

July 30, 2009

EBA File: W14101142.001

Alexco Resource Canada Corp.
#3-161 Industrial Road
Whitehorse, YT Y1A 2V3

Attention: Mr. Rob McIntyre
Vice President

**Subject: Review of Potential Site for Typical Waste Rock Containment Facility
Bellekeno East Adit, Keno Hill Silver District, YT**

1.0 INTRODUCTION

In July 2008 EBA provided a typical design, including issued for construction drawings and specifications, for a containment facility to store waste rock from the Bellekeno advanced underground exploration and development program. This typical design was subject to an engineer reviewing and accepting each proposed site prior to construction of the facility.

Alexco has requested that EBA review the proposed site shown in Figure 1, which is approximately 850 m south of the Bellekeno East Adit. Alexco plans to temporarily store approximately 10,000 tonnes of waste rock at this location. EBA understands that this waste rock will be moved to an approved long-term storage location prior to 2015. This project was authorized by Rob McIntyre.

2.0 SITE CONDITIONS

Mr. Christopher Dixon, P. Eng. visited the site on May 6, 2009. The proposed site has an undetermined thickness of placer gravel overlying natural soil of the area. The natural soils in the area are expected to be frozen glacial silt till, based on review of surficial geology maps and experience with constructing the Bellekeno East Adit. The placer tailings are well graded gravel with some cobbles. The site is bounded on the west side by the natural treed slope (approximately 2H:1V) and on the east side by the placer spoil slope (approximately 2H:1V), which has no vegetation. The elevation difference from the toe to the crest of the placer spoil slope is approximately 30 m. The proposed site is approximately 35 m wide and 200 m long. There is an ephemeral creek which runs at the south end of the proposed site. The site naturally slopes from south to north at approximately 4%.

3.0 EVALUATION

EBA has examined the slopes and reviewed anticipated foundation soils expected at the site proposed for the waste rock containment facility. EBA considers the site acceptable for the construction of the facility as shown in Figures 1 and 2 subject to all conditions in the design specifications and issued for construction drawings (EBA File: W14101142), which are attached to this letter.

To construct the facility on the slope in question a setback distance equal to the slope height must be maintained from an imaginary line drawn at a 45° angle from the slope toe to the slope crest height. An example is shown in Section A on Figure 2.

EBA also reviewed the placer spoil gravel as a bearing surface. The gravel was placed in an unconsolidated condition and may be subjected to initial settlement when loaded with the waste rock. If the facility is constructed by cutting a portion of the gravel then a mass of waste rock equal to the mass of gravel removed can be placed without incurring any additional settlement. If a mass of waste rock greater than the mass of gravel is placed it should be limited to a height of 3 m if placed over a stratum of gravel greater than 3 m thick. The closer the facility is to the natural slope (west side of site), the thinner the strata of placer spoil should be. Review of the onsite topography indicates that it is not likely to have a stratum of gravel thicker than 3 m below the area where 3 m (or greater) of waste rock will be placed.

EBA collected a sample of the gravel during the site visit on May 6, 2009. The result of a particle size distribution test conducted on that sample of placer spoil is attached; the specification band shown is for Type B material from the specifications (EBA File W14101142). Currently, Alexco has not determined a source of Zone A Material.

4.0 RECOMMENDATIONS

EBA considers this site acceptable for the construction of the facility as detailed in the design drawings and specifications dated July 2008. All recommendations in the specifications and design drawings must be adhered to. If the facility is to remain in place past the year 2015, a long-term slope stability analysis should be conducted. The placer spoil gravel meets the gradation specifications for Zone B Material. Once a source of Zone A Material has been identified a sample should be collected and the particle size distribution determined. If the Zone A Materials meets the specification then liner Detail 1 can be used. If the Zone A Material is too fine then Liner Details 3 and 4 must be used. If the material is too coarse then Liner Details 5 and 6 must be used, as described in the original design drawings. If the facility is constructed to the dimensions shown in Figures 1 and 2 then it will have a storage capacity of 10,000 tonnes (5,900 m³). The placement of waste rock must be as shown in Figure 2 to achieve this capacity (i.e. heaped at a 3H:1V slope).

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Alexco and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Alexco, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions included in this report.

6.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned.

Yours truly,

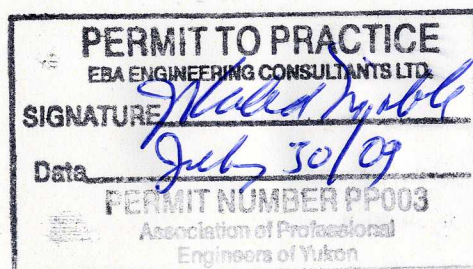
EBA Engineering Consultants Ltd.



Christopher J. Dixon, P.Eng.
Project Engineer, Yukon Region
Direct Line: 867.668.2071 x241
cdixon@eba.ca



J. Richard Trimble, FEC, P.Eng.
Project Director, Yukon Region
Direct Line: 867.668.2071 x222
rtrimble@eba.ca



DESIGN REPORT – GENERAL CONDITIONS

This Design Report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This Design Report pertains to a specific site, a specific development, and a specific scope of work. The Design Report may include plans, drawings, profiles and other support documents that collectively constitute the Design Report. The Report and all supporting documents are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, analyses or other contents of the Design Report when it is used or relied upon by any party other than EBA’s Client, unless authorized in writing by EBA. Any unauthorized use of the Design Report is at the sole risk of the user.

All reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

2.0 ALTERNATIVE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless so stipulated in the Design Report, EBA was not retained to investigate, address or consider, and has not investigated, addressed or considered any environmental or regulatory issues associated with the project specific design.

4.0 CALCULATIONS AND DESIGNS

EBA has undertaken design calculations and has prepared project specific designs in accordance with terms of reference that were previously set out in consultation with, and agreement of, EBA’s client. These designs have been prepared to a standard that is consistent with industry practice. Notwithstanding, if any error or omission is detected by EBA’s Client or any party that is authorized to use the Design Report, the error or omission should be immediately drawn to the attention of EBA.

5.0 GEOTECHNICAL CONDITIONS

A Geotechnical Report is commonly the basis upon which the specific project design has been completed. It is incumbent upon EBA’s Client, and any other authorized party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the geotechnical information that was reasonably acquired to facilitate completion of the design.

If a Geotechnical Report was prepared for the project by EBA, it will be included in the Design Report. The Geotechnical Report contains General Conditions that should be read in conjunction with these General Conditions for the Design Report.

GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

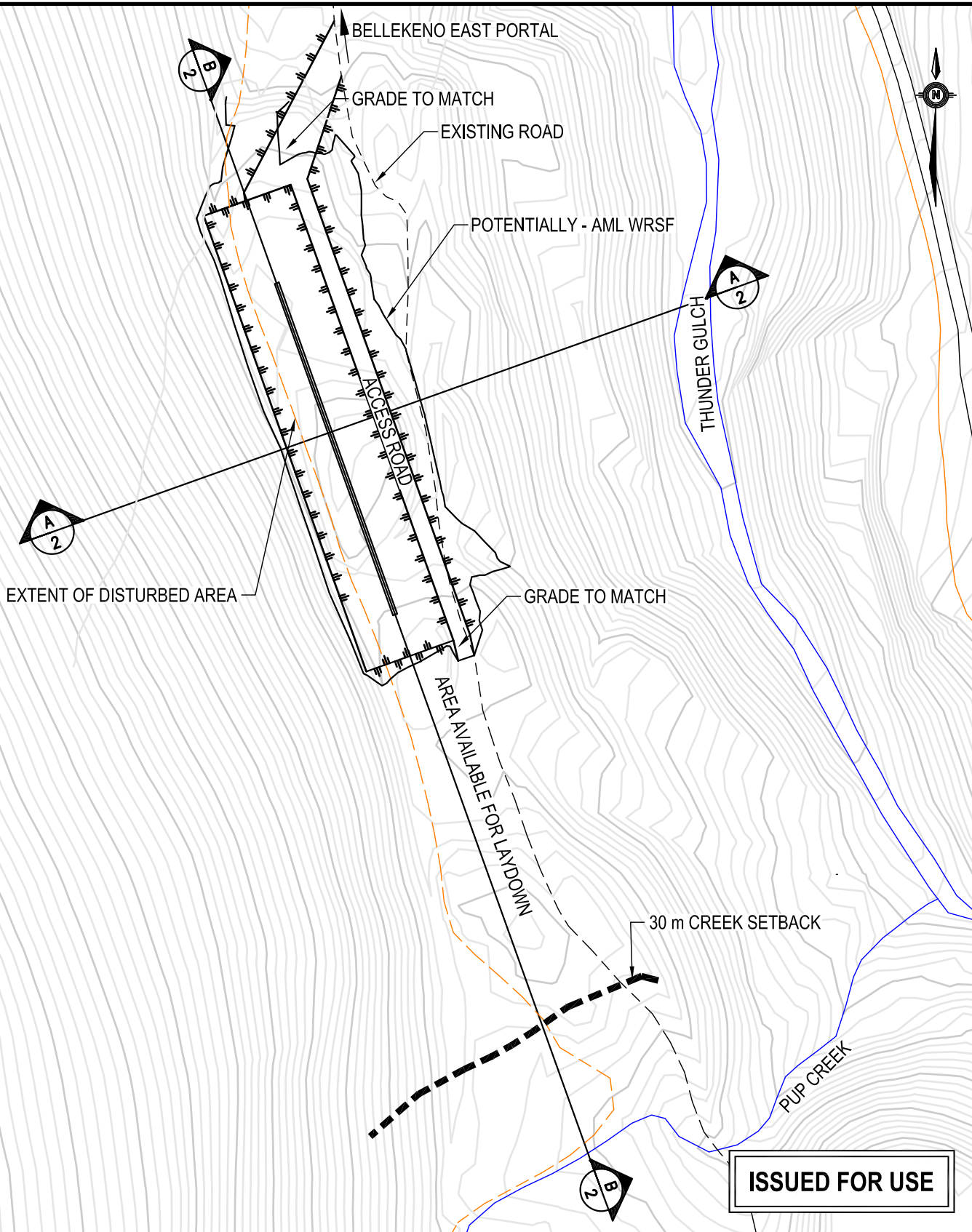
13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

O:\Keno\W14101142 Onek Waste Containment Facility - Design\001 - Bellekeno P-AML Waste Facility\Bellekeno East P-AML Facility-20090727.dwg [FIGURE 1] July 30, 2009 - 2:12:57 pm (BY: CHRIS DIXON)



0 50
Scale: 1: 1 250 (metres)

CLIENT



**EBA Engineering
Consultants Ltd.**



**TEMPORARY WASTE CONTAINMENT FACILITY
BELLEKENO EAST SITE**

**BELLEKENO EAST P-AML SITE
SITE PLAN**

PROJECT NO.
W14101142.001

OFFICE
EBA-WHSE

DWN
KJT

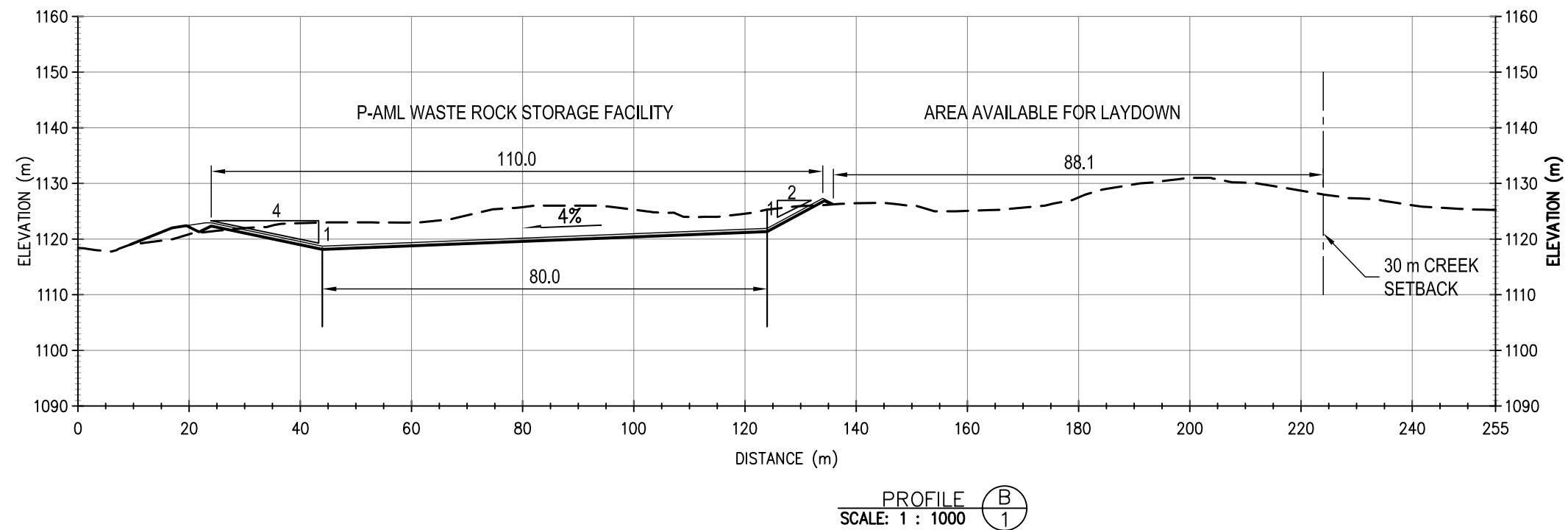
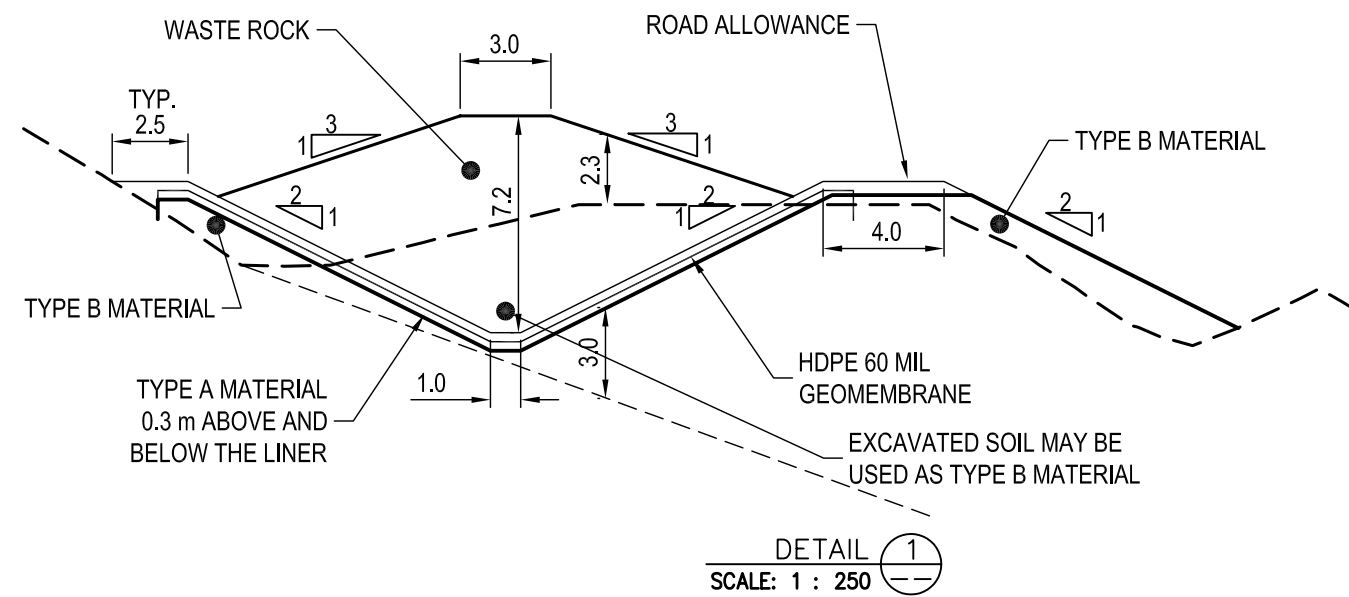
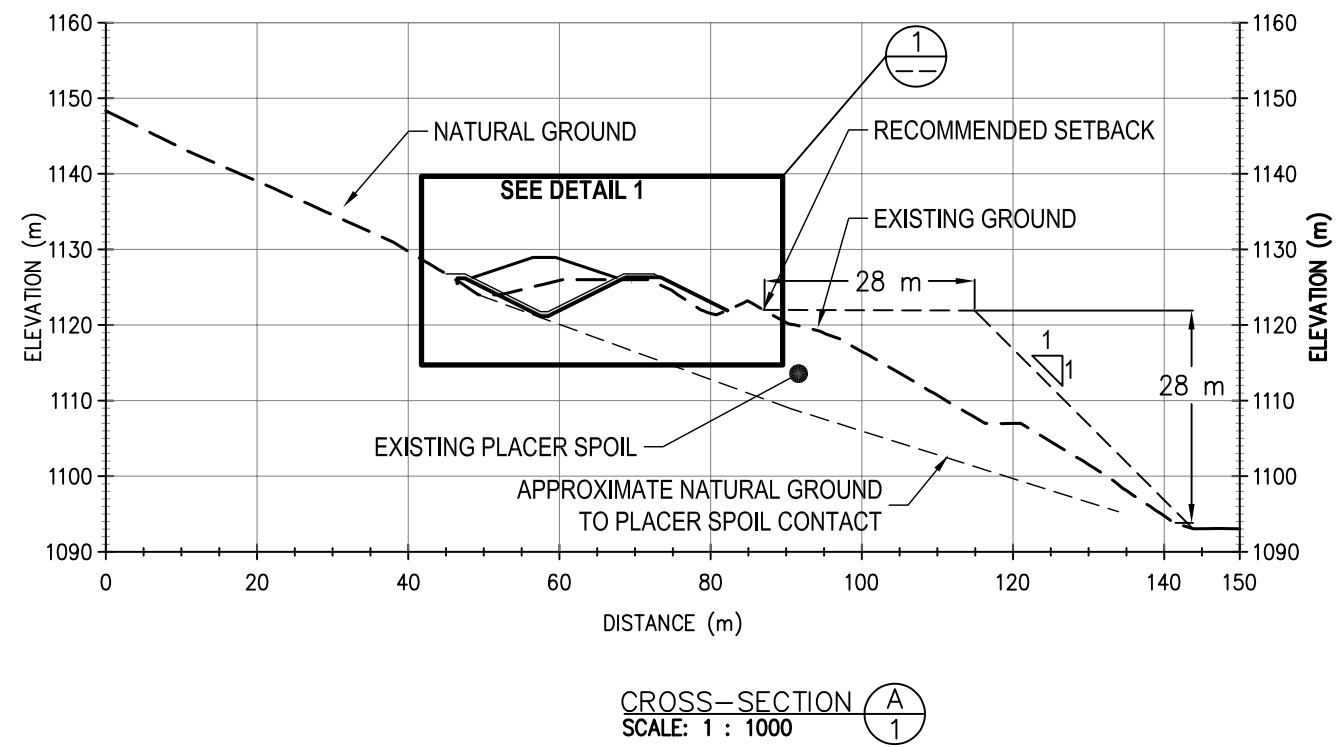
DATE
July 30, 2009

