PART B: AMENDMENTS TO THE STANDARD SPECIFICATIONS

SABS 1200C - 1980: SITE CLEARANCE

PSC 8 MEASUREMENT AND PAYMENT

PSC 8.1 Basic Principles

All items shall include for removing of cleared material to the remodeled waste body.

PSC 8.2.1 Clear and grub

General clearing will only be undertaken upon instruction by the Engineer. If the vegetation is removed in a cut to fill, spoil or stockpile operation, no payment will be made for clearing. Cleared material shall be disposed of during cut to fill or spoil operations during the earthworks phase.
C.2

OMBKA LANDFILL REHABILITATION SPECIFICATIONS

SABS 1200 D - 1988 : EARTHWORKS

PSD 1 SCOPE

This section of the Specification controls the construction of the earthworks for the roads and platforms.

PSD 3 MATERIALS

PSD 3.1 Classification for Excavation Purposes

PSD 3.1.1 Method of Classifying

Classification of material other than soft shall be agreed upon prior to excavation commencing. The Contractor shall immediately inform the Engineer if and when the nature of the material being excavated changes to such an extent that a new Classification is warranted. Failure on the part of the Contractor to notify the Engineer timeously shall entitle the Engineer to classify the excavated material at his discretion.

PSD 3.1.2 Classes of Excavation

Irrespective of Classes of excavation stated in the SABS Specifications, all excavated material shall be classified as either hard or soft excavation.

The Classification of excavation shall be as follows:

i) Hard excavation shall be classified as excavation in material which cannot be removed and loaded by normal constructional plant without first drilling and blasting.

ii) Soft excavation shall be classified as per Subclause 3.1.2(a) and (b) of Clause 3 of SABS 1200 D.

PSD 3.3 Selection

The approval of a borrow area for a certain purpose does not necessarily mean that all material within that area is suitable for the specified purpose. What it does mean, is that the borrow area contains some suitable material. The onus is on the Contractor to ensure that only material that is indeed suitable, is removed and used for the specified purpose.

Where the Contractor is required to select material from excavations or stockpile for a specific purpose, the above provisions relating to borrow areas shall apply mutatis mutandis to excavations.

The Contractor shall not waste or contaminate materials that have been selected for a specific purpose.

PSD 5 CONSTRUCTION

PSD 5.1 Precautions

PSD 5.1.1 Safety

PSD 5.1.2 Safeguarding of excavations

Add the following subparagraph:

g) The Contractor or his agent or his representative shall not require or allow any person to work under unsupported overhanging material or in an excavation which is more than 1.5m deep, and any excavation which has not been adequately supported or braced if there is a danger of the overhanging material or the sides of
the excavation collapsing. The support, shoring or bracing to be designed and constructed by the Contractor, shall be strong and sturdy enough to support the sides of the excavation in question”.

PSD 5.2 Methods and Procedures

PSD 5.2.1 Site Preparation

PSD 5.2.1.1 Clearing or clearing and stripping of site

The areas specified to be cleared shall be stripped of all vegetable matter and surface soil to a depth of 100mm.

PSD 5.2.2 Excavation

PSD 5.2.2.1 Excavations for general earthworks and for structures

Add the following additional subparagraphs:

f) Overbreak shall be backfilled at the Contractor’s expense and shall not be measured.

g) The Contractor shall so plan his cut-to-fill operations that all excavated material is used in the manner that is most appropriate.

The Contractor shall conserve all suitable surplus material and he shall not borrow, spoil or waste any material unnecessarily. If excavated material designated for a particular purpose become contaminated, is incorrectly used or becomes unavailable through injudicious planning of excavation operations, the Contractor shall replace the contaminated material and make good any shortfall with material of quality at least equal to that of the said selected material.

Where selection of excavated material is required, the method of excavation shall be so arranged as to avoid double handling. Wherever possible excavated material shall be placed in its final position without being stockpiled. If stockpiling is unavoidable, materials intended for different uses shall be stockpiled separately.

