PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

QUARRY PERMIT

APPROVING WORK SYSTEM AND RECLAMATION PROGRAM

(Issued pursuant to Section 10 of the **Mines Act** R.S.B.C. 1996, C.293)

Permit: **Q-8-094** Mine No.: **1610355**

Issued to: **South Island Aggregates Ltd**
497 A Garbally Road
Victoria BC V8T 2J9

For work located at the following property: **South Island Aggregates Quarry**

Lot 23, Blocks 156, 201 and 323, Malahat District, Plan VIP78459

This approval and permit is subject to the appended conditions.

Issued this 4th day October in the year 2006
Amended this 20th day of April, in the year 2009
Amended this 17th day of July in the year 2015

Al. Hoffman. P. Eng
Chief Inspector

INTRODUCTION

This amendment issued July 17, 2015, replaces all previous permits and subsequent amendments. It incorporates conditions established through previous amendments and, as a result of the meeting with the Chief Inspector of Mines following discussions related to hours of work. In addition, it includes conditions established by the Senior Inspector of Mines to address concerns associated with the operation of this quarry.

This amendment issued July 17, 2015 includes the change of end land use and includes the conditions necessary to construct and operated the Waste Cells in accordance with, and in addition to, the Ministry of Environment Permit "PR-105809". This amendment includes conditions as required by the ruling of the Environmental Appeal Board Decision Nos. 2013-EMA-15(b) and 2013-EMA-019(c)

PREAMBLE

Notice of intention to commence work on a quarry, including a plan of the proposed work system and a program for the protection and reclamation of the surface of the land and watercourses affected by the work dated August 23, 2006, was filed with the Inspector on August 23, 2006. Notice of such filing was published in The Pictorial on September 3, 2006, and in the BC Gazette on September 7, 2006.

This permit contains the requirements of the Ministry of Energy and Mines for reclamation. It is also compatible, to the extent possible, with the requirements of other provincial ministries for reclamation issues. The amount of security required by this permit, and the manner in which this security may be applied, will also reflect the requirements of those ministries. Nothing in this permit, however, limits the authority of other provincial ministries to set other conditions, or to act independently, under their respective permits and legislation.

This amendment references and includes terms of the following Reports:

1. Active Earth Engineering (AEEL) "Technical Assessment for Authorization to Discharge Waste", August 2012.
2. Active Earth Engineering, "Geotechnical Assessment", October 24, 2013.
3. Levelton Consultants Ltd "South Island Aggregates Stebbings Road Quarry", October 2012.
4. BC Geological Survey "Bedrock Geology of the South Island Aggregates Stebbings Road Quarry" October 28, 2013.
5. Active Earth Engineering, "Summary of Core Drilling and Testing Results", October 2013.

6. Active Earth Engineering “Environmental Procedures Manual for Waste Discharge Permit PR-105809", October 28, 2013.
7. Leveloton Consultants Ltd follow-up memo “South Island Aggregates Containment Area-640 Stebbings Road, Shawnigan Lake, BC”, November 13, 2013.

Unless modified by Permit Q-8-094, or the Ministry of Environment Permit PR-105809, all terms of the referenced report form a part of this permit. Should there be a conflict between this permit and the Ministry of Environment (MOE) permit related to requirements under the terms of the MOE permit related to environmental protection, the terms of the MOE permit shall take precedence.

Decisions made by staff of the Ministry of Energy and Mines will be made in consultation with other ministries.

CONDITIONS

The Chief Inspector of Mines (Chief Inspector) hereby approves the work plan and the program for protection and reclamation of the land surface and watercourses subject to compliance with the following conditions: Unless modified by this amended permit all conditions within the original Notice of Work, dated August 23, 2006, and the subsequent amendment form an integral part of this permit.

1. Reclamation Security

(a) The owner, agent or manager (herein called the Permittee) shall maintain with the Minister of Finance securities in the amount of fifty five thousand dollars ($55,000). The security will be held by the Minister of Finance for the proper performance of the approved program and all the conditions of this permit in a manner satisfactory to the Chief Inspector.

(b) The Permittee shall conform to all forest tenure requirements of the Ministry of Forests. Should the Permittee not conform to these requirements then all or part of the security may be used to cover the costs of these requirements.

(c) The Permittee shall conform to all Ministry of Environment approval, licence and permit conditions, as well as requirements under the **Wildlife Act**. Should the Permittee not conform to these conditions, then all or part of the security may be used to fulfill these requirements.

2. Land Use

The surface of the land and watercourses shall be reclaimed to the following land use: **Industrial Encapsulated Contaminated Soil containment cells**

3. Productivity

The level of land productivity to be achieved on reclaimed areas shall not be less than existed prior to mining on an average property basis unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, the impracticality of doing so.

4. Revegetation

Land shall be re-vegetated to a self-sustaining state using appropriate plant species.

5. Use of Suitable Growth Medium

(a) On all lands to be revegetated, the growth medium shall satisfy land use, productivity, and water quality objectives. Topsoil and overburden (to rooting depth) shall be removed from operational areas prior to any disturbance of the land and stockpiled separately on the property for use in reclamation programs, unless the Permittee can provide evidence which demonstrates, to the satisfaction of the Chief Inspector, that reclamation objectives can otherwise be achieved.

(b) No topsoil shall be removed from the property without the specific written permission of the Inspector.

6. Buffer Zones and Berms

Buffer zones and/or berms shall be established between the mine and the property boundary unless exempted in writing by the Inspector.

7. Treatment of Structures and Equipment

Prior to abandonment, and unless the Chief Inspector has made a ruling otherwise, such as heritage project consideration or industrial use:

(a) all machinery, equipment and building superstructures shall be removed;

(b) concrete foundations shall be covered and revegetated unless, because of demonstrated impracticality, they have been exempted by the Inspector; and,

(c) all scrap material shall be disposed of in a manner acceptable to the Inspector.

8. Watercourses

(a) Watercourses shall be reclaimed to a condition that ensures:

(1) long-term water quality is maintained to a standard acceptable to the Chief Inspector;

(2) drainage is restored either to original watercourses or to new watercourses which will sustain themselves without maintenance: and,

(3) use and productivity objectives are achieved and the level of productivity shall not be less than existed prior to mining unless the Permittee can provide evidence which demonstrates to the satisfaction of the Chief Inspector the impracticality of doing so.

(b) Water which flows from disturbed areas shall be collected and diverted into settling ponds.

9. Roads

(a) All roads shall be reclaimed in accordance with land use objectives unless permanent access is required to be maintained.

(b) Individual roads will be exempted from the requirement for total reclamation under condition 9(a) if either:

(1) the Permittee can demonstrate that an agency of the Crown has explicitly accepted responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road, or

(2) the Permittee can demonstrate that another private party has explicitly agreed to accept responsibility for the operation, maintenance and ultimate deactivation and abandonment of the road and has, in this regard, agreed to comply with all the terms and conditions, including bonding provisions, of this reclamation permit, and to comply with all other relevant provincial government (and federal government) regulatory requirements.

10. Disposal of Fuels and Toxic Chemicals

Fuels, chemicals or reagents which cannot be returned to the manufacturer/supplier are to be disposed of as directed by the Chief Inspector in compliance with municipal, regional, provincial and federal statutes.

11. Temporary Shutdown

If this quarry ceases operation for a period longer than one year the Permittee shall either continue to carry out the conditions of the permit or apply for an amendment setting out a revised program for approval by the Chief Inspector.

12. Safety Provisions

All safety and other provisions of the ***Mines Act*** shall be complied with to the satisfaction of the Chief Inspector.

13. Monitoring

The Permittee shall undertake monitoring programs, as required by the Inspector, to demonstrate that reclamation objectives are being achieved.

14. Alterations to the Program

Substantial changes to the program must be submitted to the Inspector for approval.

15. Notice of Closure

Pursuant to Part 10.6.1 of the Health, Safety and Reclamation Code for Mines in British Columbia, a Notice of Completion of Work shall be filed with the Inspector not less than seven days prior to cessation of work.

16. Annual Report

Annual reports shall be submitted in a form and containing the information as and if required by the Inspector.

17. Site Stability

a) The inspector shall be advised in writing at the earliest opportunity of any unforeseen conditions that could adversely affect the extraction of materials, site stability, erosion control or the reclamation of the site.

b) The stability of the slopes shall be maintained at all times and erosion shall be controlled at all times.

c) The discovery of any significant subsurface flows of water, seeps, substantial amounts of fine textured, soils, silts and clays, as well as significant adverse geological conditions shall be reported to the inspector as soon as possible and work shall cease until the inspector advises otherwise.

