SECTION 02230 - AGGREGATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes the following items of work associated with the construction of the land treatment containment system:

1. Placement and compaction of containment floor, and retention berms.

1.2 RELATED SECTIONS

A. Section 02222 and 02224.

1.3 REFERENCES

A. American Society for Testing Materials, ASTM C136-01, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.

B. Alberta Transportation, Section 3.2, Aggregate Production and Stockpiling.

1.4 SAMPLES

A. Submit samples for laboratory testing to verify the material is suitable for construction as stated herein.

B. Provide Engineer with access to source and processed material for sampling.

PART 2 - PRODUCTS

2.1 GENERAL

A. Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

B. Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

1. Natural sand.

2. Manufactured sand.

3. Screenings produced in crushing of quarried rock, boulders, gravel or slag.

C. Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

1. Crushed rock.

2. Gravel and crushed gravel composed of naturally formed particles of stone.

2.2 MATERIALS SPECIFICATION

A. 20 mm Minus Crush Material

1. Material used on the containment floor and inside slopes of the embankment surfaces (minimum of 150 mm thick) for geosynthetic liner bedding material.

2. The 20 mm minus crush material shall consist of hard, durable particles, shall be free of organic matter, frozen lumps, weeds, sod, roots, logs, stumps or any other unsuitable material and deleterious material and shall have a grain size distribution as presented in Table 2.1.

TABLE 2.1
20 MM MINUS CRUSH MATERIAL
GRAIN SIZE DISTRIBUTION LIMITS

Grain Size (mm)	% Passing
20.0	100
10.0	35-77
5.0	15-55
1.25	0-30

Alberta Transportation, Section 3.2, Aggregate Production and Stockpiling

B. Pit-Run Gravel Fill

1. Material used for containment berm contruction, subgrade preparation, and access ramp.

2. The material shall consist of hard, durable particles, shall be free of organic matter, frozen lumps, weeds, sod, roots, logs, stumps or any other unsuitable material.and deleterious material and shall have a grain size distribution as presented in Table 2.2.

TABLE 2.2
PIT-RUN GRAVEL FILL MATERIAL
GRAIN SIZE DISTRIBUTION LIMITS

Grain Size (mm)	% Passing
125.0	100
50.0	55-100
25.0	38-100
16.0	32-85
5.0	20-65
0.315	6-30
0.008	2-15

Alberta Transportation, Section 3.2, Aggregate Production and Stockpiling

PART 3 - EXECUTION

3.1 PREPARATION

A. Processing

1. Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

2. Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Engineer.

3. Wash aggregates, if required to meet specifications.

4. When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

B. Handling

1. Handle and transport aggregates to avoid segregation, contamination and degradation.

C. Stockpiling

1. Stockpile aggregates on site in locations that will be determined by contractor and in agreement with the Engineer.

2. Stockpile aggregates in sufficient quantities to meet project schedules.

3. Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

4. Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

5. Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 hours of rejection.

6. Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

7. Do not cone piles or spill material over edges of piles.

8. During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

A. Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

B. Leave any unused aggregates in neat compact stockpiles as directed by Engineer.

SECTION 02498 - GEOTEXTILES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Installation and material specification of geotextile on the landfarm containment floor and inside slopes.

1.2 RELATED WORK

A. Section 02222, 02224 and 02498.

1.3 REFERENCES

A. CAN/CGSB-148.1, Methods of Testing Geotextiles and Geomembranes.

1. No. 2-[M85], Mass per Unit Area.
2. No. 3-[M85], Thickness of Geotextiles.
3. No 7.3-[92], Grab Tensile Test for Geotextiles.
4. No.6.1-[93], Bursting Strength of Geotextiles Under No Compressive Load.

B. American Society for Testing Materials, ASTM D4491 [98], Test Methods for Water Permeablity of Geotextiles by Permittivity.

C. ASTM D4595-[86], Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

D. ASTM D4716-[87], Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.

E. ASTM D4751-[87], Test Method for Determining the Apparent Opening Size of a Geotextile.

1.4 SAMPLES

A. Submit to Engineer following samples at least 3 weeks prior to commencing work.

1. Minimum size of 300 mm x 300 mm of geotextile.

1.5 MILL CERTIFICATES

A. Submit to Engineer copies manufacturer's name, mill test data, and certificate at least 4 weeks prior to start of work.

1.6 DELIVERY AND STORAGE

A. During delivery and storage, protect geotextile from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris, cold temperatures and burrowing animals.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Geotextile: non-woven synthetic fibre fabric, supplied in rolls by manufacturers.

