

Metcalfe, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Wednesday, May 20, 2015 12:08 PM
To: Leuschen, Allan ENV:EX; s.22 Downie, AJ ENV:EX
Cc: Taje, Eddy MEM:EX; Dunkley, Jim R MEM:EX; Hoffman, AI MEM:EX; s.22
Subject: RE: Permit 105809 - EAB DIRECTIONS - DRAFT PERMIT AMENDMENTS

Gentlemen,

As requested, please see the following comments/clarifications on the draft permit amendment:

1:200 year storm

The Environmental Procedures Manual section 7.1 states that a 1:200yr storm event plus snowmelt is 181.4mm. Removing the snowmelt gives a trigger 200yr storm event of 151.4mm. The on-Site rain gauge will be used to determine when a 200yr storm event has occurred. Daily monitoring of the rain gauge is part of the daily records described in the EPM.

If a 200yr event occurs (determined by the trigger 24hr rainfall accumulation of 151.4mm or greater), samples will be collected from surface water sampling locations for the full suite of parameters included in the quarterly monitoring program. Monitoring of locations SW-1, SW-2 and SW-3 is assumed to be the intent of the EAB decision.

Time-frame for Roof over SMA

The following wording (or similar) is requested: "A roof structure will be constructed over the SMA no later than March 1, 2016. However, all reasonable actions will be taken to have the roof completed by October 31, 2015."

The rationale for the above-requested dates are as follows:

- The roof cannot be constructed until the Mines permit is amended and soil is moved out of the SMA (hopefully the Mines permit amendment is forthcoming)
- It is anticipated that a building permit will be difficult to obtain from the CVRD (may cause delays)
- The original permit did not require a permanent roof because the facility is designed to operate without it.
- Any soil in the SMA is required (in the permit) to be covered during wet weather in the permit (the roof is a permanent cover but not the only option).
- There is no significant change to impacting the environment by adding the roof, and it is not a requirement (as far as I know) at any other similar facility.
- The roof is a "nice-to-have" and not a necessity.
- The roof is costly and there are significant cash flow hardships being experienced, including ongoing legal challenges, that result in the request for maximum flexibility

Overall, the intent is to construct the roof as soon as possible and before this winter. Given that there is some uncertainty and anticipated difficulties, we are requesting maximum flexibility on the dates put into the amendment.

Thank you for your considerations and request for comments on the draft amendment.

Sincerely,

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9

-----Original Message-----

From: Leuschen, Allan ENV:EX [<mailto:Allan.Leuschen@gov.bc.ca>]

Sent: May 11, 2015 9:17 AM

To: Matt Pye; s.22

Cc: Taje, Eddy MEM:EX; Dunkley, Jim R MEM:EX

Subject: Permit 105809 - EAB DIRECTIONS - DRAFT PERMIT AMENDMENTS

Importance: High

Greetings: As a result of the Environmental Appeal Board decision and directions , attached are draft permit amendments. Please review the draft permit amendments.

With regard to section 3.6 Receiving Environment Sampling, please provide details regarding how the 1-in-200 year, 24-hour storm event will be determined, and how immediately the sampling will begin. Related details are also requested regarding the 1 in 10 year event referred to in sections 1.5 and 3.4 of the permit. These details must be included in the Environmental Procedures Manual (section 2.13 of the permit).

COMMENTS REGARDING THE DRAFT PERMIT AMENDMENTS MUST BE RECEIVED BY MAY 18, 2015. SEND COMMENTS TO MY EMAIL allan.leuschen@gov.bc.ca

Please confirm receipt of this email. If you have any questions or concerns please contact me. Thank you.

A. Leuschen
Senior Environmental Protection Officer
Authorizations – South
Environmental Protection Division
Ministry of Environment
tel 250 751-3199
allan.leuschen@gov.bc.ca

Metcalf, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Tuesday, May 26, 2015 2:57 PM
To: Leuschen, Allan ENV:EX; Downie, AJ ENV:EX; Hoffman, Al MEM:EX; Taje, Eddy MEM:EX
Subject: SIA Permit Amendments

Gentlemen,

I am just touching base to see how things are progressing with the two permit amendments?

Regards,

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9
250-686-9850

Metcalfe, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Wednesday, June 17, 2015 5:06 PM
To: Hoffman, Al MEM:EX; todd@allterraconstruction.ca; s.22
Cc: Dunkley, Jim R MEM:EX; Bouffard, Maryann J MEM:EX; Barcelona, Gerry MEM:EX; Olsen, Michael MEM:EX; s.22
Subject: RE: photos from SIA site and hydrogeology reports

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Al,

I will provide you with the requested letter within 24 hours.

I would like to quickly respond here first with a few points that may be useful background for you:

- The reports by Lowen and Kohut were considered by MOE prior to issuing the MOE permit and were presented in great detail during the EAB hearing. However, the findings of these 2 hydrogeologists were found to be incorrect by the MOE, the EAB board and also the Association of Professional Engineers of BC (APEGBC) as well as a third party hydrogeologist from Piteau Associates that was engaged by APEG to review the Lowen reports.
- The CVRD is continually revisiting these reports and other information that has been well considered by numerous professionals (including the MOE and EAB and others) and debated and determined to be unsubstantiated and/or incorrect. Another example includes the CVRD/SRA's assertion that the CRD Sooke watershed is at risk from the SIA site. The CRD commissioned an internal assessment and they concluded in their report that it is impossible for the SIA site to impact the Sooke watershed. The CVRD/SRA did not like this answer and successfully lobbied for the CRD to re-evaluate their findings with a second report. The CRD again concluded that there is no risk from the SIA site. These conclusions are ignored by the CVRD/SRA.
- The CRD review situation is analogous to what the CVRD is doing right now by providing the Lowen and Kohut reports to you at this time. They know these reports are incorrect but the reports say what the CVRD wants to hear. Many professional have reviewed these reports and determined them to be incorrect and the CVRD knows this, however, they continue to use them whenever there is a new ear to listen.

The above background is intended to provide you with some context when reviewing the above reports. I would also like to provide a few technical points about the hydrogeology at the Site:

- The rock at the Site is very low permeability and is an aquitard (versus an aquifer) so it does not allow water to flow easily through.
- There is no aquifer beneath the Site because of the permeability of the rock, however, there is groundwater within the aquitard (low permeability rock).
- The piezometric pressure in the rock at the base of the quarry is above the pit bottom elevation. This means that groundwater within the aquitard will flow very slowly into the pit.
- Groundwater seepage into the pit is extremely slow and not observable it is so slow.

- Rainfall on the Site is largely collected in the low point at the base of the pit and has created a pond. This pond is present year round because the water cannot seep into the rock and cannot flow out of the site because it is surrounded by rock (like a bath tub).
- The water at the base of the pit is predominantly rainfall and there is no aquifer beneath the site. The inputs from groundwater are negligible if any.
- The water in the pond at the bottom of the pit will slowly evaporate over the dry months but is deep enough that it is present year round.

I will summarize the above in a short, signed and sealed letter tomorrow.

Regards,
Matt

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9
250-686-9850

From: Hoffman, Al MEM:EX [mailto:Al.Hoffman@gov.bc.ca]
Sent: June 17, 2015 3:42 PM
To: 'todd@allterraconstruction.ca'; 'matt.pye@activeearth.ca'; s.22
Cc: Dunkley, Jim R MEM:EX; Bouffard, Maryann J MEM:EX; Barcelona, Gerry MEM:EX; Olsen, Michael MEM:EX
Subject: RE: photos from SIA site and hydrogeology reports

Thanks for your telephone call this afternoon. I look for written sealed and stamped letter from Matt indicating where the standing water is from in the bottom of the quarry.

You must also follow all the orders in Gerry Barcelona's inspection report.

I understand that the CVRD also hired another hydrogeologist and I would like to review this report.

Al Hoffman, P.Eng.
Chief Inspector of Mines

From: Hoffman, Al MEM:EX
Sent: Wednesday, June 17, 2015 1:52 PM
To: 'todd@allterraconstruction.ca'; 'matt.pye@activeearth.ca'; s.22
Cc: Dunkley, Jim R MEM:EX; Bouffard, Maryann J MEM:EX; Barcelona, Gerry MEM:EX; Olsen, Michael MEM:EX
Subject: FW: photos from SIA site and hydrogeology reports

Todd, Matt s.22

I have received two concerns from Ms. Sonia Furstenau. The first one related to a blast yesterday where the mine operation encroached again on the CVRD property. This is unacceptable. Inspector Barcelona attended the site yesterday and wrote applicable orders.

I also received another concern related to the photos attached which appear to be ground water at the base of the quarry. Since there has been little rain in the last few weeks - Where is this water coming from?

Matt

What evidence is there that the mine workings have not broken into an aquifer?

I expect a response to these questions within 24 hrs please.

Thanks for your co-operation.

Al Hoffman, P.Eng.
Chief Inspector of Minesw

From: Sonia Furstenau s.22
Sent: Wednesday, June 17, 2015 12:48 PM
To: Hoffman, Al MEM:EX
Subject: photos from SIA site and hydrogeology reports

Mr Hoffman,

Thank you for returning my call.

Attached are photos from the site yesterday that show pools of water that have appeared since the operators covered this area with gravel.

I will also forward you the Lowen Hydrogeology report and the Kohut Report.

I appreciate your action on this matter.

Sonia Furstenau

Metcalfe, Megan MEM:EX

From: Brody, Margo X MEM:EX
Sent: Wednesday, September 9, 2015 3:23 PM
To: Metcalfe, Megan MEM:EX
Subject: Second email - FOI 52875 Request Matt Pye
Attachments: Hydrogeology Summary - SIA Quarry Poned Water.pdf

Second set.
Margo

From: Hoffman, Al MEM:EX
Sent: Wednesday, September 9, 2015 3:20 PM
To: Brody, Margo X MEM:EX
Subject: Second email - FOI Request Matt Pye

These two emails include all of the emails I have from Matt Pye

From: Matt Pye [<mailto:matt.pye@activeearth.ca>]
Sent: Thursday, June 18, 2015 4:26 PM
To: Hoffman, Al MEM:EX; todd@allterraconstruction.ca; s.22
Cc: Dunkley, Jim R MEM:EX; Bouffard, Maryann J MEM:EX; Barcelona, Gerry MEM:EX; Olsen, Michael MEM:EX; s.22
s.22 Hunse, Laura A ENV:EX; s.22 s.22
Subject: RE: photos from SIA site and hydrogeology reports

Hi Al,

The requested signed and sealed letter is attached. Please advise if you require anything further.

Regards,
Matt

From: Hoffman, Al MEM:EX [<mailto:Al.Hoffman@gov.bc.ca>]
Sent: June 17, 2015 5:20 PM
To: 'Matt Pye'; todd@allterraconstruction.ca; s.22
Cc: Dunkley, Jim R MEM:EX; Bouffard, Maryann J MEM:EX; Barcelona, Gerry MEM:EX; Olsen, Michael MEM:EX; s.22
s.22 Hunse, Laura A ENV:EX
Subject: RE: photos from SIA site and hydrogeology reports

Thank you
Exactly what I need

Al Hoffman, P.Eng.
Chief Inspector

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- There is no aquifer beneath the Site because of the permeability of the rock, however, there is groundwater within the aquitard (low permeability rock).
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- The water in the pond at the bottom of the pit will slowly evaporate over the dry months but is deep enough that it is present year round.