SITE SPECIFIC CONDITIONS:

1. The importation of soil is permitted subject to the following conditions:

a) Soil imported must meet Ministry of Environment Soil Guidelines for the intended end land use, as identified in the Ministry of Environment Permit PR-105809.

b) Importation of material other than defined in 18(a) is prohibited unless approved by the Inspector.

c) The approval as required in 18(b) shall be processed as an amendment to this permit.

d) Documentation identifying the soil condition and suitability for the intended end land use must be maintained at the mine site office and made available to the Inspector on demand.

2. Property boundaries shall be permanently marked and maintained, and pit boundaries (mine footprint) shall be permanently marked and maintained. All

persons working on the property will be instructed as to the meaning of the markings; and,

a) The Permittee shall install a substantial fence along the property boundary.

b) This fence can be installed in stages with completion by September 1, 2016.

c) The portion of the property abutting the lands owned by the Cowichan Valley Regional District (CVRD) shall be fenced by September 2015. This includes lands abutting the restrictive covenant along Shawinigan Creek.

3. An 8-metre wide vegetation buffer shall be maintained on the northeast property boundary. The exiting trees shall not be removed.

4. All blasts shall be electronically monitored.

5. Blast limits are established at 50 millimeters per second peak particle velocity and 120 decibels on the L scale, at the property boundary, and:

a) The electronic monitor unit shall be located such that the air pressure (microphone) sensor has a clear unobstructed line of sight to the centre of the blast. The Inspector may allow or require monitoring at specific locations on a case by case basis as may be required.

b) The Manager shall maintain at the Mine Site Office, a signed copy of the Blast Log for each blast and a copy of the Electronic Monitor Record. Such records shall be made available to the Inspector on request.

c) Residents within 1km of the centre of the Quarry, and the Inspector, shall be given 24 hours notice of each scheduled blast. This 24 hours notice will establish a window of 1.5 hours within which the blast can be fired.

i. If, due to circumstances beyond the control of the Manager, a blast has been loaded and cannot be detonated within the time frame as described above, the Manager shall secure the site, post a watchman, and fire the blast the next day following the issuing of the required 24 hours notice. The Inspector may, at his discretion, allow the blast to be fired outside of the 24 hour notice window or, outside

of normal hours of work. In such cases the Inspector shall establish the conditions necessary for firing the blast.

6. For purposes of establishing the 1 km radius, the centre of the quarry is defined as: **W 48* 33.103, N 123* 36.390**

Standard Quarry Blasting Conditions:

7. To the extent practical, all blasts initiated on the quarry shall be videoed, and:

   a) A copy of the video shall be kept at the mine office, and made available to the Inspector on request.

   b) The video file shall include the following identification information as a word document;

      1. the pit name, and mine number
      2. the bench/location identification, including a map showing the location on the mine footprint.
      3. the name of the blaster
      4. the date of the blast
      5. the time of the blast

   c) Other information and records as may be required as conditions of the permit, or directives of the Inspector.

   d) The video shall clearly show the conduct of the blast in sequence of events including.

   e) The free faces prior to the blast, with emphasis placed on the face profile and the rock structure.

   f) The layout of the blast pattern including the tie ins.

   g) The overall site layout of the area within the “danger zone.”

8. Within 1 month of the date of this amendment to Permit Q-8-094, the Manager shall file with the Inspector an approved plan for ensuring compliance with Part 8, sections 8.7.1 to 8.7.4 of the Health Safety and Reclamation Code for Mines in British Columbia.

9. Hours of work shall be between 7am and 5pm Monday to Friday. No work, except as defined below, shall occur on weekends or Statutory Holidays:

   a) Light maintenance is permitted on Saturdays between 9am and 4pm. *Light Maintenance is defined as:* work requiring the only the use of hand

tools. It does not include air impact tools, air arcing, or any heavy equipment to perform a task.

b) Drilling operations shall be limited to the hours of 8am to 4pm Monday to Friday.

c) Notwithstanding the above, nothing in this condition prevents the Manger from working outside the permitted hours of work should:

i) a safety concern on site is such that a failure to complete necessary work can result in harm or risk to workers, members of the public, or the environment or,

ii) an agency having jurisdiction declares an emergency and product from this operation is required to mitigate or assist in the mitigation of the emergency.

d) Should the provisions of condition 23(c) be implemented the Manager shall advise the Inspector without delay.

e) A sign shall be posted at the entrance to the Quarry clearly indicating the permitted hours of work.

10. The Manager shall forward to the Inspector a copy of the updated mine plan required by the code. This code section refers to updates every three months.

11. The Manager shall schedule truck traffic entering or leaving the Quarry such that the trucks do not conflict with elementary school bus pick-up or drop off times.

12. **Occupational Health and Safety Committee:**

a) The Manager shall establish and maintain an Occupation Health and Safety Committee (HSRC) in accordance with the Health, Safety, and Reclamation Code for Mines in British Columbia 1.6.1(b).

b) HSRC 1.6.8 which requires Occupational Health and Safety Committee members to receive training shall apply to this site.

13. Within six months of the date of issue of this amendment, the Manager shall ensure one supervisor, as defined in the HSRC, is the holder of an Open Pit Shiftboss Certificate.

Permit Conditions related to the Construction, operation, and Maintenance of the Waste Cells as referenced in this Permit.

14. Blasting:

    a) No blasts shall be initiated during the installation of the liner, (geo- tech liner) including the upper liner as required by the approved plan.

    b) Installation includes the completion of any soil cover to a compactness of 0.66 meters thick.

15. Blasting of final walls in the quarry and for the waste cells:

    a) All final walls within the quarry shall be blasted using controlled blasting techniques, commonly referred to as “smooth blasting”.

    b) Following the blast all walls shall be scaled as may be required.

    c) Any row of holes to be blasted within 10 meters of the common boundary between the Quarry and property owned by the CVRD shall be surveyed in by a Licensed Land Surveyor. A copy of the survey shall be forwarded to the Inspector within one week of the blast.

16. Clay placed above the bedrock shall be placed in 250mm lifts, and compacted to 90% standard proctor until the Clay is 1meter compacted thickness.

17. At the completion of each 1 meter (compacted) lift the Manager shall provide the Inspector an as built of the lift signed by a suitable registered professional, registered in the Province of British Columbia.

    a) For soil imported into the cell, not including clay or sand, the Engineer of record shall identify soils where 95 Proctor could not be obtained, and shall identify the type of soil, the maximum compactness the soil can sustain, and the maximum moisture content to attain the compaction.

    b) For purposed of clarity, the engineer of record is not required to provide the above information on soil for every square foot of surface area but can provide the report in accordance with good engineering practice and standards.

18. All surface water shall be drained and controlled such that surface water does not have free access to the waste cell.

    a) Following rainfall, snow melt, or inadvertent flow of water into the waste cell, the Permittee shall take such measures as may be necessary to drain any accumulations of surface water from the cell.

    b) This may require suitable time frames to allow the drying of the soil to the point that the engineer of record is satisfied the moisture content does not compromise the achievement and maintenance of the required compaction as defined in this permit.

19. **Geotechnical**

    1. Design and Construction

        a) The construction of the waste storage facility, as described in the application, is approved.

        b) The sediment control pond shall be designed with a minimum 1 metre freeboard during the 200-year flood event.

        c) The Permittee shall ensure the facility is constructed under the supervision of a qualified professional engineer.

        d) Rock cuts and slope design shall be reviewed by a professional geotechnical engineer following blasting and excavation. The requirement for scaling and/or stabilization measures shall be evaluated to ensure the safety of workers working below these slopes.

        e) The facility shall be constructed in accordance with the design and construction specifications outlined in the application and approved by the Engineer of Record. The Engineer of Record shall review the construction drawings and specifications to verify that recommendations are properly incorporated as per design. Any changes to the proposed method of development will require previous approval of the Inspector.

        f) During construction, appropriate Quality Assurance/Quality Control (QAQC) shall be carried out. Within 30 days of completing construction, a construction QAQC report shall be submitted to the Inspector. This report shall include a summary of the liner installation, materials testing and

compaction information and the QAQC measures employed during construction.

g) The Permittee shall submit an as-built report with drawings to the Inspector prior to operation of the facility. As-built reports shall be sealed by a professional engineer and shall include a statement indicating that the facility was constructed in "general conformance with the design and specifications." A complete set of As-built drawings shall be kept at the mine site at all times and be provided to any Mines Inspector upon request.

