TYPE (kPq) ▲ 160 (kPq) ■ 160 (kPq) ■ 160 (kPq) ● 160
E TYPE BULK DE 4 BULK DE 4 E 20 44 PLASTIC	GRAB SA NSITY (kn/ 12 % CLAY 60 M.C.	m3)▲ 16 80 LIQUID	USC	iube disturbed SOIL DESCRIPTI(	)N		ORE BARREL WIF 40 80 120 TV SHEAR STRENGTH ( 40 80 120 LV SHEAR STRENGTH ( 40 80 120 LV SHEAR STRENGTH ( 40 80 120 QU SHEAR STRENGTH (	RELINE-TYPE       (kPa) ▲       160       (kPa) ●       160       (kPa) ●       160       (kPa) ●       160       (kPa) ●       160       -27.0
A BULK DE 4 E 20 44 PLASTIC	NSITY (kn/ 12 % CLAY 0 60 M.C.	m3)▲ 16 80 LIQUID	USC	SOIL DESCRIPTIO	)N SAMPLE TYPE	SAMPLE/SPT(N)	▲ PP SHEAR STRENGTH ( 40 80 120 ■ TV SHEAR STRENGTH ( 40 80 120 ◆ LV SHEAR STRENGTH ( 40 80 120 ◆ QU SHEAR STRENGTH (	$\begin{array}{c} (kPa) \blacktriangle \\ 160 \\ (kPa) \bigstar \\ 160 \\ (kPa) \bigstar \\ 160 \\ 160 \\ (kPa) \bigstar \\ 150 \\ 150 \\ 150 \\ -27.0 \end{array}$
20 4	% CLAY <b>◆</b> 0 60 M.C.	80 Liquid 		DESCRIPTIO	)N	SAMPLE	TV SHEAR STRENGTH ( 40 80 120 LV SHEAR STRENGTH ( 40 80 120 QU SHEAR STRENGTH (	(kPa) ■ 160 (kPa) ◆ 160 (kPa) ◆ 160 (kPa) ● 160 -27.0
20 4 PLASTIC	0 60 M.C.	Liquid I		DESCRIPTIO	)N	SAMPLE	40 80 120 ◆ LV SHEAR STRENGTH ( 40 80 120 ◆ QU SHEAR STRENGTH (	160     H       160     H
<b> </b>						S	40 80 120 • QU SHEAR STRENGTH (	(kPa) ● 160 27.0
40 8	0 120	160				S		(kPa) ● 160 27.0
		•		—— slickenside at 8.69 metre		107		-27.0
		•		—— slickenside at 8.69 metre		107		
		•		—— slickenside at 8.69 metre				10 A
		•		slickenside at 8.69 metre				-20.0
		•			s.	108		-29.0
								-29.0
								-30.0
	1							31.0
						109		
				horizontal fracture at 9.7	5 metres.			-32.0
								-33.0
						110		740
				<ul> <li>horizontal fracture at 10.</li> </ul>	36 metres.			-34.0
								-35.0
								-36.0
								-37.0
								-38.0
								-39.0
								-40.0
								-42.0
								-43.0
								-44.0
								45.0
								-46.0
		ļ,						-47.0
								-48.0
								-49.0
	·····							
								-50.0
								-51,0
				~				-52.0
					PLETION DEPTH 10.7	m	DATE DRILLED:	03/06/91
				UMA Engineering	UMA Engineering Ltd.		UMA Engineering Ltd.	UMA Engineering Ltd.

			EVALUATION WASTE MAN		DRILLED BY: PADDOCK DRILL TYPE: CANTERRA				ESTHOLE No. M roject No: 6544-0	<u>SA-TH</u>	
	CT ENGINI					NA. HOLLOW STEM AUGER	₹		LEVATION 238.95 (		
	LE TYPE		SAMPLE	SHEL	BY TUBE DISTURBED	NO RECOVERY	Π			WIRELINE-T	TYPF
		DENSITY (k	n/m3) 🛦						A PP SHEAR STRENGT	H (kPa)	1
(m)	4	8 12 ♦% CLAY €	<b>&gt;</b>		SOI	T.	TYPE	/SPT(N)	40 80 120	160 H (kPa) 📾	-
H	20	40 60		USC			ш	E/S	40 80 120	160	-
DEPTH	PLASTIC	M.C.			DESCRIF	PTION	SAMPLE	SAMPLE/	40 80 120	160	
	40	80 120	3 160	Baltimation .			N	S	QU SHEAR STRENGT 40 80 120		
0.0				eres e	TOPSOIL — some silt and					*	C
					SILT — trace clay, firm, h — dry, yellow brown	omogeneous		139			-1
-					- ury, yenow brown			•••			2
											-3
-1.0	•				some clay, laminate	d from 1.07		140			
					to 1.52 metres.	u hom 1.07		עדי			-4
-					CLAY — some silt, firm, lo	minated	$\left  + \right  + \left  + \right $				5
					– moist, brown						
-2.0					<ul> <li>stratified with fine</li> <li>3mm thick) at 100</li> <li>1.52 to 3.05 metre</li> </ul>	sand (1 to		141			-6
					1.52 to 3.05 metre	nam spucing inom S.					-7
							$\left  + + \right $				<u>_</u> -8
		A	~					142			
70		T							TI		Гэ
-3.0											<sup></sup>  1
					horizontal fractures 3.35 metres.	at 3.20 and		143			-1
-					occasional gypsum 3.35 to 4.27 metres.	inclusions from		UTJ			  -1
					3.35 to 4.27 metres.						
-4.0											1
	•				slickenside at 4.26			144			-1
-	-				<ul> <li> frequent gypsum inc 4.27 to 5.33 metres.</li> </ul>	ausions from	Ш				 1
-5.0								145			1
											-1
-					CLAY — firm, high plastici	ty, homogeneous					
					— moist, grey			146			
		T							T		-1
-6.0											-2
											-2
-					horizontal fracture o	it 6.40 metres.		147			•••
											-2
-7.0					——— slickenside at 7.01	metres.	$\square$				
	•							148			-2
-											
								149			-2
8.0					slickenside at 7.78	Y					-2
					ıg Ltd.	COMPLETION DEPTH 10	.7 m	) 	DATE DRILLE	D: 04/06,	/91
		Winnipeg, Manito			itoba	LOGGED BY KK		Fia.	No.	Page 1	of

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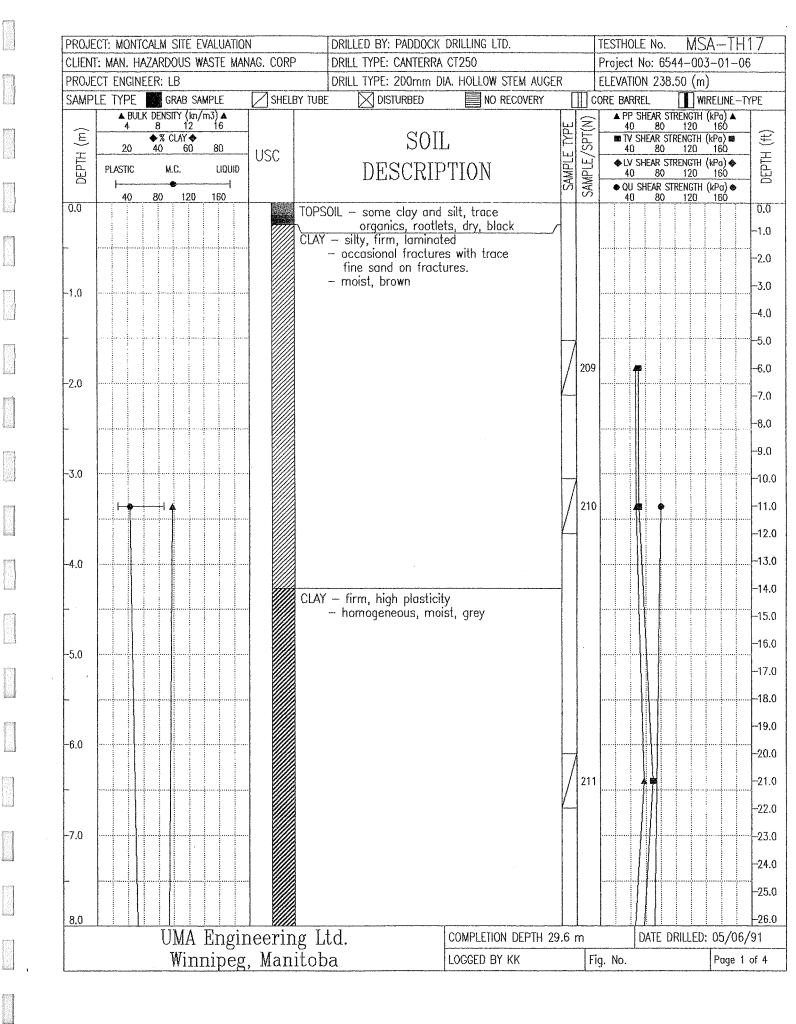
										r E
PROJE	ECT: MONTO	CALM SITE E	VALUATIO	N	DRILLED BY: PADDOCI	< DRILLING LTD.		Ti	resthole No. MSA-7	H15
		ZARDOUS W	laste mai	NAG. CORP	DRILL TYPE: CANTERR			F	Project No: 6544-003-01	-06
	ECT ENGINE		·····			DIA. HOLLOW STEM AUGE			ELEVATION 238.95 (m)	
SAMP		GRAB SA		SHELBY '	TUBE 🛛 DISTURBED	NO RECOVERY		r	RE BARREL WIRELIN	
(m)	4	DENSITY (kn/ 8 12 ◆% CLAY ◆	16		aoi	т	TYPE	(N) 145	▲ PP SHEAR STRENGTH (kPg) 40 80 120 160	
H (I	20	40 60	80	USC	SOI	.L.		۲ ک	■ TV SHEAR STRENGTH (kPa) 40 80 120 160	
DEPTH	PLASTIC	M.C.	Liquid		DESCRI	PTION	SAMPLE	SAMPLE	◆LV SHEAR STRENGTH (kPo) ◆ 40 80 120 160	
	40	80 120	160				5	NAD	● QU SHEAR STRENGTH (kPa) ● 40 80 120 160	
8.0								49		
							'			-27.0
-								ŀ		-28.0
	•	Å			slickenside at 8.84	matras	1	50	▲ ◆	-29.0
9.0					SHEREHAUE UT 0.04	medes.		ŀ		-30.0
										-30.0
	•••••						1	51		-31.0
				- ///	slickenside at 9.70	metres.				-32.0
10.0										-33.0
					<ul> <li>slickenside at 10.05</li> <li>slickenside at 10.26</li> </ul>			52		· · · · · · · · · · · · · · · · · · ·
				. 🥢	occasional pebbles	from 10.36 to				-34.0
					<u>10.67 metres.</u> ND OF TEST HOLE AT 10		μų			-35.0
11.0					OTES: TEST HOLE AT TO					-36.0
										-37.0
								ľ		-38.0
12.0										-39.0
12.0										40.0
										-40.0
										-41.0
										-42.0
13.0										-43.0
										-44.0
										-45.0
14.0										-46.0
•										-47.0
										-48.0
15.0										-49.0
										-50.0
								ľ		-51.0
16.0										-52.0
		UMA	Engin	ieering	Ltd.	COMPLETION DEPTH 10	).7 m	l	DATE DRILLED: 04/C	6/91
				, Manito		LOGGED BY KK	T	Cia.		2 of 2

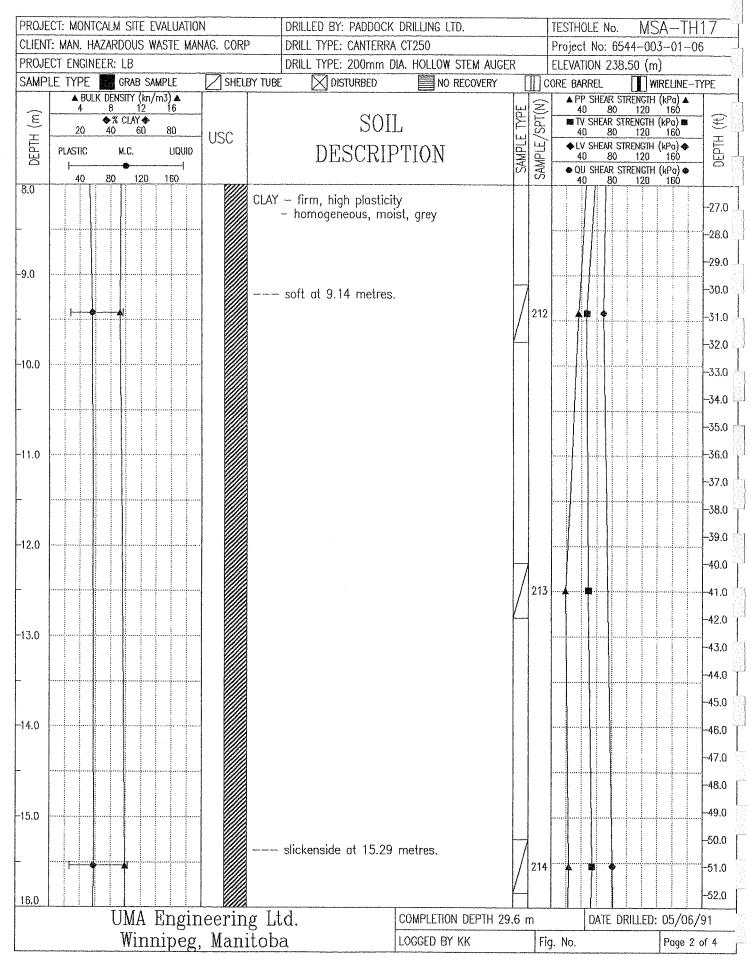
	CT: MONTCALM SIT			DRILLED BY: PADDOCK DRILLING LTD.			ISA-TH16
	: MAN. HAZARDOU	S WASTE MAN	IAG. CORP	DRILL TYPE: CANTERRA CT250		Project No: 6544-(	
	CT ENGINEER: LB		[]]	DRILL TYPE: 200mm DIA. HOLLOW STEM AU		ELEVATION 238.56 (	
SAMPL	E TYPE GRAE BULK DENSITY		SHELBY	TUBE 🛛 DISTURBED 📄 NO RECOVER			WIRELINE-TYPE
	48 <sup>·</sup>	12 16			TYPE (CDT/M)	A PP SHEAR STRENG 40 80 120 TV SHEAR STRENG	) 160
(m)	◆% CLAY 20 40 €	Y � 6080		SOIL		2 40 80 120	
DEPTH	PLASTIC M.C.	LIQUID	USC	DESCRIPTION	LE APLE	LV SHEAR STRENG 40 80 120	1 160 1H (kPa) ♣ 0 160
8	<b>-</b>			DEDOMI IION	SAMPLE	QU SHEAR STRENG	1H (KPa) 🗢 🕴
0.0	40 80 1	20 160	T Real	OPSOIL — some clay and silt, dry, black		<u>     40 80 120     120     121     1     1     1     1 </u>	) 160
				of sole solide day and silt, dry, black			-1
-				LAY — silty, trace organics, firm — homogeneous, moist, black		53	
				— homogeneous, moist, black			-2
				impringented because from 0.00			
-1.0	•			<ul> <li>-— laminated, brown from 0.90 to 0.99 metres.</li> </ul>	/    <sub>1</sub>	54	
			L L	ILT - some clay, firm, laminated		~ '	-4
-  -				- dry, yellow brown	/		
				ILT - some clay, firm, laminated - dry, yellow brown LAY - some silt, firm, laminated - dry to moist, brown			
-2.0					1:	55	
							-7
			- 🖉	moist at 2.28 metres.	++-		
-						E P	
						56	-6
-3.0				frequent avosum inclusions from			-1
				<ul> <li> frequent gypsum inclusions from 3.05 to 5.18 metres.</li> </ul>			_
					1!	57	
							-1
-4.0							
7.0			- 🖉 -	slickenside at 4.06 metres.	1	58	
							-1
-					-#-1		-1
							-1
-5.0					1	59	
			- 🕅 -	slickenside at 5.18 metres.			-
-				slìckenside at 5.41 metres.	TTL,		
				CLAY — firm, homogeneous		60	
-60				— medium to high plasticity — moist, grey			ŕ
-6.0							H
-			- ////	stratified with silt (1 to 3mm thick)	1	61	· · · · · · · · · · · · · · · · · · ·
				at 100 to 125mm spacing from 6.50 to 6.71 metres.			
-7.0				D.OU TO D./I metres.			
						62	
							H H
-					<b> -+ -</b>		H
80						63	
8.0	TIM	A Engir	L	Ltd. COMPLETION DEPTH	107 m		ED: 03/06/91
	UM		, Manit				-0. 00/00/3

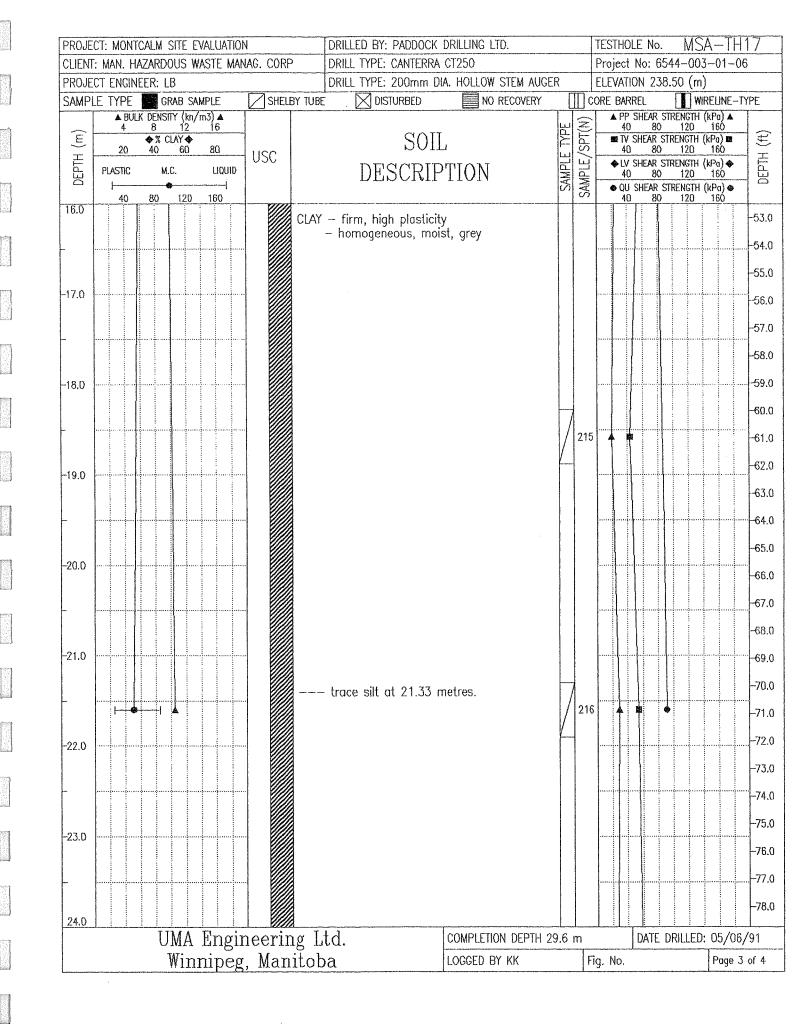
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PROJE	TT. MONTO	CALM SITE E	ναιιιάτιο	N	DRILLED BY: PADDOCK			TESTHOL	E No. 1	MSA-TH	116
		ZARDOUS W			DRILL TYPE: CANTERRA			+		003-01-0	
	CT ENGINE					DIA. HOLLOW STEM AUGE	R		DN 238.56		
		GRAB SA	MPLE	SHELB		NO RECOVERY		CORE BAR		WIRELINE-	TYPE
	▲ BULI	C DENSITY (kn/	m3) ▲					A DD 1	SHEAR STREN	GTH (kPa)▲	<u> </u>
(m)	4	8 12 • % CLAY •	16	-	SOI	T	<pre>CPT(N)</pre>	40	80 12 SHEAR STRENG	20 160	(#)
Ĕ	20	40 60	80	USC	IVG			40	80 12	20 160	
DEPTH	PLASTIC	M.C.	LIQUID		DESCRII	PTION	SAMPLE .	}   ◆LV : - 40	SHEAR STRENG 80 12	STH (kPa)♠ 20 160	EPTH
<u> </u>	40	80 120	160				SAN	• QU 40	SHEAR STREN	GTH (kPa) 👄 20 160	
8.0		00 120	100				$+\pi+$	40	<u>ov 1</u> 2	20 160	
							16	3			-27.0
_									···•		
					slickenside at 8.53	metres.	16	A			20.0
A A					occasional silt inclu	sions (5mm dia.)	10	4			-29.0
-9.0					occasional silt inclu from 8.84 to 10.67 n	netres.					-30.0
					slickenside at 9.30	metres					
-					horizontal fracture (		16	5			31.0
											-32.0
-10.0			ļļ				$\left  + + \right $				
											-33.0
	6						16	6			-34.0
-											
					END OF TEST HOLE AT 10	67 METRES IN CLAY	14				-35.0
-11.0					NOTES: TEST HOLE DRY U						36.0
											77.0
											-37.0
-											-38.0
											-39.0
-12.0											
											-40.0
-	•										-41.0
											1.0
											-42.0
13.0											-43.0
											10.0
											-44.0
											-45.0
-14.0											
11.0											-46.0
					•						-47.0
-											
											-48.0
15.0											-49.0
											<u></u>
											-50.0
•											
16.0		TT3 F 4	<u> </u>		τια	[					-52.0
				neering		COMPLETION DEPTH 10	.7 m	[	DATE DRILL	ED: 03/06	/91
		Wint	nineg	, Manit	oha	LOGGED BY KK	F	ig. No.		Page 2	of ?