I will summarize the above in a short, signed and sealed letter tomorrow.

Regards,
Matt

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.

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Chief Inspector of Mines

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Chief Inspector of Minesw

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I appreciate your action on this matter.

Sonia Furstenau



June 18, 2015

Ministry of Energy and Mines

PO Box 9053

Stn Prov Govt

Victoria, BC V8W 9E2

ATTENTION: Al Hoffman, M.Sc., P.Eng.
Chief Inspector of Mines

REFERENCE: Hydrogeology Summary
SIA Quarry on Stebbings Road

As requested, Active Earth Engineering Ltd. (Active Earth) has prepared this brief letter to describe the hydrogeological conditions at the SIA Quarry on Stebbings Road in Shawnigan Lake, BC (the "Site"). In particular, it was requested that an explanation be provided in relation to the presence of standing water in the base of the pit.

The hydrogeological conditions at the Site have been thoroughly analyzed by Active Earth and reviewed by numerous other professionals, both internal to the provincial government, and external consultants. The Site hydrogeology was debated at length during the Environmental Appeal Board (EAB) hearing pertaining to the Waste Discharge Authorization (the "Permit") that was obtained for the Site, allowing waste soil to be landfilled as part of the mine reclamation process. The opinions of other professionals contradicting those of Active Earth and Dr. Kevin Morin were ultimately found to be unsubstantiated, highly exaggerated and/or erroneous. Regardless, opponents of the Permit continue to bring these alternate opinions forward as if they are new information and have not been thoroughly examined, considered, and ultimately dismissed.

The following points are intended to provide a description of the hydrogeological conditions at the Site. None of this is new information, having been presented initially as part of the Technical Assessment undertaken to support the Permit application, and subsequently to address questions posed by Ministry officials and others.

- The Site is underlain by igneous bedrock (Wark Gneiss) which is very competent and does not have significant fracturing or joint sets. The Site geology was mapped extensively by Kirk Hancock, B.Sc., P.Geo. of the BC Geological Survey as part of the

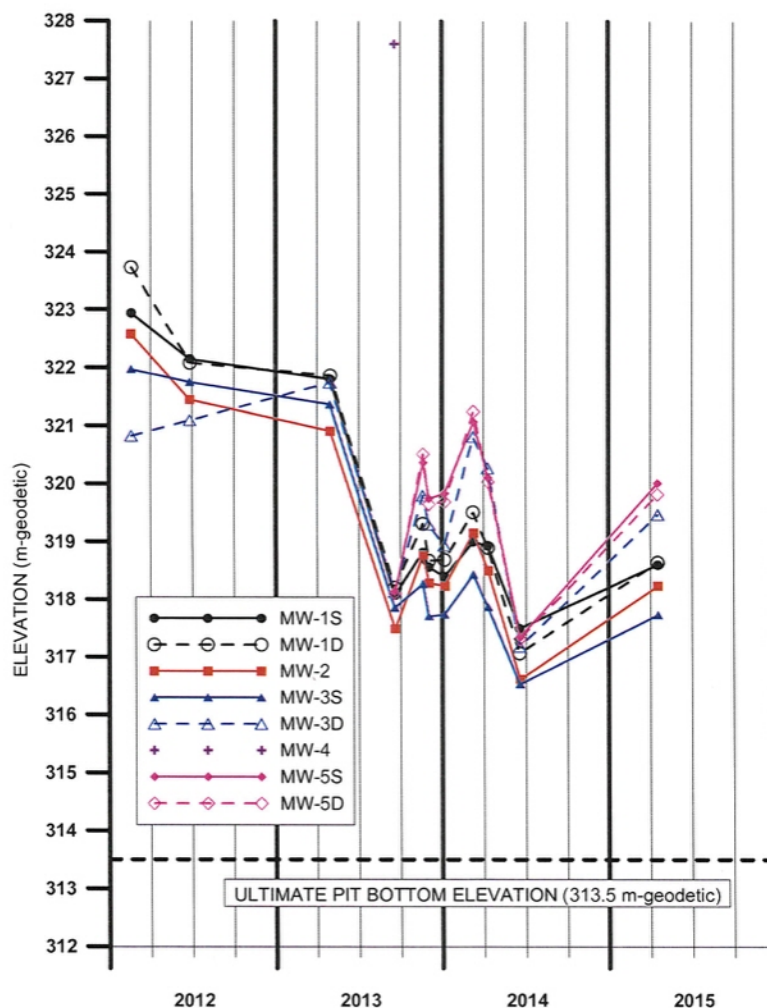
Langley
Vancouver
Victoria

Mailing Address:
105 – 4343 Tyndall Avenue
Victoria, BC, V8N 3R9

Telephone: 250.686.9850
Facsimile: 778.430.5475
Website: www.activeearth.ca

Permit application process. Mr. Hancock produced two reports which we anticipate you have on file but we could provide you copies if requested.

- Groundwater flow within the bedrock only occurs within fractures and requires fractures to be open, frequent and interconnected in order to produce sufficient flows to be described as an aquifer. Dr. Kevin Morin provides a thorough explanation of flow mechanisms in his report prepared as part of the EAB process. We can provide you a copy of Dr. Morin's report if requested.
- The bedrock at the Site does not have the frequency of open interconnected fractures needed to be considered an "aquifer" and is therefore considered an "aquitard" because of the limited ability to transmit groundwater flow.
- There is still groundwater present in the limited fractures within the bedrock, and the water pressure in these fractures has been measured. This is the "piezometric pressure" in the rock and it has been monitored at the Site since early 2012. The plot below presents the piezometric monitoring results.



- As shown in the plot, the piezometric pressure is above the pit bottom elevation at all monitoring locations on the Site. The ponded water currently in the base of the pit is very close in elevation to the ultimate pit bottom.
- If there were groundwater flow within fractures in the rock it would be evident as seepage into the pit, however, we do not observe any seepage into the pit below the piezometric elevations. This is because the rock is an aquitard and does not convey significant groundwater flow.
- Since there is a constant upward hydraulic gradient into the pit, as determined by the piezometric pressures being above the ultimate pit bottom elevation, the design of Site for reclamation accounts for some degree of seepage into the pit.
- The current configuration of the pit has a low spot in the northwest corner that is near the ultimate pit bottom elevation. This elevation is below the elevation of the surface water flow path which discharges from the Site at the west property boundary. As such, the northwest corner of the pit acts like a bathtub and collects precipitation that falls within the catchment at the low point.
- The collected surface water cannot flow out of the pond because it is lower in elevation than the tributary that leaves the Site. The ponded water also cannot infiltrate into the rock because of the low permeability of the rock.
- The ponded water is present year round in the northwest corner of the Site and slowly evaporates over the dry summer months. However, the depth of the pond is significant enough that all of the water does not evaporate in the summer.

We trust the above is sufficient for present needs. Please contact the undersigned if further information or clarifications are required.

Yours truly,

ACTIVE EARTH ENGINEERING LTD.



Matt Pye, P.Eng.

Principal, Senior Hydrogeologist

Metcalfe, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Monday, June 29, 2015 11:14 AM
To: Hoffman, Al MEM:EX; Dunkley, Jim R MEM:EX; Skelly, Kerri ENV:EX
Cc: s.22
Subject: Mine Boundaries for Lot 21 and Lot 23
Attachments: 320 Mine Boundary - June 2015.pdf

Hi All,

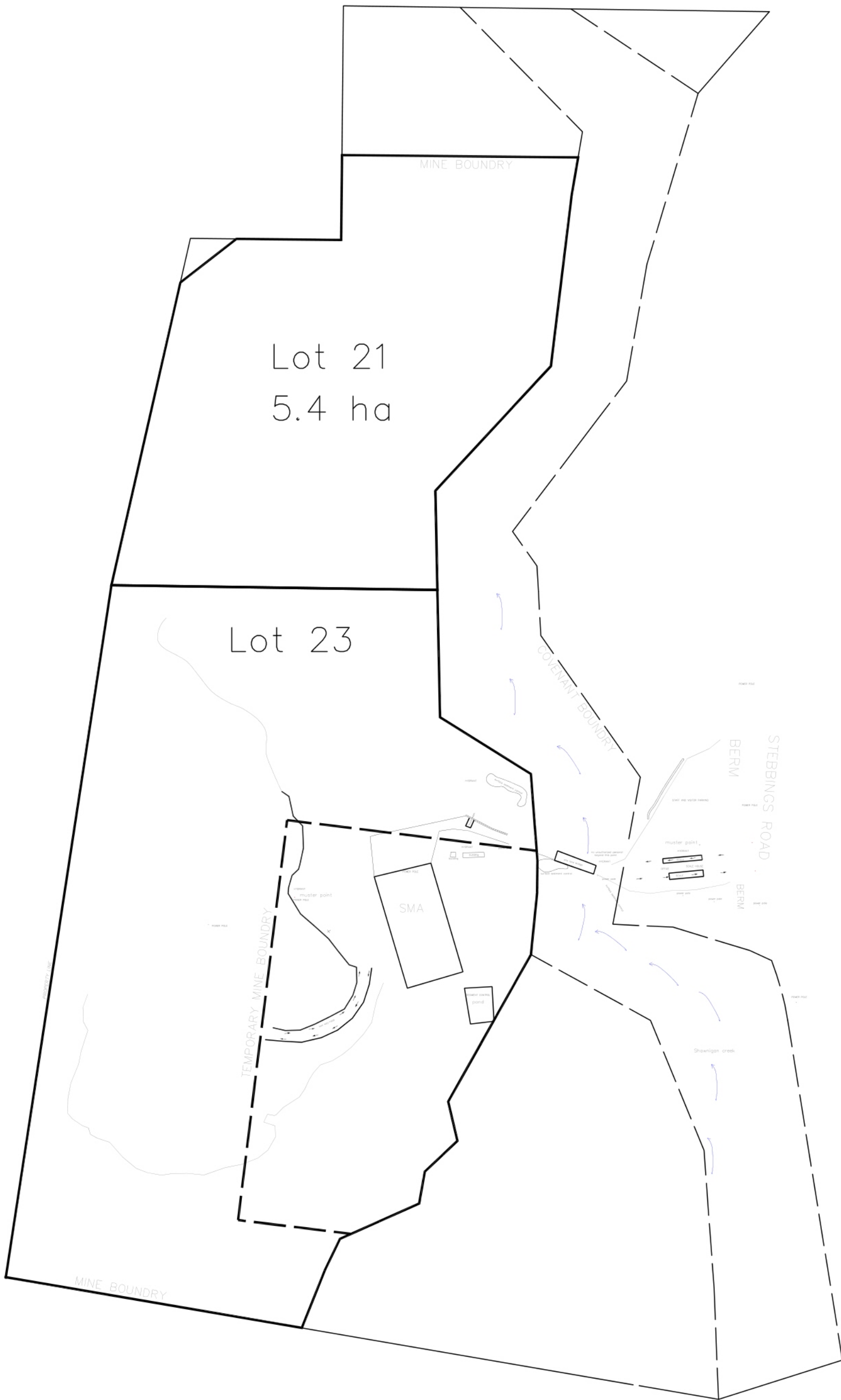
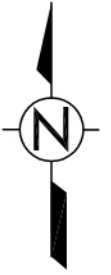
The attached PDF shows the boundaries for the mining permits on Lots 21 and 23.