PSD 5.2.2.2 Borrow Pits

Add the following:

“Where it is specified that material shall be obtained from a designated borrow pit, the Contractor shall be responsible and include in his rates for making all arrangements for procuring the material. No payment will be made for the removal of overburden or stockpiling or clearing at the source and no extra over payment for excavating in intermediate, hard or boulder material shall apply”.

Add the following new Subsubclause:

PSD 5.2.2.4 Selection and Stockpiling

The approval or designation of a particular borrow area for a particular purpose will not imply that all the material is suitable for that purpose or should be used for that purpose. The Contractor shall select suitable material from that source, discard unsuitable material and reserve material for other purposes as necessary. When required and as ordered by the Engineer, material shall be stockpiled for later use when the excavation thereof is unavoidable in order to excavate the material required at the time.
OMBIKA LANDFILL REHABILITATION

SPECIFICATIONS

PSD 5.2.3 Placing and Compaction

PSD 5.2.3.1 Embankments

Amend Subsubclause 5.2.3.1 to read:

“Each layer shall be compacted at OMC to a density of at least 93% of modified AASHTO maximum density”.

PSD 5.2.3.2 Backfilling and compaction of trenches and excavations around structures

a) General
   Each layer shall be compacted at OMC to a density of at least 93% of modified AASHTO maximum density”.

b) Restricted
   The width of the restricted backfill behind the retaining walls shall be as dimensioned on the drawings.

PSD 5.2.5 Transport for Earthworks

PSD 5.2.5.1 Freehaul

The freehaul distance applicable to this contract shall be 10km from the centroid of the site. All haulage from commercial sources shall be considered as freehaul. The cost of this haulage shall be deemed to be covered by other rates in the Schedule of Quantities.

PSD 5.2.5.2 Overhaul

Transportation of all excavated material (except that from commercial sources) beyond the freehaul distances applicable (10km from the centroid of the site) will be regarded as overhaul.
This section of the Specifications shall be extended to include for all subsoil drains, open drains, concrete lined drains, water pipes and trenches for electrical cables.

Irrespective of Classes of excavation stated in the SABS Specifications, all excavated material shall be classified as either hard or soft excavation.

The Classification of excavation shall be as follows:

i) Hard excavation shall be classified as excavation in material which cannot be removed and loaded by normal constructional plant without first drilling and blasting.

iii) Soft excavation shall be classified as per Subclause 3.1.2(a) and (b) of Clause 3 of SABS 1200 D.

Replace the words "if he so wishes" in the first line of the second paragraph with the words "at his own cost".

The precautions for excavations as specified in Clause 5.1.1 of Section 1200D shall apply to all trench excavations.

The Contractor shall take all the steps necessary to ensure that no person is required or allowed to work in a trench or any other unsupported overhanging excavation which is more then 1,5m deep, and any excavation which has not been adequately supported, shored or braced if there is any danger whatsoever of the sides of the excavation collapsing. The support, shoring or bracing to be designed and constructed by the Contractor, shall be strong and sturdy enough to support the sides of the excavation in question.

Excavations for all drains and foundations shall be excavated to the dimensions as shown on the drawings. Payment will be made based on the width shown on the drawings.

For pipes constructed in fill areas, the fill must be placed to attain a minimum of 600mm above the crown of the pipe unless indicated otherwise on the drawings, before excavating the trench to the specified width. In such instances,
payment for excavation shall be calculated from this level.

Where selected layers are specified above the pipe, excavation shall be measured from the bottom of the selected layer or from 600mm above the crown whichever is the lesser. Excavation for manholes and other structures shall be included with an allowance of 600mm around the structure to provide working space. For subsoil pipes the excavation depth shall be the full depth as shown the drawings.

**PSDB 5.6.3 Disposal of soft excavation material**

Excavation material from the trench which is classified as soft and has become surplus because of bulking, displacement by the pipe and importation shall be stockpiled on site as directed by the engineer.