2. Operation and Monitoring

a) Prior to operation of the facility, the Permittee shall submit an updated Operation, Maintenance, and Surveillance (OMS) manual and a Mine Emergency Response Plan (MERP) to the Inspector that outlines procedures for the successful operation, maintenance, and surveillance of the facility and emergency preparedness and response procedures. These documents shall be kept current and updated over time as procedures are modified.

b) All waste materials entering the facility shall meet the specifications as specified by the geotechnical engineer in the stability analyses and design of the facility. No waste materials that are subject to liquefaction (regardless of triggering mechanism) shall be disposed in the facility. Materials not meeting design specifications or operational requirements must be spoiled off-site at an alternate approved location.

c) Instrumentation shall be installed as recommended by the professional geotechnical engineer to monitor conditions related to the stability of the facility. Monitoring frequency, thresholds, and response procedures shall be determined by the geotechnical engineer and be clearly described in the OMS manual.

d) During operations, appropriate Quality Assurance/Quality Control (QA/QC) shall be carried out on the waste materials to ensure material properties meet geotechnical design and compaction requirements. Results of this testing shall be provided to the Inspector upon request. An up-to-date copy of QA/QC procedures, testing results, and inspection logs shall be maintained at site and made available for any Inspector upon request.

3. Reporting

a) Annual inspections of the waste storage facility shall be undertaken by a qualified Professional Geotechnical Engineer with a report submitted to the Inspector by March 31 of the year following the inspection. The report shall include a summary of observations, review of monitoring data including instrumentation, QA/QC procedures, testing results, and recommendations with respect to any necessary changes to operating procedures. Any recommendations relating to health and safety or geotechnical stability shall be followed unless a suitable alternative course of action is approved in writing by the professional undertaking the review, or by a third party qualified Professional Engineer, as may be determined by the Inspector.

20. **Completion of the cell:**

a) The final cover of each cell shall consist of two meters of till or residential classification soil, compacted to the degree necessary to prevent/limit erosion and sustain growth of appropriate vegetation.

b) The permitted shall prior to applying any vegetation cover to the completed cell provide the inspector a plan designed by an appropriate Qualified Person which demonstrates the vegetation cover is suitable for the area, and as cover for the waste cell.

c) Filling of the cells shall be conducted on a one cell at a time basis. Filling of the next cell can only commence upon completion of the cell the previous cell.

d) The previous condition does not prevent the Permittee form doing cell preparation, up to the point of being ready to receive fill material.

e) Prior to receiving fill in any cell the Permittee must provide a signed as built of the construction of the cell to date. This as built, signed by the engineer of record shall state that this construction meets the standards required by this permit and Ministry of Environment Permit PR-105809.

f) Each completed cell shall remain in and be subject ongoing monitoring under the terms of this permit for the life of the mine.

g) Once completed a cell shall not be disturbed unless work is necessary for maintenance or repair, and then only with the written approval of the Inspector.

h) The Manager shall, by March 31 of each year, provide the Inspector a report identifying the volume of water treated through the treatment plant, and shall include all operating costs associated with the operation and maintenance of the treatment plant.

21. The Manager shall forward to the Inspector a copy of the report submitted to the Minister of Finance in relation to the annual Health and Safety Assessment. This report provides a report stating the annual production.

22. Surface water not subject to treatment in the water treatment plant shall be monitored at the discharge point to the receiving environment and suspended solids shall not exceed 25mg/litre. In addition this monitoring shall include analysis for nitrates, and nitrate content shall not exceed the limits specified for drinking water.

23. Production from this quarry is limited to 240,000 tonnes annually.

Active Earth
Engineering Ltd

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

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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);

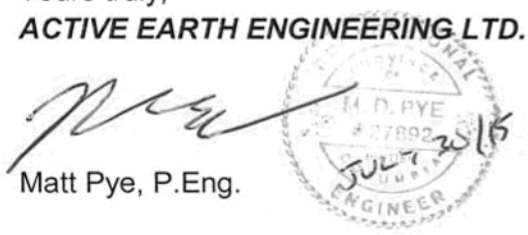
- A single panel (no field welds) of 40 mil LLDPE synthetic liner was placed over the sand layer. The liner dimensions are 35.5m x 85m. The liner was placed up the berms on the south and east sides of Cell 1. The liner was underlain by a geotextile on the berm slopes to provide protection. The required 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:

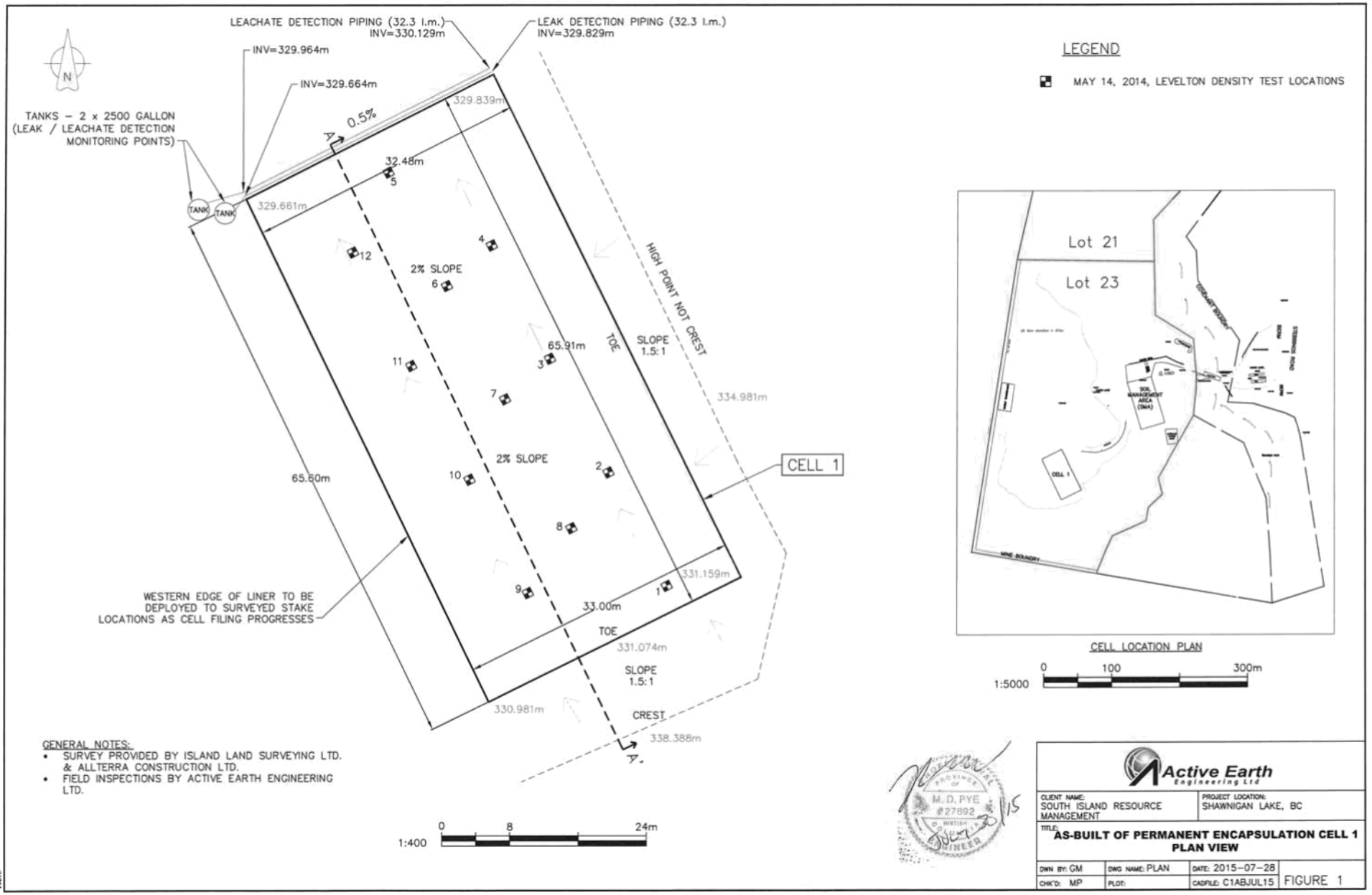
- Photographs of key construction details;
- Active Earth Figures 1 and 2 showing the as-built information for Encapsulation Cell 1;
- Western Tank & Lining Ltd. specifications and QA/QC for 40 mil liner;
- Premier Plastics specifications for 2500 gallon holding tanks;
- Levelton Field Review Report 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.