The MOE permit applies to the larger solid line boundary on Lot 23. The dashed line boundary on Lot 23 shows the area temporarily removed from the active mining permit area that I understand is to be reinstated.

Feel free to contact me at the number below if you have any questions.

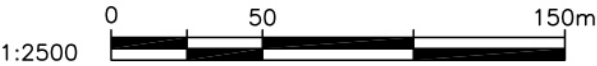
Regards,

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9
250-686-9850



693 STEBBINGS ROAD

JUNE 25, 2015



Metcalfe, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Thursday, July 30, 2015 3:55 PM
To: Hoffman, Al MEM:EX; Downie, AJ ENV:EX
Cc: Dunkley, Jim R MEM:EX; Hunse, Laura A ENV:EX; s.22
Subject: Cell 1 As-Built
Attachments: Cell1_As-Built_PR105809_Q-8-094.pdf

Mr. Hoffman and Mr. Downie,

Please find the as-built report attached for Cell 1 at the SIA Quarry site. A hard copy will be delivered to your offices.

Sincerely,

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9
250-686-9850



July 30, 2015

BC Ministry of Energy and Mines
1810 Blanshard Street
Victoria, BC V8W 9N3

and

BC Ministry of Environment
2080A Labieux Road
Nanaimo, BC V9T 6J9

ATTENTION: Al Hoffman, P.Eng. – Chief Inspector
AJ Downie – Director, Authorizations - South

REFERENCE: **As-Built Report - Encapsulation Cell 1**
MOE Permit PR-105809 and MEM Permit Q-8-094
640 Stebbings Road, Shawnigan Lake, BC

As required by the Ministry of Energy and Mines (MEM) Permit Q-8-094, and the Ministry of Environment (MOE) Permit PR-105809, Active Earth Engineering Ltd. (Active Earth) has prepared this As-Built report for Encapsulation Cell 1.

Encapsulation Cell 1 is located on southern side of the Site, as shown on the key plan in Figure 1. The cell construction was initiated in early 2014 and completed on July 30, 2015.

This report is comprised of a compilation of information from various sources that pertain to the base construction of Encapsulation Cell 1. The attached Figures 1 and 2 present the as-built details in plan view and cross-section, respectively.

The construction of Encapsulation Cell 1 consisted of the following:

- Native bedrock subbase as described in the bedrock integrity inspection report prepared for Cell1 and previously submitted to MOE, dated October 10, 2013.
- Minimum of 1m compacted clay placed above the bedrock. The clay varies in thickness and is over 3m thick in some areas. The surface of the clay is sloped at approximately 2% towards the north. The clay was placed and compacted under the supervision of Active Earth and Levelton Consultants. Laboratory and field testing results to confirm clay compaction was achieved to greater than 90% standard proctor are attached. Field density test locations are shown on Figure 1.
- Free-draining sand was placed at a minimum of 0.3m thickness overlying the compacted clay. This sand layer acts as a leak detection layer and protects the liner from potential

Langley
Vancouver
Victoria

Mailing Address:
105-4343 Tyndall Ave
Victoria, BC V8N 3R9

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Facsimile: 778-430-5475
Website: www.activeearth.ca

puncture/damage. The sand layer is hydraulically connected to a perforated piping collection system (comprised of 4 inch diameter perforated schedule 40 PVC pipe, surrounded by clear crush drain rock and wrapped with geotextile) at the north side of the cell. The piping conveys any water to a 2500 gallon holding tank at the northwest corner of the cell (holding tank specs attached);

- A single panel (no field welds) of 40 mil LLDPE synthetic liner was placed over the sand layer. The liner dimensions are 35.5m x 85m. The liner was placed up the berms on the south and east sides of Cell 1. The liner was underlain by a geotextile on the berm slopes to provide protection. The required protection on the base is provided by the underlying sand leak detection blanket. The liner is sloped downward to the north at approximately 2%, towards the toe of the cell. Liner specs and manufacturer QA/QC details are attached.
- A second free-draining sand layer was placed at a minimum of 0.3m thickness overlying the synthetic base liner. This sand layer acts as a leachate collection layer and protects the liner from potential puncture/damage. The sand layer is hydraulically connected to a second perforated piping collection system at the north side of the cell. The leachate collection piping conveys any water to a second 2500 gallon holding tank at the northwest corner of the cell.
- Soil to be encapsulated in Cell 1, will be placed directly upon the second sand layer. A minimum of 0.3m of sand or a geotextile will be placed over the 40 mil liner on the berm slopes as filling progresses.

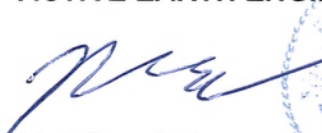
The following documents are attached to this report:

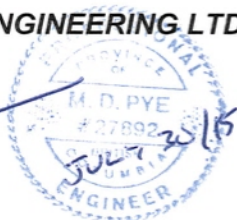
- Photographs of key construction details;
- Active Earth Figures 1 and 2 showing the as-built information for Encapsulation Cell 1;
- Western Tank & Lining Ltd. specifications and QA/QC for 40 mil liner;
- Premier Plastics specifications for 2500 gallon holding tanks;
- Levelton Field Review Report dated April 16, 2014 pertaining to the stability of the rock slopes adjacent to Encapsulation Cell 1; and
- Levelton Laboratory reports for the Grain Size analyses, Proctor tests and field density tests undertaken on the clay utilized in construction of the base liner for Encapsulation Cell 1.

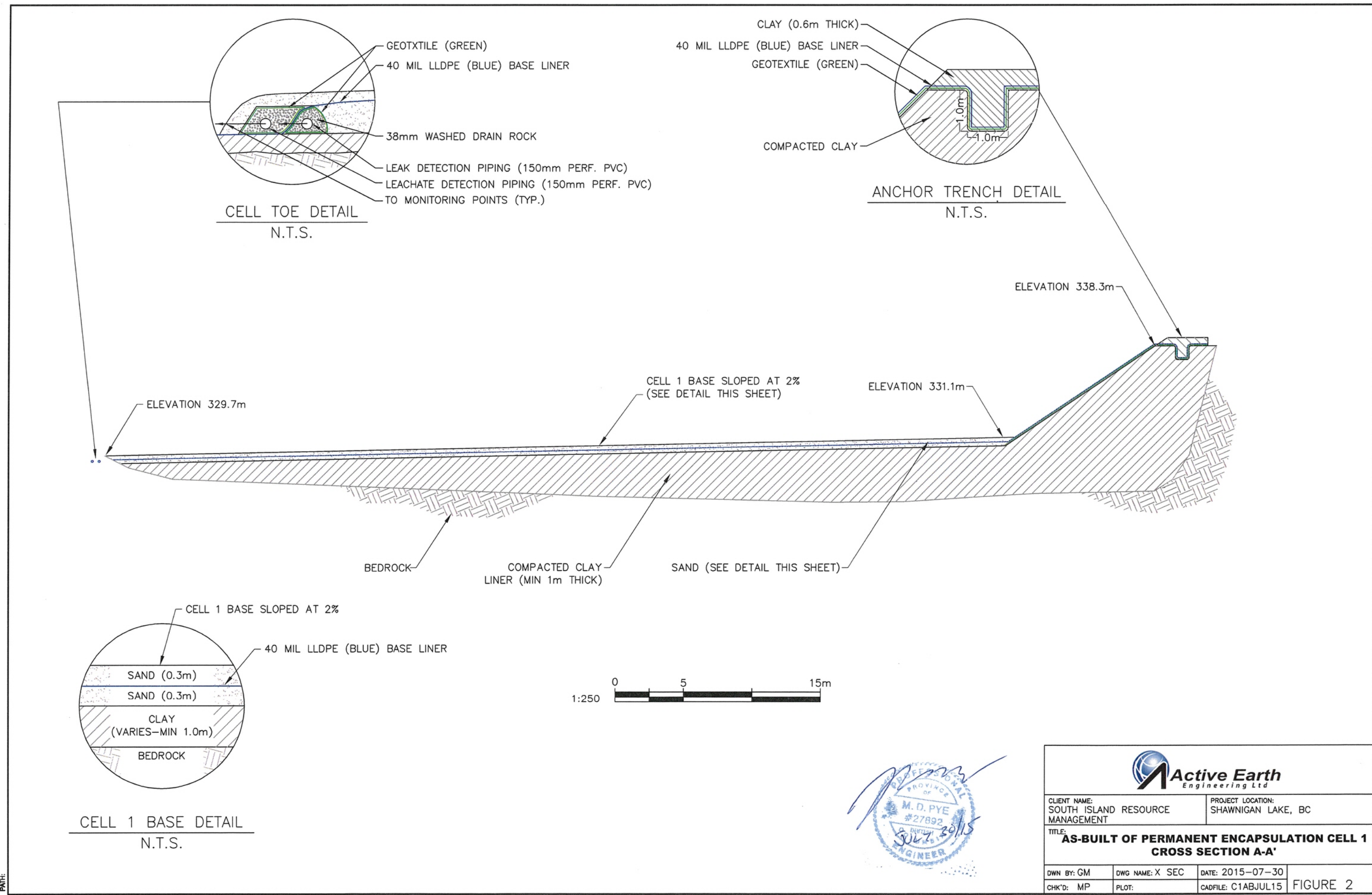
The base construction of Encapsulation Cell 1 is in accordance with the requirements of both the MEM (Q-9-094) and MOE (PR-105809) permits.

Yours truly,

ACTIVE EARTH ENGINEERING LTD.


Matt Pye, P.Eng.