CKD
CJD

REV
0

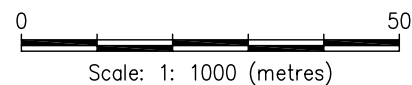
FIGURE 1

O:\Keno\W14101142 Onek Waste Containment Facility - Design\001 - Bellekeno P-AML Waste Facility\Bellekeno East P-AML Facility-20090727.dwg [FIGURE 2] July 30, 2009 - 2:12:22 pm (BY: CHRIS DIXON)



ISSUED FOR USE

LEGEND



CLIENT



EBA Engineering
Consultants Ltd.



BELLEKENO EAST P-AML WASTE ROCK STORAGE
KENO CITY, YUKON

PROFILE, SECTION AND DETAIL

PROJECT NO. W14101142.001	DWN KJT	CKD CJD	REV 0
OFFICE WHSE	DATE July 27, 2009		

FIGURE 2

Alexco Resource Canada Corp.

TYPICAL WASTE CONTAINMENT FACILITY DESIGN
KENO HILL SILVER DISTRICT, YT
CONSTRUCTION SPECIFICATIONS
ISSUED FOR USE

W14101142

July 2008

TABLE OF CONTENTS

<u>Section</u>		<u>Number of Pages</u>
Section 1001	Definitions	1
Section 1002	General	2
Section 1003	Fill Materials	2
Section 1004	Fill Placement	2
Section 1005	Liner System	11
Section 1006	Quality Assurance	5
Section 1007	Design Alternatives	2
Section 1008	Operation and Maintenance	2

APPENDICES

Appendix A Construction Drawings



Section 1001

DEFINITIONS

DEFINITIONS

1.0 General

- .1 Definitions of terms used throughout the Construction Specifications are presented in this Section.

2.0 Definitions

Construction Drawings:	the drawings, as issued for construction, of the Typical Waste Containment Facility Design.
Construction Specifications:	this document.
Contract:	the legal and binding agreement between the Contractor and Alexco Resource Corp. regarding construction of the Waste Containment Facility.
Contractor:	the general contractor responsible for constructing the Waste Containment Facility.
Engineer:	the Professional Geotechnical Engineer registered in the Yukon who is associated with the construction process.
Owner:	Alexco Resource Corp.
Site:	the area in which construction of the Waste Containment Facility or related activity is occurring.
Unsuitable:	not meeting the requirements stated herein or not receiving the Engineer's approval.
Facility:	all components of the Waste Containment Facility.

END OF SECTION



Section 1002

GENERAL

GENERAL

1.0 General

- .1 Alexco Resource Canada Corp. intends to construct a containment facility to store waste rock from the Bellekeno advanced underground exploration and development program. As the company advances through the Keno Hill Silver District, it is anticipated further underground exploration and development programs will require similar containment facilities. Therefore, a typical design has been developed to account for the various potential site and construction material conditions.
- .2 The Facility is to be located within previously disturbed areas, all of which will be incorporated within a district wide closure plan. This district wide closure plan is required under the water license QZ06-074.
- .3 Site specific conditions and Facility location have not been provided or considered. Once Facility location and site specific conditions are known, they must be reviewed by the Engineer. Furthermore, the base of the Facility must be approved by the Engineer prior to fill placement.
- .4 The Facility will be lined with a suitable geomembrane. Water in the Facility will flow towards the vertical culvert and pond within the voids of the waste material.
- .5 Water in the Facility will be monitored and tested on a regular basis. Based on water quality analysis, the waste water will be extracted via pump truck and discharged to the environment or treated in a designated treatment facility.
- .6 Once the Facility reaches its ultimate capacity, the Facility will be capped and reclaimed.