LEACHATE DETECTION PIPING (32.3 l.m.)
INV=330.129m
LEAK DETECTION PIPING (32.3 l.m.)
INV=329.829m
INV=329.964m
INV=329.664m
TANKS – 2 x 2500 GALLON
(LEAK / LEACHATE DETECTION
MONITORING POINTS)
TANK
TANK
0.5%
329.839m
32.48m
329.661m
2% SLOPE
65.91m
TOE
SLOPE
1.5:1
HIGH POINT NOT CREST
334.981m
CELL 1
65.60m
2% SLOPE
331.159m
33.00m
TOE
331.074m
SLOPE
1.5:1
330.981m
CREST
338.388m
WESTERN EDGE OF LINER TO BE
DEPLOYED TO SURVEYED STAKE
LOCATIONS AS CELL FILING PROGRESSES
1:400
0
8
24m
LEGEND
MAY 14, 2014, LEVELTON DENSITY TEST LOCATIONS
Lot 21
Lot 23
CELL 1
CELL LOCATION PLAN
1:5000
0
100
300m
GENERAL NOTES:
• SURVEY PROVIDED BY ISLAND LAND SURVEYING LTD. & ALLTERRA CONSTRUCTION LTD.
• FIELD INSPECTIONS BY ACTIVE EARTH ENGINEERING LTD.
PROVINCE OF BRITISH COLUMBIA
M. D. PYE
#27892
PROFESSIONAL ENGINEER
JULY 30 15
Active Earth
Engineering Ltd
CLIENT NAME: SOUTH ISLAND RESOURCE MANAGEMENT
PROJECT LOCATION: SHAWNIGAN LAKE, BC
TITLE: AS-BUILT OF PERMANENT ENCAPSULATION CELL 1 PLAN VIEW
DWN BY: GM
DWG NAME: PLAN
DATE: 2015-07-28
CHK'D: MP
PLOT:
CADFILE: C1ABJUL15
FIGURE 1

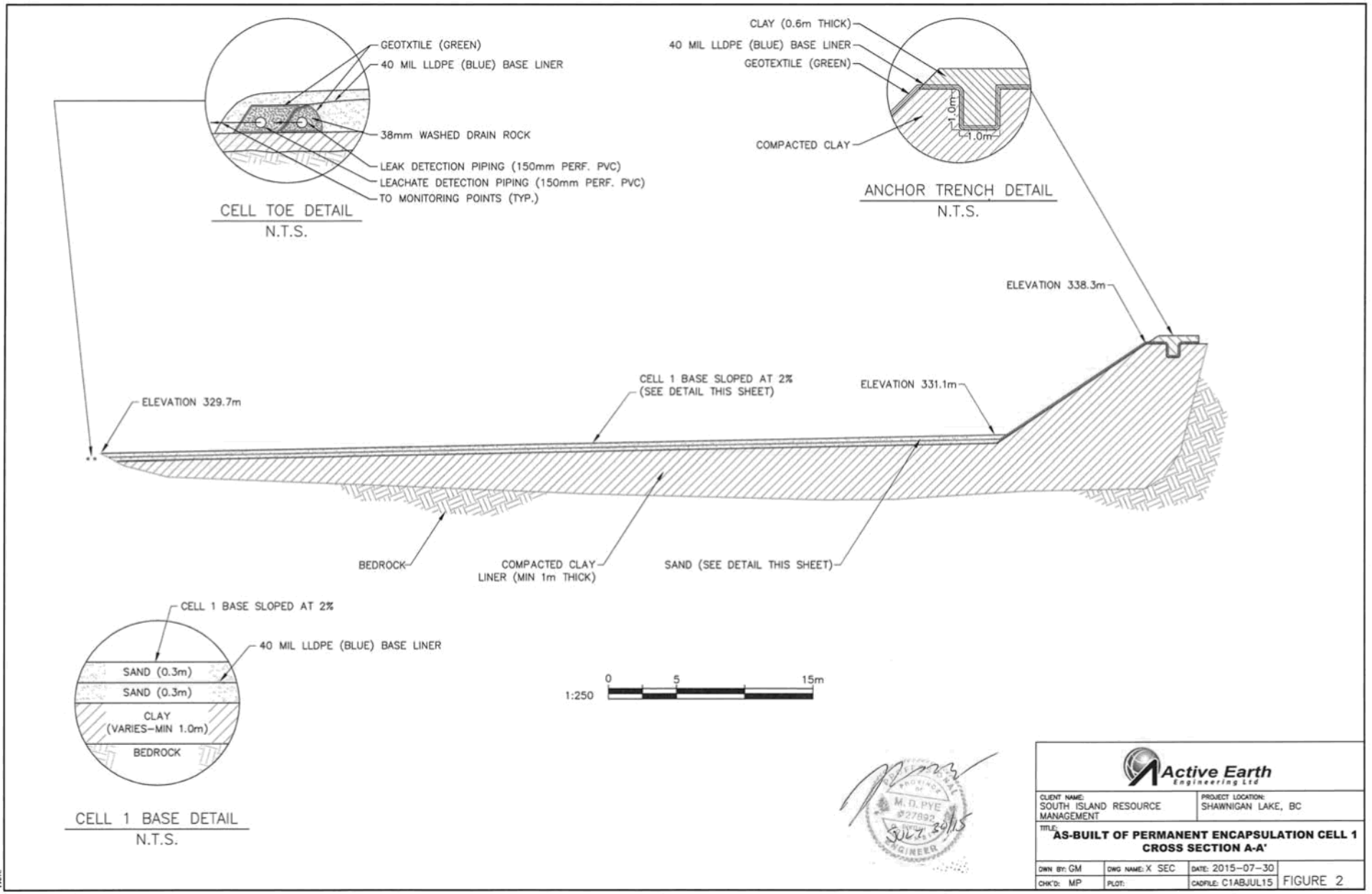

GEOTXTILE (GREEN)
40 MIL LLDPE (BLUE) BASE LINER
38mm WASHED DRAIN ROCK
LEAK DETECTION PIPING (150mm PERF. PVC)
LEACHATE DETECTION PIPING (150mm PERF. PVC)
TO MONITORING POINTS (TYP.)
CELL TOE DETAIL
N.T.S.
CLAY (0.6m THICK)
40 MIL LLDPE (BLUE) BASE LINER
GEOTEXTILE (GREEN)
COMPACTED CLAY
1.0m
1.0m
ANCHOR TRENCH DETAIL
N.T.S.
ELEVATION 338.3m
ELEVATION 331.1m
CELL 1 BASE SLOPED AT 2%
(SEE DETAIL THIS SHEET)
ELEVATION 329.7m
BEDROCK
COMPACTED CLAY
LINER (MIN 1m THICK)
SAND (SEE DETAIL THIS SHEET)
CELL 1 BASE SLOPED AT 2%
40 MIL LLDPE (BLUE) BASE LINER
SAND (0.3m)
SAND (0.3m)
CLAY
(VARIES–MIN 1.0m)
BEDROCK
CELL 1 BASE DETAIL
N.T.S.
0
5
15m
1:250
M. D. PYE
#27892
PROVINCE OF BRITISH COLUMBIA
ENGINEER
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
CHK'D: MP
PLOT:
CADFILE: C1ABJUL15
FIGURE 2