 Active Earth Engineering Ltd			
CLIENT NAME: SOUTH ISLAND RESOURCE MANAGEMENT		PROJECT LOCATION: SHAWNIGAN LAKE, BC	
TITLE: AS-BUILT OF PERMANENT ENCAPSULATION CELL 1 CROSS SECTION A-A'			
DWN BY: GM	DWG NAME: X SEC	DATE: 2015-07-30	FIGURE 2
CHK'D: MP	PLOT:	CADFILE: C1ABJUL15	



Photo 1 – Looking south at clay berms



Photo 2 – Base sand surface being prepared for liner deployment



Photo 3 – Base sand surface being prepared for liner deployment



Photo 4 – Liner deployment



Photo 5 – Placement of Leachate Collection Sand Drainage Blanket



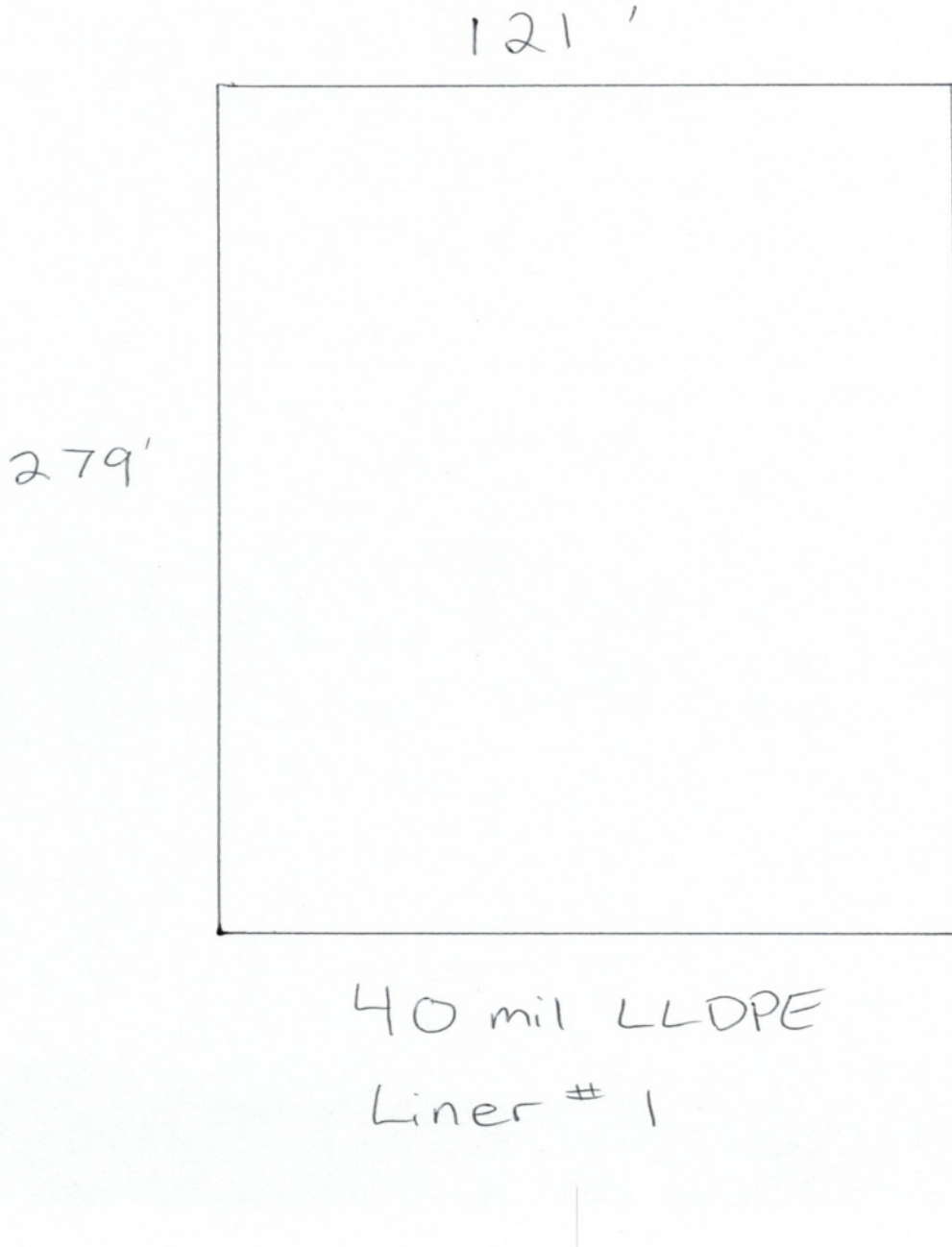
Photo 6 – Looking East at completed Cell 1 berm



Photo 7 – Leak Detection and Leachate Collection Tanks



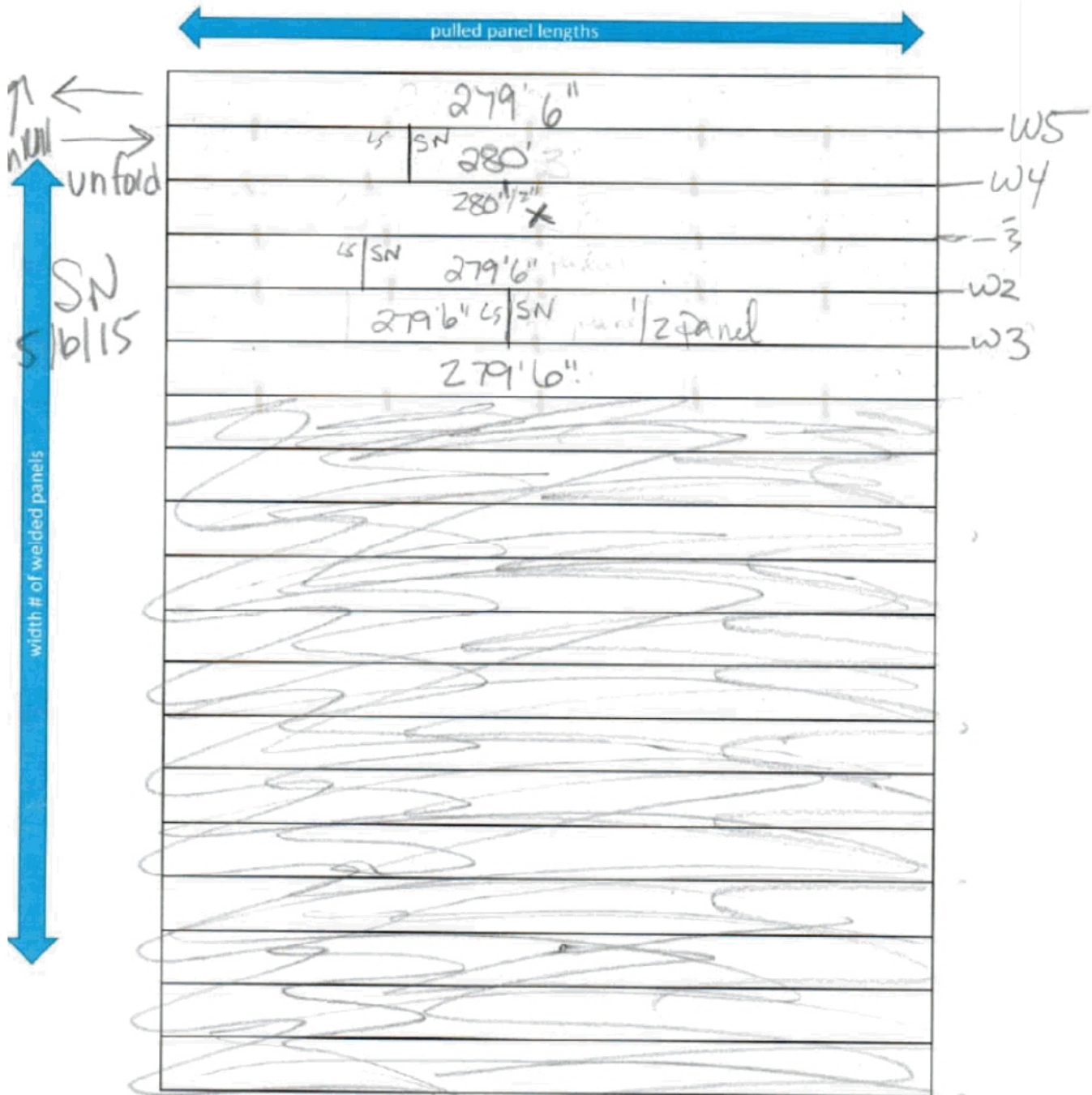
Photo 8 – Leak Detection and Leachate Collection Piping Systems



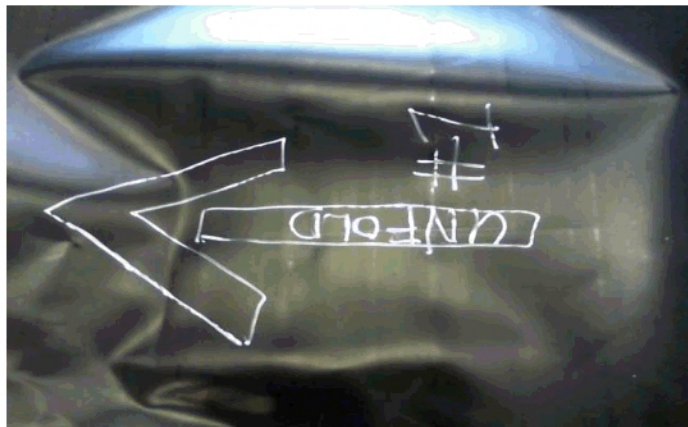
W/O L15-042276 Size 279'x121' Material 40m LLDPE

Customer Western Tank CP-99-m Liner Number #1

Material Width 22.3 Panel count 5.5 panels



#1



Liner Quality Control Audit

1

Inspector	s.22	Crew	s.22	DAY CREW	Date	06/05/2015
Work Order #	L15-042276	Size / Style	Length	Width	Style	
			279	121	RECTANGLE LINER	
PO#	CP-99-M	Customer	Allterra Construction		Liner #	#1

Width Calculator (enter for size ordered)								
Liner Length (feet)	Liner width (Feet)	Roll Width (Inches)	Weld Width overlap (Inches)	Calculated Panels Needed	Even Panel no. (rounded up)	Total Width of Even Panels (Feet)	Actual add/subtract	Actual Panel Count
279	121	267	6	5.563218	6	131	-11'	5.5
1st panel length verification size/persons					Finished Length		Actual Width	
280' 1/2" SN					279.5		120.125	
Stepped Panel lengths					N/A			
Step inset					N/A			
Secondary measurements (cut welds) NO CUT WELD, 1 EXTRUSION WELD AT W1, 2 EXTRUSION WELDS AT W2, 1 EXTRUSION WELD AT W3, W4 AND W5								
5 PANELS AT 22.3' AND 1 PANELS PULLED 142'X22.3' THEN CUT IN HALF TO MAKE A PANEL 279' 6" X11' 1.5"								
TEAR BACK TEST PERFORMED 20' FROM BEGINNING, MID CENTER, CENTER, MID CENTER, 20' FROM END								
Special Instructions					MARKED CENTER WITH X, DEPLOYMENT ARROW, MARKED #1			
Material			Solmax 40 mil LLDPE 140-7000/K7104			Color Out		
			BLACK					
Rolling					Folding			
Standard Roll					Standard Fan			
Standard Roll with Webbing					Butterfly Fold			
Scroll Rolled center mark W/Webbing					Fan Fold to center 2" web markers			
Core Type Used:					Other:			
Metal					Cardboard			
Other								
(Standard = mil, size, unroll and unfold arrow)								
Standard Information Written on Item					Other:			
X					MARKED #1			
Packing Wrap/ Color :					Other:			
Standard Liner					1.5X FELT, LLDPE, 5X 12 MIL B GRADE			
Standard Package Labeling					Other:			
X					ITL AND WTL LABELS			

Notes

Wedge/Extrusion Trial

1



12180 Vickers Way
Richmond BC V6V-1H9

Office 604.241.9487 Fax 604.241.9485

Toll-Free 1.800.551.4355

Customer: Allterra Construction PO # CP-99-M

Production Date: 05/05/2015 Time: 4:45PM

QA Test Person: s.22 W./O. L15-042276

Welding Tech: s.22 Crew: s.22

Welder Qualification For Liners: #1 Time Ending:

	Length	Width	Style
Material Type: Solmax 40 mil LLDPE 140-7000/K7104 Liner Size:	279	121	RECTANGLE LINER

Welder Number:	D4	Outside Temp:	61
Welder Set Temp:	840	Inside Temp:	60
Welder Set Speed:	899 Timed FPM 16	Sheet Temp:	61
Extrusion Rod:	N/A	Welder Set up with bar Y/N	N

Peel Data

	Inside (Lbs)	Outside (Lbs)	Failure Type	Seperation (%)	Comments
1	68	65	SE1	0	PASS
2	65	64	SE1	0	PASS
3	67	65	SE1	0	PASS
4	65	62	SE1	0	PASS
5	68	65	SE1	0	PASS

Shear Data

	Shear (Lbs)	Elongation (%)	Comments
1	73	200+%	PASS/STE
2	71	200+%	PASS/STE
3			
4			
5			

Notes:

STE = sample stretch to end of test

SE1 = sample break in outer edge of seam

SE2= break at seam edge top sheet (extrusion shear only)

SE3= break at seam edge in bottom sheet (extrusion peel only)

Wedge/Extrusion Trial

2



12180 Vickers Way
Richmond BC V6V-1H9

Office 604.241.9487 Fax 604.241.9485

Toll-Free 1.800.551.4355

Customer: Allterra Construction PO # CP-99-M

Production Date: 06/05/2015 Time: 5:30AM

QA Test Person: s.22 W./O. L15-042276

Welding Tech: s.22 Crew: s.22

Welder Qualification For Liners: #1 Time Ending:

Material Type: Solmax 40 mil LLDPE 140-7000/K7104 Liner Size: Length 279 Width 121 Style RECTANGLE LINER

Welder Number: D4
Welder Set Temp: 860
Welder Set Speed: 999 Timed FPM 17
Extrusion Rod: N/A

Outside Temp: 42
Inside Temp: 50
Sheet Temp: 42
Welder Set up with bar Y/N N

Peel Data

	Inside (Lbs)	Outside (Lbs)	Failure Type	Seperation (%)	Comments
1	69	71	SE1	0	PASS
2	69	70	SE1	0	PASS
3	69	69	SE1	0	PASS
4	68	69	SE1	0	PASS
5	66	69	SE1	0	PASS

Shear Data

	Shear (Lbs)	Elongation (%)	Comments
1	71	200+%	PASS/STE
2	70	200+%	PASS/STE
3			
4			
5			

Notes:

STE = sample stretch to end of test

SE1 = sample break in outer edge of seam

SE2= break at seam edge top sheet (extrusion shear only)

SE3= break at seam edge in bottom sheet (extrusion peel only)

Wedge/Extrusion Trial

3



12180 Vickers Way
Richmond BC V6V-1H9

Office 604.241.9487 Fax 604.241.9485

Toll-Free 1.800.551.4355

Customer: Allterra Construction PO # CP-99-M

Production Date: 06/05/2015 Time: 5:45AM

QA Test Person: s.22 W./O. L15-042276

Welding Tech: s.22 Crew: s.22

Welder Qualification For Liners: #1 Time Ending:

Material Type:	Solmax 40 mil LLDPE 140-7000/K7104	Liner Size:	Length	Width	Style
			279	121	RECTANGLE LINER

Welder Number: EXTRUSION
Welder Set Temp: 400PREHEAT/440 PLASTIC HEAT
Welder Set Speed: HAND Timed FPM N/A
Extrusion Rod: SOLMAX LL

Outside Temp: 42
Inside Temp: 50
Sheet Temp: 42
Welder Set up with bar Y/N N/A

Peel Data

	Inside (Lbs)	Outside (Lbs)	Failure Type	Seperation (%)	Comments
1	73	X	SE3	0	PASS
2	68	X	SE3	0	PASS
3	72	X	SE3	0	PASS
4	68	X	SE3	0	PASS
5	68	X	SE3	0	PASS

Shear Data

	Shear (Lbs)	Elongation (%)	Comments
1	75	200+%	PASS/STE
2	73	200+%	PASS/STE
3	75	200+%	PASS/STE
4	72	200+%	PASS/STE
5	73	200+%	PASS/STE

Notes:

STE = sample stretch to end of test

SE1 = sample break in outer edge of seam

SE2= break at seam edge top sheet (extrusion shear only)

SE3= break at seam edge in bottom sheet (extrusion peel only)

Seam End Coupon Log



12180 Vickers Way
Richmond Bc V6V-1H9
Office 604.241.9487 Fax 604.241.9485
Toll-Free 1.800.551.4355

Customer:	Allterra Construction		PO#	CP-99-M	
Production Date:	05/05/2015		Shift:	DAY	
<i>Welder Settings</i>					
Welder #	D4	Operator	s.22	Temp/Speed	860/999
<i>Timed welder speed</i>					
Distance in feet	34	Timed Sec.	122	Feet per min.	17
QA Test Person:	s.22		W./O.	L15-042276	
Material Type:	Solmax 40 mil LLDPE 140-7000/K7104				
<i>Length Width Style</i>					
Liner Size:	279	121	RECTANGLE LINER	Liner #	#1

Seam Number	Test # P# / S#	Inside (Lbs)	Outside (Lbs)	Failure Type	Seperation (%)	Shear (Lbs)	Elongation (%)	Comments
W1	P1/S1	71	72	SE1	0	77	200+	PASS/STE
W1	P2/S2	72	69	SE1	0	72	200+	PASS/STE
W2	P1/S1	69	68	SE1	0	75	200+	PASS/STE
W2	P2/S2	65	69	SE1	0	72	200+	PASS/STE
W3	P1/S1	70	70	SE1	0	75	200+	PASS/STE
W3	P2/S2	67	66	SE1	0	74	200+	PASS/STE
W4	P1/S1	67	70	SE1	0	74	200+	PASS/STE
W4	P2/S2	65	63	SE1	0	69	200+	PASS/STE
W5	P1/S1	68	67	SE1	0	72	200+	PASS/STE
W5	P2/S2	66	69	SE1	0	73	200+	PASS/STE

Notes: 1 EXTRUSION WELD AT W1, 2 EXTRUSION WELDS AT W2, 1 EXTRUSION WELD AT W3, W4 AND W5

STE = sample stretch to end of test

SE1 = sample break in outer edge of seam

Tear Back Testing Performed on each weld:

5



12180 Vickers Way
Richmond BC V6V-1H9

Office 604.241.9487 Fax 604.241.9485

Toll-Free 1.800.551.4355

ASTM D 5199 MATERIAL THICKNESS LLDPE

Date MFG date	Mil Mfg	Roll ID #	Roll Width	sample area	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	Avg.	QA
5/5/2015 9/14/2014	Solmax 40 mil LLDPE 140- 7000/K7104	5-13692	22.3	PARTIAL	37.7	37.5	37.2	37.2	37.2	37.9	37.4	37.2	37.9	37.4	37.46	5.77
5/6/2015 3/13/2015	Solmax 40 mil LLDPE 140- 7000/K7104	5-13669	22.3	BEGIN	36	36.7	37	37.6	37.4	40.5	37.3	36.7	38.1	38.1	37.54	5.77
5/6/2015 3/14/2015	Solmax 40 mil LLDPE 140- 7000/K7104	5-13691	22.3	BEGIN	35.7	38.6	38.7	38.7	39.2	39.9	39.7	39.8	39.1	37.3	38.67	5.77



SOLMAX

LIST OF GEOMEMBRANE ROLLS

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
 Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

Project Name : Abbotsford, BC

Project Number : CP-SML15-4



Reference Number : 108071

Packing Slip Number : 216764

Roll Number	Product Code	Resin Lot Number	Manufactured Date	Resin Melt Index 190/2.16 g/10 min D1238	Resin Density g/cc D1505	OIT Spec Result min D3895	HPOIT Spec Result min D5885	ESCR SP-NCTL Spec Roll Tested hours D5397
5-13668	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13669	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13670	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13671	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13672	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13673	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13674	Solmax 140-7000	CFB810520	13-Mar-15	0.36	0.919	100 > 120		N/A
5-13680	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13681	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13684	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13687	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13688	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13689	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13690	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13691	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A
5-13692	Solmax 140-7000	CFB810520	14-Mar-15	0.36	0.919	100 > 120		N/A

Quantity (rolls) :

16

Project Name : Abbotsford, BC

Project Number : CP-SML15-4

Reference Number : 108071

Packing Slip Number : 216764



Product : Solmax 140-7000

Properties	Unit	Thickness average	Geo- membrane Density	Carbon Black Content	Carbon Black Dispersion	Tensile				Tear Resist.	Puncture Resist.	Dimension. Stability	Asperity Height in / out
						Yield	Elong.	Strength	Break				
						Strength	Elong.	Strength	Elong.				
						kN/m	%	kN/m	%				
Test Method		mm	g/cc	%	Cat. 1 and 2	D6693				N	N	%	mm
Frequency		D5199	D1505/D792	D4218 / D1603	D5596	1/5 ro				D1004	D4833	D1204	
Specification		Each roll	1/Lot	1/2 ro	1/10 ro					1/10 ro	1/10 ro	Cert	N/A
		0.90	≤ 0.939	2.0 - 3.0	Cat. 1 / Cat. 2			31.5	1000	85	298	± 2	
5-13668	MD XD	0.92	0.931	2.49	10 /10 Views			34.1 34.9	1021 1152	94 104	354		/
5-13669	MD XD	0.92	0.931	2.53	10 /10 Views			34.1 34.9	1021 1152	94 104	354		/
5-13670	MD XD	0.93	0.931	2.53	10 /10 Views			34.1 34.9	1021 1152	94 104	354		/
5-13671	MD XD	0.93	0.931	2.55	10 /10 Views			34.1 34.9	1021 1152	94 104	354		/
5-13672	MD XD	0.93	0.931	2.55	10 /10 Views			37.2 34.3	1166 1163	94 104	354		/
5-13673	MD XD	0.93	0.931	2.29	10 /10 Views			37.3 34.3	1166 1163	94 104	354		/
5-13674	MD XD	0.94	0.931	2.29	10 /10 Views			37.3 34.3	1166 1163	94 104	354		/
5-13680	MD XD	0.92	0.932	2.42	10 /10 Views			36.6 33.8	1145 1156	94 102	353		/
5-13681	MD XD	0.93	0.932	2.55	10 /10 Views			36.6 33.8	1145 1156	94 102	353		/
5-13684	MD XD	0.91	0.930	2.54	10 /10 Views			33.8 34.3	1076 1121	94 102	353		/
5-13687	MD XD	0.92	0.930	2.45	10 /10 Views			36.6 35.5	1176 1165	96 102	363		/
5-13688	MD XD	0.93	0.930	2.45	10 /10 Views			36.6 35.6	1176 1165	96 102	363		/
5-13689	MD XD	0.92	0.930	2.57	10 /10 Views			36.6 35.6	1176 1165	96 102	363		/
5-13690	MD XD	0.92	0.930	2.57	10 /10 Views			36.6 35.6	1176 1165	96 102	363		/
5-13691	MD XD	0.93	0.930	2.38	10 /10 Views			36.6 35.6	1176 1165	96 102	363		/
5-13692	MD XD	0.92	0.930	2.38	10 /10 Views			35.9 33.5	1127 1143	96 102	363		/