	OT HONTO							1	TESTHOLE No.	MSA-TH	1 7
	CT: MONTC					DRILLED BY: PADDOCK DRILLING LTD.					
	: MAN. HAZ		VASTE MAP	IAG. CURP	DRILL TYPE: CANTERRA	IA. HOLLOW STEM AUGE			Project No: 65 ELEVATION 238		0
	CT ENGINEI	GRAB SA		SHELBY		NO RECOVERY		Πc	ORE BARREL	WIRELINE-	
-\I¥I1		DENSITY (kn/					ΓĪ	~		RENGTH (kPa) ▲ 120 160	
DEPTH (m)	4 8 12 16 ◆% CLAY ◆ 20 40 60 80			USC	SOI		E TYPE	/SPT(N	TV SHEAR ST 40 80	RENGTH (kPa) ■ 120 160	- (£) -
DEPTH	PLASTIC	M.C.	liquid I	030	DESCRIF	PTION	SAMPLE -	SAMPLE/SPT(N)	40 80 • QU SHEAR ST	RENGTH (kPa) <b>*</b> 120 160 TRENGTH (kPa) <b>*</b>	DEPTH
1.0	40	80 120	160		CLAY firm, high plastici - homogeneous, mo	ty			40 80	120 160	-79.0
					– nomogeneous, mo	ist, grey	$\left  \right\rangle$	047			0.08-
5.O								217			-81.0 
											-83.0
											-84.0
.0											-85.0 -86.0
.0											-88.0
											-89.0
								218			-91,0
.0							<u> </u>				-92.0
											-93.0 94.0
.0											95.(
											-96.0
					END OF TEST HOLE AT 29. NOTES: TEST HOLE DRY U						-97.0 -98.0
.0										-99.(	
.0											-101. -102
											-103
2.0											-104.
		UMA	Engir	neering	g Ltd.	COMPLETION DEPTH 29	9.6	n	DATE D	RILLED: 05/06	/91
				, Mani		LOGGED BY KK		F	ig. No.	Page 4	of A

PROJECT: MONTCALM SITE EVALUATION CLIENT: MAN. HAZARDOUS WASTE MANAG, CORP							EXCAVATED BY: D. TOUCHETTE & SONS EXCAVATOR TYPE: CASE 580 BACKHOE				TESTHOLE No. MSA-BTP1 Project No: 6544-003-01-06					
	CT ENGIN			AJIL MAI	MO. CONF	. <u> </u>	EACHIMION TIPE, CASE	JOU DAUNINE			ELEVATIO				0	
	E TYPE		rab sa			BY TUBE	DISTURBED	NO RECOVERY	<u>-</u>		ORE BARR	~~~~		IRELINE-	YDF	
JAWIT L			SITY (kn/							<u></u>				(kPa) ▲	T	
Ê	4	8	12 CLAY ♦	16			COT		TYPE	(SPT(N)	40	80	120	160 (kPa) ■	4 -	
5	20	40	60	80	USC		SOII	1	Г Ш	/SP	40	80	120	160		
DEPTH (m)	PLASTIC	м	I.C.	LIQUID	030		DESCRIP	TION	SAMPLE	SAMPLE/	◆LV S 40	HEAR ST 80	rength 120	(kPa) ◆ 160		
ā	F		•					11010	¥5	SAM		HEAR ST	RENGTH	(kPa) ● 160	7	
0.0	40	80	120	160		7000		£:			40	80	120	160	0	
						IUP5	OIL — silty, trace clay — weathered, mois	, urm t. black								
															-1.	
-		1													-2	
-1.0		ļļ	ļļ	ļļļ								ļļ	ļļ	ļ	3.	
						01.41/	.:	i							-4	
						ULAY	– silty, firm, laminat – dry, brown	20								
-																
										:					-6	
-2.0		Î													"  _	
						SILT	<ul> <li>clayey, firm, moist</li> <li>stratified with thin</li> </ul>	to wet							-7	
							from 2.38 to 2.6 me	sana layers Itres								
-							– grey brown							ļļ	8	
						OL AV	1176									
						LAT	— stiff, homogeneous — medium plasticity,	s, moist brown							-9.	
							meanin producity									
-3.0		1					trace of seepage at	3.00 metres.							-1(	
															-1	
_				ļ												
						END									-1:	
						ENU	OF TEST PIT @ 3.66 N	ILIKES IN ULAY.								
-4.0			+		. 1	NOTE	s: test pit dry upon	I COMPLETION.							<u> </u> -1:	
															-1	
-		1	1	1										†	1	
5.0															-1	
		U	MA	Engii	neerin	g L	td.	COMPLETION DEPTH	3.7 m			date d	RILLED	: 17/06	/91	
					, Man			LOGGED BY KK		Fie	g. No.			Page 1	of	

		ICALM SITE			EXCAVATED BY: D. TOUC EXCAVATOR TYPE: CASE				TESTH(			SA-BT 3-01-0	
	CT ENGIN		MACHE MIAT		LAVANAIVIT TIEL: VADL			+			38.50 (n		×
	E TYPE		AMPLE	SHELBY	TUBE DISTURBED	NO RECOVERY	Г		DRE BAI			VIRELINE-	TYPE
		K DENSITY (kn	n/m3)▲		K N THE REAL	hand	ГĪ		▲ PF	SHEAR	STRENGT	I (kPa) ▲	
Ê	4	8 12 ♦% CLAY♦	16	-	SOII		SAMPLE TYPE	SAMPLE/SPT(N)	41 ■ TV		0 120 STRENGTH	160 (kPa)	- E
) н	20	40 60	80	USC		J	Ш	-/SF	4	) 8	<u>0 120</u>	160	
DEPTH (m)	PLASTIC	M.C.	LIQUID		DESCRIP	TION	MPI	ШЦ	◆L\ 4	SHEAR	STRENGTI 0 120	(kPa) ◆ 160	DEPTH
	40	80 120	160				5	SAN	● QL 4		STRENGT	l (kPa) ● 160	
0.0				the second se	) PSOIL - some silt, some	a clav rootlete				<u> </u>	<u>v 120</u>		0.0
				a state of the second s	- weathered to 1.	1 metres							
					— moist, black								-1.0
244 1													
					LT — clayey, firm, dry to	moist							-2.0
					<ul> <li>yellow brown</li> </ul>	ſ							2.0
1.0		ĻĻĻ									ļļ	ĻĻĻĻ	-3.0
													-4.0
				- M.	AY - silty firm medium	valasticity							
					LAY — silty, firm, medium — laminated, moist, b	irown							
													-6.0
2.0													
													-7.0
													-8.0
•		·			—— 75mm thick silty sar	ad laver							
					at 2.66 metres.								
				- 🖉	trace of silt, stiff, he	omogeneous							-9.0
3.0					high plasticity, moist								
5.0													-10.0
				4			-	ļ					-11.0
		ļļļ.		.     E	ND OF TEST PIT @ 3.35 N	METRES IN CLAY.					ļļ		
					otes: test pit dry upoi	I COMPLETION							-12.0
													12.0
4.0													13.0
								l					-14.0
								ļ					-15.0
													10.0
5.0													-16.0
<u></u>	I	TIMA	Engi	neering	Ltd.	COMPLETION DEPTH 3.4	4 m	I	L	DATE	DRILLE	D: 17/06	/91
				, Manit		Logged by KK			g. No.	1		Page 1	······
		¥¥ 11.	mpeg	, mann	una di				9. 110.	·····		1, 490	

	CT: MONTC					TOUCHETTE & SONS CASE 580 BACKHOE		TESTHO Project		<u>MSA-B</u> 1-003-01-	
PROJE	CT ENGINE	ER: LB							ION 238.8		
SAMP	LE TYPE	GRAB S		SHELBY	TUBE 🛛 DISTURBED	NO RECOVERY		CORE BAR		WIRELINE-	
(m)	▲ BULK	DENSITY (kn 8 12 ♦% CLAY ♦	/m3) ▲ 16		C		TYPE SPT(N)	▲ PP 40	80	NGTH (kPa)▲ 120 160 NGTH (kPa)■	
DEPTH (1	20	40 60	80	USC		OIL	LE T F/SP		80	120 160 NGTH (kPa)◆	
DEP	PLASTIC	M.C.	UQUID 		DESCH	RIPTION	SAMPLE TYPE	40 • QU	) 80 Shear Stre	120 160 ENGTH (kPa) •	
0.0		80 120	160	Т	DPSOIL — some silt, s — weathered o	and fractured		<u>, 40</u>	80	120 160	0
Ę					– dry to mois ILT – trace clay, hon						1 
					<ul> <li>dry, brown</li> <li>dry, brown</li> <li>clayey, moist fro metres.</li> </ul>						-2
-1.0					LAY — silty, firm, lam — moist, brown	ninated	1				
											-4
-											
-2.0											<del>با</del> 
					hanna - 24 - 4266 - 6						
-				-	—— trace silt, stiff, l —— high plasticity, n	noist					
7.0											-1
-3.0		····•									
-					nd of test pit at 3. Otes: test pit dry (						
,											T
-4.0											
											-
-											
5.0		TIMA	Engir	eering	Itd	COMPLETION DEPTH 3	32 m			LLED: 17/0	6/91
				, Manit		LOGGED BY KK		Fig. No.	UNIC UNI	·	1 of '

						VALUATIO	)N NAG. CORF	EXCAVATED BY: D. TOU EXCAVATOR TYPE: CASE				TESTHO Proj <del>e</del> ct		). MS	A—BT 3-01-0	
			NEEF									ELEVAT	ION 2	38.80 (m	)	
MPI	LE 1	YPE				MPLE	SHEL	r Tube 🛛 Disturbed	NO RECOVERY		∏Co	ORE BAR			RELINE-	TYPE
_		▲ B( 4	· . 8	3	12	/m3)▲ 16				ы	$\widehat{\mathbf{Z}}$	40	) 8(	STRENGTH	160	
(m)		20	° .♦	% CL 0	AY ◆ 60	80		SOII	_i	TYPE	(N)TPT	■ TV 40	SHEAR	STRENGTH D 120	(kPa) ■ 160	12
<b>DEPIH</b>	DI	ASTIC	12.253	M.C		LIQUID	USC	DECODIT	TUTU	SAMPLE		♦LV	SHEAR	STRENGTH	(kPa)♦	DEPTH
- - -		юііс 		•	,. 			DESCRIF	TION	SAM	SAMPLE/	40 • QU		D 120 STRENGTH	160 (kPa)●	-  🖂
0	;	40	8	0	120	160				ļ	S	40	) 8		<u>160</u>	0.0
J							et que a Maria	TOPSOIL - some silt and	clay,							0.0
								<ul> <li>weathered to 0.</li> <li>dry to moist, bl</li> </ul>								-1.0
								silty from 0.15 to 0.	51 metres.		ľ				4	
						+			-+::+	-						
								CLAY — silty, stiff, low pla — damp, brown	sucity							-2.0
								warring wrotter								
																-3.0
				ΪÎ	Ì	TT	"									
																-4.0
										1						
								some silt from 1.52	to 3.96 metres.							
								stratified with fine e	and (2 to							-6.0
)				ļļ				stratified with fine s 3mm thick) at 150mr 1.85 to 2.44 metres.	n spacing from			ļ			ļļļ.	
								1.85 to 2.44 metres.								-7.0
																-8.0
							///	fine sand layers (5 150mm spacing from	to 10mm thick) at		ļ				$\left\{ -\right\}$	-0.0
								to 3.96 metres.	۷.44							
								100mm thick fine s	and layer							-9.0
								at 2.44 metres.								
)				1			-  ///							••		-10.0
																-11.0
														ļļ	Ļ	
			Î													10.0
																-12.0
0	ļ			ļ				trace silt stiff how	indenentic						+	-13.0
								trace silt, stiff, hom medium to high pla	sticity							
								J 1	-	-						-14.0
								END OF TEST PIT AT 4.27	METRES IN CLAY.							
								NOTES: TEST PIT DRY UPO	N COMPLETITION.						++	15.0
																10.0
0											1					-16.0
<u> </u>	L	<u>. i</u>	<u> </u>	ĪT	MΔ	Eng	ineerir	a Itd	COMPLETION DEPTH 4	.3 n	 n	<u> </u>	DATI	: : : E DRILLEC	): 17/06	5/91
									LOGGED BY KK			g. No.	1		Page	
				1	W111	mpe	g, Man	liuua	LUGOLU DI MA			y. nu.			I uye	· Vr I

M	PROJE	CT: MONT	CALM SITE	EVALUATIO	N		EXCAVATED BY: D. TOUC	CHETTE & SONS		Ī	TESTHO	ILE No.	MS	A-BTI	25
				WASTE MA	NAG. CORP		EXCAVATOR TYPE: CASE	580 BACKHOE						6-01-06	3
en-ella		CT ENGINE			<b>F</b>		<u> </u>					ION 239			
	SAMP	LE TYPE		SAMPLE		y tube		NO RECOVERY	<u> </u>	Шc	ORE BAF	SHEAR ST			(PE T
	f (m)	4 20	(DENSITY (k 8 12 ◆% CLAY ◀ 40 60	•	USC		SOII	L	SAMPLE TYPE	SAMPLE/SPT(N)	40 ■ TV 40	i 80 Shear St i 80	120 Rength ( 120	160 kPa) ■ 160	+ (#)
	DEPTH	PLASTIC	M.C.	LIQUID 	USC		DESCRIP	TION	SAMPLI	AMPLE,	4( ● QU	SHEAR ST	120	160	DEPTH
[7]	0.0	40	80 120	) 160			MI - some slit and a	Nav		S	40	80	120	160	0.0
						101.0	OIL - some slit and c - rootlets to 0.36 - dry, black	metres							-1.0
	-														-2.0
	-1.0								19						-3.0
							— trace clay, firm — homogeneous, dry — brown								-4.0
	_						DIGWI							*	-5.0
	-2.0					CLAY	– silty, stiff, laminat – medium plasticity	ed							<b>6.</b> 0
							– moist, brown								-7.0
	ł														-8.0
	-3.0														-9.0
															-10.0
	-						- trace silt, stiff - high plasticity, homo	geneous							-12.0
	-4.0					END	of test pit at 3.35	metres in clay.							-13.0
	T.U					NOTE	es: test pit dry upoi	N COMPLETION.					~		-14.0
	-														-15.0
	5.0														-16.0
		- <b>-</b>	UMA	Engi	neerin	g L	td.	Completion depth	1 3.8 m	1		DATE D	RILLED:	17/06,	/91
(33)					, Man			Logged by KK		Fi	g. No.			Page 1	of 1
	h				•••••••••••••••••••••••••			······································							

UPLE TYPE         GRAP SAMUL         SHELBY TUPE         DISTURBED         NO RECOVERY         III CORE EVENT.         IIII CORE EVENT.		CT ENGIN	AZARDOUS FFR: LB	WASTE MAP	NAG. CURP	EXCAVATOR TYPE: CASE	580 DACKHUE			t No: 6544-00 110N 238.70 (n		
Image: Second and the second		le type	GRAB S		SHELB	TUBE DISTURBED	NO RECOVERY		CORE BA	RREL V	VIRELINE-TY	PE
Puestic         M.C.         DESCRIPTION         Description <thdescription< th="">         Description         <thdescri< td=""><td></td><td>▲ BUL 4</td><td>8 12</td><td>16</td><td></td><td></td><td></td><td>μE</td><td></td><td>0 80 120</td><td>160</td><td>_</td></thdescri<></thdescription<>		▲ BUL 4	8 12	16				μE		0 80 120	160	_
40         80         120         180         0.0         100         0.0         100         100         0.0           1         1         1         1         1         100         100         0.0         100         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         0.0         100         110         110         110         110         110         110         110         110         110         110         110         110         110         110         110         110		20		80		SOIL	a	Σ LdS/	■T 4	/ Shear Strength 0 80 120		T (F)
40         80         120         180           TOPSOIL - some clay and silt, blocky         - crotels to 0.30 metres.         0.0           - dry, broak         - dry, broak, gypsum inclusions         - l.0           - dry, broak         - dry, broak, gypsum inclusions         - dry, broak           - medium platicity, moist         - medium platicity, moist         - dry, broak           - medium platicity, moist         - dry, broak         - dry, broak           - medium platicity, moist         - dry, broak         - dry, broak           - medium platicity, moist         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak         - dry, broak           - dry, broak         - dry, broak	טברור	plastic I	M.C.	uquid i	USC	DESCRIP	TION	SAMPLE AMPLE		0 80 120	160	DEPTH
<ul> <li>- rocite's to 0.30 metres. - dry, back</li> <li>SUT - some clay, firm, cominated - dry to moist, gypsum inclusions</li> <li>- brown</li> <li>CLAT - sity, stiff, lominated - medium plasticity, moist</li> <li>- brown</li> <li> stiff, high plasticity</li> <li> stiff, high plasticity</li> <li> homogeneous</li> <li> stiff, high plasticity</li> <li> homogeneous</li> <li> stiff, high plasticity</li> <li> homogeneous</li> <li> stiff, high plasticity</li> <li></li></ul>	1	40	80 120	160		TOPSOIL - come alou and	silt blocky		4	0 80 120		0.0
CLAY - sity, stiff, laminoted - medium plosticity, moist - brown stiff, high plosticity stiff, high plosticity homogeneous stiff, high plosticity stiff, high plosticity 						<ul> <li>rootlets to 0.30</li> <li>dry, black</li> <li>SILT - some clay, firm, lar</li> <li>dry to moist, gypsu</li> </ul>	metres.	<b>-</b>				-1.0
						— brown CLAY — silty, stiff, laminate	ed					-2.0
	0					— medium plasticity, i	moist					-3.0
stiff, high plasticity homogeneous -												-4.0
stiff, high plasticity homogeneous homogeneous homogeneous homogeneous homogeneous homogeneous homogeneous 												-5.0
	0					stiff, high plasticity homogeneous				· · · · · · · · · · · · · · · · · · ·		-6.0
						5						-7.0
-10.0 -10.0 -11.0 -11.0 -12.0 -12.0 -12.0 -13.0 -14.0 -15.0 -15.0 -15.0												-8.0
Pilod Pi												-9.0
END OF TEST PIT AT 3.66 METRES IN CLAY. NOTES: TEST PIT DRY UPON COMPLETION. -13.0 -14.0 -15.0 -16.0	)											-10.0
PIND OF TEST PIT AT 3.66 METRES IN CLAY. NOTES: TEST PIT DRY UPON COMPLETION. -13.0 -14.0 -15.0 -16.0												-11.0
-14.0						END OF TEST PIT AT 3.66 M	METRES IN CLAY.					-12.0
	)					Notes: Test Pit Dry Upon	I COMPLETION.					-13.0
-16.0												-14.0
												-15.0
UMA Engineering Ltd.  COMPLETION DEPTH 3.7 m   DATE DRILLED: 17/06/91	0			<b>n</b> •								-16.0
Winnipeg, Manitoba LOGGED BY KK Fig. No. Page 1 of 1			UMA	Engir	neerin	g Ltd.		··		DATE DRILLED		

	CT: MONT F: MAN, H/					<u>ר</u>	Excavated by: D. Tou Excavator type: Case				TESTHOL			SA-BT 3-01-0	
	CT ENGIN		5 MAC	STE MAN	MAG, CUILF		EACAVATON TIPE: CASE	JOU DAUNINUL			ELEVATIO				10
	LE TYPE	Sec. 200	3 SAMF	ЯF		BY TUBE		NO RECOVERY			ORE BARR			URELINE-	TYPF
JANNI	▲ BUL	K DENSITY		3) 🔺					<u> </u>					(kPa) ▲ 160	1
(۳	20	♦% CLA	(	<u>16</u> 80			SOII		TYPE	SAMPLE/SPT(N)	=1V S 40	HEAR ST 80	IRENGTH	(kPa) ■ 160	DEPTH (ft)
DEPTH	PLASTIC	40 M.C.		LIQUID	USC		DESCRIP		SAMPLE	E/				(kPa)♦	E
В	40	•	20	 160			DESCIMI	TION	SAN	SAMF		SHEAR S 80		160 (kPa) ● 160	
0.0						TOPS	OIL – some clay and – rootlets to 0.30 – dry, black	silt metres							0.0
						CLAY	— silty, firm, laminat — moist, brown	ed							-1.0
															-2.0
1.0															-3.0
															-4.0
															-5.0
2.0							soft, moist to wet fr 2.13 metres.	om 1.83 to							-6.0
							- trace silt, stiff - high plasticity, home	aeneaus							-7.0
									-						-8.0
															-9.0
3.0		·····				END	of test pit at 3.15	METRES IN CLAY.							-10.0
-		·····				NOTE	es: test pit dry upo	N COMPLETION.							-11.0
															-12.0
4.0															-13.0
															-14.0
-															-15.0
5.0		TTL		1			1 7								-16.0
				ingn	neerir	ig L	ia.	COMPLETION DEPTH 3	5.1 N			UAIE	JKILLEL	): 17/06	
		W.	inn	ipeg	, Man	IIIOD	a	logged by KK		H	g. No.			Page 1	1 10

			EVALUATIO	N NAG. CORP	EXCAVATED BY: D. TOU EXCAVATOR TYPE: CAS				TESTH		lo. 6544-	MSA		
	CT ENGINE		WWIL WW								238.50	_		
	E TYPE	GRAB S	AMPLE	SHELBY	TUBE DISTURBED	NO RECOVERY	T		ORE BA				TINF-	TYPE
		DENSITY (kr 8 12									r stren			
Ē	4	8 12 ♦% CLAY♦	16	4	COT	т	TYPE	(SPT(N)	4	0	80 1	20 1	160	
DEPTH (m)	20	40 60		USC	SOI	L	F	ŝ	4	0		20 1	160	]€ 
E	PLASTIC	M.C.	LIQUID	030	DESCRI	στιαν	립	Щ	♦Ľ	SHEA	R STREN	GTH (M	•(0 <sup>2</sup>	DEPTH
	40	80 120	1		DESCIMI		SAMPLE	SAMPLE/	•0	<b>U</b> SHEA	R STREN	igth (k	160 Pa}● 160	
0				T	OPSOIL — some clay and — rootlets to 0.30	silt ) metres								0.0
				i c	<u> </u>		4							-1.0
					<ul> <li>medium plasticity</li> <li>moist, brown</li> </ul>									
														-2.0
0														-3.0
														-4.0
														-5.0
														-6.0
0														-7.0
														1.0
					trace silt, stiff									-8.0
				-	high plasticity, hom	ogeneous								-9.0
0					•									
														-10.0
														-11.0
				] 🌌			_							-12.0
				1 1 1	ND OF TEST PIT AT 3.65 OTES: TEST PIT DRY UPO									
)				.    N	VILS. ILSI FIL VITI UPU	N JUMFLEHUN.								13.0
														-14.0
														-15.0
<u> </u>		T 73.44			<u></u>	T								-16.0
		UMA	Engir	neering	Ltd.	COMPLETION DEPTH 3	6.7 m			DAT	e drill	LED: 1	7/06	/91
		Win	inipeg	, Manit	oba	Logged by KK		Fi	g. No.			F	<sup>2</sup> age t	of 1