**PSDB 8 MEASUREMENT AND PAYMENT**

**PSDB 8.1 Basic Principles**

**PSDB 8.1.4 Transport**

Except where otherwise specifically stated, the provisions of subclause PSD 5.2.5 of SABS 1200 D shall apply to this clause.

**PSDB 8.3 Scheduled Items**

**PSDB 8.3.2 Excavation**

Clause 8.3.2 a) should now read:

a) “Excavate in all materials for trenches, backfill, compact and stockpile of surplus material.”

All soft surplus material from trench excavations will be stockpiled on site as directed by the engineer.

In addition to the requirements of Subclause 8.3.2, the tendered rate for excavation shall also include for trimming the excavations and for compacting the base of the trenches to 93% mod AASHTO maximum density to a depth of 100mm.

Tenderers are to note that in all cases the compaction of the trench backfill shall be to 93% mod AASHTO density with the backfill layers not exceeding 150mm in thickness. The tendered rate for excavation and backfilling in all materials shall include for the increased compaction of the trench bottom excavations and backfill to 95% mod AASHTO density.
SABS 1200 DK - 1996 : GABIONS AND PITCHING

PSDK 1 SCOPE

This specification shall be extended to cover the geotextile component required for the leachate drainage and the retaining walls.

PSDK 3 MATERIALS

PSDK 3.1.3 Geotextile

a) Non woven needle punched geotextile for leachate collection and retaining walls.

The geotextile shall be a non-woven polypropylene or polyester geofabric with a minimum nominal mass of 150g/m² and shall have the following properties:

<table>
<thead>
<tr>
<th>Property (a)</th>
<th>Test Method (ASTM)</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Grab Tensile Strength</td>
<td>D 4632</td>
<td>N</td>
<td>480</td>
</tr>
<tr>
<td>Minimum Trapezoidal Tear Strength</td>
<td>D 4533</td>
<td>N</td>
<td>245</td>
</tr>
<tr>
<td>Minimum Pore Size</td>
<td>D 4751</td>
<td>µm</td>
<td>310</td>
</tr>
<tr>
<td>Minimum Burst Strength</td>
<td>D 3786</td>
<td>MPa</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Notes:

(a) All values are MARV unless otherwise indicated.
(b) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure

Where products are tested under other test methods, the methods and results should accompany the tender.

The geotextile must be stable in the presence of chemicals typically found in a landfill and should be resistant to attack from these chemicals.

All geotextiles should be stable at a temperature of 100 °C.

PSDK 3.1.4 Geomembrane

The Damp Proof Course (DPC) geomembrane shall be a waterproof sheet of polyethelene with a minimum thickness of 250µm.

PSDK 8 MEASUREMENT AND PAYMENT

PSDK 8.2.4 Geotextile (or Geomembrane)

The tendered rate shall include for procuring, transporting, cutting, joining, wasting and overlapping of geotextiles and geomembranes.
PSDM 1 SCOPE

This section of the Specification controls the construction of the roadworks and platforms.

PSDM 3 MATERIALS

PSDM 3.1 Classification for Excavation Purposes

Irrespective of the classification of excavation contained in the SABS Specifications, all excavated material shall be classified as that stated in PSDB 3.1 of this Document.

PSDM 3.2 Classification for Placing Purposes

a) The nomenclature used for the classification of the various material types to be used in the designed pavement layers is that defined in the NITRR documents TRH 4 and TRH 14.

b) Where G7, G8 and G9 materials are called for in these Project Specifications, the material shall conform in all respects to the requirements of G7, G8 and G9 materials as described in TRH 14 in preference to the material properties given in Subclause 3.2.3.

PSDM 3.2.6 Protection and Desiccation Layers

The material shall comply with the following specification:

It shall consist of natural gravel material obtained from commercial sources. It shall be free from deleterious matter such as large roots, stones and refuse.

PSDM 5 CONSTRUCTION

PSDM 5.2 Methods and Procedures

PSDM 5.2.8 Transport

Except where otherwise specifically stated, the provisions of subclause PSD 5.2.5 of SABS 1200 D shall apply to this clause.