PROPERTY	TEST METHOD	FREQUENCY ⁽¹⁾	UNIT Metric	Solmax 140-7000
SPECIFICATIONS				
Thickness (Nominal $\pm 10\%$) (11)	ASTM D-5199	Every roll	mm	1.00
Resin Density	ASTM D-1505	Certification	g/cc	< 0.926
Melt Index - 190/2.16 (max.)	ASTM D-1238	Certification	g/10 min	1.0
Sheet Density (8)	ASTM D-1505	1/Batch	g/cc	≤ 0.939
Carbon Black Content (9)	ASTM D-4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D-5596	Every 10 rolls	Category	Cat. 1 / Cat. 2
OIT - standard (avg.)	ASTM D-3895	1/Batch	min	100
Tensile Properties (min. avg) (2)	ASTM D-638	Every 5 rolls		
Strength at Break			kN/m	31.5
Elongation at Break			%	1000
2% Modulus (max.)	ASTM D-5323	Per formulation	kN/m	420
Tear Resistance (min. avg.)	ASTM D-1004	Every 10 rolls	N	85
Puncture Resistance (min. avg.)	ASTM D-4833	Every 10 rolls	N	298
Dimensional Stability	ASTM D-1204	Certification	%	± 2
Multi-Axial Tensile (min. avg.)	ASTM D-5617	Per formulation	%	90
Oven Aging - % retained after 90 days	ASTM D-5721	Per formulation		
STD OIT (min. avg.)	ASTM D-3895		%	35
HP OIT (min. avg.)	ASTM D-5885		%	60
UV Resistance - % retained after 1600 hr	GRI-GM-11	Per formulation		
HP-OIT (min. avg.)	ASTM D-5885		%	35
SUPPLY SPECIFICATIONS (Roll dimensions may vary $\pm 1\%$)				
Roll Dimension - Width	-		m	6.80
Roll Dimension - Length	-		m	237.7
Area (Surface/Roll)	-		m ²	1616.4

NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).
2. Elongation is measured with a gage length of 1.5".
8. Correlation table is available for ASTM D792 vs ASTM D1505. Both methods give the same results.
9. Correlation table is available for ASTM D1603 vs ASTM D4218. Both methods give the same results.
11. The minimum average thickness is $\pm 10\%$ of the nominal value.

* All values are nominal test results, except when specified as minimum or maximum.

* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsibility of the user. SOLMAX assumes no liability in connection with the use of this information.

**MATERIAL CONFORMITY CERTIFICATE
ISSUED BY
THE MANUFACTURER**

Varennnes, October 16th, 2014

Ref.: Stock Material
ATTN: **s.22**

To whom it may concern,

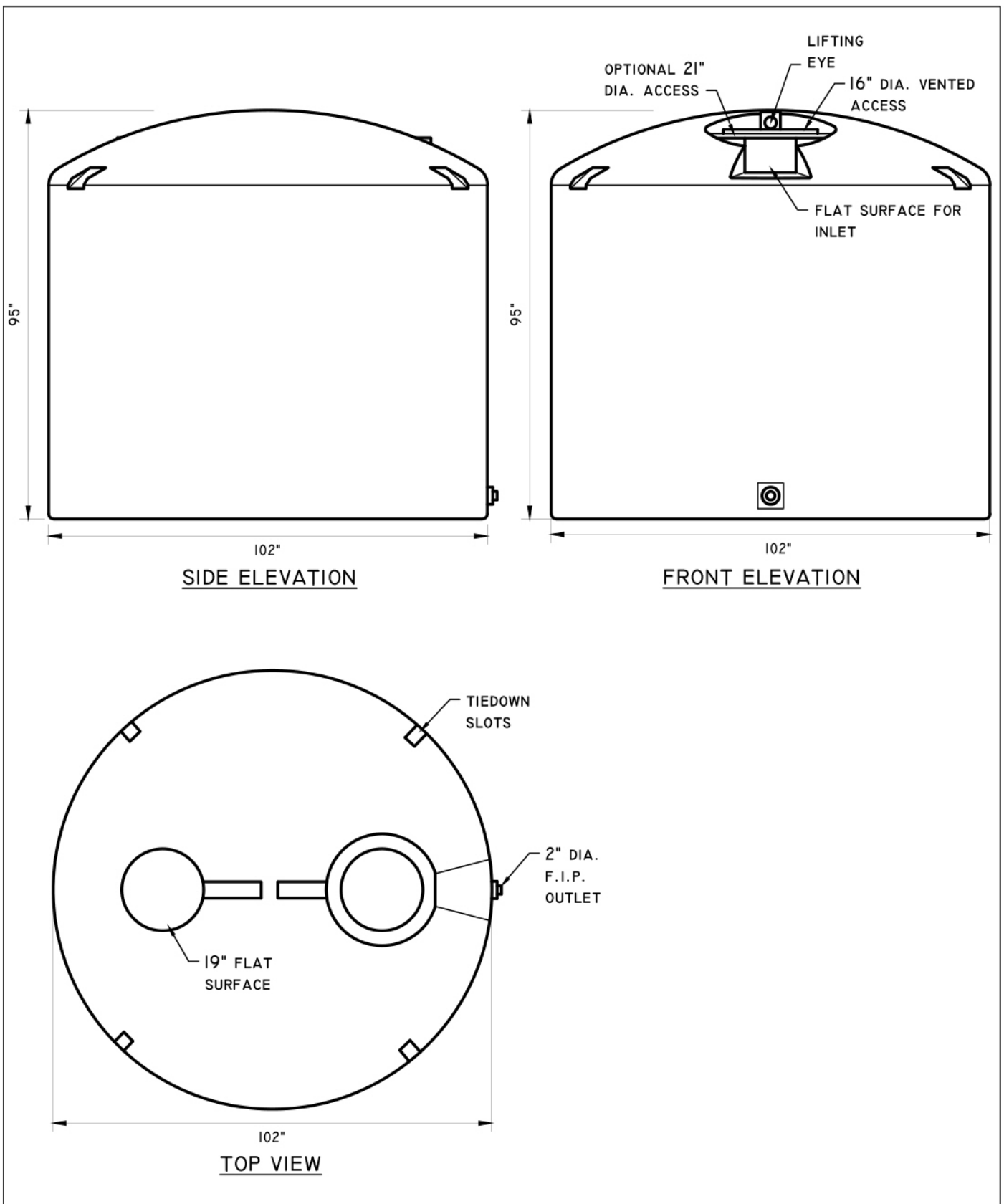
Solmax International hereby certifies that 130-2000 and 140-7000 smooth LLDPE geomembrane supplied for the above-mentioned project meets the following:

- Axi-Symmetric Break Resistance Strain (min) ASTM D5617 90 %

Hoping the above information is satisfactory. Do not hesitate to contact us if you require any additional information.

Sincerely,

Chantal Gagnon
Technical Services
Solmax International Inc.



www.premierplastics.com 1-800-661-4473

VERTICAL WATER TANK

2500 IMP. GALLON - VW2500

3000 US. GALLON - VU3000

POLYETHYLENE

DATE: AUG 2008

SCALE: NTS

DRAWN: SGM

DWG. No. VW2500

REV.



Levelton Consultants Ltd.

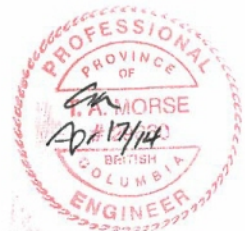
760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel: 250-475-1000
Fax: 250-475-2211
E-Mail: victoria@levelton.com

FIELD REVIEW REPORT

PROJECT: Soil Containment Cell Construction	Report No 1	In Attendance:
LOCATION: SIA Quarry – Stebbings Road, Shawnigan Lk	Date: April 16, 2014	Matt Pye
CONTRACTOR: South Island Aggregates	Project No: R714-0514	s.22
OWNER: South Island Aggregates	Time: 11:00 am	
CONTRACT REF Matt Pye – Active Earth Eng.	Weather: Drizzle/mild	

OBSERVATIONS/REMARKS/ACTIONS BY: **s.22**

- excavation for Cell #1 of the soil containment area had been carried out prior to the site visit and review of the temporary cut slopes on the west and south sides of the cell was conducted;
- compaction testing of the liner materials was also ongoing at the time of the site visit, the results of which are to be reported separately;
- the cut slopes on the west and south sides of Cell #1 are approximately 8 to 10m in height and mainly consist of intact bedrock following blasting and excavation;
- the bedrock has been scaled to removal loose particles and the remaining bedrock slope is considered stable for cell construction to be ongoing below;
- there were two areas where the crest of the slope consists of overburden, silty sand materials that have been cut steeply above the top of the intact bedrock;
- it is recommended that all soil exposures above the bedrock be sloped at a maximum 2H:1V for appropriate stability;
- following re-shaping of the soil cuts, the temporary cut slopes are considered suitable for authorized personnel to be working within the soil containment cell;
- it is recommended that the stability of the bedrock be reviewed on a semi-annual (twice a year) basis if still exposed.



LEVELTON CONSULTANTS LTD.

Distribution:

Active Earth Engineering: Matt Pye – matt.pye@activeearth.ca

Per:

PROCTOR TEST REPORT

PROJECT: Active Earth

DATE ISSUED: April 15, 2014

CLIENT: Active Earth

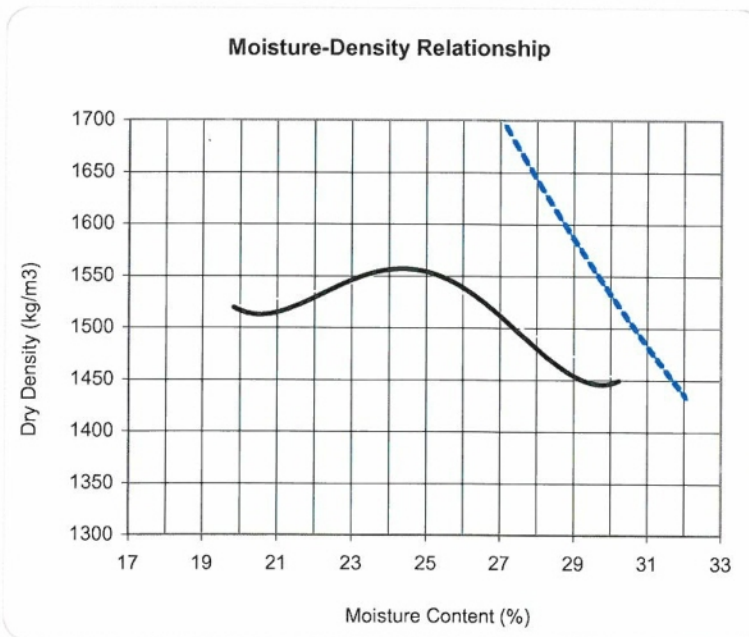
ISSUED BY: LCL-Victoria

FILE NO.: R714-0514-00

REPORT NO.: 1

Sample Information					
Material Classification: Cell Liner					
Material Description: Fine Sandy Silt					
Date sampled	April 9, 2014	Sampled by	Client	Estimated SG	2.700
Date received	April 9, 2014	Supplier	N/A	Insitu moisture	NA
Sample Source	Client site			Sample Number	1

Test Information							
Trial Number	1	2	3	4	5	Test Standard	Standard
Wet Density (kg/m ³)	1820	1886	1940	1919	1887	Test Procedure	ASTM D-698 Method C
Dry Density (kg/m ³)	1519	1539	1556	1511	1449	Date tested	April 11, 2014
Moisture Content (%)	19.8	22.6	24.7	27.0	30.2	Tested by	GG



Test Result Summary	
Oversize correction method:	ASTM 4718
Retained 19.0mm sieve:	0%
Oversize specific gravity:	2.700
Maximum Dry Density Values	
Uncorrected Value	1567 kg/m ³
Corrected Value	1567 kg/m ³
Optimum Moisture Content	
Uncorrected Value	24.5 %
Corrected Value	24.5 %

Distribution	
Active Earth - Matt Pye - matt.pye@activeearth.ca	

Per: 
LEVELTON CONSULTANTS LTD.