1. Composed of minimum 85% by mass of [polypropylene] [polyester] [with inhibitors added to base plastic to resist deterioration by ultra-violet and head exposure for 60 days.

B. Physical Properties:

1. Thickness: to CAN/CGSB-148.1, No.3, nominal thickness 4.2 mm.

2. Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 542 g/m^2.

3. Tensile strength and elongation: to ASTM D4595.

a. Tensile strength: minimum 1,690 N, wet condition.

b. Elongation at break: 50 %.

c. Seam strength: equal to or greater than tensile strength of fabric.

C. Hydraulic properties:

1. Apparent opening size (AOS): to ASTM D4751, 150 micrometres.

D. If seams are sewn, thread for sewn seams shall have equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with filled sand bags.

B. Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

C. Place geotextile material on sloping surfaces in one continuous length from toe of slope, over the containment berm and down the outside of the slope.

D. Overlap each successive strip of geotextile 150 mm (minimum) over previously laid strip.

E. Placement shall be such that horizontal seams on the sloping surfaces are kept to a minimum. If a horizontal seam is necessary on the slope, the overlap at each seam shall be minimum of 300 mm.

F. Join successive strips of geotextile by heat tacking .

G. Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

H. Replace damaged or deteriorated geotextile to approval of Engineer.

SECTION 02499 - GEOMEMBRANES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Installation and material specification of Arctic Liner® NT 30 (U) on the biocell treatment floor and side slopes.

1.2 RELATED WORK

A. Section 02222, 02224 and 02498.

1.3 REFERENCES

A. ASTM D751, Standard test Methods for Coated Fabrics.

B. ASTM D3083-89, Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining.

C. ASTM D4545-86(99), Standard Practice for Determining the integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes.

D. ASTM D6392-99, Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

E. ASTM D5641-94, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

F. ASTM D1790-02 Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact.

G. ASTM D1004-03 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

H. D1203-94 (2003) Standard Test Methods for Volatile Loss From Plastics Using Activated Carbon Methods.

I. D882-02 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

J. D5199-01 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics

1.4 SAMPLES

A. Submit to Engineer following samples at least 2 weeks prior to commencing work.

1. Minimum size of 300 mm x 300 mm of geomembrane.

1.5 MILL CERTIFICATES

A. Submit to Engineer copies of manufacturer's name, mill test data and certificate at least 2 weeks prior to start of work.

B. Submit to Engineer certificates, including test results, at least 2 weeks prior to delivery to job site.

1.6 QUALITY CONTROL TESTING

A. All field seams shall be tightly bonded using heat welding (supported materials) or solvent bonding techniques. If field welds are performed, then a Qualification weld shall be prepared at the beginning of each seaming period. Heat welded seam qualification welds will be qualitatively tested for field seam Peel Adhesion. A minimum rating of AD-DEL will be obtained. Solvent welded qualification welds will be allowed to cure for 24 hours prior to testing.

B. Instrumented tensile tests of Peel Adhesion and Bonded Seam strength may be performed once every 150 m (500 ft) of seam on projects over 10,000 m2 (100,000 ft2). Tensile testing shall be performed in accordance with ASTM D6392. Field seam qualification weld samples may be tested on site or sent to the fabricator's plant for tensile testing if required by this section.

C. Field seams shall conform to the strength requirements of the field seam strength table corrected to 23°C (73°F). Seams that do not meet these requirements are to be repaired.

D. All field seams shall be non-destructively tested along their entire length using the Air Lance Test (ASTM D4545). Patches and seams around pipe penetrations and fitments shall be tested using the Mechanical Point Stress test (ASTM D4545). Supported materials may also utilize the Vacuum Box test method (ASTM D5641) All discontinuities detected by any test method shall be repaired.

E. Repairs shall utilize the same material as the geomembrane and shall extend a minimum of 100 mm (4 inches) beyond the defect. Repairs shall be accomplished with heat welding or solvent bonding techniques depending on material and site conditions. All repairs are to be tested using Air Lance, Point Stress, or Vacuum Box methods as applicable (ASTM D4545, D5641).

1.7 SHOP DRAWING

A. Submit drawings indicating installation layout, dimensions and details, including fabricated and field seams, anchor trenches and protrusion details.

1.8 DELIVERY AND STORAGE

A. During delivery and storage, protect geomembranes from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

B. The material shall be handled such that no damage shall be done to the geomembrane.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Arctic Liner® NT 30 (U) supplied by Layfield Plastics or equivalent.