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	CT: MONTC					TOUCHETTE & SONS CASE 580 BACKHOE		-+-	TESTHOLE Proj <del>e</del> ct N		<u>MSA-E</u> -003-01-	
PROJE	CT ENGINE	ER: LB								N 238.50		
SAMP	le type	GRAB S		SHELE	y tube 🛛 disturbei	NO RECOVERY			ORE BARRE		WIREUNE	
~	▲ BULK 4	DENSITY (kn 8 12	/m3) ▲ 16				ш	(N)	▲ PP SI 40	IEAR STREN	GTH (kPa)▲ 20 160	
DEPTH (m)	20	♦% CLAY ♦ 40 60	80		S	OIL	SAMPLE TYPE	SAMPLE/SPT(N)	■ TV Sł 40	IEAR STREN	GTH (kPa) 20 160	
HI	PLASTIC	M.C.	LIQUID	USC			믭	LE/	♦LV Sł	HEAR STREN	GTH (kPa) ♦	- 1 i
因					DEOCL	RIPTION	NS.	AMP	40 ● OU SI		20 160 GTH (kPa) •	
0.0	40	80 120	160		TODOON (1)			S	40	80 1	20 160	-
					TOPSOIL - some silt o - dry to mois	ind clay t						
				2	– black							
					CLAY — silty, stiff, larr — moist, brown	inated						
-					— moist, brown							
-1.0											ļ	
												$\vdash$
•												
					iron staining at	1 83 metres						
-2.0					non stanning at					ļļ	ļļ	
					high plasticity homogeneous							
					nomogeneous							
-										ŀ	<u> </u>	
												Γ
-3.0										ļļ	ļ,	
												ŀ
					END OT TEST PIT AT 3.							
					NOTES: TEST PIT DRY	JPON COMPLETION.						╞
-								-			•	
												-
4.0												
-												
5.0						·····						
			Engir			COMPLETION DEPTH :	3.1 m		D	ate drill	_ED: 17/0	6/9
				, Mani		LOGGED BY KK		Fir	1. No.		Page	1 of

ROIF	ct: montca	I M SITE I		N	EXCAVATED BY: D. TOUG	HETTE & SONS		TESTHOLE No.	MSABTP	10
	: MAN. HAZ				EXCAVATOR TYPE: CASE				44-003-01-0	
	CT ENGINEE							ELEVATION 238		
	E TYPE	GRAB S	AMPIE	SHELBY 1	UBE DISTURBED	NO RECOVERY	Шa	CORE BARREL	WIRELINE-1	IYPE
Jrun L		DENSITY (kn,					TT	A PP SHEAR S	TRENGTH (kPa)	T
	4	8 12 * CLAY	16		COLL		SPT(N)	40 80	120 160 TRENGTH (kPa) ■	12
DEPTH (m)		40 60	80	USC	SOII	L	E S	40 80	120 160	DEPTH (#)
E	PLASTIC	M.C.	LIQUID	030	DESCRIP	TION	SAMPLE/SAMPLE/S	◆LV SHEAR S 40 80	TRENGTH (kPa) ◆ 120 160	
Ы	<b> </b>	•			DEDOM		NA SA	OU SHEAR S	TRENGTH (kPa) •	
0.0	40	<u>80 120</u>	160					40 80	120 160	0.0
J.U					PSOIL — some clay and — dry, black	silt, rootlets				
-				S	LT — some clay, soft, ho — dry, brown	mogeneous				-1.0
<i>6</i>					AY — silty, firm, laminat	ad				-2.0
					– moist, brown	τ <b>u</b>				
					•					-3.0
.0										
										-4.0
										1.0
										-5.0
					abratician	and (1 to				-6.0
					stratilied with fine so 2mm thick) at 20 to	40mm spacina				
.0					stratified with fine se 2mm thick) at 20 to from 2.13 to 3.35 m	etres.				
										-7.0
										-8.0
										-9.0
										<b>-</b> 9.0
0										-10.0
										-11.0
				📶 -	homogeneous					
				- 🕅 -	—— high plasticity					
										-12.0
							-			
.0				E	ND OF TEST PIT AT 3.81	METRES IN CLAY.				-13.0
					otes: test pit dry upo	n completion.				
										-14.0
										14.0
										-15.0
										-16.0
<u>i.0</u>										
		UMA	Engi	neering	Ltd.	COMPLETION DEPTH 3	.8 m	DATE	DRILLED: 17/08	5/91
			O	, Manit	_	LOGGED BY KK				

				VALUATION	N NAG. CORP		EXCAVATED BY: D. TOU EXCAVATOR TYPE: CASE				TEST			******	SABT 03-01-	and the second
	CT ENGIN				<b>10.</b> 0010								238.7			
	E TYPE		GRAB SA	MPLE	SHELB	Y TUBE		NO RECOVERY	[		ORE B				VIRELIN	E-TYPE
(m)	▲ BU 4 20	8	SITY (kn/ 12 CLAY ← 60	/m3)▲ 16 80			SOII	1	TYPE	SPT(N)		40	80	120	i (kPa) 160 i (kPa) 160	<b>−</b>  €
DEPTH	PLASTIC		M.C.	LIQUID	USC		DESCRIP		SAMPLE .	SAMPLE/SPT(N)	<b>•</b>	.v she 40	ar str 80	ENGTI 120	i (kPa) 160	
	40	80	120	160					S	SA		10 She 10	AR STR 80	ENGTI 120	l (kPa) 160	
0.0						TOPS	OIL – some silt and – rootlets to 0.46 – dry, black	clay metres								0.( -1.(
-						CLAY	– silty, stiff, homoge	neous								-2.(
							<ul> <li>moist, brown</li> <li>occasional gypsum in</li> <li>0.90 to 1.83 metres.</li> </ul>									-3.(
-1.0							).90 to 1.83 metres. some silt, laminated 3.35 metres.									-4.(
-																-5.(
																-6.(
-2.0							stratified with fine s form thick) at 100mn rom 2.13 to 3.50 me	and ( 2 to a spacing								-7.9
_							rom 2.13 to 3.50 me occasional iron stair 2.44 metres.	tres. ing from 2.13								-8.0
														******		-9.
-3.0												-				-10
-																-11
							<ul> <li>high plasticity</li> <li>homogeneous, moist</li> </ul>								÷.	-12
4.0							of test pit at 3.96									-13
						NOTE	es: test pit dry upo	N COMPLETION.								-14
-																-15
5.0		<u>т</u>	TNA	Franci-		~ T									D. 17	-1E
		(		Engli	neerin , Man	g L	ia.	Completion Depth 4	1.U M		g. No		VIE DH			06/91 e 1 of 1

	.91	icalm site e	VALUATION	N	EXCAVAILU B	IY: D. TOUCH	HETTE & SONS			estho	LE NO	. <u>N</u>	ISAB	<u>IPI</u>	<u> </u>
LIEN	F: MAN. H	AZARDOUS V	vaste man	NAG. CORP	EXCAVATOR T	YPE: CASE	580 BACKHOE		F	roject	No: 6	i544-i	003-0	1-06	
ROJE	CT ENGIN	IEER: LB							E	LEVAT	ON 23				
SAMP	LE TYPE			SHELBY	TUBE 🛛 DIST	URBED	NO RECOVERY	Ш	] CO	re bar			WIRELI		PE
	A BUI	K DENSITY (kn, 8 12	/m3)▲		· · · · · · · · · · · · · · · · · · ·			шЗ	2	▲ PP 40	SHEAR 80	STRENG	TH (kPa 0 16	<b>}</b> ▲	
E		♦% CLAY♦				SOIL		SAMPLE TYPE	SAMPLE/SPI(N	TV	SHEAR	STRENG	TH (kPa	<b>≥</b> ∎	DEPTH (ft)
DEPTH (m)	20	40 60	80	USC				<u>الا</u>	끍	40 ●LV			0 16 TH (kPa		E
B	PLASTIC	M.C.	LIQUID		DEX	SCRIP'	l'ION	NA S	ᆋ	40	80	) 12	0 16	Ò (	E E
	40	80 120	160					S	۶,	● QU 40	SHEAR 80		TH (kPo 0 16		
0.0					OPSOIL - silty, t - dry, blo	trace clay ack									0.0 -1.0
									ļ						-2.0
															-3.0
1.0					SILT — clayey, fir — brown	m, moist									-4.0
					trace fine s 2.13 metres.		1.37 to								-5.0
0 A															-6.0
2.0					CLAY — silty, stif — iron stain	f, laminate iing, moist	d								-7.0
					<ul> <li>brown</li> <li>stratified</li> <li>2mm thick</li> <li>2.13 to 3.0</li> </ul>	) at 100m	and (1 to m spacing from								-8.0
3.0					high plastic	aitu									-10.0
					END OF TEST PIT	ous, moist		-							-11.0
					NOTES: TEST PIT										-12.0
-4.0															13.0
															-14.0
•															-15.0
5.0		TIMA	Engi	neerin	aItd		Completion Depth 3	3.4 m	<u>.</u>		DATI		LED: 1	7/06	-16.0 /91
		UNIA	ET LA LET	11001111	≚ ມເພ.		VUM CENTON DEL III V				1			.,,	- •

PROJECT ENGINEER: LB ELEVATION 238.70 (m)		ON EXCAVATED BY: D. TOUC ANAG, CORP EXCAVATOR TYPE: CASE		MSABTP13 -003-01-06
SAMPLE TYPE         GRAG SAMPLE         SHELEN TUBE         DISTURBED         NO RECOVERY         Click State         APPL STATE STATE         APPL STATE         <				
A BULK REMON (ky/m3) A B (12 kg)         A PE SIZE STREMENT (kg) a b (2 kg)         A PE SIZE STREMENT (kg) a c (2 kg)         <		SHELBY TUBE SISTURBED		WIRELINE-TYPI
40       80       120       100       120       100         0.0       100       120       100       100       100       100         - <t< th=""><th>A PP SHEAR STRENGTH (kPa)</th><th>SOIL</th><th>A PP SHEAR STRE</th><th>20 160 KGTH (kPa) ■</th></t<>	A PP SHEAR STRENGTH (kPa)	SOIL	A PP SHEAR STRE	20 160 KGTH (kPa) ■
0.0       TOPSOIL - some silt and clay, soft         - dry, black         SILT - some clay, firm         - moist, brown         sondy from 0.76 to 0.91 metres.         CLAY - silty, firm, stratified         - moist, brown         moist, brown         laminated from 1.42 to 2.59 metres.         -2.0         blacky from 2.59 to 2.89 metres.         trace of seepage at 2.89 metres.         high plasticity, moist, brown         high plasticity, moist, brown         END OF TEST PIT AT 3.66 METRES IN CLAY.	CION	DESCRIP	U U U U U U U U U U U U U U U SHEAR STREE	120 160 NGTH (kPa) ●
		TOPSOIL — some silt and c — dry, black		
laminated from 1.42 to 2.59 metres. -2.0 -2.0 -3.0		- moist, brown sandy from 0.76 to (	s	
-2.0 -2.0 -3.0		CLAY — silty, firm, stratified — moist, brown		
-3.0 -3.0 blocky from 2.59 to 2.89 metres trace of seepage at 2.89 metres trace silt, stiff, homogeneous high plasticity, moist, brown END OF TEST PIT AT 3.66 METRES IN CLAY.	to 2.59 metres.	laminated from 1.42	etres.	
-3.0 blocky from 2.59 to 2.89 metres trace of seepage at 2.89 metres trace silt, stiff, homogeneous high plasticity, moist, brown END OF TEST PIT AT 3.66 METRES IN CLAY.				
-3.0 trace of seepage at 2.89 metres. trace silt, stiff, homogeneous high plasticity, moist, brown END OF TEST PIT AT 3.66 METRES IN CLAY.				
-3.0 trace of seepage at 2.89 metres. trace silt, stiff, homogeneous high plasticity, moist, brown END OF TEST PIT AT 3.66 METRES IN CLAY.				
trace silt, stiff, homogeneous high plasticity, moist, brown END OF TEST PIT AT 3.66 METRES IN CLAY.				
END OF TEST PIT AT 3.66 METRES IN CLAY.				
	geneous brown	trace silt, stiff, horno		
A CONTRACTOR OF				
UMA Engineering Ltd.COMPLETION DEPTH 3.7 mDATE DRILLED: 17/Winnipeg, ManitobaLOGGED BY KKFig. No.Page				LLEU: 1//06/9 Page 1 of

							uatioi e mai	N NAG. CO	ORP	EXCAVATED BY: D. TOUC EXCAVATOR TYPE: CASE						E No:		MS 4-00		TP1 1-06	
	CT E																38.7	'0 (m	1)		
MPI	LE T				B SA				IELE	iy tube 🛛 disturbed	NO RECOVERY	[	∏C							NE-T	YPE
		BUL	K DEI 8	ISITY	' (kn/ 12	m3)	<b>A</b> 6					L.	Î		▲ PP 40		≀str ø	ENGTH 120	(kPo 16		
DEPTH (m)			\$7	CLA	Y.			1		SOII		TYPE	/SPT(N)		TV	SHEAR	STR	ENGTH	(kPa)		DEPTH (#)
Ξ		20	40	í	60	8		USC	:			SAMPLE	No Contraction	<u> </u>	40 ▲1V		0 STR	120 ENGTH	16( (kPa)	_	독
	PLA	STIC		M.C.		L	IQUID			DESCRIP	TION	L L L L L L L L L L L L L L L L L L L	SAMPLE/		40	8	0	120	16	)	
	╞	40	80		120	18						2	SA	'	● QU 40	SHEAN	r str 10	ENGTH	(kPa 16(	}•	
0		1		T	10					TOPSOIL - silty, trace clay		1					ĪT				0.0
										- dry, black											
										CLAY - silty, firm, laminat	ed										-1.0
										<ul> <li>low to medium play</li> </ul>	sticity										
			Τİ							– moist, brown	·							Î			-2.0
į																					2.0
																					-3.0
)	h		1			1								[		Ī	ΓŤ	Î	1		1
										trace of seepage at	1 17 motros										-4.0
										unce of seepage at	1.17 mcucs.							1			-+.0
						1									l		1	1			-5.0
																					-6.0
																					0.0
1			·				<b>  </b>								$\left\  \cdot \right\ $		+		1		
										stratified from 2.13	to 2.60										-7.0
										metres											1
													1								-8.0
			+					-		——— 100mm fine sand la	yer at 2.44 metres.				$\square$		+				1
										stiff, high plasticity											1.
										homogeneous											-9.0
).			÷														+		1		-10.0
																					1
														1							-11.0
	-		-				<u>}</u>								t			·····			
										· · · · · · · · · · · · · · · · · · ·		_		l							-12.0
										END OF TEST PIT AT 3.66	metres in clay.										
										Notes: Test Pit Left ope	N FOR 15 MINUTES										-13.0
)			1	Ť			1	"		UPON COMPLETION.	TEST PIT DRY.			-	$\mathbb{T}^{+}$						
													1								
										· ·											-14.0
													ł								
			1	-		1	1	"						1	11		-	l i	1		-15.0
												ł	1								
																					1
0																					-16.0
<u>~</u>	- <u>t</u> t		1	TIN	ΔN	F	noi	nee	rit	ng Ltd.	COMPLETION DEPTH :	3.7 1	n		·	DAT	E DI	RILLEI	D: 17	7/06	/91
				UU UU	viri 17;	اند. نحر	ne.	. 1		it obs				in	No	1				age 1	
				¥	vin	nı	peg	<u>, M</u>	an	itoba	LOGGED BY KK		1+	ig,	IND.				14	uge 1	or I

	: MAN, HAZ CT ENGINE		*******C ##**	* IVI UUIN	EXCAVATOR TYPE: CASE 580 BACKHOE			ELEVAT			003-01 (m)	
	E TYPE	GRAB S	SAMPLE	SHEL	BY TUBE DISTURBED NO RECOVERY			ORE BAR	REL	Π	WIRELIN	
DEPTH (m)	4	DENSITY (kr 8 12 • X CLAY • 40 60 M.C.	16	USC	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/SPT(N)	■ TV 40	SHEAR 0 8 SHEAR	STRENG	TH (KPo)	
В	40	80 120			DESCIMI HOI	SA	SAMI		SHEAF	STRENC	STH (kPa)	•
0.0					TOPSOIL — some silt and clay, weathered — rootlets to 0.61 metres. — dry, black							0.0
-					SILT — clayey, firm, laminated — moist, brown		e					-2.0
-1.0					CLAY — silty, firm, laminated — moist, brown							-3.0
_												-4.0
											20 	-6.0
-2.0					high plasticity							-7.0
					homogeneous, moist							-8.0
-3.0												-9.(
					END OF TEST PIT AT 3.05 METRES IN CLAY. NOTES: TEST PIT DRY UPON COMPLETION.							-10.
												-12.
-4.0				n.								-13
												-14.
												-15.
5.0						2.1						
		UMA	nnipeg	neerii	ng Ltd. COMPLETION DEPTH itoba LOGGED BY KK	5.1 M		ig. No.	- J	e. dkili	LED: 17	/U5/91 ge 1 of 1

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		ICALM SITE			EXCAVATED BY: D. TOUC EXCAVATOR TYPE: CASE						No.		SABT 03-01	P16 -06	
roje		IEER: LB		SHELBY	TUBE DISTURBED	NO RECOVERY			ELEV ORE E			.90 (1		e-type	
DEPTH (m)		LK DENSITY (km 8 12 • X CLAY • 40 60 M.C. 80 120	16 80 UQUID	USC	SOIL DESCRIP'			SAMPLE/SPT(N)		40 TV Sł 40 LV Sł 40	80 IEAR ST 80 IEAR ST 80	120 TRENGTI 120 TRENGTI 120	H (kPa)H 160 H (kPa)H 160 H (kPa)		ענרות ייע
0	40	80 120		T	OPSOIL – some silt and cl – rootlets to 0.56 i – dry, black	ay, weathered netres								0.0	
¥л,					CLAY — silty, firm, blocky — moist, yellow brown —— laminated from 0.56	to 1.93 metres.								-2.0	
)														-3.(	
					atraticiant with all (A	ta 7mm thiab)								-5.0	
)					<ul> <li>stratified with silt (4 at 100mm spacing fror 1.93 metres.</li> <li>trace of sand, moist 1.90 metres.</li> </ul>									-6.0	
					trace silt high plasticity, homog	jeneous								-8.	.0
)							-							-9. -10	
					end of test pit at 3.05 m Notes: test pit dry upon									-11	1.0
														-12	2.0 3.0
0														-14	
															5.0
.0		UMA	Engi	neerin <sub></sub>	g Ltd.	COMPLETION DEPTH 3	 .1 m	 1			DATE	DRILLI	D: 17,	/06/91	6.0
		Wir	nipe	g, Mani	toba	Logged by KK		F	ig. N	0.			Po	ge 1 of 1	1

			EVALUATIO WASTE MAI		DRILLED BY: PADDOCK DRILLING L DRILL TYPE: CANTERRA CT250	α, α χρητή ματοδοποίο ματοδούται το πολογοριατικό ματοδού το πολογοριατικό το πολογοριατικό το πολογοριατικό π Η πορογοριατικό ποι παραγοριατικό ποι πολογοριατικό ματοδού ποι πολογοριατικό ποι πολογοριατικό ποι πολογοριατικ	Project No: 6	544-003-01-0	01 16
	CT ENGINE				DRILL TYPE: 125mm DIA. SOLID S	STEM AUGER	ELEVATION 23		
	LE TYPE		SAMPLE	SHELE			CORE BARREL	WIRELINE-	TYPE
	A BULK	DENSITY (1 8 12	kn/m3)▲ 2 16				▲ PP SHEAR 40 80	STRENGTH (kPa) ▲ 120 160	1
DEPTH (m)	20	<ul> <li>♦% CLAY</li> <li>40 60</li> </ul>	•	USC	SOIL	SAMPLE TYPE SAMPLE TYPE	40 80 TV SHEAR 40 80	STRENGTH (kPa) ■ 120 160	
DEPT	PLASTIC	M.C.			DESCRIPTION	SAMPLE SAMPLE	40 80 ♦ QU SHEAR	STRENGTH (kPa) •	
0.0	40	80 12	0 160	1.1	TOPSOIL — some clay and silt, trace		40 80	120 160	0
_					CLAY — silty, firm, laminated — occasional fractures with tra	ick d			-1
					<ul> <li>occasional fractures with tra fine sand on fractures.</li> <li>moist, brown</li> </ul>	ice			-2
-1.0					- moist, brown				
-								· · · · · · · · · · · · · · · · · · ·	
									-6
-2.0									7
-									8
-3.0									-9 
									-1
									  1
-4.0									-1
					CLAY — firm , high plasticity				-1
					– homogeneous, moist, grey	21	19		ľ
5.0					END OF TEST HOLE AT 5.01 METRES	IN CLAY.			
-					NOTES: TEST HOLE DRY UPON COMF 19mm DIA. PIEZOMETER INST TOP OF PIEZOMETER ELEV. 2	ALLED,			
<b>.</b>					PIEZOMETER INTAKE ELEV. FF 234.490 TO 233.890 METRES	ROM			-1
6.0									
			<b>.</b>						
-7.0									
									F
-									  -
8.0		TIM	A Engi	neerir	ng Ita COMPLETI	ION DEPTH 5.0 m		DRILLED: 06/06	<u>-</u> 5/9'
					itoba LOGGED E	r	Fig. No.	Poge	

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PROJE	CT: MONTC	ALM SITE E	VALUATIO	N	DRILLED BY: PADDOCK	DRILLING LTD.		TESTHOLE No.	MSA-CP2	<u></u>
CLIENT	: MAN. HAZ	ZARDOUS W	ASTE MAN	VAG. CORP	DRILL TYPE: CANTERRA	CT250		Project No: 654	the stand of the set o	
PROJE	CT ENGINE	ER: LB				DIA. SOLID STEM AUGER		ELEVATION 238.		
SAMPL		GRAB SA		SHELBY TU	IBE 🛛 DISTURBED	NO RECOVERY		CORE BARREL	WIRELINE-TY	PE
	A BULK	DENSITY (kn/ 8 12	m3) 🛦 16		COT	r	TYPE SPT(N)	▲ PP SHEAR STF 40 80	120 160	会園
DEPTH (m)	20	♦% CLAY ♦ 40 60	80	USC	SOI	L	SAMPLE TYPE SAMPLE/SPT(N	TV SHEAR STR 40 80	120 160	H (ft)
	PLASTIC	M.C.	LIQUID	030	DESCRII	PTION	SAMPLE '	LV SHEAR STR 40 80	120 160	DEPTH
	1 40	80 120				11011	SAN	QU SHEAR STE     40 80	RENGTH (kPa) 👁 120 160	
0.0		00 120		TOF	PSOIL — some clay and	l silt, trace	+			0.0
					organics, rooth AY — silty, firm, lamina	ets, dry, black 💋 🦯				-1.0
-			· · · · · · · · · · · · · · · · · · ·		- occasional fractur	es with trace				-2.0
					fine sand on fracti — moist, brown	ures.				
-1.0					– moist, brown					-3.0
										-4.0
+										-5.0
-2.0										-6.0
2.0										-7.0
										-8.0
										-9.0
										-9.u
-3.0										-10.0
										-11.0
-										-12.0
-4.0										-13.0
					ANY 6'					-14.0
-					AY — firm, high plastic — homogeneous, ma	ny xist, grey				-15.0
										1. 16 1.64 1. 1
5.0										-16.0
										-17.0
										-18.0
										-19.0
-6.0										토
0.0										-20.0
										-21.0
		·····								-22.0
-7.0										23.0
										-24.0
-										-25.0
8.0		ΤΤΝΛΛ	- Frai	1 Ma	Ita	COMPLETION DEPTH 9	4 m		RILLED: 06/06/	-26.0
				neering		LOGGED BY KK	r	Fig. No.	Page 1	an an an an an an Arl
L		¥¥ 111	mhef	, Manito	Jua				l'uge i	