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

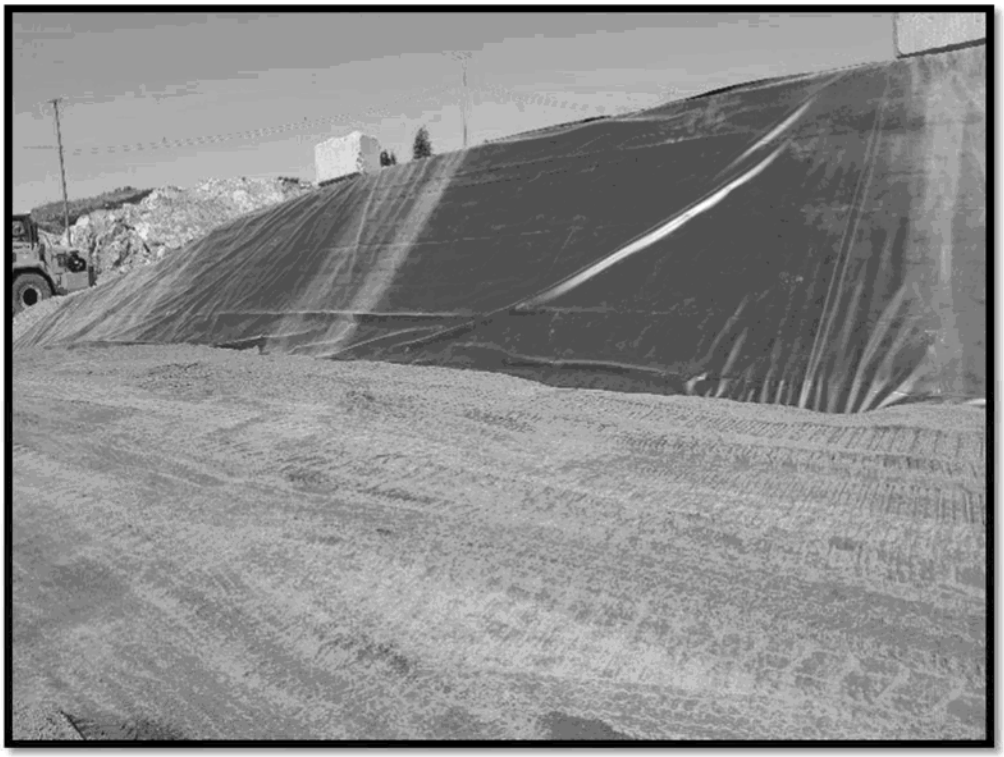
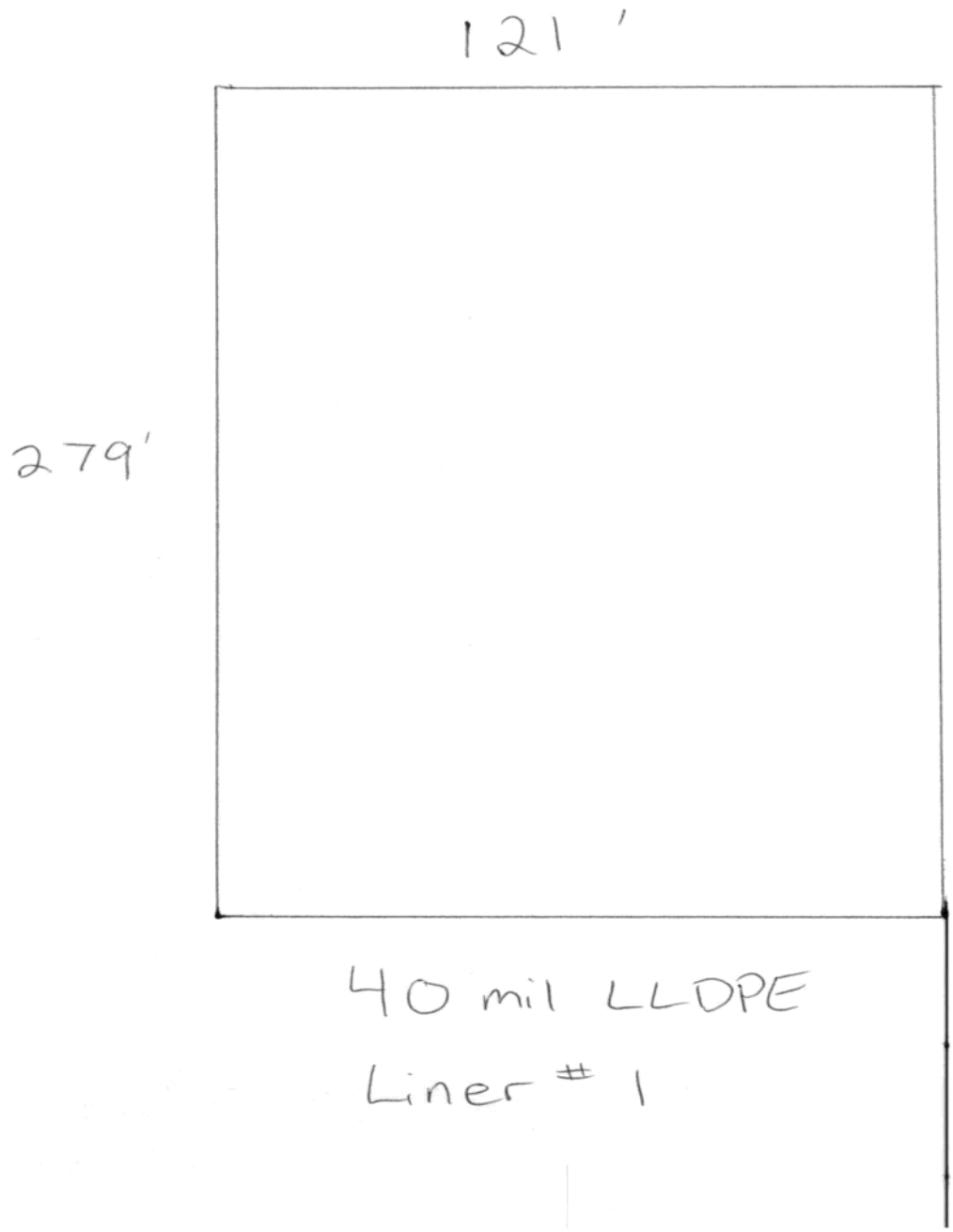


Photo 6 – Looking East at completed Cell 1 berm

Photo 7 – Leak Detection and Leachate Collection Tanks

Photo 8 – Leak Detection and Leachate Collection Piping Systems

Allterra Construction Ltd.
40mil LLDPE
Liner #1



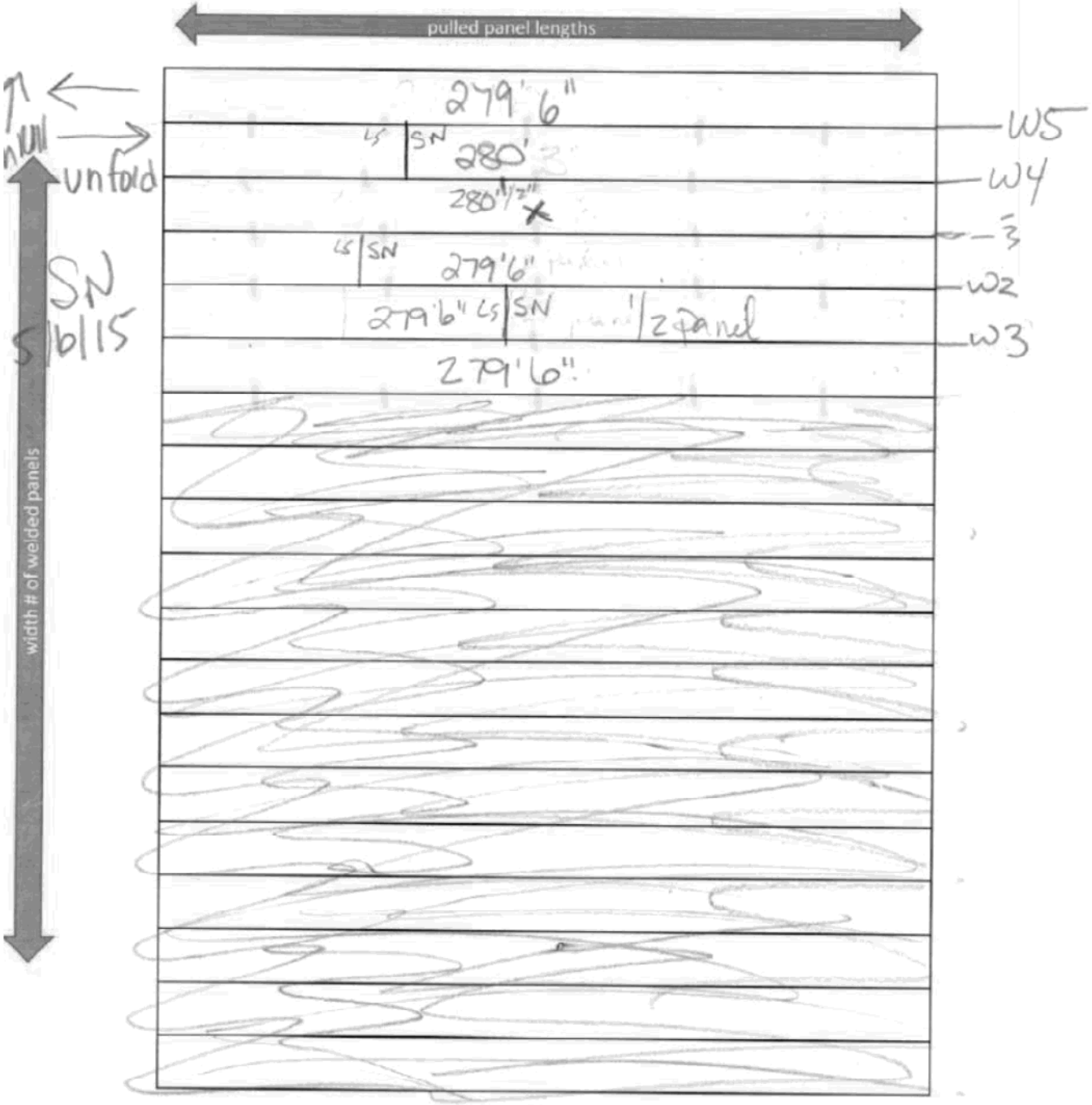
VANCOUVER: 12180 Vickers Way, Richmond, BC V6V 1H9T: 604-241-9487 F: 604-241-9485
CALGARY: 105 Stockton Pt., Okotoks, AB T1S 1A5 T: 403-938-4361 F: 403-938-4371