B. Physical properties:

1. Thickness: to ASTM D5199, minimum 0.75 mm (30 mil) and nominal thickess of 0.72 mm (28.5 mil).

C. Tensile strength and elongation: to ASTM D882:

1. Tensile strength: minimum 10 N/mm.

2. Elongation: 500 %.

D. Tear resistance: to ASTM D1004, 26.7 N.

E. Low temperature brittleness: to ASTM D1790: minus 54 °C.

F. Field seams require the Heated Bond Seam strength to be 80 pounds/inch (ppi) and Heat Bonded Peel Adhesion Strength to be 15 ppi with film-tear-bond type failure. Shop seams require the Heated Bond Seam strength to be 100 pounds/inch (ppi) and Heat Bonded Peel Adhesion Strength to be 20 ppi with film-tear-bond type failure.

G. Dimensional stability: to ASTM D1204, 4%.

H. Water Extraction: to ASTM D3083, 0.25%.

I. Volatile Loss: to ASTM D1203, 1%.

J. Geomembrane: free of striations, roughness, pinholes, bubbles, blisters, undispersed raw materials and any sign of contamination by foreign matter.

K. Seams: welded in accordance with manufacturer's recommendations. Physical properties for resin used for welding to be same as those for resin used in manufacture of membrane.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Maintain area of installation free of water, snow, dirt, and/or dust accumulations.

B. Repair excessively soft supporting material as directed by Engineer.

C. Place and seam panels in accordance with manufacturer's recommendations on graded surface in orientation and locations indicated. Minimize wrinkles, avoid scratches and crimps to geomembranes and avoid damage to supporting material.

D. Place panels according to the panel layout drawings. Sufficient thermal slack shall be incorporated during placement to ensure that harmful stresses do not occur in service. Liner panels manufactured for secondary containments are made slightly oversize. Place any extra material in the containment area, do not pull liner tight. Distribute slack wrinkles evenly.

E. Solvent bonding in the field shall be conducted in ambient temperature above 10°C. Heat shall be applied to the Liner if solvent welding is done at a lower ambient temperature.

F. Protect installed membrane from displacement, damage or deterioration before, during and after placement of material layers.

G. Replace damaged, torn or permanently twisted panels to approval of Engineer. Remove rejected damaged panels from site.

H. Panels shall not be installed with horizontal seams (perpendicular to the slope) on the sloping surfaces of the berms. Keep field seaming to minimum. Locate field seams up and down slopes, with no horizontal field seam less than 1.5 m beyond toe of slope.

I. Keep seam area clean and free of moisture, dust, dirt, debris and foreign material.

J. Field seamed samples shall be obtained at a minimum of 150 lineal meters (approximately) to verify that seaming conditions are adequate. Samples shall be taken in areas where repairs are not required or kept to a minimum.

K. Test field seams as seaming work progresses by non-destructive methods over their full length. Repair seams which do not pass non-destructive test. Reconstruct seam between failed location and any passed test location, until non-destructive testing is successful.

L. Repair minor tears, cuts, scratches, punctures, pinholes, and stretched material by patching until non-destructive testing is successful. Patches to be round or oval in shape, made of same geomembrane material, and extend minimum of 75 mm beyond edge of defect.