2.0 Scope of Work

- .1 The scope of work for the construction of the Facility is as follows:
 - a. Construct the liner subgrade and berms with Zone B material at the specified grade. This could include cut/fill operations should the foundation material be satisfactory;
 - b. If required, install a geotextile layer to act as separator for Zone A and Zone B materials;
 - c. Construct the liner bedding with Zone A material;

- d. Install the liner system consisting of a suitable liner material and if required, protective geotextile layers above and below the liner, and a geocomposite reinforcing layer;
- e. Place and compact cover material, Zone A material, over the liner system;
- f. Install vertical culvert as specified on the Construction Drawings;
- g. Place and compact the waste material;
- h. Regrade the waste material and place and compact capping material;
- i. Install vegetative cover.

END OF SECTION



Section 1003

FILL MATERIALS

FILL MATERIALS

1.0 General

- .1 This section describes the construction material specifications for the Waste Containment Facility.

2.0 Reference Standards

- .1 The most recent copy of American Society for Testing Materials, ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.

3.0 Material Sources

- .1 No material of any type shall be borrowed or excavated without the Owner's prior approval.
- .2 Pits and quarries shall be maintained and managed in accordance with the requirements set out in the Owner's Land Use and Quarry Permits.
- .3 Zone A material shall be obtained from sources approved by the Owner, provided the final product meets the requirements specified herein. Processing may be required to achieve the specified gradation.
- .4 Zone B material shall be obtained from sources approved by the Owner, provided the final product meets the requirements specified herein. Processing may be required to achieve the specified gradation.
- .5 The parent rock from which all fill materials are derived shall consist of sound, hard, durable material free from soft, thin, elongated or laminated particles and shall contain no unsuitable substances. The potential quarry source shall be approved by the Engineer.
- .6 The quarry source for the Facility fill materials shall be inspected by the Engineer throughout material processing to ensure the product meets the requirements stated herein.

4.0 Material Specifications

.1 Zone A Material

The Zone A material shall consist of hard, durable particles, shall be free of roots, topsoil, and deleterious material and shall have a particle size distribution, as measured by ASTM C136, as presented in Table 1003.1.

TABLE 1003.1: ZONE A MATERIAL (10 MM MINUS) - PARTICLE SIZE DISTRIBUTION LIMITS

Sieve Size (mm)	% Passing Fine Limit	% Passing Coarse Limit
10	100	100
5	80	100
2	55	100
0.63	25	65
0.25	10	40
0.08	2	15

.2 Zone B Material

The Zone B material shall be free of roots, topsoil and other deleterious material and shall have a particle size distribution within the limits presented in Table 1003.2.

TABLE 1003.2: ZONE B MATERIAL (200 MM MINUS) - PARTICLE SIZE DISTRIBUTION LIMITS

Sieve Size (mm)	% Passing Fine Limit	% Passing Coarse Limit
200	100	100
100	85	100
50	65	100
25	40	100
5	20	55
2	0	20

END OF SECTION



Section 1004

FILL PLACEMENT

FILL PLACEMENT

1.0 General

- .1 The fill placement methods to be used during construction of the Waste Containment Facility are described in this Section.
- .2 Construction shall be performed in accordance with the best modern practice and with equipment best adapted to the work being performed. Embankment materials shall be placed so that each zone is homogeneous; free of stratifications; ice chunks, lenses or pockets; and layers of material with different texture grading not conforming to the requirements stated herein.
- .3 No fill material shall be placed on any part of the foundation until it has been prepared, as specified herein. Placement of fill material shall conform to the lines, grades and elevations shown on the Construction Drawings.
- .4 Embankment construction shall not proceed when the work cannot be performed in accordance with the requirements of the Construction Specifications. Any part of the embankment that has been damaged by the action of rain, snow or any other cause shall be removed and replaced with the appropriate material conforming to the requirements stated herein.
- .5 Stockpiling, loading, transporting, placing, and spreading of all materials shall be carried out in such a manner to avoid segregation. Segregated materials shall be removed and replaced with the materials meeting the requirements stated herein.
- .6 The Contractor shall remove all debris, vegetation or any other material not conforming to the requirements stated herein. The Contractor shall dispose of these materials in an area approved by the Owner.

2.0 Zone B Material Placement

- .1 The Zone B material shall be placed to the design elevation as specified in the Construction Drawings in lifts no greater than 500 mm in uncompacted thickness.
- .2 The design elevation for the top of the Zone B berm material shall be no less than 0.5 m above original ground.
- .3 Moisture condition and compact using the minimum number of passes established in accordance with section 1006.4.2.

3.0 Zone A Material Placement

- .1 The Zone A material shall be placed as bedding for the liner system (minimum 300 mm thick) to the design grade specified in the Construction Drawings.
- .2 Subsequent to the liner installation, the Zone A material shall be placed as liner system cover material. The liner system cover material shall be placed to the minimum thickness specified in Table 1004.1 dependent on the type of liner selected.

TABLE 1004.1: RECOMMENDED MINIMUM COVER THICKNESSES

Liner Material	Minimum Required Thickness
Enviro Liner® 4040 (Without Geocomposite)	1.3 m
Enviro Liner® 4040 (With Geocomposite)	0.3 m
HDPE 60	0.3 m
PVC 40 (With Geocomposite)	0.3 m

- .3 The Construction Drawings are based on the selection of Enviro Liner® 4040 with the installation of a geocomposite reinforcing material. Other design alternatives are detailed in Section 1007.
- .4 Zone A material shall be placed in lifts not exceeding 300 mm in uncompacted thickness. Vehicle traffic is prohibited from maneuvering within the Facility until the cover material has reached the minimum thickness required as specified in Table 1004.1.
- .5 Moisture condition and compact with using the minimum number of passes established in accordance with section 1006.4.1.
- .6 Equipment with ground pressures higher than 380 kPa should not be permitted inside the Facility once the liner system has been placed. Care is required to provide the appropriate thickness of fill beneath a vehicle when placing material above the liner system to ensure it is not damaged. Traffic in the area should be restricted to low ground pressure equipment.

END OF SECTION



Section 1005

LINER SYSTEM

LINER SYSTEM

1.0 General

- .1 The product and installation specifications for the non-woven geotextile, liner systems and geocomposite materials to be used in the Waste Containment Facility are presented in this section.
- .2 The liner system will be provided by the Owner and installed by the Contractor.

2.0 Reference Standards

- .1 The most recent copy of the following American Society for Testing Materials standards:
 - a. ASTM D638 Standard Methods for Tensile Properties of Plastics.
 - b. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - c. ASTM D1004 Standard Test Methods for Initial Tear Resistance of Plastic Film and Sheeting.
 - d. ASTM D1603 Standard Test Methods for Carbon Black in Olefin Plastics.
 - e. ASTM D1777 Standard Test Methods for Thickness of Textile Materials.
 - f. ASTM D4533 Standard Test Methods for Trapezoidal Tearing Strength of Geotextiles.
 - g. ASTM D4632 Standard Test Methods for Grab Breaking Load and Elongation of Geotextile.
 - h. ASTM D4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

- i. ASTM D4833 Standard Test Methods for Index Puncture Resistance for Geotextile, Geomembranes, and Related Products.
 - j. ASTM D5199 Standard Test Methods for Measuring the Nominal Thickness of Geosynthetics.
 - k. ASTM D5261 Standard Test Methods for Measuring Mass per Unit Area of Geotextiles.
 - l. ASTM D5994 Standard Test Methods for Measuring Core Thickness of textured Geomembranes
- .2 Federal Test Method
- a. FTM Standard 101.

3.0 Materials

.1 Geotextile

- a. The non-woven geotextile shall have a weight of 542 g/m². The manufacturer shall, prior to shipment of materials, provide to the Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1005.1.