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	and the second stand in second stands	ICALM SIT					DRILLED BY: P						-CP2	
LIENT:	MAN. H	AZARDOU	JS WA	ASTE N	AANAG. CO	<u>IRP</u>	DRILL TYPE: C					Project No: 6544-003-	-01-06	******
	CT ENGIN								SOLID STEM AUGER			ELEVATION 238.50 (m)		
SAMPLI		GRA			SH	IELBY 1	TUBE 🔀 DISTU	RBED	NO RECOVERY		1.1.1		EUNE-TY	PE
	A BUL 4	lk density 8	(kn/m 12	n3) ▲ 16						Щ	E	▲ PP SHEAR STRENGTH (ki 40 80 120 1	160	
DEPTH (m)	20	🗢 🖇 CLA'	AY 🔶 60	80				SOIL		TYPE	101	NO SHEAR STRENGTH (KE 40 80 120	Po)∎ 160	(#)
HIT	PLASTIC	M.C.	and approximate of	LIQUII	USC		DFC	CRIPT		SAMPLE	E/	♦LV SHEAR STRENGTH (KF 40 80 120	Pa) 🍫	NFDTH
DE		(n.c.)	-minuturity.co				UE0	UNII I		SAN	SAMPLE/	40 80 120	160 (Pa) •	Ë
8.0	40	80	120	160		777				+	-05	40 80 120	160	
						// C'	LAY – firm, high – homogeneo	plasticity	1500					-27
							- Homoyened	us, moise,	grey					-28
				•									1	
-9.0										/				-29
-9.0	(	<b>b</b>	•							/'	220	/		-30
						<u>///</u>					1			-31
-							ND OF TEST HOLE IOTES: TEST HOLE							
						1	19mm DIA.	PIEZOMET	ER INSATLLED.					-32
-10.0				1	5-m				ELEV. 240.143 ELEV. FROM					-33
							230.133 TC						1	-34
~  -	r													
														-3!
-11.0					1									-31
														-3
	ļ		;											
														-38
100														-39
-12.0														-4
-		,												4
														-4
-13.0														
-														-4
														-4
-14.0										ļ				-4
														-4
														-4
														-4
-15.0														
														-5
-														5
														-
16.0		TIN	<u> </u>	<u>.</u>					Completion Depth 9		<u> </u>	DATE DRILLED:	<u> </u>	
					gineer			}		).4 II 			1	
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		alm site en			DRILLED BY: PADDOCK DRILLING	LTD.			:P3
		ARDOUS WA	ISTE MAN	IAG. CORP	DRILL TYPE: CANTERRA CT250			Project No: 6544-003-01-	06
	CT ENGINEE				DRILL TYPE: 125mm DIA. SOLID			ELEVATION 238.50 (m)	······
		GRAB SAN		SHELBY TU	BE 🛛 DISTURBED	NO RECOVERY		DRE BARREL	
(m)		DENSITY (kn/r 8 12 • 7 CLAY •			SOIL	TYPE	SPT(N)	▲ PP SHEAR STRENGTH (kPa) ▲ 40 80 120 160 ■ TV SHEAR STRENGTH (kPa) ■	(#)
DEPTH	20	40 60	80	USC				40 80 120 160	
DEP	PLASTIC	M.C.	LIQUID		DESCRIPTION	SAMPLI	SAMPLE/	40 80 120 160 ● QU SHEAR STRENGTH (kPd) ●	
0.0	40	80 120	160		001		3	40 80 120 160	0.0
					SOIL — some clay and silt, tra organics, rootlets, drv. h	ce			
				CLA	organics, rootlets, dry, t Y — silty, firm, laminated	/		···· • • ···· • • • • • • • • • • • • •	-1.0
					<ul> <li>occasional fractures with t fine sand on fractures.</li> </ul>	race			-2.0
.0					- moist, brown				-3.0
									-4.0
									-5.0
0									-6.0
									-7.0
							-		-8.0
۰ ·									-9.0
0 '							ŀ		-10.
			•••••						-11.
									-12.
.0									-13. -14.
				CLA	Y — firm, high plasticity — homogeneous, moist, grey				-15.
									-16.
0									-17.
									-19.
0	•••••								-20.
									-21.
									-22.
0									-23.
									-24.
							ŀ		-25.
0		TTLEA			1.]		]		-26.0
		UMA I	rigin	leering I	ua. COMPLE	TION DEPTH 15.5 m	ו	DATE DRILLED: 06/0	6/91

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		icalm site e				OCK DRILLING LTD.				-CP3
LIENT:	: MAN. H	AZARDOUS W	VASTE MAN	VAG. CORP	DRILL TYPE: CANTE				roject No: 6544-003-	-01-06
	ct engin					nm DIA. SOLID STEM AUG			EVATION 238.50 (m)	
SAMPL		GRAB SA		SHELBY TL	UBE 🔀 DISTURBED	D NO RECOVER	<u>к П</u>	L		ELINE-TYPE
	▲ BUL 4	K DENSITY (kn/ 8 12	/m3)▲ 1 16				ы.	<u>ŝ</u>	▲ PP SHEAR STRENGTH (kF 40 80 120 1	160
(m)	20	♦% CLAY ♦ 40 60			S'	OIL	TYPI APT	(SPT(N)	TV SHEAR STRENGTH (KP	100 1 -
DEPTH	PLASTIC	40 00 M.C.	LIQUID	USC					♦ LV SHEAR STRENGTH (KP	Pa) 🔹 🗧
DEI	ruono 1				NEOOL	RIPTION	SAMPL	SAMPLE,	• QU SHEAR STRENGTH (KF	(Pa) 🗢
8.0	40	80 120	160		a de la cale			<u>~</u> +-		160
0.0				CL/	AY — firm, high plas — homoqeneous,	sticity				-27.
, .	ļ				— потподенсова,	moist, grey				-28
9.0										-29
A.0										-30
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						T 15.51 METRES IN CL				-4
-14.0				NC NC	JTES: TEST HOLE DF	RY UPON COMPLETION. EZOMETER INSTALLED. METER ELEV. 240.143 VTAKE ELEV. FROM				
~14.0					TOP OF PIEZO	"ZUMETER INSTALLED. MFTER ELEV. 240.147	3			
I					PIEZOMETER IN	ITAKE ELEV. FROM				-4
~					223.995 10 22	23.393 METRES.				-4
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	-	UMA	Engi	neering	Ltd.	COMPLETION DEPT	[H 15.5 n	n	DATE DRILLED:	06/06/91
		Wir	inipeg	<u>g, Manito</u>	oba	LOGGED BY KK		Fig.	. No.	Page 2 of :

			VALUATION		DRILLED BY: PADDOCK DRIL				SA-CP	
LIENT	: MAN, HAZ	ARDOUS W	IASTE MAN	AG. CORP	DRILL TYPE: CANTERRA CT2			t No: 6544-00		3
	CT ENGINEE				DRILL TYPE: 125mm DIA. S			10N 238.50 (m		
AMPI.	e type			SHELBY TU	BE 🛛 DISTURBED	NO RECOVERY	CORE BAR		IRELINE-T	YPE.
~	▲ BULK I 4	DENSITY (kn/ 8 12	′m3)▲ 16					P SHEAR STRENGTH 0 80 120	160	
DEPTH (m)		₩ CLAY 40 60	80		SOIL	TYPE		SHEAR STRENGTH	(kPa) 📾 160	€)
H				USC				/ SHEAR STRENGTH	(kPa) �	DEPTH
BO	PLASTIC	M.C.	LIQUID		DESCRIPTI	ON SAMPLE		0 80 120 J SHEAR STRENGTH	160 (kPa) @	- H
	40	80 120	160				73 41		160	0.0
.0				TOF	SOIL - some clay and silt, organics, rootlets, dr	trace				
					Y - silty, firm, laminated					-1.0
					occasional fractures wi	th trace			*	-2.0
					fine sand on fractures. – moist, brown					
.0					- moist, brown					-3.0
										-4.0
										-5.0
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					NY firm high placticity					-14
					AY — firm, high plasticity — homogeneous, moist, g	irey				-15
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		UMA		neering	Liu. I <sup>cur</sup>	IFLEHUN VEMTH 20.1 M		UAIC URILLEL	j. UU/UU/	131

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SAMPL						AMP	1F	~	17	SHEI	LBY TL								ECOVERY					RREL				UNE-T	IYPF
		BULK									T		<u> </u>	7000						<u>-</u>	T						TH (ki 0 1		1-
(m)		4	8	CLAY	<u>12</u> Y 🔶	1	16								S(	JIC				TYPE	(SPT(N)	-	40 TV	I SHE	80 AR ST	RENG	TH (kF	16Ò 2∩)⊯	1
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		40	80	@	120	1	160							Lef serve	/		he de s.			ŝ	SAN		• QU 40	SHE	AR ST 80	IRENG	STH (M	Pa) <b>e</b> 160	
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i nour	.CI: MONI	CALM SITE E	VALUATIO	N	DRILLED BY: PADDOCK	DRILLING LTD.		TESTHOLE NO. M	SA-CP4
CLIEN	: MAN. H	AZARDOUS W	IASTE MAI	VAG. CORP	DRILL TYPE: CANTERRA	CT250		Project No: 6544-0	
PROJE	CT ENGIN	EER: LB			DRILL TYPE: 125mm DI	A. SOLID STEM AUGER		ELEVATION 238.50 (	m)
SAMP	le type	GRAB SA	MPLE	SHELBY TUBE	E 🛛 DISTURBED	NO RECOVERY			WIRELINE-TYPE
	▲ BUL 4	K DENSITY (kn/ 8 12	′m3) ▲ 16				ш(2	A PP SHEAR STRENGT	160
DEPTH (m)	20	🗢 % CLAY 🔶	80		SOII	1	SPT(N)	TV SHEAR STRENGT	H (kPo) ■ 😤
Η				USC			21E	€ LV SHEAR STRENGT	H (kPa)
DEF	PLASTIC	M.C.	LIQUID		DESCRIP	LION	SAMPLE SAMPLE/S	40 80 120 QU SHEAR STRENGT	160 III
100	40	80 120	160				S I S	40 80 120	160
16.0				CLAY	firm, high plasticit	1			-53.0
					- homogeneous, moi	st, grey			-54.0
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		UMA	Engi	neering L	td.	COMPLETION DEPTH 2	5.1 m	DATE DRILLE	D: 06/06/91
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AL LEWIT					VALUA									LING LTD.				resth					-CP4	
					VASTE	MAN/	AG. C	ORP				ANTERRA											1-06	
PROJE(							<del></del>		L					OLID STEM		<u>-</u>	L	ELEVA						
SAMPL						r		HELB	Y TUBE	2	🛛 DISTL	RBED		NO RECO	OVERY	L	<u> </u>	RE BA				WIRELI H (kPa	INE-TY	PE r
	4	1	8	TY (kri/ 12	/m3) & 16		I					~~T	т			TYPE	(SPT(N)	4	40	80	120	16	0	9
(m)	2	0	�% C 40	EAY 🔶 60	80			$\sim  $				SOI	L.			Lш	/SP		40	80	120		0	H (ft)
DEPTH	PLAST	IC	M.I	.C.	LIQU	uid	USC	/			NRS	CRII	זידכ	ON		SAMPLE	PLF,	<b>\$</b> L	V SHE	AR STI 80	RENGTI 120	l (kPa 16		DEPTH
۲ ۲				<b>9</b>		1					ULU	OTATT	. 11	Q14		SA	SAMPLE/	•0	U SHE	AR ST	RENGT	H (kPa	ı) 🗢	0
24.0	4	0	80	120	160				CLAY	– firm	n, high	plastici	ity						40	80	120	16	0	-79.0
-										- hom	nogeneo	bus, mo	oist, q	grey										-80.0
		•		Å													222							-81.0
-25.0										ר דבס		- <u>*</u> T 25	11 1		<u>elav</u>	-	-							82.0
								1		S: TES	t hole	DRY U	PON	METRES IN	ON.									-83.0
										TOP	OF PIE	ZOMETE	ER EL	R INSTALLE EV. 240.0° EV. FROM	.U. 75								-	-85.0
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			TE EVALUATIO		DRILLED BY: PADDOCK DRILL TYPE: CANTERRA				TESTHOLE No. MSA-CF Project No: 6544-003-01-0	
			J WADIE MA		DRILL TYPE: 125mm DI				ELEVATION 238.50 (m)	
			R SAMPLE	SHELBY TI		NO RECOVERY	ΠΠ		DRE BARREL WIRELINE-	TYPE
<u>YII</u>	<u> </u>	BULK DENSITY							▲ PP SHEAR STRENGTH (kPa) ▲ 40 80 120 160	1
(m)	4		Υ÷	-	SOII	ſ	SAMPLE TYPE	÷+	📾 TV SHEAR STRENGTH (kPa) 🛤	-  (¥)
	20			- USC			L L L L	0/-	40 80 120 160 • LV SHEAR STRENGTH (kPo) •	- H
עביוח	PLASTIC	C M.C.	LIQUID		DESCRIP	TION	SAMPLE -	1-L	40 80 120 160	DEPTH
2	1 40	<b>ه</b>	120 160			** * = ·	UN NO	λ. Έ.	QU SHEAR STRENGTH (kPa) 40 80 120 160	
)			24 100	TOF	PSOIL — some clay and	silt, trace				0.0
					organics, rootlet	s, dry, black/	1			-1.0
1					AY — silty, firm, laminat — occasional fracture	ea es with trace				-2.0
		ENGINEER: LB DRILL TYPE: 125 TYPE GRAB SAMPLE SHELBY TUBE DISTURB ABULK DENSITY (kr/m3) A 4 8 12 16 20 40 60 80 USC DESC 40 80 120 160 TOPSOIL - some clor organics, r CLAY - silty, firm, la - occasional fr fine sand on - moist, brown CLAY - firm, high pl	fine sand on fractu							
)					- moist, brown					-3.0
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				CI	AY _ firm high plastici	 .tv	-			-14.
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	donora	U₩	A Engi	ineering	Ltd.	COMPLETION DEPTH 3	.3.8 m		DATE DRILLED: 06/01	6/91
				g, Manito		LOGGED BY KK	r	Fic	g. No. Page	1 of 5

	: MAN. HA			ASTE	MANA	G. CORI			) BY: PAD YPE: CAN	terra (									-003	ACF i-01-0	and the second has been a
	CT ENGINE											STEM AUGER							0 (m)		
SAMPL	E TYPE				<u>l</u>	SHEL	BY TUBE		DISTURB	ED	N(	) RECOVERY		Шc	ORE					RELINE-1	TYPE
	▲ BULF 4	DENSIT 8	Y (kn/i 12	m3)▲ 16						N 0 TT			TYPE	SPT(N)		40	SHEAR	0	NGIH ( 120	(kPa) ▲ 160 kPa) ■	
DEPTH (m)	20	◆% CL 40	AY 🗇 60	80						SOIL			Σ		{	40	- 8	0	120	160	(4)
ET [	PLASTIC	M.C		LIQU		USC		Т	DESC	RIP	FION		SAMPLE		4	►LV S 40	SHEAR 8	STRE	NGTH ( 120	kPa) <b>♦</b> 160	nedtu
B	40	<b>®</b>	120	160				1.	1000	1711			SAN	SAMPLE/	4	+0 +0U 1 +00	SHEAR 8	STRE	NGTH ( 120	(kPa) & 160	2
8.0	10		120	180			CLAY -	– firm.	hiah pl	asticity								0	120	100	105
							-	- homo	, high pl ogeneous	s, moist	, grey										-27
-	ss.s - gs																				28
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ROJE	CT: MONT	CALM SITE EV	/ALUATIOI	V	DRILLED BY: PADDOCK E			TESTHOLE No.		-CP	
LIEN	: MAN. HA	ZARDOUS W	aste man	IAG. CORP	DRILL TYPE: CANTERRA			Project No: 65		-01-06	ò
	CT ENGINI	Construction of the second sec			DRILL TYPE: 125mm DIA			ELEVATION 238			
AMP		GRAB SAN		SHELBY 1	IUBE 🔀 DISTURBED	NO RECOVERY	<u>, Ш</u>	CORE BARREL		ELINE-T	(PE
	▲ BUL 4	K DENSITY (kn/r 8 12	m3)▲ 16		~~~~		PE (N)	▲ PP SHEAR S 40 80	120	160	-
E)	20	♦% CLAY ♦ 40 60	80		SOIL		Lay	5 <b>III</b> TV SHEAR S 40 80	120	160	H (ft)
DEPTH (m)	PLASTIC	M.C.	LIQUID	USC	DESCRIP	TION	SAMPLE TYPE	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	120	160	DEPTH
<u> </u>	40	80 120	160					5 40 80	120	160	
6.0				CI	AY — firm, high plosticity — homogeneous, mois	ł, grey					-53.0 -54.0
			1.2.4.1.1 enter 20141								-55.0
7.0											-56.0
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24.0		ΤΙΜΛ	Engi	l	Ltd	COMPLETION DEPTH 3	3.8 m	DATE	DRILLED:	06/06/	 /91
		Win-	ninoo	, Manit	aba	LOGGED BY KK	r	Fig. No.		Page 3	******

PROJE	ECT: MONT	icalm site	EVALUATION	N	DRILLED BY: PAD	DOCK DF	RILLING LTD.		<del></del> 1	TESTHO	JLE N	o. N	ASA-	-CP!	õ
JLIENT	F: MAN. H	AZARDOUS	WASTE MAN	NAG. CORP	DRILL TYPE: CAN	TERRA CT	/250		T	Project	t No:	6544-0	003-0	01-06	
	ECT ENGINE				DRILL TYPE: 125	mm DIA.	SOLID STEM AUGER			ELEVAT	ION 2	238.50 (	(m)		
SAMPI		GRAB S		SHELBY TU	UBE DISTURB	JED	NO RECOVERY	Γ	Шc	CORE BAR				LINETY	'PE
Τ	A BUL'	LK DENSITY (ki 8 12	kn/m3)▲ 2 16					T_	Î	. ▲ PP 4	SHEAF	R STRENGT BO 120	TH (kP	a) ▲ 60	
(m)	20	♦% CLAY ♦	<b>♦</b>		Ç	SOIL		TYPE	(N)LdS	TV 40	/ SHEAR	R STRENGT	TH (kPa	a) 🖩 👘	(ft)
DEPTH (	20	40 60		- USC			ዣヘኄፕ				SHEAR	R STRENGT	TH (kPa	a) 🚸	DEPTH
DEP	PLASTIC	M.C. 80 120	LIQUID 		DESC	KIPT	ION	SAMPL	SAMPLE/	40 ● QU 40	<u>0 8</u> U SHEAR	80 120 R STRENG 80 120	0 16 GTH (kP	60	DEF
24.0		<u> </u>			AY – firm, high pl	lacticity					<u> </u>	<u>v</u>	<u> </u>		-79.0
					– homogeneous	s, moist,	grey								-80.0
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25.0		-													-82.0
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		U IVI <i>F</i>	A Elikii	neering	Lta.			<u>い</u> .u				E UNILL			
		W17	nnipeg	<u>g, Manito</u>	<u>oba</u>		OGGED BY KK		!	Fig. No.			ŀ	Page 4	of 5