1-800-551-4355

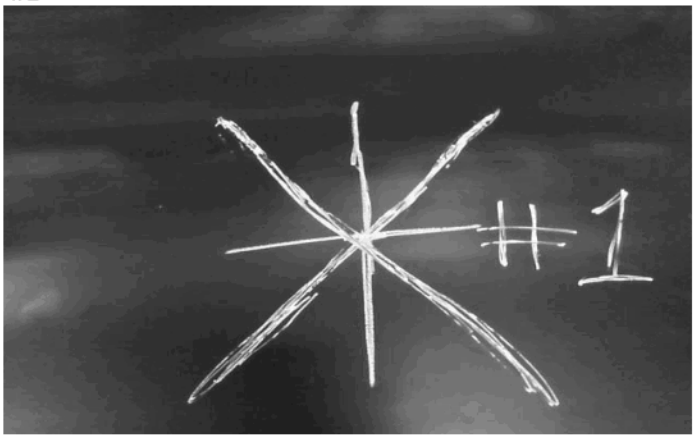
W/O LIS-042276 Size 279'x121' Material 40m LLDPE

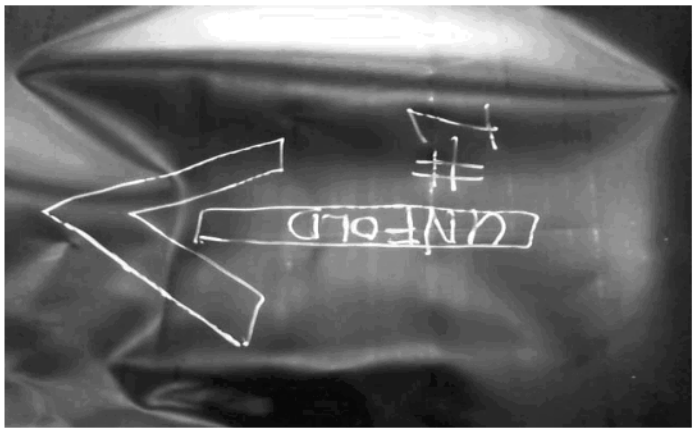
Customer Western Tank CP-99-m Liner Number #1

Material Width 22.3 Panel count 5.5 panels



#1





Liner Quality Control Audit

Inspector	SARA	Crew	PAUL/LENON/FREDDY/DAY CREW	Date	06/05/2015

Work Order #	L15-042276	Size / Style	Length: 279	Width: 121	Style: 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	280' 1/2" SN	Finished Length	279.5	Actual Width	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	X	Butterfly Fold	X
Scroll Rolled center mark W/Webbing		Fan Fold to center 2" web markers	

Core Type Used: Metal [X] Cardboard [ ] Other [ ]

(Standard = mil, size, unroll and unfold arrow)

Standard Information Written on Item [X] Other: MARKED #1

refer to E.I.C for standards

Packaging Wrap/ Color : Standard Liner [X] Other: 1.5X FELT, LLDPE, 5X 12 MIL B GRADE

refer to E.I.C for standards

Standard Package Labeling [X] Other: ITL AND WTL LABELS

Notes

Wedge/Extrusion Trial

WESTERN TANK & LINING LTD.

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:	SARA	W./O.	L15-042276
Welding Tech:	PAUL	Crew:	PAUL/LENIN/FREDDY

Welder Qualification For Liners: #1 Time Ending:

Material Type:	Liner Size:	*Length*	*Width*	*Style*
Solmax 40 mil LLDPE 140-7000/K7104		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

WESTERN TANK & LINING LTD.

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:	SARA	W./O.	L15-042276
Welding Tech:	PAUL	Crew:	PAUL/LENIN/FREDDY

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:	42
Welder Set Temp:	860			Inside Temp:	50
Welder Set Speed:	999	*Timed FPM*	17	Sheet Temp:	42
Extrusion Rod:	N/A			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

WESTERN TANK & LINING LTD.

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:	SARA	W./O.	L15-042276
Welding Tech:	LENIN	Crew:	PAUL/LENIN/FREDDY

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:	EXTRUSION	Outside Temp:	42
Welder Set Temp:	400PREHEAT/440 PLASTIC HEAT	Inside Temp:	50
Welder Set Speed:	HAND *Timed FPM* N/A	Sheet Temp:	42
Extrusion Rod:	SOLMAX LL	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

WESTERN TANK & LINING LTD.

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

Welder Settings

Welder #	D4	Operator	PAUL	Temp/Speed	860/999

Timed welder speed

Distance in feet	34	Timed Sec.	122	Feet per min.	17

QA Test Person:	SARA	W./O.	L15-042276
Material Type:	Solmax 40 mil LLDPE 140-7000/K7104		

	Length	*Width*	Style		
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

WESTERN TANK & LINING LTD.

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	SARA
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	SARA
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	SARA

LIST OF GEOMEMBRANE ROLLS

SOLMAX

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

SOLMAX Quality Assurance APPROVED

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**

SOLMAX

MANUFACTURING QUALITY CONTROL

Test Results - 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

Product : Solmax 140-7000

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

SOLMAX

TECHNICAL DATA SHEET

Geomembrane LLDPE Smooth

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tel.: (450) 929-1234 Fax: (450) 929-2550 www.solmax.com

PROPERTY	TEST METHOD	FREQUENCY (1)	UNIT Metric	Solmax 140-7000
SPECIFICATIONS				
Thickness (Nominal ±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 ±1%)				
Roll Dimension - Width	-		m	6.80
Roll Dimension - Length	-		m	237.7
Area (Surface/Roll)	-		m²	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 ± 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 responsability of the user. SOLMAX assumes no liability in connection with the use of this information.

SOLMAX
2801, BOUL. MARIE-VICTORIN,
VARENNES (QC) CANADA J3X 1P7
450.929.1234
SOLMAX.COM

MATERIAL CONFORMITY CERTIFICATE ISSUED BY THE MANUFACTURER

Varennes, October 16th, 2014

Ref.: Stock Material
ATTN: Mr. Clint Powell

To whom it may concern,

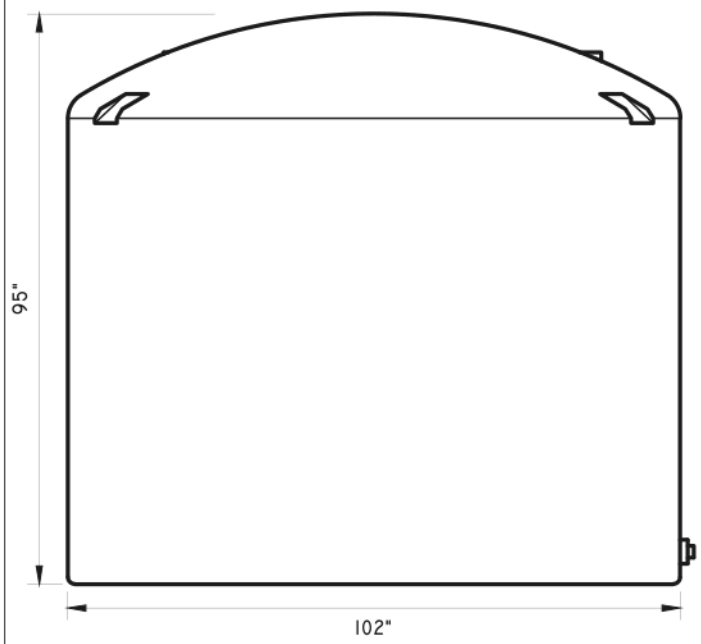
Solmax International hereby certifies that 130-2000 and 140-7000 smooth LLDPE geomembrane supplied for the above-mentioned project meets the following:

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

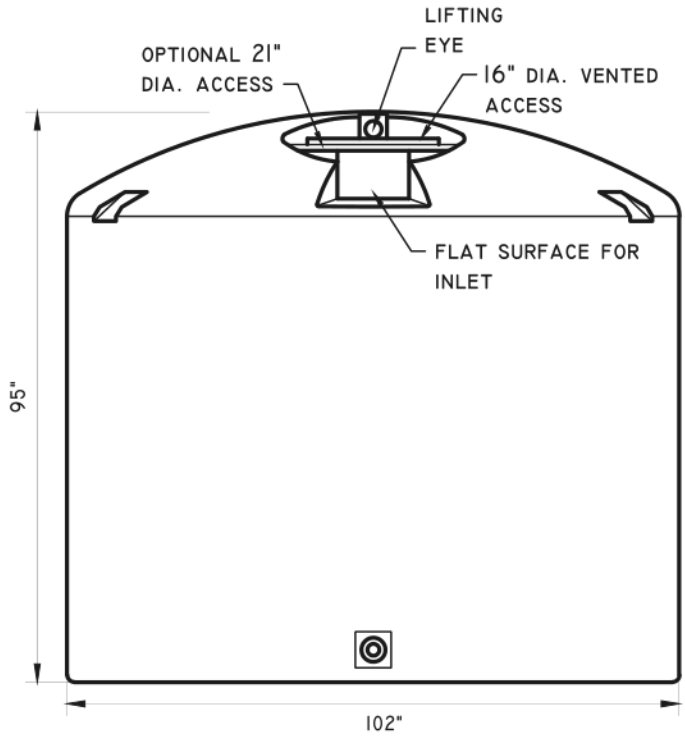
Hoping the above information is satisfactory. Do not hesitate to contact us if you require any additional information.

Sincerely,

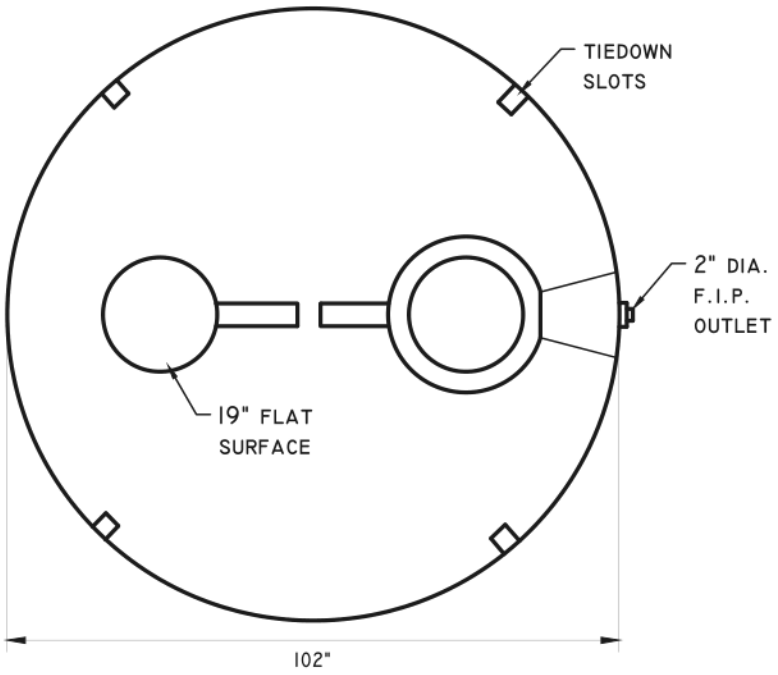
Chantal Gagnon
Technical Services
Solmax International Inc.



SIDE ELEVATION



FRONT ELEVATION



TOP VIEW

PREMIER PLASTICS

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**	**Adam Miller**
OWNER: **South Island Aggregates**	Time: **11:00 am**	**Alec Morse**
CONTRACT REF **Matt Pye – Active Earth Eng.**	Weather: **Drizzle/mild**	

OBSERVATIONS/REMARKS/ACTIONS BY: **Alec Morse, P.Eng.**

- 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.

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

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PROCTOR TEST REPORT

PROJECT: Active Earth

CLIENT: Active Earth

FILE NO.: R714-0514-00

DATE ISSUED: April 15, 2014

ISSUED BY: LCL-Victoria

REPORT NO.: 1

Sample Information

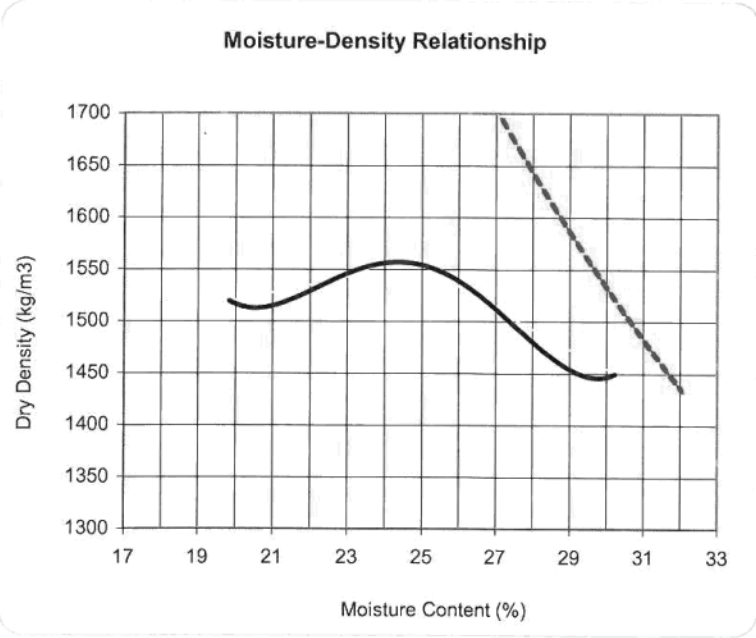
Material Classification: Cell Liner

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/m³)	1820	1886	1940	1919	1887	Test Procedure	ASTM D-698	Method C
Dry Density (kg/m³)	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/m³
Corrected Value	1567	kg/m³

Optimum Moisture Content

Uncorrected Value	24.5	%
Corrected Value	24.5	%

Distribution

Active Earth - Matt Pye - matt.pye@activeeath.ca

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PROCTOR TEST REPORT

PROJECT: Active Earth

CLIENT: Active Earth

FILE NO.: R714-0514-00

DATE ISSUED: April 16, 2014

ISSUED BY: LCL-Victoria

REPORT NO.: 2

Sample Information

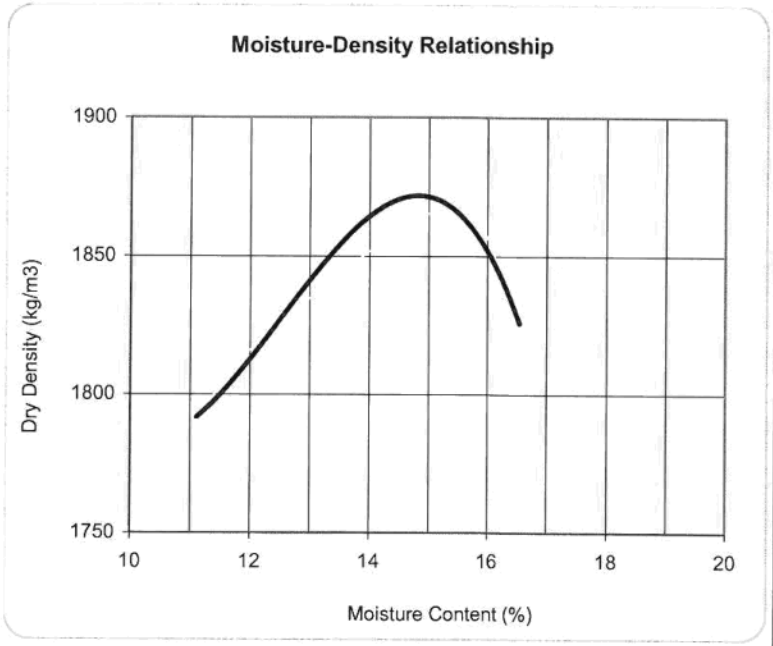
Material Classification: Cell Liner

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/m³)	1991	2048	2155	2128		Test Procedure	ASTM D-698	Method C
Dry Density (kg/m³)	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/m³
Corrected Value	1923	kg/m³
Optimum Moisture Content		
Uncorrected Value	14.8	%
Corrected Value	13.6	%