This report constitutes a testing service only. No engineering interpretation opinion is expressed or implied. Engineering review and interpretation can be provided on written request.

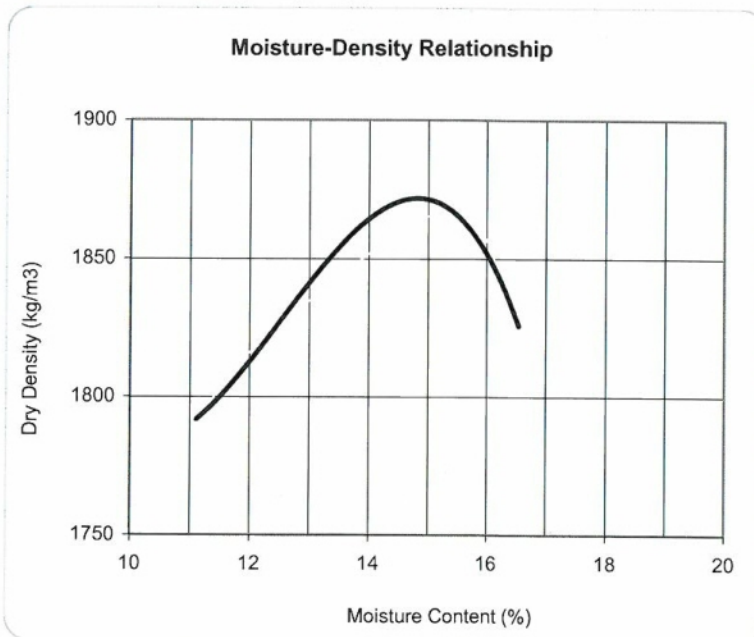
**LEVELTON CONSULTANTS LTD.**

760 Enterprise Crescent
Victoria, B.C.
Canada V8Z 6R4
Tel : (250) 475- 1000
Fax: (250) 475 - 2211
E-mail: victoria@levelton.com

PROCTOR TEST REPORT**PROJECT:** Active Earth**DATE ISSUED:** April 16, 2014**CLIENT:** Active Earth**ISSUED BY:** LCL-Victoria**FILE NO.:** R714-0514-00**REPORT NO.:** 2

Sample Information					
Material Classification: Cell Liner					
Material Description: Return haul clay with gravel					
Date sampled	April 9, 2014	Sampled by	Client	Estimated SG	2.650
Date received	April 9, 2014	Supplier	N/A	Insitu moisture	NA
Sample Source	Client site			Sample Number	2

Test Information							
Trial Number	1	2	3	4	5	Test Standard	Standard
Wet Density (kg/m ³)	1991	2048	2155	2128		Test Procedure	ASTM D-698 Method C
Dry Density (kg/m ³)	1792	1823	1868	1826		Date tested	April 14, 2014
Moisture Content (%)	11.1	12.4	15.4	16.6		Tested by	GG



Test Result Summary	
Oversize correction method:	ASTM 4718
Retained 19.0mm sieve:	9%
Oversize specific gravity:	2.700
Maximum Dry Density Values	
Uncorrected Value	1872 kg/m ³
Corrected Value	1923 kg/m ³
Optimum Moisture Content	
Uncorrected Value	14.8 %
Corrected Value	13.6 %

Distribution
Active Earth - Matt Pye - matt.pye@activeearth.ca

Per: 
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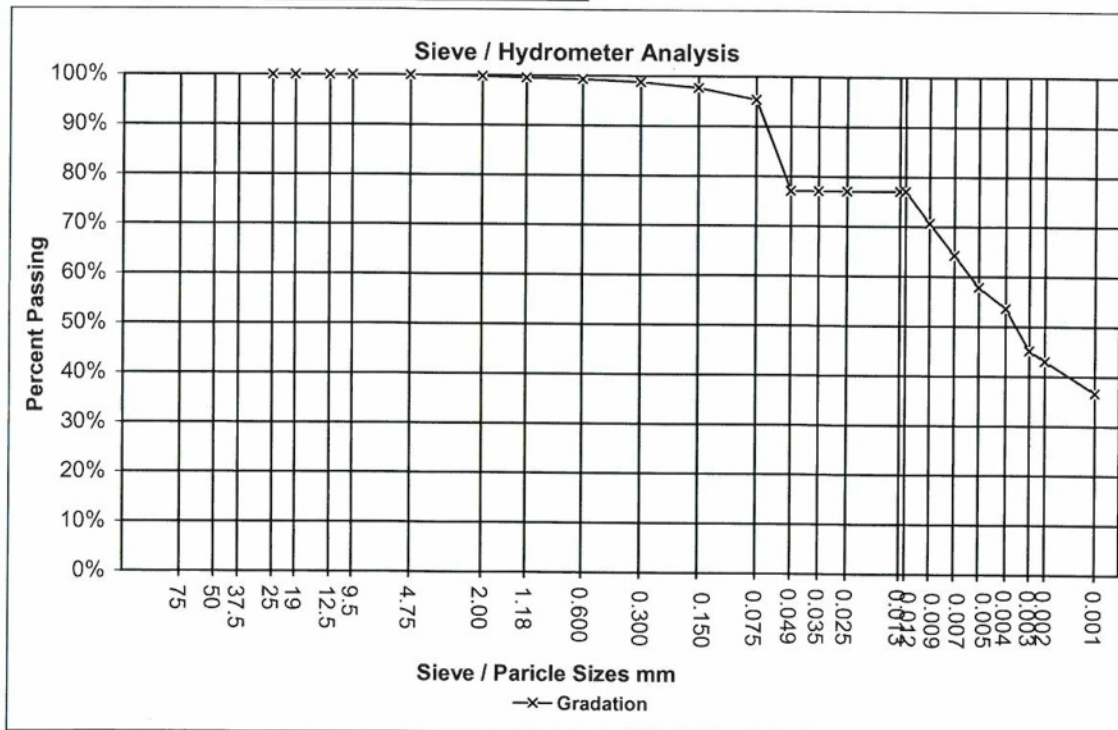
Grain Size Analysis (Hydrometer)

Client: Active Earth Engineering Ltd
Project Name: Laboratory Testing
Site Location: SIA
Sample Source: N/A
Comments: Silty Fine Sand with Clay

Job No. R714-0514-00
Lab No. 3801 A
Date Tested: April 14, 2014
Date Sampled: N/A
Sampled By: Client
Tested By: IS

Sieve Analysis		Hydrometer Analysis	
Sieve Sizes mm	Percent Passing	Particle Sizes mm	Percent Passing
75			
50			
37.5		0.049	77%
25	100%	0.035	77%
19	100%	0.025	77%
12.5	100%	0.013	77%
9.5	100%	0.012	77%
4.75	100%	0.009	71%
2.00	100%	0.007	64%
1.18	100%	0.005	58%
0.600	99%	0.004	54%
0.300	99%	0.003	45%
0.150	98%	0.002	43%
0.075	95%	0.001	37%

Cobble Sizes: 200 mm to 60 mm
Gravel Sizes: 60 mm to 2.0 mm
Sand Sizes: 2.0 mm to 0.06 mm
Silt Sizes: 0.06 mm to 0.002 mm
Clay Sizes: Smaller Than 0.002 mm



REMARKS: Tested in accordance with ASTM D-422

REPORTS TO: Active Earth Engineering Ltd.: Matt Pye

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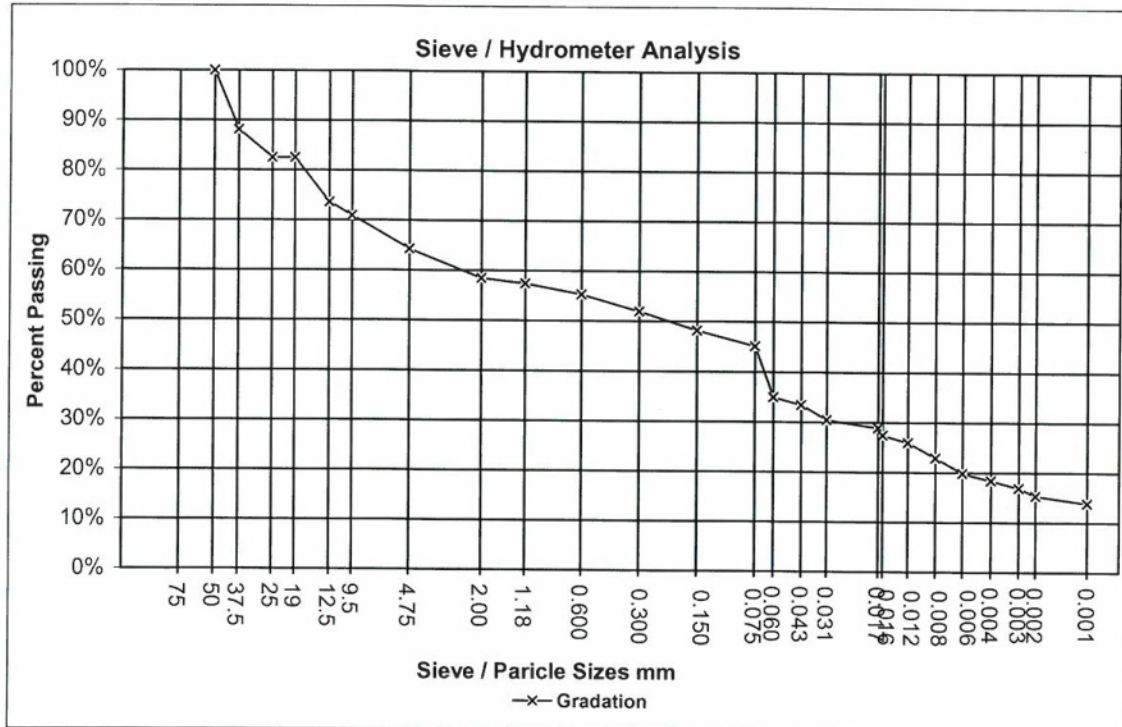
Grain Size Analysis (Hydrometer)

Client: Active Earth Engineering Ltd
Project Name: Laboratory Testing
Site Location: SIA
Sample Source: Omicron
Comments: Return haul silty Clay with sand and gravel.