TABLE 1005.1: RECOMMENDED MINIMUM GEOTEXTILE PROPERTIES

Physical Property	Minimum Average Roll Value (Weakest Principle Direction)
Thickness – Typical (ASTM D5199)	3.6 mm
Grab Tensile Strength (ASTM D4632)	1690 N
Elongation at Failure (ASTM D4632)	50 %
Trapezoidal Tear Strength (ASTM D4533)	645 N
Puncture (ASTM D4833)	1070 N
Apparent Opening Size (ASTM D4751)	150 microns
Weight – Typical (ASTM D5261)	542 g/m ²

- b. Any visible damage to the shipment of geotextile shall be noted on the freight receipt and project records.
- c. Storage of geotextile rolls on site shall be in a secure location that will minimize exposure to the elements, UV light and physical damage.

.2 Enviro Liner® 4040

- a. The Enviro Liner® shall be 1.0 mm (40 mil) thick geomembrane or equivalent. The manufacturer shall, prior to shipment of materials, provide to the Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1005.2.

TABLE 1005.2: RECOMMENDED MINIMUM GEOMEMBRANE PROPERTIES

Property	Enviro Liner® 4040
Minimum Average Thickness (ASTM D5994)	1.0 mm
Relative Density (ASTM D792)	0.939
Tensile Strength at Yield (ASTM D638)	26.6 N/mm
Elongation at Yield (ASTM D638)	800 %
Tear Resistance (ASTM D1004)	98 N
Puncture Resistance (FTMS 101)	271 N
Carbon Black Content (ASTM D1603)	2.0 – 3.0 %

- b. The liner material supplied under the specifications shall not have any blisters, holes, undispersed raw materials or any signs of contamination or inclusions of foreign matter. Such defects shall be repaired using techniques in accordance with manufacturer's recommendations. Excessive defects may be grounds for rejecting the entire roll of liner.
- c. Storage of geomembrane rolls on site shall be in a secure location that will minimize exposure to the elements and physical damage.
- d. Enviro Liner® geomembrane is suitable for secondary containment of hydrocarbons and other chemicals, and primary containment of water and water based effluents or as approved by manufacturer.

.3 HDPE Liner

- a. The HDPE geomembrane shall be 1.5 mm (60 mil) thick geomembrane or equivalent. The manufacturer shall, prior to shipment of materials, provide to the Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1005.3.

TABLE 1005.3: RECOMMENDED MINIMUM GEOMEMBRANE PROPERTIES

Property	Textured HDPE 60
Minimum Average Thickness (ASTM D5994)	1.5 mm
Relative Density (ASTM D792)	0.94
Tensile Strength at Yield (ASTM D638)	22.0 kN/m
Elongation at Yield (ASTM D638)	12 %
Tear Resistance (ASTM D1004)	187 N
Puncture Resistance (FTMS 101)	480 N
Carbon Black Content (ASTM D1603)	2.0 – 3.0 %

- b. The liner material supplied under the specifications shall not have any blisters, holes, undispersed raw materials or any signs of contamination or inclusions of foreign matter. Such defects shall be repaired using welding techniques in accordance with manufacturer's recommendations. Excessive defects may be grounds for rejecting the entire roll of liner.
- c. Extrusion resin used for extrusion joining of sheets and for repairs should be HDPE from the same resin batch as the sheet resin. Physical properties must be the same as the liner sheets.
- d. HDPE liner is suitable for containment of hydrocarbons and chemicals as well as water and water based effluents or as approved by manufacturer.
- e. Storage of geomembrane rolls on site shall be in a secure location that will minimize exposure to the elements and physical damage.

.4 PVC Liner

- a. The PVC geomembrane shall be 0.95 mm (38 mil) thick geomembrane or equivalent. The manufacturer shall, prior to shipment of materials, provide to the

Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1005.4.

TABLE 1005.4: RECOMMENDED MINIMUM GEOMEMBRANE PROPERTIES

Property	PVC 40
Minimum Average Thickness (ASTM D5994)	0.95 mm
Tensile Strength at Yield (ASTM D638)	17 N/mm
Elongation at Yield (ASTM D638)	430 %
Tear Resistance (ASTM D1004)	44 N

- b. The liner material supplied under the specifications shall not have any blisters, holes, undispersed raw materials or any signs of contamination or inclusions of foreign matter. Such defects shall be repaired using techniques in accordance with manufacturer's recommendations. Excessive defects may be grounds for rejecting the entire roll of liner.
- c. PVC liner is suitable for containment of water and water based effluents or as approved by manufacturer. It is not suitable for containment of hydrocarbons.
- d. Storage of geomembrane rolls on site shall be in a secure location that will minimize exposure to the elements, UV light and physical damage.

.5 Geocomposite

- a. The geocomposite reinforcing material shall be 5 mm (200 mil) thick or equivalent. The manufacturer shall, prior to shipment of materials, provide to the Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1005.5.

TABLE 1005.5: RECOMMENDED MINIMUM GEOCOMPOSITE PROPERTIES

Property	Geo-Comp 5
Minimum Average Thickness (ASTM D5994)	5 mm
Relative Density (ASTM D792)	0.94
Tensile Strength at Yield (ASTM D638)	79 N/cm
Puncture Resistance (FTMS 101)	489 N
Carbon Black Content (ASTM D1603)	2.0 %

- b. The geocomposite material supplied under the specifications shall not have defects or any signs of contamination or inclusions of foreign matter. Excessive defects may be grounds for rejecting the entire roll of geocomposite.

4.0 Installation - Enviro Liner® 4040 Design (with Geocomposite)

- .1 The liner system consists of the following layers (starting from the top layer):
 - Geo-Comp 5 or equivalent geocomposite
 - Enviroliner 4040 or equivalent geomembrane
- .2 The liner should line the entire surface of the Facility, which includes the crest of the berms, inside slopes, and floor. The geocomposite material is only required on the floor and approach berm of the Facility.
- .3 The Contractor shall ensure that the integrity of the liner system and its components are not compromised during construction. Precautions the Contractor may take to avoid damaging the liner system may include, but will not be limited to, providing light plants in the work area to improve visibility or using pylons to mark the lift/liner system interface.
- .4 Any damage to the liner system and/or its components shall be repaired as soon as possible. Fill placement shall cease immediately in an area where the integrity of the liner system has been compromised. Fill surrounding the damaged liner system may have to be excavated, without further damaging the integrity of the liner, to permit repairs to be made. Hand excavation shall be used to expose damaged portions of the liner for repair.
- .5 The liner system shall be anchored at the top of the berm so that movement downslope does not occur during backfilling at any stage of construction.
- .6 The Contractor shall take the necessary steps to ensure that backfilling does not induce tensile stress in the liner system. Care shall be taken to avoid making sharp turns, sudden stops or sudden starts adjacent to the liner system. Non-essential heavy equipment traffic in the immediate vicinity of the liner system shall not be permitted.

Enviro Liner® Installation

- .7 The Enviro Liner® should be deployed subsequent to the placement of Zone A bedding material.

- .8 The Engineer should walk the liner to observe for any defects caused by on-site equipment and tools. Any liner area showing injury due to excessive scuffing, puncture, or distress from any cause should be replaced or repaired with an additional piece of Enviro Liner® installed as per the manufacturer's specifications over the defective area. All patches should have rounded edges and extend a minimum of 150 mm beyond the affected area.
- .9 Low ground pressure equipment should be used to deploy the liner material. No equipment shall be allowed on the liner.

Geocomposite Reinforcing Installation

- .10 The geocomposite material should be deployed subsequent to the placement of the Liner.
- .11 No equipment is permitted on the liner material during the placing of the geocomposite reinforcing material. The geocomposite reinforcing material must be rolled out by hand and the cover material placed in accordance with Section 1004.