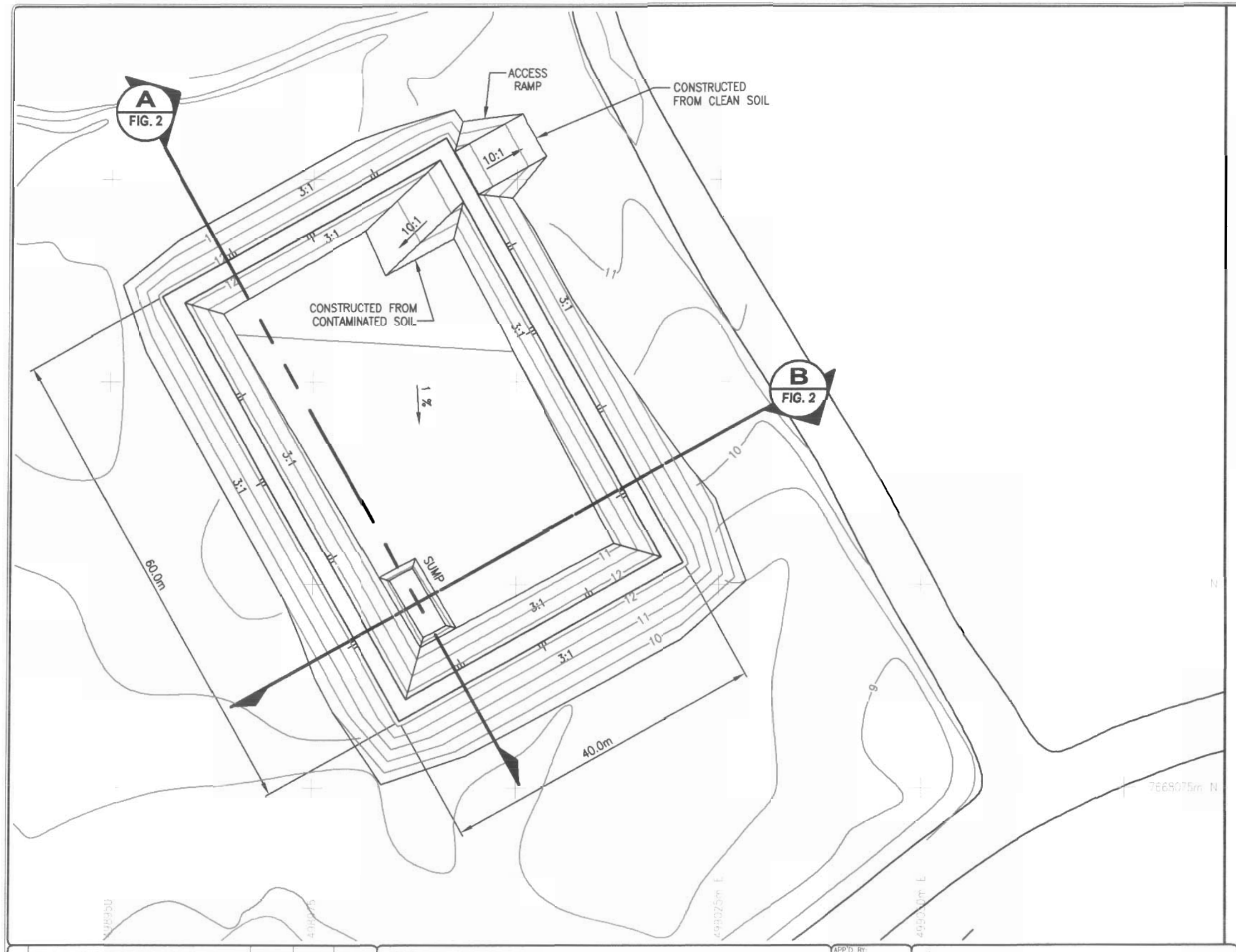
M. Repair shall be inspected and approved by the Engineer.

3.2 PROTECTION

A. Do not permit passage of any vehicle directly on membrane at any time.

B. Equipment with sharp edges shall be protected from the geomembrane to prevent cut, punctures, or scratches on the material.

APPENDIX II
PRELIMINARY CONSTRUCTION DRAWINGS



LANDFARM DESIGN

DIMENSIONS (OUTSIDE CREST)	40m x 60m
CREST ELEVATION	12.2m
CREST WIDTH	2.0m
INSIDE SLOPE	3:1
OUTSIDE SLOPE	3:1
BOTTOM SLOPE	1%
MIN. DEPTH	1.0m

EARTHWORK QUANTITES

PIT RUN GRAVEL	3,020m^3
20mmø MINUS CRUSHED ROCK	320m^3
RAMP FILL – CLEAN FILL (OUTSIDE BIOCELL)	30m^3
FOOTPRINT AREA (TOE OF PIT RUN)	3,600m^2
LINER AREA (38mil ARTIC LINER)	3,720m^2

PRELIMINARY
NOT FOR CONSTRUCTION

0 5 10 15 20 25m
SCALE 1 : 500

REV	DESCRIPTION	DATE	REV BY	DESIGN BY
A	PRELIMINARY	04-04-28	C.D.M.	J.T.