PROJECT:         MONTE LANICOM         DPRILTD BY: PADDOCK DRILLING UID.         IESHOLE No.         MSA-CPS           DIENT:         MAX.         MAX.         DAVEL IMPE: Voltage         DAVEL IMPE: Voltage         Tested Voltage         Tes														
PRDLEY:         LINE         DRULT 1775:         2320 000 Store Auge:         LINE NOT 1000         Direction 1000 Store Auge:         LINE NOT 1000 First Not 1000 Store Auge:         LINE NOT 1000 First Not 1000 Store Auge:         Auge: Store St	PROJE	CT: MONTC	alm site e	VALUATIO	N		DRILLED BY	: PADDOCK D	RILLING LTD.			TESTHOLE No.	MSA-(	CP5
SAMPLE TYPE         Description         Description <thdescription< th=""> <thdescription< th=""></thdescription<></thdescription<>	CLIENT	: MAN. HAZ	ZARDOUS W	IASTE MAN	NAG. CORP		DRILL TYPE	: CANTERRA (	T250			Project No: 65	44-003-01	-06
* #0.4 Description         *														
SOIL         SOIL         Source	SAMPI				SHELE	BY TUBE		STURBED	NO RECOVERY			A DEI SLIEAD C		
End         PASTE         NUMBER         DESCRIPTION         End         Cost and states method weights         End	(	A BULK	8 12	m3)▲ 16				TAN		Цd	T(N)	40 80	120 160	
-40         50         120         100	- (u			80	1150			SOIL		Ц Ц	/SP	40 80		
-40         50         120         100         106.0           32.9         1	EPTI	PLASTIC	M.C.	LIQUID	0.50		DE	SCRIP'	FION	MPL	PLE	40 80	120 160	
CLY - firm, high plasticity - homogeneous, most, grey - 53.0 - 33.0 - 34.0 - 408.7 - 109.0 - 113.0 - 11		40	80 120							ري لاح	SAM	QU SHEAR S     40 80	TRENGTH (kPa) 120 160	
- homogeneous, moist, grey - homogeneous, moist, grey - 107.4 - 109.4 - 112.4 - 113.4 -	32.0					CLAY	— firm, hic	ah plasticity						
33.0							– homoger	neous, mois	, grey					-106.
33.0		******												-107.6
33.0														-108.00
-34.0         223         -110.0           -34.0	-33.0												2	
-34.0       -34.0       -111.01         -34.0       -111.01       -112.01         -35.0       -113.01       -112.01         -35.0       -113.01       -112.01         -35.0       -113.01       -112.01         -35.0       -113.01       -112.01         -35.0       -113.01       -112.01         -35.0       -113.01       -113.01         -35.0       -115.01       -113.01         -35.0       -115.01       -113.01         -35.0       -115.01       -113.01         -35.0       -115.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -113.01         -35.0       -113.01       -122.01         -35.0       -123.01       -123.01         -35.0       -123.01										1	ł			[109.0]
34.0       END OF TEST HOLE AT 33.83 METRES IN CLAY.       112.6         NOTES: TEST HOLE DRY UPON COMPLETION.       113.00         100 OF PEZOMETRE NELW. 240.081       113.01         111.01       112.6         112.01       122.0         112.01       122.0	-										223	5		-110.
-35.0         -1124           -35.0         -113.0           -35.0         -113.0           -35.0         -115.0           -35.0         -115.0           -35.0         -115.0           -35.0         -115.0           -36.0         -115.0           -36.0         -115.0           -36.0         -115.0           -36.0         -115.0           -36.0         -115.0           -36.0         -115.0           -37.0         -115.0           -38.0         -115.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -125.0           -38.0         -128.0           -38.0         -128.0           -38.0         -128.0           -39.0         -128.0           -39.0         -128.0           -39.0         -128.0							<u></u>							-111.01
-35.0 -35.0 -35.0 -35.0 -36.0 -37.0 -38.0 -38.0 -39.0 UMA Engineering Ltd. VOIES: IEST HOLE DY OFON COMPLETION. COMPLETION. COMPLETION DEPTIH 33.8 m COMPLETION DEPTIH 33.8 m COMPLETION DEPTIH 33.8 m DATE DRILLED: 06/06/91 COMPLETION DEPTIH 33.8 m DATE DRILLED: 06/06/91	-34.0									′.				-112.00
-35.0       -35.0       -114.0         -35.0       -115.0       -114.0         -35.0       -116.0       -117.0         -36.0       -118.0       -118.0         -36.0       -118.0       -118.0         -36.0       -118.0       -118.0         -36.0       -118.0       -118.0         -36.0       -118.0       -118.0         -37.0       -118.0       -118.0         -37.0       -120.0       -122.0         -37.0       -128.0       -128.0         -38.0       -128.0       -128.0         -39.0       -128.0       -128.0         -39.0       -128.0       -128.0         -39.0       -128.0       -128.0         -39.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0         -31.0       -128.0       -128.0 <td-< td=""><td></td><td></td><td></td><td></td><td></td><td>NOIE</td><td>S: IEST HO 19mm D</td><td>ILE DRY UP( 1A. PIFZOME</td><td>ON COMPLETION. FER INSTALLED.</td><td></td><td></td><td></td><td></td><td></td></td-<>						NOIE	S: IEST HO 19mm D	ILE DRY UP( 1A. PIFZOME	ON COMPLETION. FER INSTALLED.					
-35.0 -35.0 -36.0 -37.0 -37.0 -38.0 -38.0 -39.0 -39.0 	-						TOP OF F	PIEZOMETER	ELEV. 240.081					
														-114.(
-36.0 -36.0 -37.0 -37.0 -37.0 -38.0 -38.0 -39.0 -30.0	-35.0													-115.0
-36.0 -36.0 -37.0 -37.0 -37.0 -38.0 -38.0 -39.0 -30.0														-116.
-36.0 -36.0 -37.0 -37.0 -37.0 -38.0 -38.0 -39.0 -39.0 -40.0 UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91 -118.0 -118.0 -118.0 -118.0 -118.0 -118.0 -120.0 -120.0 -121.0 -122.0 -122.0 -125.0 -126.0 -131.0 -														B
														F117.0
-37.0 -37.0 -38.0 -38.0 -39.0 -39.0 -39.0 -39.0 -39.0 	-36.0													118.
-37.0 -37.0 -38.0 -38.0 -39.0 -40.0 														-119.0
-37.0 -37.0 -38.0 -38.0 -39.0 -40.0 	-													-120.
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	-37.0													
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-38.0125.0125.0126.0126.0126.0126.0126.0126.0127.0128.0	-													
-38.0125.0125.0126.0126.0126.0126.0126.0126.0127.0128.0														-124
	-38.0													
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-39.0	-									Same and Second				-126.0
40.0 UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91														-127.0
40.0 UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91	-39 N													128
40.0 UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91	40.0													
40.0     UMA Engineering Ltd.     COMPLETION DEPTH 33.8 m     DATE DRILLED: 06/06/91	L													-129.0
UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91	Γ													-130.0
UMA Engineering Ltd. COMPLETION DEPTH 33.8 m DATE DRILLED: 06/06/91	40.0													-131.0
		· · · · · · · · · · · · · · · · · · ·	UMA	Engi	neerin	ıg L	td.		COMPLETION DEPTH	33.8	m	DATE	DRILLED: 06,	
								-	Logged by KK		F	ig. No.	Paç	je 5 of 5

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		CALM SITE E NZARDOUS W			DRILLED BY: FRIESEN DRILL TYPE: FAILING R			TESTHO	L No. No: 6544	MSA-		
	CT ENGIN		ADIE MAN	HO. LUKP	DRILL TYPE: 171mm [				DN 238.5			
		GRAB SA	MDIF	SHELBY T		NO RECOVERY		CORE BAR			INE-TY	'PF
SAMP'I								+ 00	SHEAR STRE			
(m)	4.	K DENSITY (kn/ 8 12 �% CLAY�	16		COL	т	TYPE DT/N	40	80 SHEAR STRE	120 16	Ò I	(†)
-) +	20	40 60	80	USC	SOI	L		5 <u>40</u>	80	120 16	0	E H
DEPTH	PLASTIC	м.с.	LIQUID	000	DESCRII	PTION	SAMPLE TYPE	d <b>♦</b> LV 40		120 16	Ò	NFPTH (#)
$\square$	40	80 120	 160				SAL	ξ <b>Φ</b> QU 40	SHEAR STRE 80	NGTH (kPc 120 16		
0.0	10	00 120	100	ei TC	PSOIL – some clay and	I silt, trace						0.0
					organics, rootle	ts, dry, black						-1.0
-		· · · · · · · · · · · ·			organics, rootle AY — silty, firm, lamina — occasional fractur	es with trace		••••				-2.0
					fine sand on fract	ures.						
-1.0					- moist, brown							-3.0
												-4.(
_												E
												-5.(
												-6.0
-2.0									1.4 (1.444) (1.477) (1.477)			-7.0
												0
•-								-				-8.
												-9.
-3.0			· · · · · · · · · · · · · · · · · · ·									-10
		ļ	······									-11
												-12
-4.0												-13
τ.υ												
				C C	AY — firm, high plastic	ity						-14
					<ul> <li>homogeneous, mo</li> </ul>	bist, grey						-15
												-16
-5.0												1,-
												-17
-												-18
												-19
-6.0												
												-20
_								1			ļ,	-21
												-22
-												
-7.0												+23
												-24
												-25
8.0		TTLE	<u> </u>		τι 1				DATE DE		0 /02	<u>-26</u>
		UMA	Engir	neering	Ltd.	COMPLETION DEPTH 4	4.2 m		DATE DR			
		Win	nipeg	, Manit	oba	LOGGED BY KK		Fig. No.		P	age 1	of 6

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	ECT: MONTCALM SITE EVALUATIO		DRILLED BY: FRIESEN				TESTHOLE No.	MSA-TF	71
	IT: MAN. HAZARDOUS WASTE MA		DRILL TYPE: FAILING R				Project No: 654	******	
	ECT ENGINEER: LB		DRILL TYPE: 171mm D				ELEVATION 238.5		
	PLE TYPE GRAB SAMPLE	SHELBY TUP		NO RECOVERY	Π	Πc	ORE BARREL	WIRELINE-	TYPE
	▲ BULK DENSITY (kn/m3) ▲		<u> </u>		ΤŤ	$\sim$	▲ PP SHEAR STR		
(m)	♦% CLAY ♦	-	SOI		TYPE	SAMPLE/SPT(N)	40 80 TV SHEAR STRE	ENGTH (kPa) 🗰 🛛	-  (₽
E	20 40 60 80	USC			Ш	Š	40 80 ALV SHEAR STRI	120 160	- 프
DEPTH	PLASTIC M.C. LIQUID		DESCRIF	PTION	SAMPLE	PL	40 80	120 160	DEPTH
	40 80 120 160				3	SA	● QU SHEAR STR 40 80	ENGTH (kPa)	
.0			Y — firm, high plastici	v					
			– homogeneous, mo	st, grey					-27.0
									-28.
									-29.
0									-2.9.
									-30.
									-31.
									-32.
0.0									33.
									-34.
									-35.
.0									-36.
									-37.
									-38.
									-39.
2.0									
									-40.
									-41.
3.0									-42.
).U									-43.
									-44.
									-45.
4.0									
									-47.
									-48.
-									-49.
i.D									
									-50.
									-51.
5.0				r					-52.
	UMA Engi	neering I	Ltd.	COMPLETION DEPTH 4	4.2 n	1	DATE DR	ILLED: 18/06	6/91
		, Manitol		Logged by KK		F	ig. No.	Page :	2 of fi

	CT: MONT					DRILLED BY: FRIESE				OLE No.	MSA-	
				ASTE MA	NAG. CORP	DRILL TYPE: FAILING					44-003-0	1-06
	CT ENGINI					DRILL TYPE: 171mn		- m	1	TION 238		
SAMPL		GRA				TUBE DISTURBED	NO RECOVERY		CORE BA			
$\langle m \rangle$	4	CDENSITY 8 • % CLA	12 Y 🌢	16	-	SC	ATT	<u>: TYPE</u> /SPT(N)	4	0 80	TRENGTH (kPa) 120 160 TRENGTH (kPa)	
⇒ E	20		60	80	USC					0 80	120 160	
DEPTH	PLASTIC	M.C.		0000 		DESCR	IPTION	SAMPLE	4	U SHEAR S	IRENGTH (kPa) 120 160 TRENGTH (kPa)	<b>4</b>
16.0	40	80	120	160		CLAY – firm, high plast	icity		2 4	0 80	<u>120 16Ć</u>	-5
						- homogeneous, r	noist, grey					-5
												-5
-17.0			(     , , , , , , , , , , , , , , , , ,									-5
												-5
												-5
-18.0												
												-6
												-6
19.0												-6
_												-6
												6
-20.0												-6
												-6
												-6
21.0												-6
												-7
												-7
22.0												-7
												-7
												-7
-23.0												-7 -7
_												-7
-												-7
24.0		TTM	<u>Γ</u> Δ	Engi	l neering	htd	COMPLETION DEPTH	44,2 m		DATE D	RILLED: 18,	
		U IV. TAT		ingi	g, Manit	- h -	LOGGED BY KK		Fig. No.		·····	ge 3 of I

 $\left\{ \begin{array}{l} \sum\limits_{i=1}^{N} \left( \sum\limits_{j=1}^{N} \left( \sum\limits_{i=1}^{N} \left( \sum\limits_{i=1}^{N} \left( \sum\limits_{j=1}^{N} \left( \sum\limits_{i=1}^{N} \left( \sum\atopi=1} \right) \right) \right) \right) \right) \right) \right\} \right\} \right\} \right\} \right\}$ 

					DRILLED BY: FRIESEN DI			••	TESTHO			A-TP	
			VASTE MAI	VAG. CORP					Project				6
	LE TYPE						F		ELEVATION ORE BAR			) Reline-1	VDE
AMP							TĨ		A PP	SHEAR ST	RENGTH	(kPa) A	T
Ê	4	8 12	16		COLL		TYPE	T(N	40	80 SHEAR ST	120 RENGTH (	160 (kPa) 🖬	(ft)
DEPTH (m)	20	40 60	80	USC	SOIL			SAMPLE/SPT(N)	40	80	120	160	
EPT)	PLASTIC	M.C.	LIQUID		DESCRIP	TION	SAMPLE .	PLE	40	shear st 80	120	160	DEPTH
	40	80 120	160				<del>ا</del> ک	SAN	QU     40	SHEAR ST 80	RENGTH 120	(kPa) 👁 160	
4.0				CLAY	— firm, hiah plasticity								-79.0
					<ul> <li>homogeneous, mois</li> </ul>	t, grey							-80.0
		·····											
													-81.0
5.0		TER: LB DRILL TYPE: 171 <b>CENSITY</b> $(kn/m3) \triangleq$ <b>B</b> 12 16 <b>CENSITY</b> $(kn/m3) \triangleq$ <b>B</b> 12 16 <b>CENSITY</b> $(kn/m3) \triangleq$ <b>B</b> 12 16 <b>CENSITY</b> $(kn/m3) \triangleq$ <b>CENSITY</b> $(kn/m3) =$ <b>CENSITY</b>											
		ZARDOUS WASTE MANAG. CORP ER: LB GRAB SAMPLE CDENSITY (kn/m3) A 8 12 16 40 60 80 USC MC. LIDUID 80 120 160 CLAY - firm, high pl - homogeneous CLAY - firm, bigh pl - homogeneous UMA Engineering Ltd.									-83.0		
		ZARDOUS WASTE MANAG. CORP EER: LB GRAB SAMPLE SHELBY TUBE OISTURE K DENSITY (kn/m3) A B (12) 16 A (14) C (10) RC. LIQUID RO 120 160 CLAY - firm, high plc - homogeneous CLAY - firm, high plc - homogeneous UMA Engineering Ltd.											
											-84.0		
6.0													-85.0
0.0													-86.0
													-88.0
7.0													
													-91.0
8.0													
													-93.0
													-94.0
<u>ه م</u>													-95.0
9.0							ŀ						
													-96.0
													<sup></sup> -97.0
													-98.0
0.0													
													-99.0
													100.
													-101.
1.0													
			UMA Engineering Ltd.									-102.	
			UMA Engineering Ltd. Winnipeg, Manitoba									-103.	
		UMA Engineering Ltd. Winnipeg, Manitoba									-104		
0.0													F104.
2.0	<u>L </u>	TIMA	Fnair	Leoring I	t d	COMPLETION DEPTH 4	42	1 m	<u> </u>	DATE D		18/06	/91
			JMA Engineering Ltd. Winnipeg, Manitoba				1.2			ليا ــــــــــــــــــــــــــــــــــــ			
		win:	mpeg	, manitor	Ja l	logged by KK		†	g. No.			Page 4	of 6

	CT: MONTCALM SITE : MAN. HAZARDOUS			DRILLED BY: FRIESEN DRILL TYPE: FAILING R				HOLE N	o. MS 6544-00.	SA-TP	
	: MAN. HAZARDOUS ( CT ENGINEER: LB	WASTE MAI	AG. LURF	DRILL TYPE: FAILING R					238.50 (m		<u> </u>
	E TYPE GRAB S	SAMDI F	I SHFLF	AY TUBE DISTURBED		m	CORE E			17 IRELINET	NPF
	▲ BULK DENSITY (kn 4 8 12					T			R STRENGTH 30 120		<u> </u>
(in the second s	4 8 12 ◆% CLAY ◆	16	-	SUL	T	E TYPE /SPT(N)	2	40 E	30 120 R STRENGTH	<u>160</u> (kPa) 📾	(11)
H H	20 40 60		USC	SOI			5	40 8	30 120	160	
DEPTH (m)	PLASTIC M.C.			DESCRIE	PTION	SAMPLE -		40 E	R STRENGTH 30 120 R STRENGTH	<u>160</u> (kPa) 👁	DEDTU
32.0	40 80 120	) 160					<u></u>	<u>40 8</u>	<u>30 120</u>	160	10
				CLAY — firm, high plastici — homogeneous, mo	ty ist, grey						-10
•									Parata da cara cara cara cara cara cara cara		-10
-33.0											
_											-1( 
-34.0											1 ·
											-1
											-1
-35.0											-1
~										· · · · · · · · · · · · · · · · · · ·	-1
				SILT TILL — some clay — dense, grey	and gravel						
-36.0					,						-1
-											  1
-37.0											-1
				l .							-1
				1							
-38.0										1	-1 -1
				l							-1
-				1							1
-39.0				ł							+1
											-1
-											-1
40.0	UMA	L Engir	l neerin	ø Ltd.	COMPLETION DEPTH 44	⊥⊥ 4.2 m		DAT	e drilled	): 18/06	_ <u> -</u> 5/91
	Wir	ningo	, Mani	itoba	LOGGED BY KK	T	Fig. No	 n		Page 5	i of

	CT: MONTCALM SITE EVALUATION T: MAN. HAZARDOUS WASTE MA		DRILLED BY: FRIESEN DRILLING LTD. DRILL TYPE: FAILING ROTARY RIG			OLE No. t No: 6544	<u>MSA-TF</u> 4-003-01-1	
	ECT ENGINEER: LB		DRILL TYPE: 171mm DIAMETER	a / 29 m - 29 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m - 2 m		TION 238.5		
	LE TYPE GRAB SAMPLE	SHELBY TUE		OVERY	CORE BAI		WIRELINE-	TYPE
	▲ BULK DENSITY (kn/m3) ▲ 4 8 12 16				APE	P SHEAR STR	ENGTH (kPa)	
e)	♦% CLAY ♦	-	SOIL	SPT(N)	- 41 183 ]\	0 80 V SHEAR STRE	120 16Ó ENGTH (kPa) 🛤	
H (	20 40 60 80	- USC		LE.	41	0 80 V SHEAR STRE	120 160 ENGTH (kPa) �	
DEPTH	PLASTIC M.C. LIQUID		DESCRIPTION	SAMPLE/ SAMPLE/	4	0 80	120 160	DEPTH
	40 80 120 160			SAS	<ul> <li>♥ QL</li> <li>4/</li> </ul>	U SHEAR STRI 0 80	ENGTH (kPa) @ 120 160	
).0		CIL T	· • • • • •					-132
		SLI	TILL					1.02
	••••••••••••••••••••••••••••••••••••••							-133
								-134
1.0			ally brown of 11 10 meters					-135
			- silty, brown at 41.10 metres.					L.100
	······································							-136
								-137
2.0								-138
								-139
			increasing stay at 10.70 matrice					-140
70			- increasing clay at 42.70 metres.					141
3.0								
								-142
								-143
								-144
4.0								
			) OF TEST HOLE AT 44.16 METRES IN					-145
		SILT	TILL.					
		NOT	ES: 51mm DIA. PIEZOMETER INSTALL					-147
5.0		•••	TOP OF PIEZOMETER ELEV. 240.1 PIEZOMETER INTAKE ELEV. FROM	.07				
			194.742 TO 196.242 METRES.					-148
								-149
								-150
6.0					****			-151
								-152
								-153
7.0								154
								-155
8.0								-157
	UMA Engi	neering ]	td. COMPLETION I	DEPTH 44.2 m		DATE DR	RILLED: 18/0	6/91
		g, Manito		K I	-ig, No.		Page	6 of 6

	CT ENGI			1171			AG. CORF	DRILL TYPE: FAILING ROTARY RIG DRILL TYPE: 171mm DIAMETER			Project No: 6544-00 ELEVATION 238.50 (m		
	E TYPE			SAM	DIF			BY TUBE DISTURBED IN RECOVERY				U IRELINE-TYP	
JAWIF L		LK DEM								1	▲ PP SHEAR STRENGTH		
(m)	4	8	12 CLAY	2	16			COII	TYPF	SAMPLE/SPT(N)	40 80 120	160	1
+ (r	20	40			80		USC	SOIL	F L	/SP	40 80 120	160	DEDT1 / 44
DEPTH	PLASTIC		M.C.		LIQU	ID	0.50	DESCRIPTION	SAMPI F	ШЦ	♦ LV SHEAR STRENGTH 40 80 120	(kPa) ◆ 160	101
ā			•	 0				DEDOIVE HOIV	SA	SAM	• QU SHEAR STRENGTH	(kPa) 👁	6
0.0	40	80	12	0	160			TOPSOIL — some clay and silt, trace			40 80 120	160	D.
								organics, rootlets, dry, black	$\Lambda$				-1.
								organics, rootlets, dry, black CLAY — silty, firm, laminated — occasional fractures with trace					
								fine sand on fractures.					-2.
				i				– moist, brown					-3.
-1.0			··· 4·····4										
													-4.
													-5.
20												-	-6.
-2.0					•								-7.
						1							~
-	1	······				-							-8
					•								g
-3.0								,					4
													-1(
												-	-1
-					·····	•							-15
-4.0													-1
													-1,
								CLAY — firm, high plasticity					
								— homogeneous, moist, grey				-	-1
												-	-11
-5.0				1									
													-1
						<b>.</b>							-11
													-1
-6.0													-1
0.0												-	-2
													-2
-		···				· · · · ·							
												+	-2
-7.0													-2
													-2
						Ţ							-2
0.0													
8.0		1	TRA	\ T	i In /	:	L IIII	ig Ltd. COMPLETION DEPTH	567		DATE DRILLED		-2
		1	J₩ŀ	1 1	3116	211.	ieerii	IZ LIU. JUMPLETIUN DEPTH	30.7	111	DATE URILLEL	- TO/ UD/ Y	11

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	value         value <th< td=""></th<>										
······································			ASTE MAN	VAG. CORP	······································						
							<u>[]]</u>			-	(DE
SAMPI	LE IYPE ▲RUI	GRAB SA	MPLE m3) 🛦	K RHFTRA I	INRE MISIOKRED	NO RECOVERY			FAR STRENGTH	(kPa) A	PE
(u	4	8 12 • % CLAY •	16		COII		YPE.		80 120 AR STRENGTH	160 (kPa) 📾	E C
DEPTH (m)	20	40 60	80	usc					80 120	160	U → E
)EP1	PLASTIC	М.С.			DESCRIP	TION	AMP		80 120	160	DEP'
	40	80 120					5	天 ● QU SH 40			
8.0				CI	AY — firm, high plasticit	y					-27.0
					— homogeneous, moi	st, grey					
											-28.0
											-29.0
9.0		••••••••••••••••••••••••••••••••••••••	·····						···· (· · · · · · · · · · · · · · · · ·		-30.0
											71.0
		····· • ··· • • ··· •						··· · · · · · · · · · · · · ·			-91.0 C
											-32.0
-10.0											-33.0
											-34.0
-											
											-35.0
-11.0											-36.0
											-37.0
											-38.0
-12.0											-39.0
											-40.0
17.0											-42.0
-13.0											-43.0
											-44.0
-											
											-45.0
-14.0											-46.0 <sup>La</sup>
											-47.0
-		·····	••••••••••••								
-15.0											-49.0
											-50.0
-		ļļ.									-510
16.0											L
		UMA	Engir	neering	Ltd.		6.7 m	ranne and an	TE DRILLED:		
		Win	nipeg	, Manito	oba	Logged by KK		Fig. No.		Page 2 d	of 8