Job No. R714-0514-00
Lab No. 3801 B
Date Tested: April 14, 2014
Date Sampled: N/A
Sampled By: Client
Tested By: IS

Sieve Analysis		Hydrometer Analysis	
Sieve Sizes mm	Percent Passing	Particle Sizes mm	Percent Passing
75			
50	100%		
37.5	88%	0.060	35%
25	83%	0.043	33%
19	83%	0.031	30%
12.5	74%	0.017	29%
9.5	71%	0.016	27%
4.75	64%	0.012	26%
2.00	58%	0.008	23%
1.18	57%	0.006	20%
0.600	55%	0.004	18%
0.300	52%	0.003	17%
0.150	48%	0.002	15%
0.075	45%	0.001	14%

Cobble Sizes: 200 mm to 60 mm
Gravel Sizes: 60 mm to 2.0 mm
Sand Sizes: 2.0 mm to 0.06 mm
Silt Sizes: 0.06 mm to 0.002 mm
Clay Sizes: Smaller Than 0.002 mm



REMARKS: Tested in accordance with ASTM D-422
REPORTS TO: Active Earth Engineering Ltd.: Matt Pye

LEVELTON CONSULTANTS LTD.


PER:

**Levelton Consultants Ltd.**760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4Tel. (250) 475-1000
Fax. (250) 475-2211
E-mail: victoria@levelton.com
www.levelton.com**SOIL FIELD DENSITY TEST RESULTS**PROJECT: **Materials Testing - SIA**
CLIENT: **Active Earth Engineering Ltd.**
MATERIAL CLASSIFICATION: **Cell Liner (Return Haul Clay with Gravel)**FILE No.: **R714-0514-00**
REPORT No.: **1**DATE: **April 16, 2014**
TECHNICIAN: **AM**PROCTOR: **Standard**
MAXIMUM DENSITY: **1872 kg/m³**REQUIRED % PROCTOR: **95 %**
OPTIMUM MOISTURE: **14.8 %**DENSITY EQUIPMENT USED: **Nuclear Densometer**
ASTM: **D-6938**

TEST No.	DATE TESTED	LOCATION Pit East of Crusher	PROBE DEPTH (mm)	IPD WET (kg/m ³)	W%	CORR. PROCTOR (kg/m ³)	IPD DRY (kg/m ³)	% PROCTOR	REMARKS
1	April 16	60 m South from East inside corner of rock face	300	2049	13.7	1923	1802	94	Tests #2 & #4 Corrected
2		15 m South of location #1	300	2160	9.6	2028	1970	97	For 25% oversize
3		20 m West of location #2	300	2063	10.8	1923	1861	97	Tests #1 & #3 Corrected
4		20 m West of location #3	300	2303	12.1	2028	2055	>100	For 9% oversize

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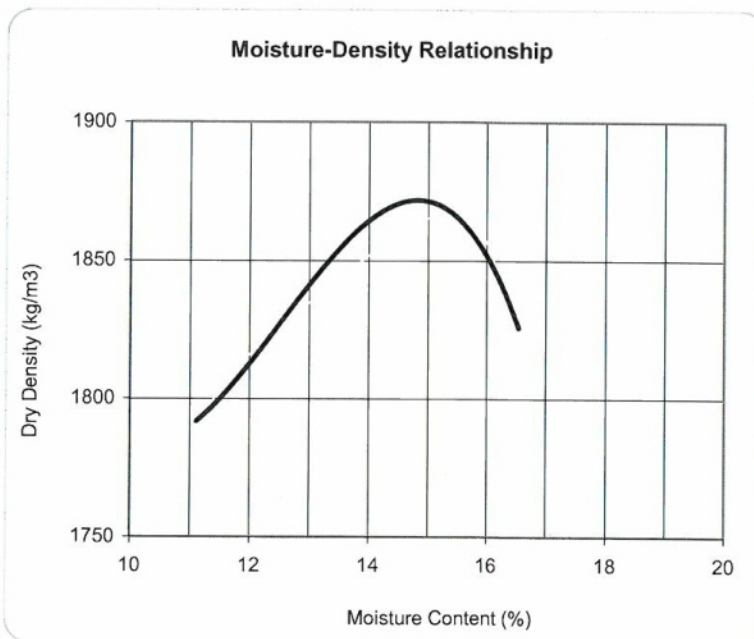
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PROCTOR TEST REPORT**PROJECT:** Active Earth**DATE ISSUED:** April 16, 2014**CLIENT:** Active Earth**ISSUED BY:** LCL-Victoria**FILE NO.:** R714-0514-00**REPORT NO.:** 2

Sample Information					
Material Classification: Cell Liner					
Material Description: Return haul clay with gravel					
Date sampled	April 9, 2014	Sampled by	Client	Estimated SG	2.650
Date received	April 9, 2014	Supplier	N/A	Insitu moisture	NA
Sample Source	Client site			Sample Number	2

Test Information							
Trial Number	1	2	3	4	5	Test Standard	Standard
Wet Density (kg/m ³)	1991	2048	2155	2128		Test Procedure	ASTM D-698 Method C
Dry Density (kg/m ³)	1792	1823	1868	1826		Date tested	April 14, 2014
Moisture Content (%)	11.1	12.4	15.4	16.6		Tested by	GG



Test Result Summary	
Oversize correction method:	ASTM 4718
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Maximum Dry Density Values	
Uncorrected Value	1872 kg/m ³
Corrected Value	1923 kg/m ³
Optimum Moisture Content	
Uncorrected Value	14.8 %
Corrected Value	13.6 %

Distribution	
Active Earth - Matt Pye - matt.pye@activeearth.ca	

Per: 
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SOIL FIELD DENSITY TEST RESULTS

PROJECT: **Materials Testing – SIA – Cell #1**

CLIENT: **Active Earth Engineering Ltd.**

MATERIAL CLASSIFICATION: **50/50 Mixture of fine sandy silt & silty clay**

FILE No.: **R714-0514-00**

REPORT No.: **3**

DATE: **May 14, 2014**

TECHNICIAN: **GJP**

PROCTOR: **Standard**

MAXIMUM DENSITY: **1745 kg/m³**

REQUIRED % PROCTOR: **95 %**

OPTIMUM MOISTURE: **19.7 %**

DENSITY EQUIPMENT USED: **Nuclear Densometer**

ASTM: **D-6938**

TEST NO.	DATE TESTED	LOCATION Base clay – 1 m fill depth	PROBE DEPTH (mm)	IPD WET (kg/m ³)	W%	CORR. PROCTOR (kg/m ³)	IPD DRY (kg/m ³)	% PROCTOR	REMARKS
1	May 14	SE Corner	150	1987		1745	1715	98	
2		15 m North of #1	150	1901	17.2		1622	93	
3		30 m North of #1	150	1949	18.7		1642	94	
4		45 m North of #1	150	1996	17.3		1702	98	
5		12 m North & 8 m West of #4	150	1935	16.8		1656	95	
6		15 m South of #5	150	1909	16.6		1638	94	
7		30 m South of #6	150	1990	19.5		1666	96	
8		47 m South of #7	150	2013	19.1		1690	97	
9		8 m West & 4 m South of #8	150	2095	15.2		1819	>100	
10		15 m North of #9	150	1850	16.4		1589	91	
11		30 m North of #9	150	1946	17.5		1657	95	
12			150	1968	17.4		1677	96	

NOTES: **s.22** (SIA) operator advised that running rubber tired equipment over the clay fill will increase % compaction.

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Metcalfe, Megan MEM:EX

From: Matt Pye <matt.pye@activeearth.ca>
Sent: Monday, August 31, 2015 2:45 PM
To: Hoffman, Al MEM:EX; Downie, AJ ENV:EX; Dunkley, Jim R MEM:EX; Hunse, Laura A ENV:EX
Cc: s.22
Subject: Cell 1 As-Built Addendum - Clarification and QA/QC Summary
Attachments: Cell1_QAQC Addendum_Q-8-094.pdf

Please find the attached addendum for Encapsulation Cell 1. Feel free to call me at the number below if you have any questions or require further clarifications.

Regards,

Matt Pye, P.Eng.
Principal, Senior Hydrogeologist
Active Earth Engineering Ltd.
105-4343 Tyndall Ave, Victoria, BC V8N 3R9
250-686-9850



August 28, 2015

BC Ministry of Energy and Mines
1810 Blanshard Street
Victoria, BC V8W 9N3

and

BC Ministry of Environment
2080A Labieux Road
Nanaimo, BC V9T 6J9

ATTENTION: Al Hoffman, P.Eng. – Chief Inspector
AJ Downie – Director, Authorizations - South

REFERENCE: **Addendum Number 1 – Clarifications and QA/QC Summary**
As-Built Report - Encapsulation Cell 1
MOE Permit PR-105809 and MEM Permit Q-8-094
640 Stebbings Road, Shawnigan Lake, BC

Active Earth Engineering Ltd. (Active Earth) has prepared this Addendum to our previously issued As-Built report for Encapsulation Cell 1, dated July 29, 2015. This letter has been prepared at the request of the Ministry of Energy and Mines (MEM) to provide specific clarifications in order to confirm compliance with MEM Permit Q-8-094, and the Ministry of Environment (MOE) Permit PR-105809 (the "Permits").

As this is an Addendum, information contained within the original report will not be reproduced nor summarized herein. The information provided below is in addition to the information in the July 29, 2015 As-Built report, and there are no corrections required to the information in that report.

The following bullets address the requested clarifications:

- Encapsulation Cell 1 was constructed in general conformance with the design and specifications provided in the Permits and supporting documents including the Technical Assessment Report and the Environmental Procedures Manual, and this construction meets the standards required by the Mines Permit Q-8-094 and Ministry of Environment Permit PR-105809.
- Appropriate Quality Assurance/Quality Control (QA/QC) was carried out during the construction of Encapsulation Cell 1. The details of the QA/QC, including a summary of the liner installation, materials testing and compaction information are provided in the As-

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Built report. The QA/QC measures employed during construction of the base liner system included:

- Bedrock integrity assessment as described in the October 10, 2013 report;
- Grain size distribution analysis to determine appropriate clay content for the base liner;
- Proctor testing of clay sources and field density testing to confirm appropriate compaction of the base liner;
- Visual inspection, hand measurement and survey to confirm appropriate thickness and slope of the base liner;
- Inspection and approval of sand used for leak detection and leachate collection blankets to confirm free-draining properties and appropriateness for liner protection;
- Direction for liner installation procedures and visual inspection of deployed liner for any potential damage;
- Review of supplier (Western Tank and Lining) factory QA/QC report that documents liner integrity testing;
- No field welds were utilized for Encapsulation Cell 1 liner; and,
- Leak detection and leachate collection piping systems were visually inspected during construction.

In summary, the base construction of Encapsulation Cell 1 is in accordance with the requirements of both the MEM (Q-9-094) and MOE (PR-105809) permits.

Yours truly,

ACTIVE EARTH ENGINEERING LTD.


Matt Pye, P.Eng.