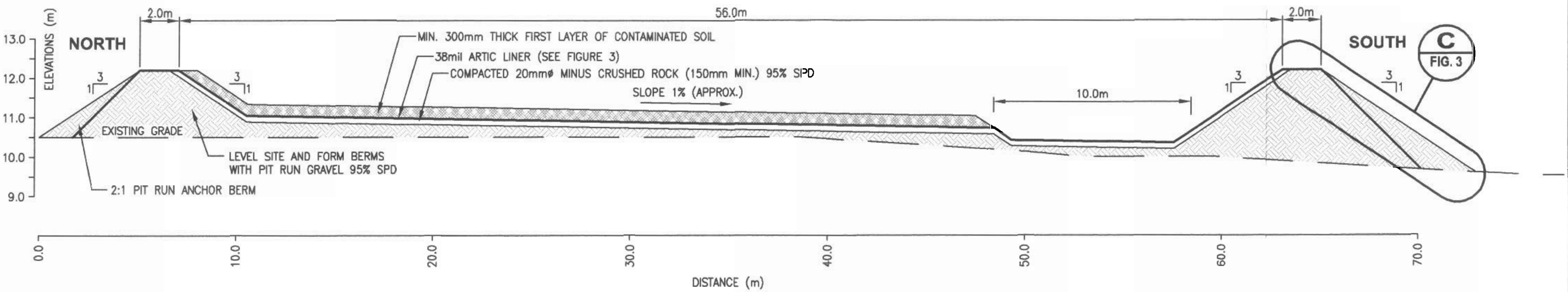
NOTES:
1. EXISTING TOPO SOURCE: DIGITAL MAPPING BASE IS A PRODUCT OF THE GOVERNMENT OF NUNAVUT. FILE NO.: 410-2302.

APP'D BY:
DATE:
SCALE:
AS SHOWN

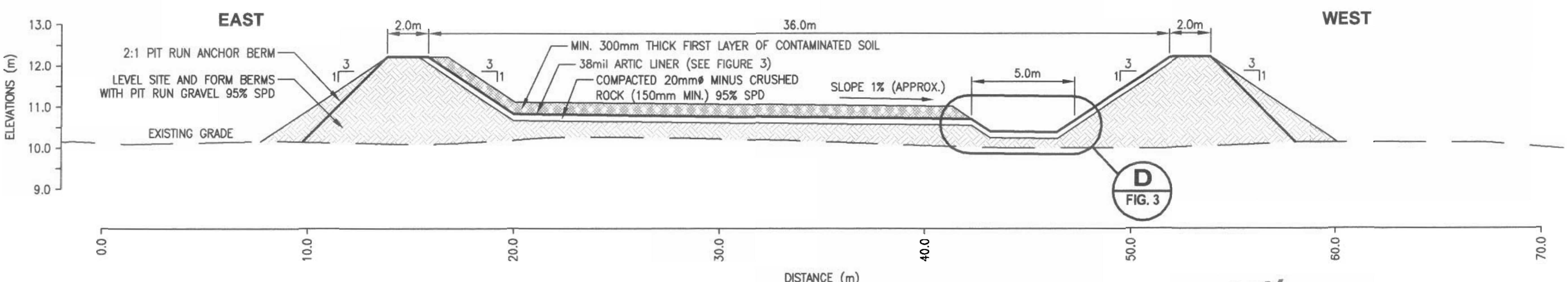
KOMEX INTERNATIONAL LTD.
ENVIRONMENT AND WATER RESOURCES

KITNUNA CORPORATION
CAMBRIDGE BAY BIOCELL
BIOCELL PLAN VIEW
FIGURE No: Y00000401 - FIGURE 1 | A

J:\Y\Y00000401\Y00000401\BASE.dwg



A / FIG. 1 **LANDFARM CROSS-SECTION**
HORZ. 1:200
VERT. 1:100



B / FIG. 1 **LANDFARM CROSS-SECTION**
HORZ. 1:200
VERT. 1:100

PRELIMINARY
NOT FOR CONSTRUCTION

VERT. 1 : 100
0 1 2 3 4 5m
0 2 4 6 8 10m
HORIZ. 1 : 200

REV	DESCRIPTION	DATE	REV BY	DESIGN BY
A	PRELIMINARY	04-04-28	C.D.M.	J.T.