		~		VALUATIO		DRILLED BY: FRIESEN D					HOLE M			A-TP2	
				ASTE MA	NAG. CORP	······································								-01-06	<u>;</u>
	CT ENGIN					DRILL TYPE: 171mm DI		<u>r</u>				238.5			-
SAMPL	E TYPE				SHELF	BY TUBE 🔀 DISTURBED	NO RECOVERY		<u>∭ c(</u>	ORE BA				ELINE-T	YPE
$\sim$	▲ BUL 4	lk densi 8	IY (kn/)	m3) <b>▲</b> 16				Ы	$ \mathbf{Z} $	▲ P	40 5Ht/	80 80	ENGTH (H 120	Pa) 🛦 160	
(m)	20	♦% C 40	CLAY 🔶 60	80		SOIL	٤	TYPE	/SPT	B T	IV SHEA	AR STRE	ENGTH (k	(Po)∎ 160	DEPTH (#)
DEPTH	PLASTIC			LIQUID	- USC	DESCRIP	TIAN	SAMPLE .	Ē	<b>\$</b> 1	LV SHEA	AR STRE	ENGTH (	(Pa) 🐟	
	40	80	• 120	{				SAN	SAMPLE/SPT(N)	•0	QU SHEA	AR STRE	ENGTH (I	160 kPa) <b>&amp;</b> 160	- 2
16.0						CLAY — firm, high plasticity — homogeneous, mois	/ et arev								-53
-						nonrogonoodo, me.	i, 9.07					1			54
-17.0															-55
-17.0		à													-56
-															-57
-18.0															-50
1010															-60
-	. 1 									1					-61
-19.0															-62
															-6:
		· • • • • • • • • • • • • • • • • • • •	·····												-6
-20.0															-6
															-6
															-6
-21.0															
															-7
_															-7
-22.0															7
															-7
-															-7
-23.0															-7
															-7
24.0		U	JMA	Engi	neerii	ng Ltd.	COMPLETION DEPTH 5	 56.7	L m		DA	 ,TE_DR	ILLED:	18/06,	 /91
			Win	nine	g, Man	itoha	LOGGED BY KK		Fi	ig. No				Page 3	i of

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		Min	ninea	, Manit	oba	LOGGED BY KK		ig. No.			Page 4	of 8
		UMA	Engir	neering	g Ltd.	COMPLETION DEPTH 5	6.7 m		DATE DF	RILLED:	18/06	/91
32.0			<u> </u>		713							
-												-104.(
_												-103.(
-31.0												-102.0
71 0												-101.0
												100.(
-30.0												-99.0
												-98.0
-												-97.0
												-96.0
-29.0												95.0
-												-94.0
												-93.0
-28.0												-92.0
												-91.0
									,			
27.0												-89.0
												-88.0
												-86.0
26.0												-85.0
												-84.0
												-83.0
25.0												-82.0
												-81.0
					nomoyeneous, mo	st, yrey						-80.0
2.110				C	CLAY — firm, high plasticil — homogeneous, moi	y st. orov						-79.0
24.0	40	80 120	160				S AS	4	0 80	120	160	70.0
DEPTH	PLASTIC	М.С.	liquid I		DESCRIF	PTION	SAMPLE SAMPLE/S	4	0 80 J SHEAR STR	120	160	DEPTH
HI (	20	40 60	80	USC					0 80 / Shear Str	120	160	
(m)	4	8 12	16		SOI		SPT(N)	4	0 80 / SHEAR STR	120	160	(ft)
SAMP	LE IYPE	GRAB SA JLK DENSITY (kn) 8 12	AMPLE 7m31 🛦	SHELBY	TUBE DISTURBED	NO RECOVERY		CORE BA	rrel 9 shear str		RELINE-1	YPE
		NEER: LB			DRILL TYPE: 171mm D				FION 238.			
		HAZARDOUS V	VASTE MAN	IAG. CORP	DRILL TYPE: FAILING R			+	t No: 654			6
'KUJI	CT. WOR	itcalm site e	MLOATO	Y	DRILLED BY: FRIESEN I	JRILLING LID.		LILOUN	OLE No.	ND.	A-TP	2

PROJE	.CT: MONT	CALM SITE E	EVALUATIO	JN	DRILLED BY: FRIESEN	DRILLING LTD.		TESTHOLE No. MSA	A-TP2
CLIENT	: MAN. H/	AZARDOUS W	NASTE MAI	NAG. CORP	DRILL TYPE: FAILING R	ROTARY RIG		Project No: 6544-003-	
	CT ENGINE				DRILL TYPE: 171mm [	DIAMETER		ELEVATION 238.50 (m)	
SAMPL		GRAB SA		SHELB'	BY TUBE 🔀 DISTURBED	NO RECOVERY			ELINE-TYPE
	▲ BUL: 4	K DENSITY (kn/ 8 12	/m3)▲ 16				S S	PP SHEAR STRENGTH (k 40 80 120	Pa) 🛦 160
(m)	20	♦% CLAY 40 60	80		SOI	L	SPT /	TV SHEAR STRENGTH (KI	(Pa) ■ (¥) 160 =
DEPTH	PLASTIC	М.С.	LIQUID 1		DESCRII	PTION	SAMPLE TYPE SAMPLE/SPT(N	LV SHEAR STRENGTH (W 40 80 120 • QU SHEAR STRENGTH (K	(Po) ◆    d
32.0	40	80 120	160		 CLAY — firm, high plastici		- - - - - - - - - - - - - - - - - - -	40 80 120	150 105
-					- homogeneous, mo	bist, grey			-106
									-107
-33.0									-109
									-110
-34.0 ·									-111
									-11:
,									-11
-35.0									-11
									-11
					SILT TILL - some clay	and gravel, dense			-11
-36.0					– grey				
-									-11
-37.0									-12
9715									-12
38.0									-12
-									-12
									-12
-39.0				<ul> <li>A for the control of th</li></ul>					-12
-									-12
40.0									-13
				neering		COMPLETION DEPTH 5	36.7 m	DATE DRILLED:	18/06/91
				g, Mani		LOGGED BY KK	F	Fig. No.	Page 5 of 8

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	· · · · · · · · · · · · · · · · · · ·	ICALM SITE E			DRILLED BY: FRIESEN			TESTHOLE NO. MSA-TF	
		AZARDOUS V	NASTE MA	NAG. CORP	DRILL TYPE: FAILING F			Project No: 6544-003-01-0	16
	CT ENGIN				DRILL TYPE: 171mm		riri.	ELEVATION 238.50 (m)	DUDE
SAMPI	E TYPE	GRAB SA LK DENSITY (kn/		SHELBY TU	BE DISTURBED	NO RECOVERY		CORE BARREL WIRELINE	TTPE
(u	4	8 12 • % CLAY •	16		COL	T	SPT(N)	40 80 120 160 STV SHEAR STRENGTH (kPo) SS	(ft)
DEPTH (m)	20	40 60	80	USC	SOI	L	SP SP	40 80 120 160	
)EPT	PLASTIC	М.С.	LIQUID		DESCRI	PTION	SAMPLE/	◆LV SHEAR STRENGTH (kPa) ◆ 40 80 120 160	DEPTH
<i>ب</i>	40	80 120	 160				SAN	◆ QU SHEAR STRENGTH (kPa) ◆ 40 80 120 160	
40.0				SIL	r till				4.70.0
									-132.0
									-133.0
									-134.0
\$1.0									
					- silty, brown at 41.1	0 metres.			-135.(
									-136.0
									-137.0
12.0		ļ							
									-138.0
			•						-139.0
					ta and the second s	0.70			-140.0
					- increasing clay at 4	2.70 metres.			141.(
13.0									
									-142.0
									-143.0
									-144.0
14.0					very dense, some ( 43.89 metres.	ravel, brown at		-	
					10100 110100				-145.0
								-	
									-147.0
15.0									
									-148.(
									-149.0
									-150.0
46.0									
									-152.0
									-153.0
									-154.0
47.D									
									-155.(
									-157.(
48.0		T T3 J 4	<u> </u>		ΤΙ 3				
				neering		COMPLETION DEPTH	······	DATE DRILLED: 18/06	
		₩ın	nipeg	<u>, Manito</u>	ba	LOGGED BY KK		Fig. No. Page (	o of 8

		CALM SITE E				DRILLED BY: FRIESEN					SA-TP.	
· · · · · · · · · · · · · · · · · · ·		ZARDOUS V	VASTE MAN	IAG. CORF	)	DRILL TYPE: FAILING R				Project No: 6544-0		6
PROJECT		EER: LB GRAB SA			BY TUBE	DRILL TYPE: 171mm [				ELEVATION 238.50 ( ORE BARREL	m) WIRELINE-T	VDI.
(m) HI		C DENSITY (kn, 8 12 ♦% CLAY ♦ 40 60 M.C. 80 120		USC		SOI DESCRII		TYPE	SAMPLE/SPT(N)	A PP SHEAR STRENGT 40 80 120     ■ TV SHEAR STRENGT 40 80 120     ● LV SHEAR STRENGT 40 80 120     ● LV SHEAR STRENGT 40 80 120     ● QU SHEAR STRENGT 40 80 120	H (kPa) ▲ 160 H (kPa) ☎ 160 H (kPa) � 160 H (kPa) �	DEPTH (ft)
48.0	0	00 120	100		SILT	TILL				10 00 120	100	-158.0
-49.0												159.0 160.0 161.0 162.0
-50.0												-163.0
												-165.0
												-166.0
-51.0												-167.0
												-168.0
-					 0	increasing silt, soft t 51.51 metres.	to medium dense					
-52.0												-171.0
												-172.0
-53.0												-174.0
						dense at 53.34 me	res.					-175.0
												-176.0
-54.0												-177.0
												-178.0
												-179.0
-55.0												-180.0 -181.0
-												-182.0
56.0						4						-183.0
			Engir				COMPLETION DEPTH	56.7 m	)	DATE DRILLE	D: 18/06,	/91
			nipeg				Logged by KK		Fie	g. No.	Page 7	of 8

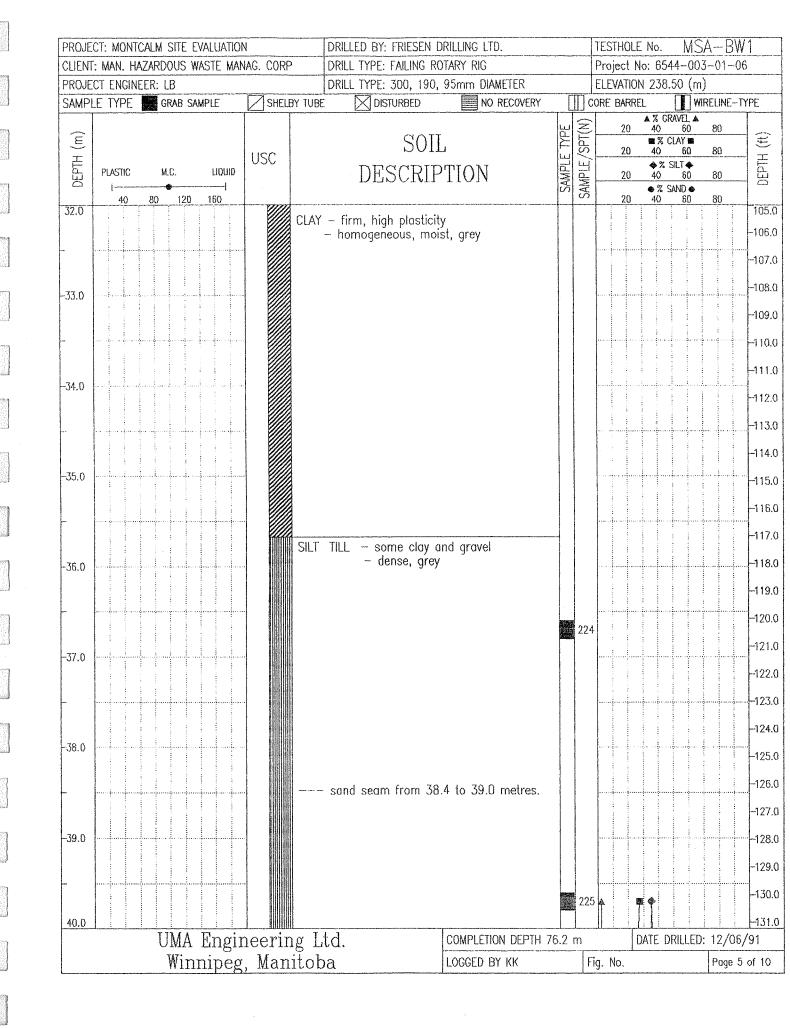
		CALM SITE E			DRILLED BY: FRIESEN D	مېسىدېمەمەرمەر دە «مەمەرمە» مەيپەرو مەيە <sup>ش</sup> ە سەمەمەمە». ««مىسەمە» دە سو مەيمەرە مى		·	LE No.		A-TP2	International Value
	: MAN. H. CT ENGIN	AZARDOUS W	ASTE MAR	IAG. CURE	DRILL TYPE: FAILING RC				No: 654			•
		GRAB SA	MPIF	SHFL	BY TUBE DISTURBED	NO RECOVERY	m	CORE BAI			RELINE-TY	ΈF
		K DENSITY (kn/	′m3) <b>&amp;</b>						SHEAR STI	RENGTH	(kPa) ▲	
(E)	4	8 12 • % CLAY •	16		SOII		(SPT(N)	41 ■ TV	SHEAR STI			(ft)
DEPTH (m)	20	40 60	80	USC			LE X		) 80 Shear Sti	120 RENGTH (	160 [kPa] 🌰	H
DEP	PLASTIC	M.C.	liquid 		DESCRIF	"TION	SAMPLE SAMPLE	4		120	160	DEPTH
60.0	40	80 120	160				N N	9 <b>•</b> QU		120	(кРа) <b>Ф</b> 160	
56.0					SILT TILL							-184.
												-185.0
												-186.
					END OF TEST HOLE AT 56.	70 METRES IN						-100.1
57.0					SILT TILL.							-187.0
												-188.
					NOTES: 51mm DIA. PIEZON	FTED INICTALLED						
					TOP OF PIEZOMETER	R ELEV. 240.111						-189.
-58.0					PIEZOMETER INTAKE							-190.
00.0					182.199 TO 183.69	9 METRES.						-191.
												101.
-			4									-192.
												-193.
59.0												104
												-194.
												-195.
												-196.
-60.0												
-00.0												-197.
											`	-198.
-				•								-199.
												139.
61.0												-200.
												-201.
_			ļļ	-								
												-202.
0.0												-203.
62.0												-204
-												-205
												-206.
-63.0										ļļļ		
												-207.
												-208
-												-209
64.0												209.
<u>04.0</u>	I	τιμα	Engi	1eerir	ng Ltd.	COMPLETION DEPTH 56	3.7 m	<u>_</u>	DATE D	RILLED'	18/06/	'91
		Win	ninoa	100111 Man	itoba			Tia No.			Page 8	
		¥¥1[]]	шреg	, man	nuba	LOGGED BY KK		Fig. No.			I Lade Q	VI Q

	CT: MONTCA					SEN DRILLING LTD.			STHOL			A-B	
	: MAN. HAZ/		VASTE MAI	AG. CORP	DRILL TYPE: FAILI			1			44-00		06
	CT ENGINEE	and the President of the Sol Sol				190, 95mm DIAMETER					8.50 (m	-	
SAMPL	e type	GRAB S	AMPLE	SHELB	y Tube. 🔀 Disturbi	ED NO RECOVERY	<u> </u>		E BARF			RELINE-	TYPE
						TT	TYPE	2L	20	40	RAVEL A 60	80	
DEPTH (m)				USC		SOIL		/SPT(N)	20	■ % 40	CLAY 📾 60	80	
HT	PLASTIC	M.C.	LIQUID	USC	DESC	RIPTION	SAMPLI	Ш	20	<b>*</b> % 40	SILT � 60	80	
B	<u> </u>						SAM	SAMPLE/		• %	SAND 👁		
0.0	40	<u>BO 120</u>	160		TOPSOIL – some clay	and silt trace			20	40	60	80	
					organics, ro	ootlets, dry, black							1
-					organics, ro CLAY — silty, firm, la — occasional fro	minoted actures with trace							
					fine sand on f	ractures.							-2
-1.0					- moist, brown								
													-4
-													
													+
-2.0			-										 
-													8
													Ļ.
-3.0		,											
													-1
													-1
-4.0													1
-4.0													
					CLAY – firm, high plo	osticity							-1
-					- homogeneous	, moist, grey							  -1
													-1
-5.0													••••
													-1
-													1
													-1
-6.0													
													F
-												······	
-7.0													
													-2
-													
													-2
8.0													-2
		UMA	Engir	neerin	g Ltd.	COMPLETION DEPTH	76.2 n	1		date i	RILLED	: 12/00	3/91
		Win	nineg	, Mani	toba	LOGGED BY KK		Fig.	No.			Page	1 of

		CALM SITE E			DRILLED BY: FRIESEN				TESTHOLE		SA-BW	and the second s
		ZARDOUS V	NASTE MAN	IAG. CORP	DRILL TYPE: FAILING R					o: 6544-00		<u> </u>
	CT ENGINE			SHELBY	DRILL TYPE: 300, 190 TUBE DISTURBED	NO RECOVERY	<b>-</b>		ORE BARRE	238.50 (r	nj Vireline-T	
							<u> </u>	<u></u>	1	▲ % GRAVEL ▲		
(m)					SOI	T.	SAMPLE TYPE	SAMPLE/SPT(N)	20	40 60	80	(ft)
DEPTH (m)	DIACTIO	U.P.	10100	USC			ц Ц	E/S	20	40 60	80	DEPTH
BE	PLASTIC	M.C.	LIQUID 		DESCRII	TION	SAME	AMPI	20	40 60	80	
8.0	40	80 120	160					ۍ ا	20	40 60	80	
				C	LAY — firm, high plastici — homogeneous, ma	ty ist arev						-27.0
					nomogeneous, me	iot, groy						-28.0
-9.0												-29.0
												-30.0
-												-31.0
												-32.0
-10.0												
												-33.0
												-34.0
												-35.0
-11.0												-36.0
-												-37.0
												-38.0
-12.0												-39.0
12.0												-40.0
												-41.0
170												-42.0
-13.0												-43.0
												-44.0
												-45.0
-14.0												-46.0
												-47.0
	÷										· · · · · · · · · · · · · · · · · · ·	-48.0
												-49.0
-15.0												
												-50.0
-												-51.0
10.0												-52.0
16.0		 TIMA	Engir	neering	Ltd	COMPLETION DEPTH 7	 76.2 r	n		ATE DRILLED	): 12/06/	
		Win	nineg	, Manit	oba	LOGGED BY KK	1		g. No.		Page 2	
L		11 L.L.L.	<u></u>	,	~~~~				3			

			EVALUATIO		DRILLED BY: FRIESEN DRILL TYPE: FAILING R				TESTH				<u>A-B</u> 3-01-(	
	ECT ENGINE		MAJIL MAI	VIU. UUNE	DRILL TYPE: 300, 190							.50 (m		<u> </u>
		GRAB	SAMPLE	SHELBY TU		NO RECOVERY	Γ		DRE B				Z RELINE-	TYPE
					<u> </u>			<u> </u>				AVEL A	80	
DEPTH (m)					SOI		TYPE	SPT(N)		20		LAY M 60	80	
НТЧ	PLASTIC	м.с.	LIQUID	USC	DESCRI		PLE				�%	SILT 🚸		
DE					DESCAI	TION	SAMPLE	SAMPLE,		20		60 AND •	80	
16.0	40	80 12	0 160							20	40	60	80	
				CL/	AY — firm, high plastici — homogeneous, mo	ty <sub>.</sub>								-5
			•••••		<ul> <li>homogeneous, mo</li> </ul>	ist, grey								+5
														-5
-17.0														-5
														-5
-														
														-5
-18.0														5
											ŧ			-6
											····	····  ····		-6
														-0
-19.0														
														H
											·····			
														-6
-20.0			4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -											
														-6
-														
														-6
-21.0														
														-7
-														  -7
-220														7
														7
-					•				   					7
														-7
-23.0									-					7
														7
24.0														-7
24.0		TIM /	A Engi	neering	I.t.d.	COMPLETION DEPTH 7	6.2	r m	I	D	ATE D	RILLED	: 12/08	5/91
		Win	nninea	, Manito	ha	LOGGED BY KK			g. No.				Page	

PROJE	CT: MONTCA	lm site e	VALUATIO	V	DRILLED BY: FRIESEN I	DRILLING LTD.		TESTHOL	E No. MS	SA-BW	1
	F: MAN, HAZ/		NASTE MAN	IAG. CORP	DRILL TYPE: FAILING R				No: 6544-00		5
	CT ENGINEE				DRILL TYPE: 300, 190,		<u></u>	·	N 238.50 (n		
SAMP	LE TYPE	GRAB SA	AMPLE	SHELBY TU	BE 🛛 DISTURBED	NO RECOVERY	<u> </u>	CORE BARR	EL []Y	VIRELINE-T	YPE
Ê					COL		Τ(N)	20	40 60	80	
т Н				USC	SOI	ل	SP 7	20	40 60	80	
DEPTH (m)	PLASTIC	M.C.	LIQUID		DESCRIF	TION	SAMPLE TYPE	20	♦% SILT♦ 40 60	80	DEPTH
	40 8	30 120	{ 160				SAN	5 20	● % SAND ● 40 60	80	
24.0				CLA	Y — firm, high plasticit	v					-79.0
					Y — firm, high plasticit — homogeneous, moi	st, grey					-80.0
-											
											-81.0
-25.0									· · · · · · · · · · · · · · · · · · ·	<u>.</u>	-82.0
											-83.0
											-84.0
											l.
26.0											-85.0
											-86.0
											-87.0
											E E
27.0											-88.0
27.0											-89.0
											-90.0
•	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·									
											-91.0
28.0											92.0
											-93.0
											- 
											-94.0
29.0											-95.0
											-96.0
											1 3
											-97.0
30.0											98.0
											-99.0
											100.0
											0
											-101.0
31.0											-102.0
											-103.0
											-104.0
32.0		TTNAA	The state		1.1			<u> </u>			1
		UMA THT.	Engir	neering I		COMPLETION DEPTH		k-	DATE DRILLED		
		Win	nipeg	, Manitol	pa	LOGGED BY KK		Fig. No.		Page 4	of 10