Material Quantities

- .12 Estimated material quantities required for the lined pad are listed in Table 1005.6

TABLE 1005.6: MATERIAL QUANTITY ESTIMATES

Material	Total Area (m ²)
Enviro Liner® 4040	1900
Geo-Comp 5	905

5.0 Installation - HDPE 60 Design

- .1 The liner system consists of the following layers (starting from the top layer):
 - HDPE 60 mil or equivalent geomembrane
- .2 The liner should line the entire surface of the Facility, which includes the crest of the berms, inside slopes, and floor.
- .3 The Contractor shall ensure that the integrity of the liner system and its components are not compromised during construction. Precautions the Contractor may take to

avoid damaging the liner system may include, but will not be limited to, providing light plants in the work area to improve visibility or using pylons to mark the lift/liner system interface.

- .4 Any damage to the liner system and/or its components shall be repaired as soon as possible. Fill placement shall cease immediately in an area where the integrity of the liner system has been compromised. Fill surrounding the damaged liner system may have to be excavated, without further damaging the integrity of the liner, to permit repairs to be made. Hand excavation shall be used to expose damaged portions of the liner for repair.
- .5 The liner system shall be anchored at the top of the berm so that movement downslope does not occur during backfilling at any stage of construction.
- .6 The Contractor shall take the necessary steps to ensure that backfilling does not induce tensile stress in the liner system. Care shall be taken to avoid making sharp turns, sudden stops or sudden starts adjacent to the liner system. Non-essential heavy equipment traffic in the immediate vicinity of the liner system shall not be permitted.

HDPE Liner Installation

- .7 The HDPE liner should be deployed subsequent to the placement of Zone A bedding material. The liner should be placed with no horizontal seams on the slopes. Tie-in seams should be located on the floor at a minimum of 1.5 m from the toe of the slopes.
- .8 The liner panels shall be welded together along the full length of the seam to the top of the berm.
- .9 Both the wedge and the extrusion welding equipment should be qualified by conducting trial seam tests prior to start-up each day and at approximately 4-hour intervals during seaming operations. During the trial seam, the minimum peel and shear strength criteria set by the manufacturer for the 60 mil HDPE geomembrane should be met. The industry-accepted peel and shear strengths for 60 mil HDPE geomembrane are 78 ppi (pounds/inch) and 120 ppi, respectively.
- .10 The Engineer should walk the liner to observe for any defects caused by on-site equipment and tools. Any liner area showing injury due to excessive scuffing, puncture, or distress from any cause should be replaced or repaired with an additional

piece of HDPE liner extrusion welded over the defective area. All patches should have rounded edges and extend a minimum of 150 mm beyond the affected area.

- .11 Low ground pressure equipment should be used to deploy the liner material. No track-wheel equipment shall be allowed on the liner. Equipment travel on the liner material should be kept to a minimum.

Material Quantities

- .12 Estimated material quantities required for the lined pad are listed in Table 1005.7

TABLE 1005.7: MATERIAL QUANTITY ESTIMATES

Material	Total Area (m ²)
HDPE 60 Liner	1900

6.0 Installation - PVC 40 Design

- .1 The liner system consists of the following layers (starting from the top layer):
 - Geo-Comp 5 or equivalent geocomposite
 - PVC 40 mil or equivalent geomembrane
- .2 The liner system should line the entire surface of the Facility, which includes the crest of the berms, inside slopes, and floor. The geocomposite material is only required on the floor and approach berm of the Facility.
- .3 The Contractor shall ensure that the integrity of the liner system and its components are not compromised during construction. Precautions the Contractor may take to avoid damaging the liner system may include, but will not be limited to, providing light plants in the work area to improve visibility or using pylons to mark the lift/liner system interface.
- .4 Any damage to the liner system and/or its components shall be repaired as soon as possible. Fill placement shall cease immediately in an area where the integrity of the liner system has been compromised. Fill surrounding the damaged liner system may have to be excavated, without further damaging the integrity of the liner, to permit repairs to be made. Hand excavation shall be used to expose damaged portions of the liner for repair.

- .5 The liner system shall be anchored at the top of the berm so that movement downslope does not occur during backfilling at any stage of construction.
- .6 The Contractor shall take the necessary steps to ensure that backfilling does not induce tensile stress in the liner system. Care shall be taken to avoid making sharp turns, sudden stops or sudden starts adjacent to the liner system. Non-essential heavy equipment traffic in the immediate vicinity of the liner system shall not be permitted.

PVC Liner Installation

- .7 The PVC liner should be deployed subsequent to the placement of Zone A bedding material.
- .8 The Engineer should walk the liner to observe for any defects caused by on-site equipment and tools. Any liner area showing injury due to excessive scuffing, puncture, or distress from any cause should be replaced or repaired with an additional piece of PVC liner installed as per the manufacturer's specifications over the defective area. All patches should have rounded edges and extend a minimum of 150 mm beyond the affected area.
- .9 Low ground pressure equipment should be used to deploy the liner material. No equipment shall be allowed on the liner.

Geocomposite Reinforcing Installation

- .10 The geocomposite material should be deployed subsequent to the placement of the Liner.
- .11 No equipment is permitted on the liner material during the placing of the geocomposite reinforcing material. The geocomposite reinforcing material must be rolled out by hand and the cover material placed in accordance with Section 1004.

Material Quantities

.12 Estimated material quantities required for the lined pad are listed in Table 1005.8

TABLE 1005.8: MATERIAL QUANTITY ESTIMATES

Material	Total Area (m ²)
PVC 40 Liner	1900
Geo-Comp 5	905

END OF SECTION



Section 1006

QUALITY ASSURANCE

QUALITY ASSURANCE

1.0 General

- .1 The quality assurance testing suggested is described in this section.

2.0 Reference Standards

- .1 The most recent edition of the following American Society for Testing Materials standards:
 - a. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - b. ASTM D698 – Standard -Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - d. ASTM D4437 – Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
- .2 Geosynthetic Research Institute
 - a. GRI Test Method GM6 – Pressurized Air Channel Test for Dual Seamed Geomembranes.

3.0 Fill Particle Size Testing Requirements

- .1 Zone A Material
 - a. Samples of the Zone A material should be evaluated from locations within the borrow source prior to construction. One sample will be evaluated every 500 m³ placed during construction to ensure the placed gradation meets the specification stated herein. The required tests and testing frequency for the Zone A material are presented in Table 1006.1.

TABLE 1006.1: TESTING AND FREQUENCY OF ZONE A MATERIAL

Test	Test Frequency
Particle Size Analysis	One (1) test every 500 m ³ during construction.

.2 Zone B Material

- a. Samples of the Zone B material will be evaluated from the foundation material within the Facility prior to construction and every 2000 m³ placed during construction to ensure the placed gradation meets the specification stated herein. The required tests and testing frequency for the Zone B material are presented in Table 1006.2.

TABLE 1006.2: TESTING AND FREQUENCY OF ZONE B MATERIAL

Test	Test Frequency
Particle Size Analysis	One (1) location within the Facility and One (1) test every 2000 m ³ during construction.

4.0 Fill Compaction Testing Requirements

.1 Zone A Material

- a. Compact each lift with a minimum of six passes using a large smooth-drum, vibratory compactor. The optimum vibratory frequency and number of passes should be determined during construction using proof-roll tests, which demonstrate optimum compaction. The Engineer should inspect the compaction effort to ensure that this effort results in a density equivalent to about 95% MDD.

.2 Zone B Material

- a. Compact each lift with a minimum of six passes using a large smooth-drum, vibratory compactor. The optimum vibratory frequency and number of passes should be determined during construction using proof-roll tests, which demonstrate optimum compaction. The Engineer should inspect the compaction effort to ensure that this effort results in a density equivalent to about 98% MDD.
- b. The foundation material (Zone B or subcut material) should also be compacted as specified in section 1006.4.1.