NOTES

APP'D BY:
DATE:
SCALE: **AS SHOWN**

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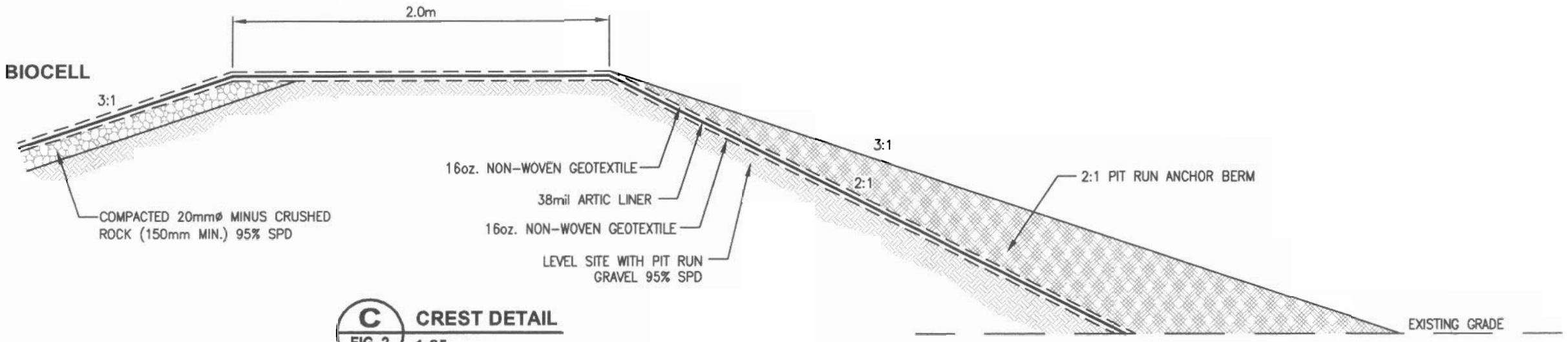
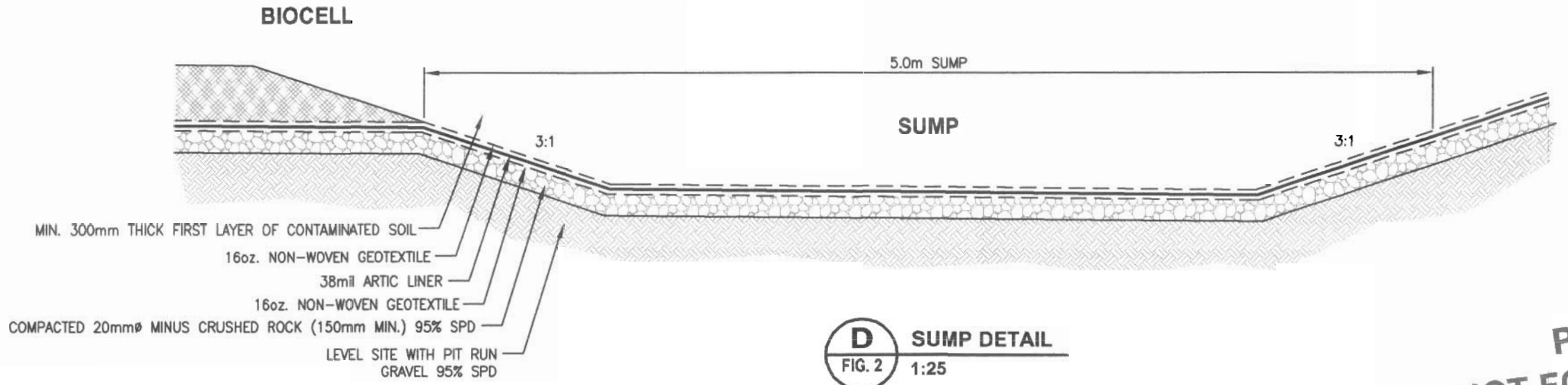
KITNUNA CORPORATION
CAMBRIDGE BAY BIOCELL
BIOCELL CROSS-SECTIONS
FIGURE No: **Y00000401 - FIGURE 2** **A**

J:\Yellowknife\Y00000401\BASE.dwg



C FIG. 2 **CREST DETAIL** 1:25



D FIG. 2 **SUMP DETAIL** 1:25

PRELIMINARY
NOT FOR CONSTRUCTION

VERT. 1 : 100
0 1 2 3 4 5m
0 2 4 6 8 10m
HORIZ. 1 : 200

REV	DESCRIPTION	DATE	REV BY	DESIGN BY
A	PRELIMINARY	04-04-28	C.D.M.	J.T.

NOTES:

APP'D BY:
DATE:
SCALE: AS SHOWN

KOMEX INTERNATIONAL LTD.
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KITNUNA CORPORATION
CAMBRIDGE BAY BIOCELL
BIOCELL DETAILS
FIGURE No: Y00000401 - FIGURE 3 | A

J:\Yellowknife\Y00000401\BASE.dwg