			·									
	CT: MONTC				DRILLED BY: FRIESEN			TESTH			SA-BW	
	T: MAN, HAZ		NASIE MAN	IAG. CURP	DRILL TYPE: FAILING R						3-01-06	\$ [
	LE TYPE		AMPLE	SHELBY	DRILL TYPE: 300, 190 TUBE DISTURBED	NO RECOVERY	m	CORE BA		38.50 (m	1) /IRELINET	/DF
									▲ %	GRAVEL A		
(m)					SOI	Ĩ.	PT(N	2		% CLAY 📾	80	(£)
DEPTH (m)	PLASTIC	M.C.	LIQUID	USC			E/S	2	0 4 •	0 60 *% SILT �	80	DEPTH
DEI		m.c.			DESCRIF	PTION	SAMPLE TYPE SAMPLE/SPT(N)	2	0 4	0 60 % SAND 👁	80	DEF
40.0	40	80 120	160	THEFT			-	2			80	
				S	SILT TILL							-132.0
-	****											-133.0
41.0												-134.0
				-	silty, brown at 41.1(	) metres						-135.0
											÷	-136.0
												-137.0
42.0												
												-138.0
												-139.0
					increasing clay at 4	27 metres						-140.0
13.0					morotomy buy ut 4.	2.7 11104163.	220	)				-141.0
					600mm dia. boulder	at 43.3 metres.						-142.0
												-143.0
14.0					very dense, some gr	ravel, brown at						-144.0
					43.89 metres.	,						-145.0
												-146.0
15.0												-147.0
r0.0												-148.0
												149.0
16.0							227		•			-150.0
ru.U					gravel seam from 4	6.03 to 46.30						-151.0
					metres. boulders from 46.30	) to 48.46 metres.						-152.0
											¢	-153.0
170										(		-154.0
7.0												
							228					-155.0
												-156.0
8.0												-157.0
0.0		UMA	Engin	eering	Ltd.	COMPLETION DEPTH 7	6.2 m	<u>u : l :</u>	DATE	DRILLED:	: 12/06/9	
				Manit		Logged by KK			L			

	CT: MONTCALM SITE MAN, HAZARDOUS			DRILLED BY: FRIESE					LE No.		SA-BV	
		WADIE MAN	AU. LURP	DRILL TYPE: FAILING							3-01-0	10
	CT ENGINEER: LB	000015		DRILL TYPE: 300, 19				of the second	10N 238			
SAMPL	E TYPE GRAB	SAMPLE	SHELB'	( TUBE DISTURBED	NO RECOVERY			ORE BAF		RAVEL &	IREUNE-	TYPE
				~~	**	TYPE	/SPT(N)	20	) 40	60	80	
DEPTH (m)			1100	SO		Σ	SPI	20	■ <b>8</b> % ) 40	CLAY 📾 60	80	
HH	PLASTIC M.C.	LIQUID	USC	DESCR	DTTAN		Ē		<b>\$</b> %	SILT 🔶		
B	<b>*</b>	[		DEPCU	LT LIVN	SAMPLI	SAMPLE/	2(		60 SAND 👁	80	- 2
48.0	40 80 121	0 160		a manganaka manga kana sa			S	20		60	80	
10.0				SILT TILL								-1
												1
-											······	
							229					-10
-49.0							229					-10
_ ].												-1
												-10
-50.0												1(
							6.8-					-1
-							230					
												-1
-51.0												-1
51.0												
												-1
-  .				increasing silt, sof	t to medium dense			• • • • • • • • •				
				increasing silt, sol at 51.51 metres.								-1
-52.0							231		¢ 1			
												-1
												-1
-												
												-11
-53.0												
- I.				dense at 53.34 m	etres.		232					-1
												-1
F 4 5												
-54.0										·		
												-1
-  -											<b>.</b>	-1
-55.0							233					-1
00.0							200					-11
-  .												1
												-1
56.0												
	UMA	Engin	eering	g Ltd.	COMPLETION DEPTH	76.2 n	٦ 		DATE D	RILLED	: 12/06	/91
	Wir	nnipeg,	Mani	toba	LOGGED BY KK		Fic	j. No.			Page 7	of

		LM SITE EVALUATIO		DRILLED BY: FRIES				HOLEN			<u>BW1</u>
		ARDOUS WASTE MAN	VAG. CORP	DRILL TYPE: FAILIN							01-06
	ECT ENGINEE	K: LB GRAB SAMPLE	SHELBY TU	Lange and the second	190, 95mm DIAMETER	, <u>n</u> n	ELEV		238.50		
		UIVID SAMPLE							% GRAVE	1.	LINE-TYP
(m)				CI	DIL	E TYPE		20	40 € ■% CLAY	50 8 1	30
TH (			USC			F /SF	<u>}</u>	20		60 E	30
DEPTH	PLASTIC	M.C. LIQUID		DESCF	RIPTION	SAMPLE SAMPLE	·	20	40 E	30 B	30
56.0	40	80 120 160	FILLER FILLER			S S	; 		▶ % SAND 40 E		30
JU.V			SILT	TILL							-
-		·····				23	4				-
								•			
-57.0											
ur - 14											
_											-
											-
50.0											-
-58.0										<u>.</u>	
											-
•				- dolomite boulder	s, trace gypsum					·····	-
				from 58.52 to 60.	U4 metres.						-
-59.0	1									<u></u>	
-						23	5	••••			-
											-
-60.0							-				-
											4
-											
											Ľ
61.0						23	6				Ľ,
											Ľ
-											-
62.0											F4
											Ľ,
	·····									·····	
											H
63.0											
											ľ
-										ļ	H
											Ľ.
64.0											
		UMA Engir	neering I	Ltd.	COMPLETION DEPTH	76.2 m		DAT	e drill	ED: 1	2/06/91
		Winnipeg	. Manitol	ba	LOGGED BY KK	1	ig. No			P	age 8 of

	ECT: MONTO					DRILLED BY: I						HOLE			ABW	teration land
				ASTE MA	NAG. CORP	DRILL TYPE: F			<u> </u>						3-01-0	6
	ECT ENGINE							95mm DIAMETER	r				238.5			
SAMP	ILE TYPE	GR/	AB SAM	MPLE		( TUBE DISTU	JRBED	NO RECOVERY			ORE E	BARRE	L L	-	RELINE-1	YPE
(c)							COTT		TYPE	/SPT(N)		20	40	60	80	4 -
DEPTH (m)					USC		SOII	L.	- b . r	/SP	L	20	■ % CL/ 40	60	80	1
EPTI	PLASTIC	M.C.		LIQUID	0.00	DES	CRIP	TION	SAMPLE	Щ		20	<b>♦%</b> SiL 40	T 💠 60	80	
	40	80	120	160			01411		SA	SAMPLE/	-	20	• % SAM 40		80	
64.0			12.0			SILT TILL						20	-10	00		21
						fractured do	lomite fr	om 64.31 to								-21
-						64.92 metres.										-21
						white gypsur	n lavers	at 64.90 metres								
-65.0						millo yypau	n luyoro	dt 01.00 motros.								-21
																-21
	·····															
						DOLOMITE — thin s anhydi	shale, sa tite/avos	ndstone um interlovers								
-66.0						uniyu	, 9)pu	ann mondyers								-21
																-21
-																-21
																-21
-67.0																2
07.0																-22
																-22
-													•			-22
-68.0																+22
																-22
-																-22
-69.0																-22
										,						-22
-						soft from 69	).34 to 7	0.87 metres.								-22
-70.0																-22
																-23
_																-23
																-23
74.0																
-71.0																-23
																-23
-					-											-23
72.0		TT	I I	[] []nai-			1		6.0					1005	10/00	+23
					neering		ŀ	COMPLETION DEPTH 7	0.2 1				ALE DRI	LLEU:	12/06,	
		W	Inr	npeg	, Mani	loba		LOGGED BY KK		Fiq	g. No	I.			Page 9	of 1

.

	ect: montca t: man. haz/			·····	DRILLED BY: FRIESEN DRILL TYPE: FAILING R				TESTHOL Project		). MS 6544-00	SA-B1 )3-01-(	
	ECT ENGINEEI				DRILL TYPE: 300, 190			- Andrew Andrew			38.50 (m		
AMP	LE TYPE	GRAB SA	MPLE		TUBE 🔀 DISTURBED	NO RECOVERY			ORE BARF		لمبالالمعا	VIRELINE-	IYPE
÷					201		Ы	S	20	) 40		80	
DEPTH (m)					SOI	Ĺ	- TYPE	/SPT	20		% CLAY ■ ) 60	80	H (ft)
HTH.	PLASTIC	M.C.	LIQUID	USC	DESCRIF	στηση	SAMPLE	12/2	20	\$ 7	% SILT 🚸	80	DEPTH
DE			1				SAM	SAMPLE/SPT(N		• %	% SAND 🔶		15
72.0	40 8	80 120	160				'		20	3 40	) 60	80	
													-237.0
								1					-238.(
					shale layer from 71	.93 to		1					
3.0					73.91 metres, red.								-239.(
).U													-240.(
													1
													-241.0
													-242.0
.0													
													-243.0
				-	gypsum layer from	74.37 to 75.59							-244.
					metres, white.								-245.0
.0												-246.	
													-2.47.
							ľ						-248.
5.0													-249.
1.0													-250.
					ND OF TEST HOLE AT 76.	20 MFTRFS IN							-2.00.
				-   DC	OLOMITE ROCK.	ZoV Phants survey or .							
				A A A A A A A A A A A A A A A A A A A		STOLIO INOTALLED							-252.
7.0					OTES: 125mm DIA. PVC AND GROUTED IN P								
					239.873 TO 172.45	54 METRES.							-253.
					- 200mm DIA. STEEL INSTALLED FROM EI	L SURFACE CASING							-254.
				-	TO 227.123 METRE	ES.					• • • • • • • • • • • • • • • • • • • •		
					– 95mm DIA. OPEN	HOLE FROM ELEV.							-255.
8.0					172.454 TO 162.70	) METRES.							-256.
													-257.
													-258.
- 0													-259.
9.0													
													-260.
													-261.
80.0										<u> </u>			-262
				neering		COMPLETION DEPTH 7	/6.2	m		DATE	DRILLED	<i>)</i> : <u>12/0</u> f	δ/91
				, Manito		LOGGED BY KK	-	TFI	ig. No.			Page	10 of 1

# SUMMARY OF PIEZOMETRIC ELEVATIONS

# UMA Engineering Ltd. Earth Sciences Division Winnipeg, MB

Setting of the set

## MONTCALM SITE EVALUATION MAN. HAZ. WASTE MAN. CORP JOB No.: 6544-003-01-06

SITE	MSA-CP1	MSA-CP2	MSA-CP3	MSA-CP4	MSA-CP5	MSA-TP1	MSA-TP2	MSA-BW1
INTAKE								
LOCATION	CLAY	CLAY	CLAY	CLAY	CLAY	TILL	TILL	BEDROCK
INTAKE	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	SLOTTED	OPEN
TYPE	SCREEN	SCREEN	SCREEN	SCREEN	SCREEN	SCREEN	SCREEN	HOLE
TOP OF PIPE		$(1, 2, 3) \in \mathbb{R}^{n}$						
ELEV. (m)	240.110	240.143	240.073	240.075	240.081	240.157	240.111	239.873
INTAKE	234.490-	230.133-	223.993-	214.390-	205.671-	196.242-	183.699-	172.454-
ELEV. (m)	233.890	229.533	223.393	213.790	205.071	194.742	182.199	162.700
			1	1				1

DATE OF			·····		<u> </u>			
READING			PIEZON	<b>IETRIC</b>	ELEVAT	ION		
JUNE 14	234.120	230.023	225.628	219.240	207.656			
JUNE 17	234.220	230.193	226.833	223.385	211.206			
JUNE 18	234.240	230.223	227.403	224.315	212.201			
JUNE 19	234.260	230.243	227.883	225.245	213.321			
JUNE 21	234.320	230.323	229.313	226.985	215.481			
JUNE 27	234.550	230.693	232.143	230.655	220.801			
JULY 04	234.790	231.583	233.993	233.075	225.301			
JULY 11	234.900	232.633	235.003	234.425	228.451			
JULY 19	235.075	233.473	235.703	235.365	231.021			
JULY 22	235.130	233.663	235.873	235.575	231.701	244.835	244.622	245.445
AUGUST 01	235.900	234.273	236.303	236.215	233.691			
AUGUST 09	236.240	234.643	236.503	236.555	234.841			
AUGUST 16	236.580	234.913	236.733	236.795	235.661			
AUGUST 29	237.020	235.243	236.593	236.585	236.671			
SEPT. 13	237.190	235.560	236.430	236.420	237.426			
OCTOBER 02	237.440	235.880	236.330	236.240	238.110			

ASTM D5084-90

SAMPLE INFORMATION:

HOLE No.: MSA-CP1

DEPTH: 4.57 m SAMPLE No.: 219

### SAMPLE CHARACTERISTICS

	DIMENS	ONS	DRY UNIT	MOISTURE	DEGREE OF
	DIAMETER	HEIGHT	WEIGHT	CONTENT	SATURATION
	(cm)	(cm)	(KN/M3)	(%)	(%)
BEFORE TEST	7.121	7.070	17.1	51.9	90.0
AFTER TEST	7.165	7.139	16.9	51.6	

BACK PRESSURE APPLIED (KI	Pa)=	103.4
EFFECTIVE CONSOLIDATION	STRESS (KPa)=	103.4
PERMEANT USED:	DEAIRED TAP W	ATER
B (degree of saturation) (%) = $($		92.0

### HYDRAULIC CONDUCTIVITY

TIME	VOLUME	TEMPERATURE	к	
(sec)	COLLECTED	(deg C.)	(cm/sec)	
	(cc)			
8820	0.3	29	7.73 E-09	
15360	0.5	30	7.24 E09	
3000	0.1	29	7.57 E-09	
 8940	0.3	29	7.63 E-09	
 Leave		Leven and the second		

# HYDRAULIC CONDUCTIVITY (cm/sec)= 7.5 E-09

REMARKS:

UMA Engineering Ltd.DATE: AUGUST 30, 19911479 Buffalo Pl.JOB No.: 6544 003 01Winnipeg, MBPROJECT: MONTCALM SITE EVALUATIONCANADA R3T 1L7SITE:<br/>TECHNICIAN: R.L.

ASTM D5084-90

SAMPLE INFORMATION:

HOLE No.: MSA-CP2

DEPTH: 9.14 m SAMPLE No.: 220

### SAMPLE CHARACTERISTICS

	DIMENS	IONS	DRY UNIT	MOISTURE	DEGREE OF
	DIAMETER	HEIGHT	WEIGHT	CONTENT	SATURATION
	(cm)	(cm)	(KN/M3)	(%)	(%)
BEFORE TEST	7.212	7.370	16.7	56.2	94.2
AFTER TEST	7.274	7.420	16.4	58.1	

BACK PRESSURE APPLIED (KI		103.4
EFFECTIVE CONSOLIDATION	STRESS (KPa)=	137.9
PERMEANT USED:	DEAIRED TAP W	TER
B (degree of saturation) (%) =		98.8

### HYDRAULIC CONDUCTIVITY

TIME	VOLUME	TEMPERATURE	К
(sec)	COLLECTED	(deg C.)	(cm/sec)
	(cc)		
3180	0.2	28	8.84 E-09
12420	0.8	28	9.06 E-09
4860	0.3	. 28	8.68 E-09
58020	3.7	28	8.97 E-09

# HYDRAULIC CONDUCTIVITY (cm/sec)= 8.9 E-09

	DATE: AUGUST 30, 1991
UMA Engineering Ltd.	JOB No.: 6544 003 01
1479 Buffalo Pl.	PROJECT: MONTCALM SITE EVALUATION
Winnipeg, MB	LOCATION: MONTCALM, MB
CANADA R3T 1L7	SITE:
	TECHNICIAN: R.L.

ASTM D5084-90

SAMPLE INFORMATION:

HOLE No.: MSA-CP3

DEPTH:15.24 m SAMPLE No.: 221

### SAMPLE CHARACTERISTICS

	DIMENSIONS		DRY UNIT	MOISTURE	DEGREE OF
	DIAMETER	HEIGHT	WEIGHT	CONTENT	SATURATION
	(cm)	(cm)	(KN/M3)	(%)	(%)
BEFORE TEST	7.203	7.141	16.1	61.0	92.0
AFTER TEST	7.214	7.169	16.1	63.2	

BACK PRESSURE APPLIED (KI	103.4	
EFFECTIVE CONSOLIDATION STRESS (KPa)=		
PERMEANT USED:	TER	
B (degree of saturation) (%) = $($		94.0

### HYDRAULIC CONDUCTIVITY

TIME	VOLUME	TEMPERATURE	K	
(sec)	COLLECTED	(deg C.)	(cm/sec)	
	(cc)			
3420	0.5	26	1.32 E-08	
9960	1.6	26	1.44 E-08	
2160	0.3	26	1.25 E-08	
720	0.1	26	1.25 E-08	

# HYDRAULIC CONDUCTIVITY (cm/sec)= 1.3 E-08

	DATE: AUGUST 30, 1991
UMA Engineering Ltd.	JOB No.: 6544 003 01
1479 Buffalo Pl.	PROJECT: MONTCALM SITE EVALUATION
Winnipeg, MB	LOCATION: MONTCALM, MB
CANADA R3T 1L7	SITE:
	TECHNICIAN: R.L.

ASTM D5084-90

SAMPLE INFORMATION:

HOLE No.: MSA-CP4

DEPTH:24.68 m SAMPLE No.: 222

### SAMPLE CHARACTERISTICS

	DIMENSIONS		DRY UNIT	MOISTURE	DEGREE OF
	DIAMETER	HEIGHT	WEIGHT	CONTENT	SATURATION
	(cm)	(cm)	(KN/M3)	(%)	(%)
BEFORE TEST	7.263	7.282	17.4	47.0	85.0
AFTER TEST	7.229	7.288	17.5	46.1	

BACK PRESSURE APPLIED (	103.4	
EFFECTIVE CONSOLIDATION STRESS (KPa)=		255.1
PERMEANT USED:	DEAIRED TAP W	ATER
B (degree of saturation) (%) =		94.5

### HYDRAULIC CONDUCTIVITY

TIME	VOLUME	TEMPERATURE	К
(sec)	COLLECTED (cc)	(deg C.)	(cm/sec)
3180	0.6	25	1.14 E-08
3720	0.8	25	1.30 E-08
4800	0.9	25	1.14 E-08
4920	1.0	25	1.23 E-08

# HYDRAULIC CONDUCTIVITY (cm/sec)= 1.2 E-08

	DATE: AUGUST 30, 1991
UMA Engineering Ltd.	JOB No.: 6544 003 01
1479 Buffalo Pl.	PROJECT: MONTCALM SITE EVALUATION
Winnipeg, MB	LOCATION: MONTCALM, MB
CANADA R3T 1L7	SITE:
	TECHNICIAN: R.L.

ASTM D5084-90

SAMPLE INFORMATION:

HOLE No.: MSA-CP5

DEPTH:36.88 m SAMPLE No.: 2 23

### SAMPLE CHARACTERISTICS

	DIMENSIONS		DRY UNIT	MOISTURE	DEGREE OF
	DIAMETER	HEIGHT	WEIGHT	CONTENT	SATURATION
	(cm)	(cm)	(KN/M3)	(%)	(%)
BEFORE TEST	7.256	7.205	16.8	52.6	90.0
AFTER TEST	7.223	7.085	17.0	47.3	

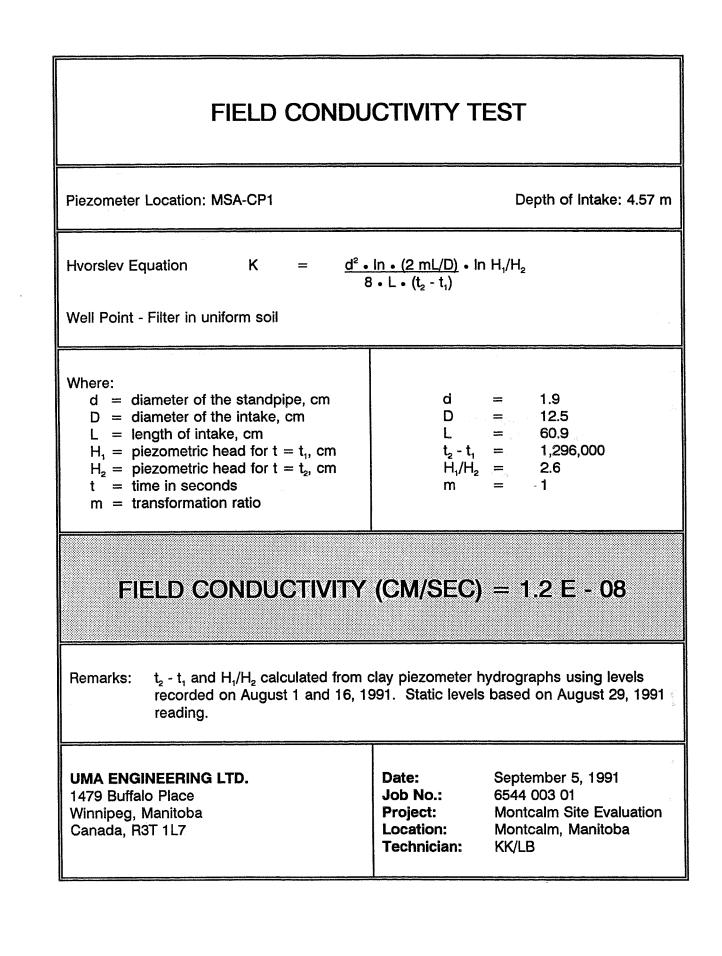
BACK PRESSURE APPLIED (KI	103.4	
EFFECTIVE CONSOLIDATION STRESS (KPa)=		379.2
PERMEANT USED:	DEAIRED TAP W	ATER
B (degree of saturation) $(\%) =$		95.0

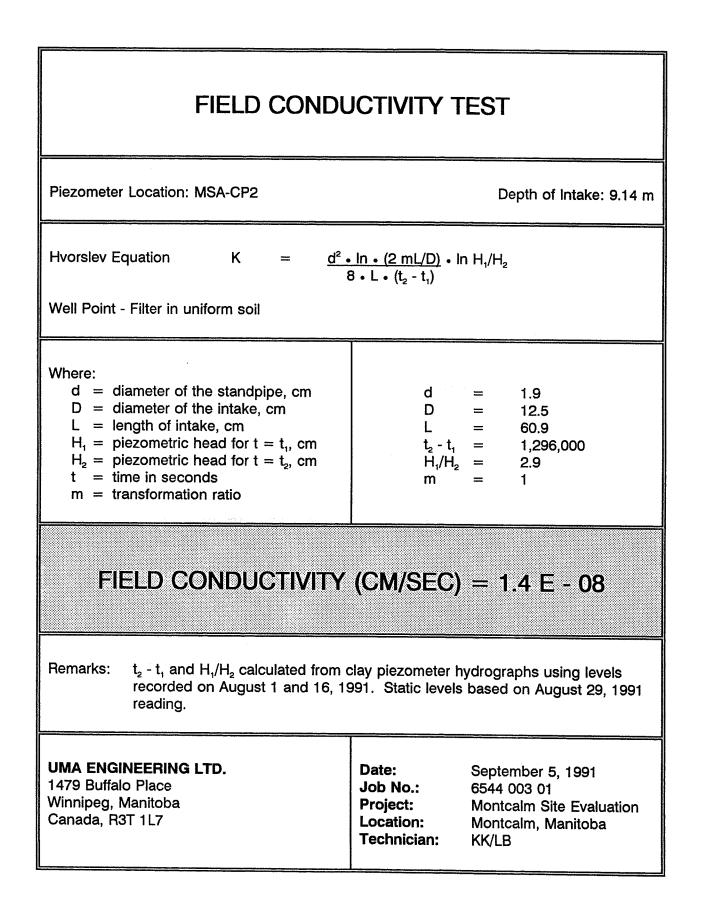
### HYDRAULIC CONDUCTIVITY

 TIME	VOLUME	TEMPERATURE	К	
(sec)	COLLECTED	(deg C.)	(cm/sec)	
	(cc)			
7500	0.5	27	3.48 E-09	
5880	0.4	27	3.54 E-09	
11340	0.75	27	3.45 E-09	
 48360	3.3	27	3.56 E-09	]