5.0 Geomembrane Testing Requirements

.1 General

- a. The Contractor is responsible for obtaining mill certificates from the manufacturer and forwarding them to the Engineer.
- b. If applicable, the Contractor shall record all seam parameters (i.e. time, date, operator, welding speed and temperature) on the liner.
- c. If applicable, the Contractor shall be responsible for completing the vacuum box testing and pressure testing for the appropriate seams. The Contractor shall mark the test number and parameters on the liner.
- d. If applicable, the Contractor shall supply and use a field tensiometer for testing liner seams for shear and peel strength.
- e. The Contractor is responsible for maintaining testing records.
- f. All coupons and test specimens remain the property of the Owner.

.2 Qualifying Welds

- a. Qualifying seams shall be conducted on fragmented pieces of material at the following times:
 - At the start of each shift of production seaming, and at 4 hour intervals during production seaming;
 - When a new operator or new machine starts welding;
 - When a machine is restarted after repairs;
 - When welding is stopped for sixty (60) minutes or more;
 - When there is a change in the ambient conditions; and
 - At the discretion of the Engineer.
- b. Qualifying seams shall be 1 m long, and shall be subject to shear and peel testing. The test seam shall meet the minimum requirements stated herein for seam strength, when tested on a field tensiometer. If a qualifying seam fails, the seaming procedure shall be reviewed and the test shall be repeated.

.3 Non-Destructive Testing

- a. Test all wedge-welded seams over their full length using a vacuum unit or air pressure test.
 - Seam intersections will also be subject to vacuum box testing, regardless of seaming method employed.
 - The Contractor shall supply all apparatus and personnel for this type of test.
 - The tests shall be witnessed and documented by the Engineer.
- b. Clean all seams to permit proper inspection.
- c. Repair any seams which fail non-destructive testing in accordance with this Specification. Repairs shall be fully documented by the Contractor.

.4 Vacuum Box Testing

- a. Extrusion welded seams should be tested using either vacuum box testing or pick-testing. Vacuum box testing involves placing the extrusion weld under a vacuum. The weld is first coated with a soapy water solution and any holes in a weld would be indicated by a stream of bubbles when vacuum is applied.
- b. No leaks shall be permitted while conducting vacuum box testing.
- c. Pick-testing is conducted on uneven surfaces where a vacuum cannot be maintained. During pick testing, attention should be paid to the following specific items:
 - The width of the weld;
 - Weld bond to the underlying geomembrane;
 - Joints between three panels (“T” joints);
 - Defects such as bubbles created within the weld due to moisture; and
 - Textured weld surfaces due to temperature fluctuation in the extrusion welder.

.5 Air Pressure Testing

- a. Wedge welded seams should be air-pressure tested over their full lengths using an air pressure test. Air pressure testing involves pressurizing the air channel located between the dual tracks of the seams to a minimum pressure of 40 psi for a period of five minutes.
- b. During the test, the air pressure is not allowed to drop more than 4 psi (10% allowance). Any leaks and bubbling in the seams found during the non-destructive tests must be repaired by extruding a patch of HDPE material over the defect.
- c. Air pressure testing shall be carried out according to GRI Test Method GM6, Pressurized Air Channel Test for Dual Seamed Geomembranes.

.6 Destructive Testing for Production Seams

- a. Cut-out coupons shall be taken at a minimum frequency of one (1) per 150 m of seam, or once per seam. Coupons shall be cut by the contractor at the location directed by the Engineer. Coupons shall generally be taken from a location that does not affect the performance of the liner. All cut-outs shall have rounded corners. Care shall be taken to ensure that no slits penetrate the parent liner.
- b. All holes left by cut outs shall be patched immediately.

.7 Testing of Repairs

- a. All repairs shall be tested using the Vacuum Box in accordance with test method ASTM 4437.

END OF SECTION



Section 1007

DESIGN ALTERNATIVES

DESIGN ALTERNATIVES

1.0 General

- .1 This section provides design alternatives for the Facility should the fill materials available on or near site not adhere to the gradation specifications stated in Tables 1003.1 and 1003.2.
- .2 Should Zone A, Zone B or both materials not meet the gradation specifications stated in Tables 1003.1 and 1003.2 then the recommended design alternatives are available in Table 1007.1.

TABLE 1007.1: RECOMMENDED DESIGN ALTERNATIVES FOR GRADATION NON-COMPLIANCE				
		Zone B		
		Meets Specifications	Gradation Below Fine Limit	Gradation Above Coarse Limit
Zone A	Meets Specifications	This section does not apply	This section does not apply	See Section 1007.2
	Gradation Below Fine Limit	See Section 1007.2	See Section 1007.2	See Section 1007.2
	Gradation Above Coarse Limit	See Section 1007.3	See Section 1007.3	See Section 1007.4

2.0 Detailed Design Alternatives – Non-Compliance Criteria I

- .1 If the fill materials do not comply with gradation specifications as per Table 1007.1 geotextile material is required at the interface between Zone A and Zone B materials.
- .2 The geotextile material should be deployed prior to the placement of Zone A material.
- .3 The geotextile should be placed with a minimum overlap of 150 mm and connected at the seam by heat bonding. If heat bonding is not available an overlap of 300 mm should be used. Horizontal seams should be kept to a minimum on the side slopes. If a horizontal seam is unavoidable, the overlap shall be capped with a 300 mm wide strip of the same geotextile and heat bonded to the underlying material.
- .4 Any tears or holes made in the geotextile should be repaired by placing a patch of geotextile on the defect and held in place by heat bonding. The patch should extend at least 300 mm beyond the damage, in all directions.

3.0 Detailed Design Alternatives – Non-Compliance Criteria II

- .1 If the fill materials do not comply with gradation specifications as per Table 1007.1 geotextile material is required above and below the liner system.
- .2 The geotextile material should be deployed prior to the deployment of the liner system as well as subsequent to the deployment of the liner system.
- .3 The geotextile should be placed with a minimum overlap of 150 mm and connected at the seam by heat bonding. If heat bonding is not available an overlap of 300 mm should be used. Horizontal seams should be kept to a minimum on the side slopes. If a horizontal seam is unavoidable, the overlap shall be capped with a 300 mm wide strip of the same geotextile and heat bonded to the underlying material.
- .4 Any tears or holes made in the geotextile should be repaired by placing a patch of geotextile on the defect and held in place by heat bonding. The patch should extend at least 300 mm beyond the damage, in all directions.

4.0 Detailed Design Alternatives – Non-Compliance Criteria III

- .1 If the fill materials do not comply with gradation specifications as per Table 1007.1 geotextile material is required above and below the liner system as well as at the interface between Zone A and Zone B materials.
- .2 The geotextile material should be placed prior to the placing of Zone A material, prior to the deployment of the liner system as well as subsequent to the deployment of the liner system.
- .3 The geotextile should be placed with a minimum overlap of 150 mm and connected at the seam by heat bonding. If heat bonding is not available an overlap of 300 mm should be used. Horizontal seams should be kept to a minimum on the side slopes. If a horizontal seam is unavoidable, the overlap shall be capped with a 300 mm wide strip of the same geotextile and heat bonded to the underlying material.
- .4 Any tears or holes made in the geotextile should be repaired by placing a patch of geotextile on the defect and held in place by heat bonding. The patch should extend at least 300 mm beyond the damage, in all directions.

END OF SECTION



Section 1008

OPERATION AND MAINTENANCE

OPERATION AND MAINTENANCE

5.0 General

- .1 This section provides a general guideline for the operation and maintenance of the Waste Containment Facility.