Distribution

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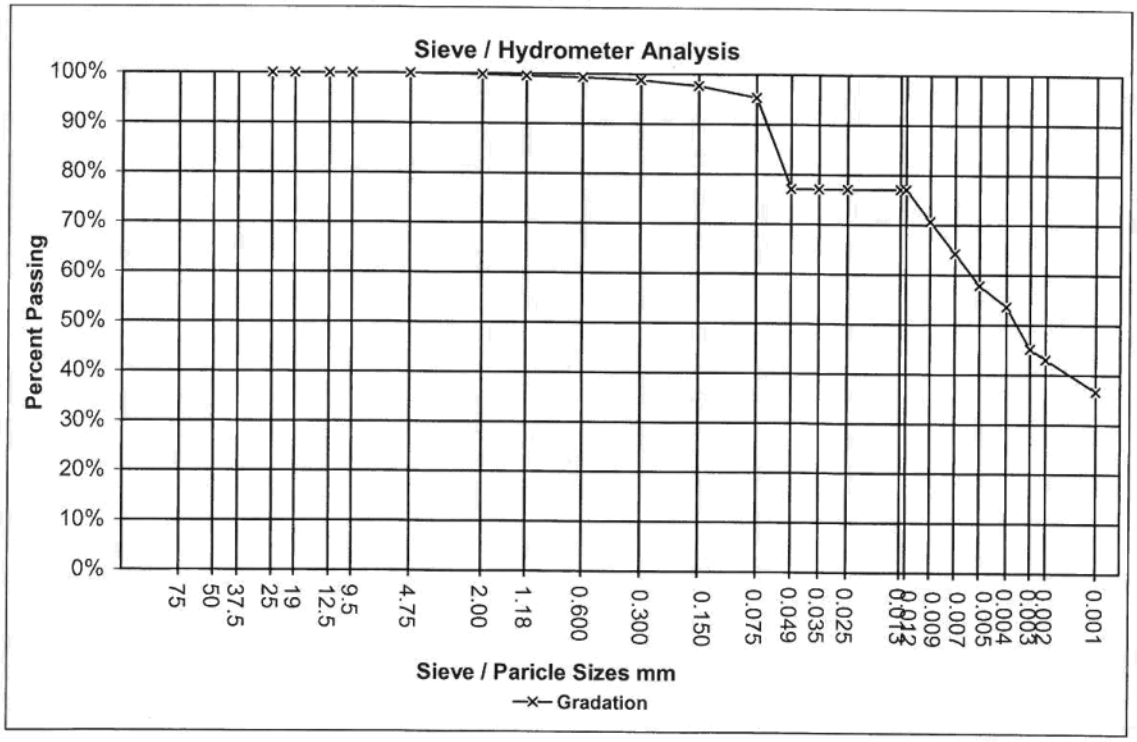
Grain Size Analysis (Hydrometer)

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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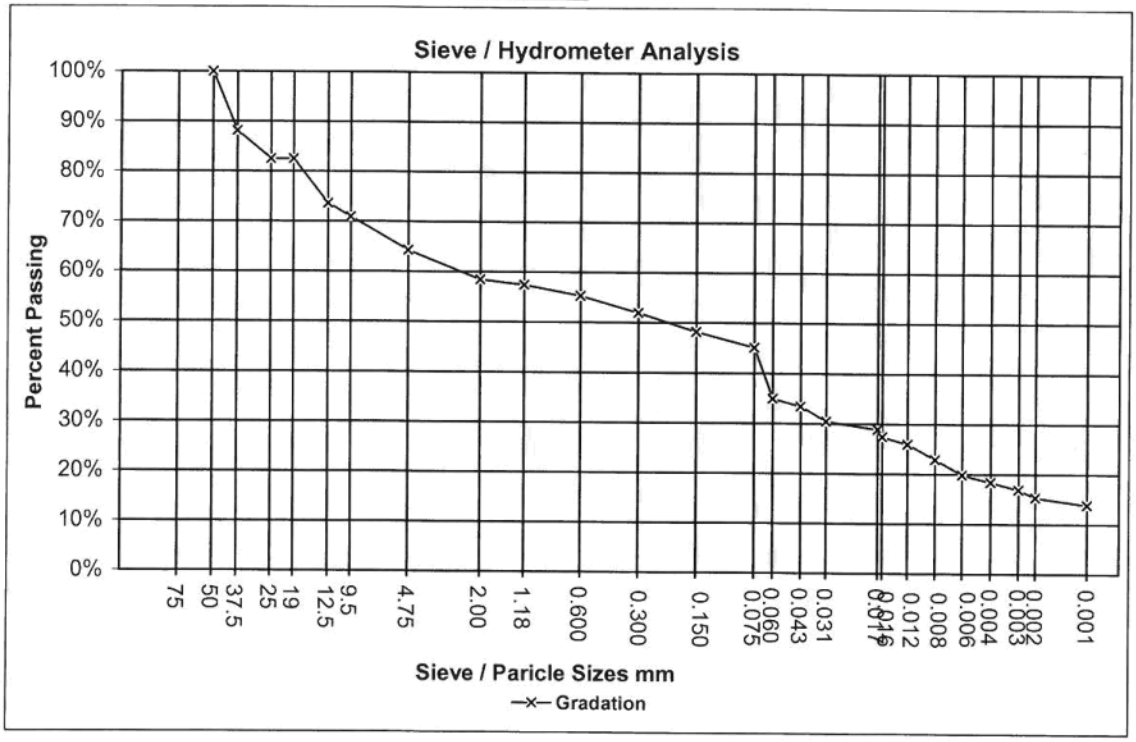
Grain Size Analysis (Hydrometer)

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

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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/m³)	W%	CORR. PROCTOR (kg/m³)	IPD DRY (kg/m³)	% 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

DISTRIBUTION:
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PROCTOR TEST REPORT

PROJECT: Active Earth

CLIENT: Active Earth

FILE NO.: R714-0514-00

DATE ISSUED: April 16, 2014

ISSUED BY: LCL-Victoria

REPORT NO.: 2

Sample Information

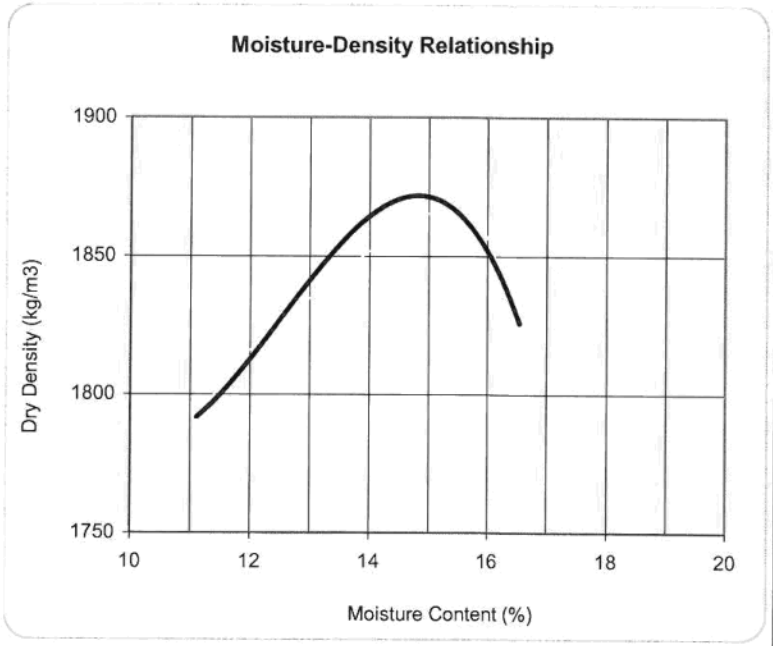
Material Classification: Cell Liner

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/m³)	1991	2048	2155	2128		Test Procedure	ASTM D-698	Method C
Dry Density (kg/m³)	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/m³
Corrected Value	1923	kg/m³
Optimum Moisture Content		
Uncorrected Value	14.8	%
Corrected Value	13.6	%

Distribution

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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/m³)	W%	CORR. PROCTOR (kg/m³)	IPD DRY (kg/m³)	% 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: Mike (SIA) operator advised that running rubber tired equipment over the clay fill will increase % compaction.
DISTRIBUTION:
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