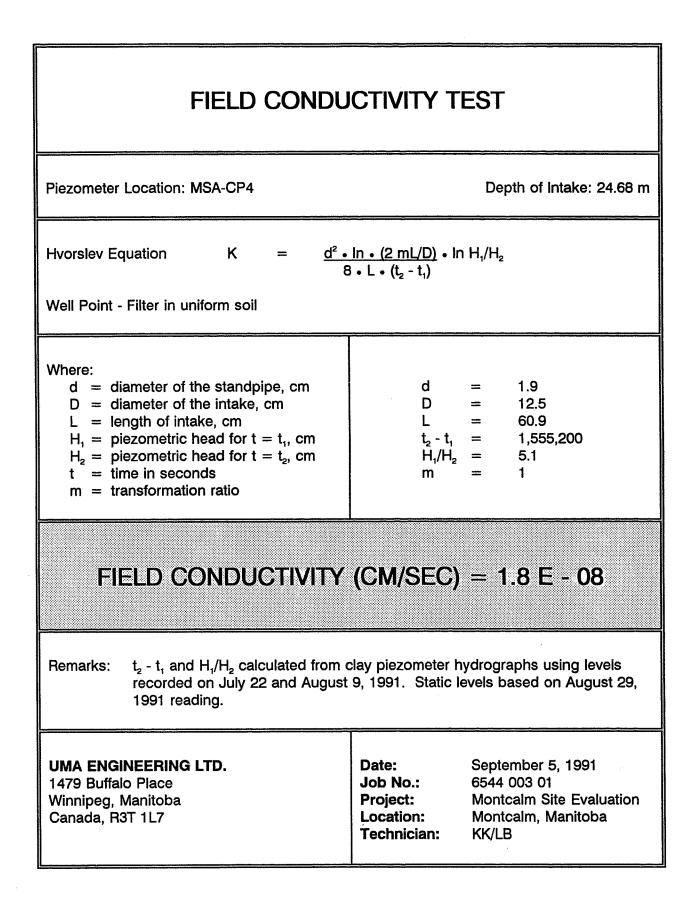
# HYDRAULIC CONDUCTIVITY (cm/sec)= 3.5 E-09

······································	
	DATE: AUGUST 30, 1991
UMA Engineering Ltd.	JOB No.: 6544 003 01
1479 Buffalo PI.	PROJECT: MONTCALM SITE EVALUATION
Winnipeg, MB	LOCATION: MONTCALM, MB
CANADA R3T 1L7	SITE:
	TECHNICIAN: R.L.

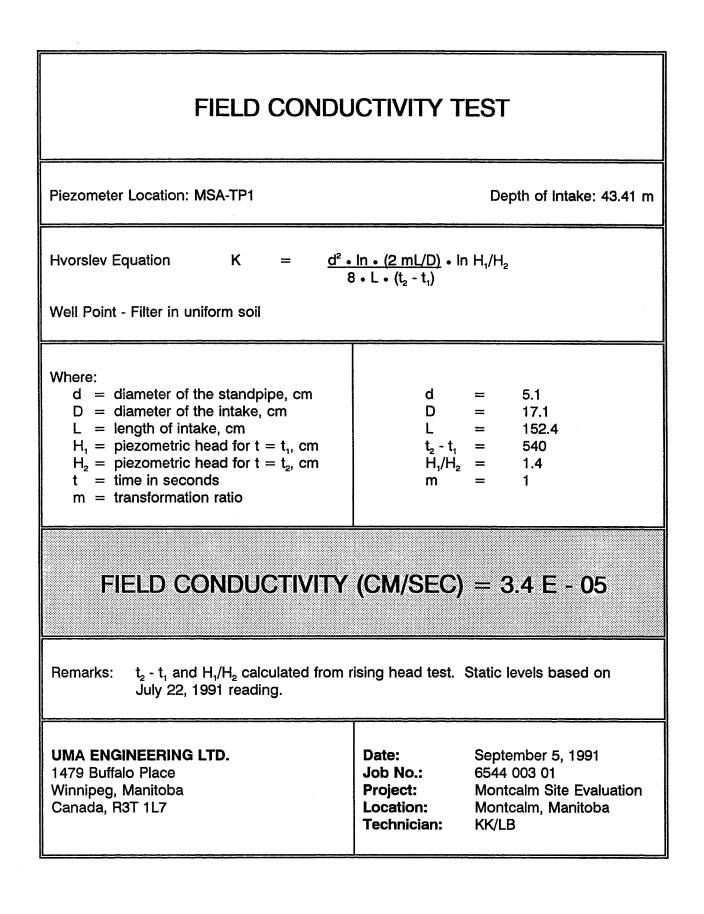




FIELD CONDU	CTIVITY T	EST		
Piezometer Location: MSA-CP3		Dep	th of Inta	ke: 15.24 m
Hvorslev Equation $K = \frac{d^2 \cdot d^2}{8}$ Well Point - Filter in uniform soil	<u>In • (2 mL/D)</u> • Ir 3 • L • (t₂ - t₁)	η Η <sub>1</sub> /Η <sub>2</sub>		
Where: d = diameter of the standpipe, cm D = diameter of the intake, cm L = length of intake, cm H <sub>1</sub> = piezometric head for t = t <sub>1</sub> , cm H <sub>2</sub> = piezometric head for t = t <sub>2</sub> , cm t = time in seconds m = transformation ratio	d D L t₂ - t₁ H₁/H₂ m	=	1.9 12.5 60.9 1,296,00 2.1 1	00
FIELD CONDUCTIVITY Remarks: t <sub>2</sub> - t <sub>1</sub> and H <sub>1</sub> /H <sub>2</sub> calculated from or recorded on August 1 and 16, 19 reading.	lay piezometer h	ydrogra	phs usin	g levels
<b>UMA ENGINEERING LTD.</b> 1479 Buffalo Place Winnipeg, Manitoba Canada, R3T 1L7	Date: Job No.: Project: Location:	6544 ( Montc		Evaluation



FIELD CONDU	ICTIVITY T	EST
Piezometer Location: MSA-CP5		Depth of Intake: 36.88
Hvorslev Equation $K = \frac{d^2 \cdot d^2}{8}$ Well Point - Filter in uniform soil	<u>ln • (2 mL/D)</u> • In 3 • L • (t <sub>2</sub> - t <sub>1</sub> )	n H <sub>1</sub> /H <sub>2</sub>
Where: d = diameter of the standpipe, cm D = diameter of the intake, cm L = length of intake, cm $H_1 = piezometric head for t = t_1, cm$ $H_2 = piezometric head for t = t_2, cm$ t = time in seconds m = transformation ratio	D ···	= 1.9 = 12.5 = 60.9 = 1,296,000 = 2.9 = 1
FIELD CONDUCTIVITY	(CM/SEC)	= 1.4 E - 08
Remarks: t <sub>2</sub> - t <sub>1</sub> and H <sub>1</sub> /H <sub>2</sub> calculated from or recorded on August 1 and 16, 19 reading.		
<b>UMA ENGINEERING LTD.</b> 1479 Buffalo Place Winnipeg, Manitoba Canada, R3T 1L7	Date: Job No.: Project: Location: Technician:	September 5, 1991 6544 003 01 Montcalm Site Evaluation Montcalm, Manitoba KK/LB



#### MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

#### MONTCALM SITE EVALUATION

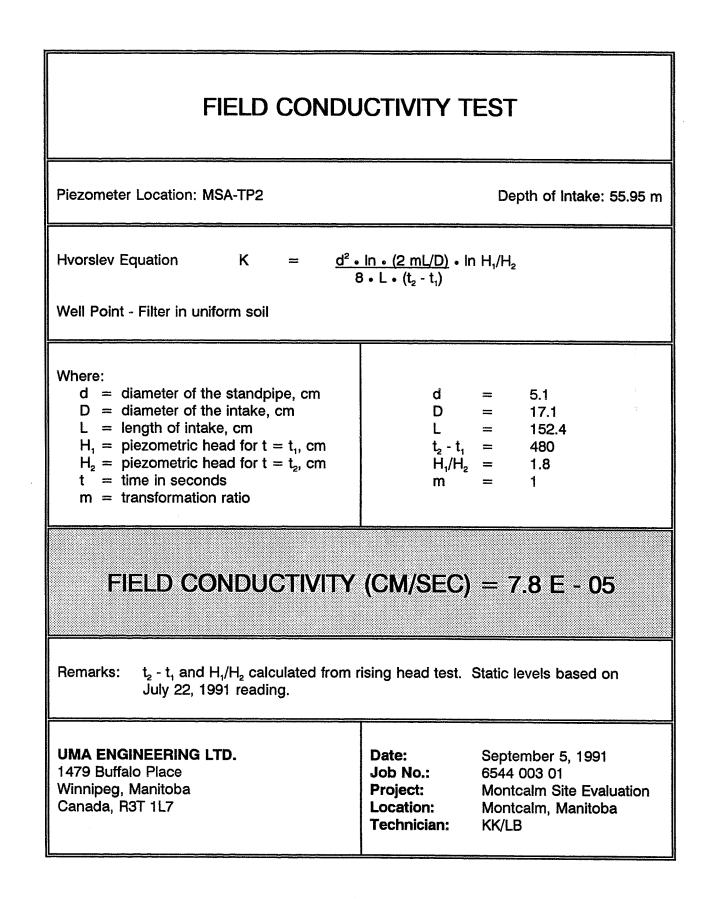
#### **RISING HEAD TEST**

### PIEZOMETER No.: MSA-TP1 TOP OF PIPE ELEV. 240.157 STATIC WATER ELEV. 244.835

ELAPSED TIME	ELAPSED TIME	DEPTH FROM	ELEV. FROM	HEAD
MIN	SEC	TOP OF PIPE	TOP OF PIPE	DIFFERENTIAL
antination faithe faith an ann an ann ann ann ann ann ann ann	a na an			
0.00	0	8.85	231.307	13.528
0.50	30	8.60	231.557	13.278
1.00	60	8.20	231.957	12.878
1.50	90	7.88	232.277	12.558
2.00	120	7.58	232.577	12.258
2.50	150	7.31	232.847	11,988
3.00	180	7.12	233.037	11.798
3.50	210	6.88	233.277	11.558
4.00	240	6.69	233.467	11.368
4.50	270	6.40	233.757	11.078
5.00	300	6.18	233.977	10.858
5.50	330	5.96	234.197	10.638
6.00	360	5.80	234.357	10.478
6.50	390	5.55	234.607	10.228
7.00	420	5.33	234.827	10.008
7.50	450	5.10	235.057	9.778
8.00	480	4.96	235.197	9.638
8.50	510	4.80	235.357	9.478
9.00	540	4.61	235.547	* 9.288
9.50	570	4.45	235.707	9.128
10.00	600	4.27	235.887	8.948
10.50	630	4.10	236.057	8.778
11.00	660	3.96	236.197	8.638
11.50	690	3.82	236.337	8.498
12.00	720	3.66	236.497	8.338
12.50	750	3.50	236.657	8.178
13.00	780	3.37	236.787	8.048

······································		·····		
13.50	810	3.28	236.877	7.958
14.00	840	3.10	237.057	7.778
14.50	870	3.00	237.157	7.678
15.00	900	2.88	237.277	7.558
15.50	930	2.76	237.397	7.438
16.00	960	2.65	237.507	7.328
16.50	990	2.53	237.627	7.208
17.00	1020	2.46	237.697	7.138
17.50	1050	2.33	237.827	7.008
18.00	1080	2.22	237.937	6.898
18.50	1110	2.12	238.037	6.798
19.00	1140	2.06	238.097	6.738
19.50	1170	1.98	238.177	6.658
20.00	1200	1.90	238.257	6.578
21.00	1260	1.72	238.437	6.398
22.00	1320	1.52	238.637	6.198
23.00	1380	1.35	238.807	6.028
24.00	1440	1.19	238.967	5.868
25.00	1500	1.10	239.057	5.778
26.00	1560	0.85	239.307	5.528
27.00	1620	0.68	239.477	5.358
28.00	1680	0.53	239.627	5.208
29.00	1740	0.40	239.757	5.078
30.00	1800	0.28	239.877	4.958
31.00	1860	0.00	240.157	4.678

No.



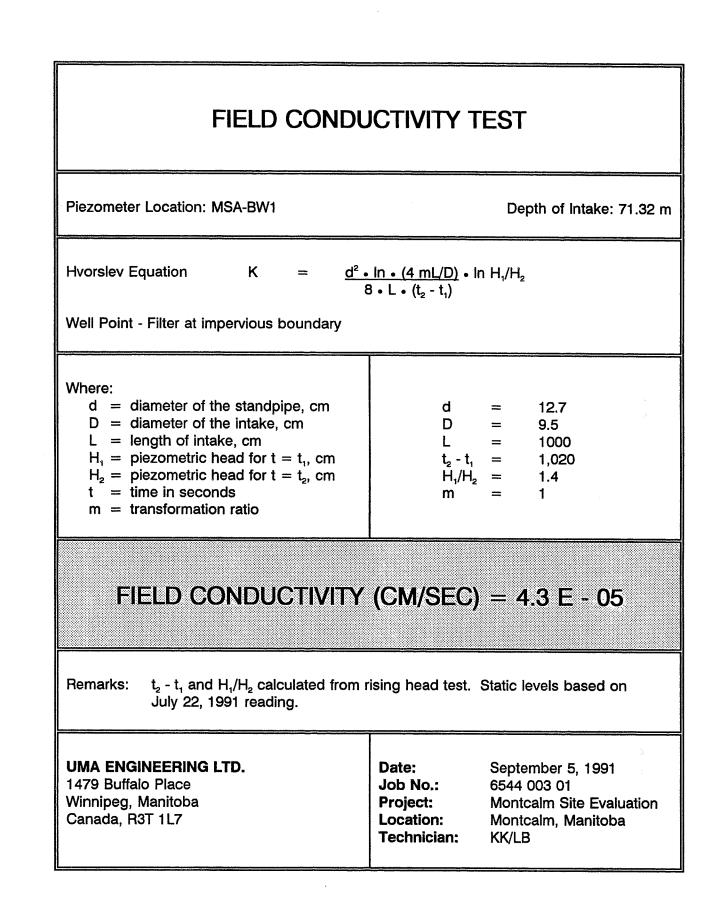
#### MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

### MONTCALM SITE EVALUATION

#### **RISING HEAD TEST**

### PIEZOMETER No.: MSA-TP2 TOP OF PIPE ELEV. 240.111 STATIC WATER ELEV. 244.622

	T			
ELAPSED TIME	ELAPSED TIME	DEPTH FROM	ELEV. FROM	HEAD
MIN	SEC	TOP OF PIPE	TOP OF PIPE	DIFFERENTIAL
0.50	30	6.60	233.511	11.111
1.00	60	6.04	234.071	10.551
1.50	90	5.55	234.561	10.061
2.00	120	5.00	235.111	9.511
2.50	150	4.60	235.511	9.111
3.00	180	4.08	236.031	8.591
3.50	210	3.52	236.591	8.031
4.00	240	3.20	236.911	7.711
4.50	270	2.80	237.311	7.311
5.00	300	2.70	237.411	7.211
5.50	330	2.25	237.861	6.761
6.00	360	1.98	238.131	6.491
6.50	390	1.72	238.391	6.231
7.00	420	1.45	238.661	5.961
7.50	450	1.23	238.881	5.741
8.00	480	1.06	239.051	5.571
8.50	510	0.81	239.301	5.321
9.00	540	0.75	239.361	5.261
9.50	570	0.58	239.531	5.091
10.00	600	0.45	239.661	4.961
10.50	630	0.30	239.811	4.811
11.00	660	0.18	239.931	4.691



#### MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

#### MONTCALM SITE EVALUATION

#### **RISING HEAD TEST**

### PIEZOMETER No.: MSA-BW1 TOP OF PIPE ELEV. 239.873 STATIC WATER ELEV. 245.445

ELAPSED TIME MIN	ELAPSED TIME SEC	DEPTH FROM TOP OF PIPE	ELEV. FROM TOP OF PIPE	HEAD DIFFERENTIAL
		na menerinya a kalendari da seri ka kalendari kena da seri ku kalendari da meneri kara da seri kana da seri ka	an an an Angaran Anna an Anna a	
0.50	30	7.98	231.893	13.552
1.00	60	7.80	232.073	13.372
1.50	90	7.68	232.193	13.252
2.00	120	7.55	232.323	13.122
2.50	150	7.40	232.473	12.972
3.00	180	7.32	232.553	12.892
3.50	210	7.18	232.693	12.752
4.00	240	7.03	232.843	12.602
4.50	270	6.84	233.033	12.412
5.00	300	6.78	233.093	12.352
5.50	330	6.70	233.173	12.272
6.00	360	6.60	233.273	12.172
6.50	390	6.50	233.373	12.072
7.00	420	6.37	233.503	11.942
7.50	450	6.18	233.693	11.752
8.00	480	6.11	233.763	11.682
8.50	510	5.99	233.883	11.562
9.00	540	5.88	233.993	11.452
9.50	570	5.78	234.093	11.352
10.00	600	5.65	234.223	11.222
10.50	630	5.60	234.273	11.172
11.00	660	5.47	234.403	11.042
11.50	690	5.36	234.513	10.932
12.00	720	5.28	234.593	10.852
12.50	750	5.15	234.723	10.722
13.00	780	5.02	234.853	10.592
13.50	810	4.93	234.943	10.502

10.382	235.063	4.81	840	14.00
10.292	235.153	4.72	870	14.50
10.232	235.213	4.66	900	15.00
10.112	235.333	4.54	930	15.50
10.012	235.433	4.44	960	16.00
9.922	235.523	4.35	990	16.50
9.859	235.586	4.29	1020	17.00
9.752	235.693	4.18	1050	17.50
9.622	235.823	4.05	1080	18.00
9.552	235.893	3.98	1110	18.50
9.482	235.963	3.91	1140	19.00
9.362	236.083	3.79	1170	19.50
9.272	236.173	3.70	1200	20.00
9.092	236.353	3.52	1260	21.00
8.892	236.553	3.32	1320	22.00
8.732	236.713	3.16	1380	23.00
8.602	236.843	3.03	1440	24.00
8.392	237.053	2.82	1500	25.00
8.272	237.173	2.70	1560	26.00
8.052	237.393	2.48	1620	27.00
7.922	237.523	2.35	1680	28.00
7.762	237.683	2.19	1740	29.00
7.592	237.853	2.02	1800	30.00
7.472	237.973	1.90	1860	31.00
7.332	238.113	1.76	1920	32.00
7.162	238.283	1.59	1980	33.00
7.002	238.443	1.43	2040	34.00
6.872	238.573	1.30	2100	35.00
6.712	238.733	1.14	2160	36.00
6.582	238.863	1.01	2220	37.00
6.472	238.973	0.90	2280	38.00
6.372	239.073	0.80	2340	39.00
6.182	239.263	0.61	2400	40.00
6.052	239.393	0.48	2460	41.00
5.922	239.523	0.35	2520	42.00
5.792	239.653	0.22	2580	43.00

### Yazon, Edwin (CC)

From: Sent: To: Subject: Yazon, Edwin (CC) June 16, 2022 3:19 PM Yazon, Edwin (CC) FW: File 3440.20 - MEC - Leachate Crop Irrigation Pilot Project

Edwin Yazon, P. Eng.

Environmental Engineer, Environmental Approvals Environment, Climate and Parks Edwin.Yazon@gov.mb.ca / Cel: 431-335-2554 1007 Century St., Winnipeg, MB R3H 0W4

Facts are key in the fight against COVID-19, visit Manitoba.ca/covid-19

To report an Environmental Emergency please call our 24/7 Environmental Emergency Response Line (204) 944-4888 Toll Free in Manitoba 1-855-944-4888

From: Dave Howes <daveh@millerenvironmental.mb.ca> Sent: June 16, 2022 2:53 PM To: Yazon, Edwin (CC) <Edwin.Yazon@gov.mb.ca> Subject: RE: File 3440.20 - MEC - Leachate Crop Irrigation Pilot Project

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION: ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Edwin,

The answers to your questions are below in blue. If you need anything else, please let me know. Thanks.

Dave

From: Yazon, Edwin (CC) <<u>Edwin.Yazon@gov.mb.ca</u>>
Sent: June 16, 2022 10:40 AM
To: Dave Howes <<u>daveh@millerenvironmental.mb.ca</u>>
Subject: File 3440.20 - MEC - Leachate Crop Irrigation Pilot Project

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning Dave,

I am currently reviewing MEC's leachate crop irrigation pilot project submission.

I have some questions about the pilot project:

- What is the plan about filtered solid in the pre-treatment tank? Where is it going? Filtered solids will be treated in our stabilization process. This will be part of our proposed closed loop system.
- The report did not indicate the location of the drainage collection point. Page 9 of the report indicates
   "groundwater will be measured at the drainage collection point. Well monitoring will be used to measure
   groundwater and ensure containment is effective. Please provide additional information.
   The term "drainage collection point" is a left-over idea from an older iteration of the design and should have
   been removed. There is no drainage collection point on the current design and there is no plan to release
   drainage or groundwater from the containment area. If there is standing water, it will be sampled and tested
   and managed internally. Groundwater will continue to be monitored through existing monitoring wells and
   managed through licenced monitoring requirements.

Sincerely,

#### Edwin Yazon, P. Eng.

Environmental Engineer, Environmental Approvals Environment, Climate and Parks Edwin.Yazon@gov.mb.ca / Cel: 431-335-2554 1007 Century St., Winnipeg, MB R3H 0W4

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