6.0 Geomembrane Lined Pad

- .1 Structure Maintenance
 - a. This section refers to the structure as the berm, side slopes, and floor of the Facility.
 - b. The structure shall be inspected regularly. Attention shall be concentrated on the following:
 - Eroded and/or damaged granular slope and floor surfaces and
 - Exposed liner material
 - c. Any identified problems should be repaired immediately. The repair can be conducted by reconstructing the damaged or eroded slopes with a material of similar gradation to Zone A material. Any exposed liner material can be recovered with Zone A material; however, if the liner material is damaged, liner installation personnel shall be retained to repair the liner.
- .2 Surface Water Management
 - a. The Facility is designed to drain all surface water to the installed vertical culvert. Each month, the water level must be inspected, pumped and disposed of appropriately.
 - b. The frequency of monitoring must be increased during times of high precipitation or snow melt within the Facility.

7.0 Filling Procedure

- .1 The filling procedure for the Facility is as follows:
 - a. Waste material is not to exceed a height of 3.0 m above the level of the top of the berm unless approved by the Engineer;
 - b. Waste material is not to be placed higher than relative elevation 0.5 m below the crest of the liner unless approved by the Engineer.

8.0 Closure

- .1 Upon reaching capacity the Facility will be capped with material meeting the specifications outlined in Table 1008.1 or as approved by the Engineer.

TABLE 1008.1: CAPPING MATERIAL- PARTICLE SIZE DISTRIBUTION LIMITS

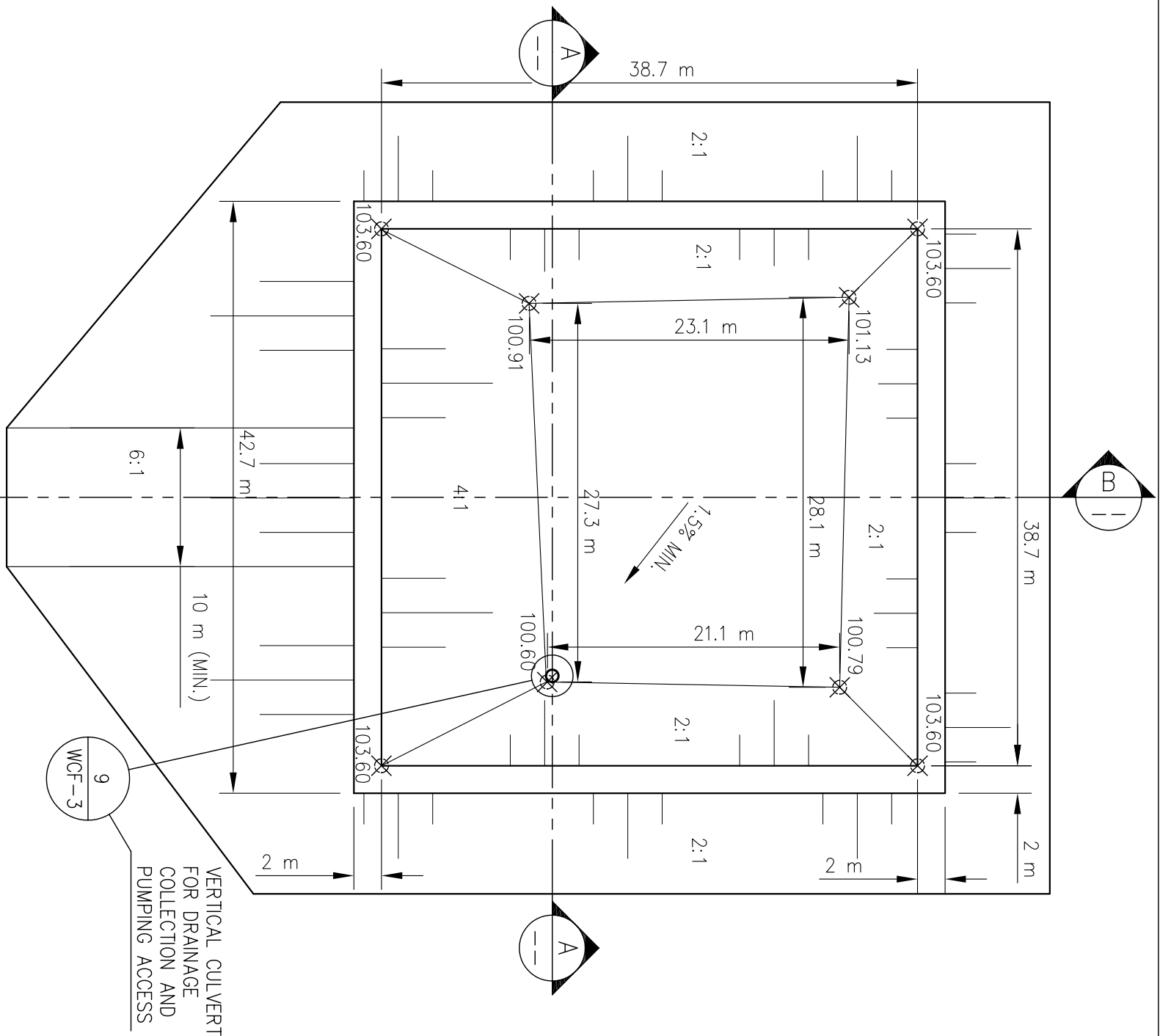
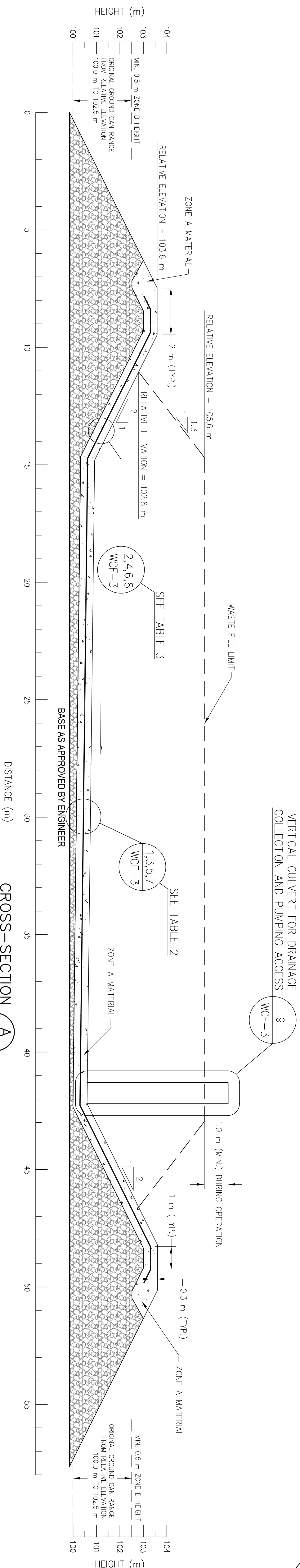
Sieve Size (mm)	% Passing Fine Limit	% Passing Coarse Limit
100	100	100
50	95	100
25	90	100
20	85	100
5	65	90
0.63	35	60
0.08	5	20

- .2 The capping material shall have a minimum thickness of 0.5 m.
- .3 The vegetative cover must be capable of self-regeneration without continuous dependence on fertilizer or re-seeding.
- .4 The vegetative cover must have sufficient density and species diversity to stabilize the surface against the effects of long term erosion.
- .5 Closure monitoring should include inspection for any ponding water. If ponded water is present capping material should be added or re-graded.

END OF SECTION

APPENDIX

APPENDIX A CONSTRUCTION DRAWINGS

[illegible]

ISSUED FOR CONSTRUCTION

TYPICAL WASTE CONTAINMENT FACILITY DESIGN KENO HILL SILVER DISTRICT, YT

ORIGINAL
SIGNED AND SEALED

ALEXCO



EBA Engineering
Consultants Ltd. 