PSDM 8 MEASUREMENT AND PAYMENT

PSDM 8.1 Basic Principles

Further to the requirements of Clause 8.1, the following shall apply:

a) Bulking and Shrinkage

For measurement and payment purposes, no allowances will be made for bulking or shrinkage and it shall be assumed that 1 cubic metre of excavated material from the site shall form 1 cubic metre of compacted fill. In the event of there being surplus material encountered on site due to bulking, the Tenderer shall allow in the relevant rates for the material to be stockpiled as directed by the engineer. Similarly, should the material shrink the Tenderer shall allow for the importation of material.
b) Volumes
Measurement for bulk earthworks shall be from topographical survey and DTM modelling.

c) Stockpiling of material

The Tenderer must note that it may be necessary to stockpile some of the excavated material before the fill areas become available. Allowance for any costs incurred in the stockpiling as described in Clause 8.3.11 must be made in the cut to fill / spoil / stockpiling rates as items have not been included in the Schedule of Quantities to cover stockpile handling.

d) Restricted Work

No extra or separate payment will be made for work considered to be of a restricted nature. These costs shall be deemed to be covered by other rates in the Schedule of Quantities.

PSDM 8.3 Scheduled Items

PSDM 8.3.4 Borrow to fill from commercial sources

a) Fill to waste excavation, minimum G9 quality and compact to 93% mod AASHTO density

The tendered rate shall cover the cost of procuring the material from commercial sources, transporting, preparing, processing, shaping, watering mixing, compacting to the densities and finishing the slopes of fills.

PSDM 8.3.5 Selected layer compacted to 93% of modified AASHTO maximum density

Add the following:

The tendered rate shall include for the procurement of the materials from commercial sources.

PSDM 8.3.7 Cut to spoil or cut to stockpile

The tendered rate shall include for stockpiling all soft excavation and spoiling all hard excavation. For the classification of materials refer to clause PSDB 3.1 of this document.

PSDM 8.3.13 Surface finishes

a) Topsoiling

The tendered rate shall cover the cost of procuring the material from commercial sources, haulage, spreading, watering and compacting as specified in subclause 5.2.4.2 of SABS 1200D 5.4.4 to a final thickness of 100mm.

The tendered rate shall also allow for any restricted work, due to confined areas and work up against existing structures and obstructions.

PSDM 8.3.17 Excavate unsuitable material 300 mm below formation upon instruction from the engineer and replace with G8 material from commercial sources

The tendered rate shall also include for stockpiling the excavated soft material at the designated stockpile on site and the spoiling of hard excavation at a legal spoil site as chosen by the contractor to the satisfaction of the engineer, trimming the area
excavated to the required level and compaction of the in situ material to 93% mod AASHTO density.

The tendered rate shall also include for the importation of G8 quality material to replace the unsuitable material removed and the compaction of the material to the required density.

The area to be undercut must be verified by the Engineer on site before any work on this item can commence.
SABS 1200 LB - 1983 : BEDDING (PIPES)

PSLB 3 MATERIALS

PSLB 3.1 Selected Granular Material

Add the following:

"Alternatively clean, coarse river sand may be used".

Add the following new Subclauses:

PSLB 3.5 Concrete Sand

Where shown on the drawings the backfill for subsoil drains shall be concrete sand (fine aggregate) as per the relevant requirements of SABS 1083. The material must be obtained from an approved source.

PSLB 3.6 Crushed Rock Aggregate

Where shown on the drawings, the backfill for subsoil drains and percolation trenches shall be as per the relevant requirements of SABS 1083. The material must be obtained from an approved source.

PSLB 3.7 Synthetic-Fibre Filter Fabric

Synthetic-fibre fabric shall be used for lining in subsoil drainage systems and retaining walls. It shall be procured, furnished and installed as specified and shown on the drawings. The lining shall not be displaced or damaged in any way during construction of the relevant items of work.

Filter fabric shall be stored under suitable cover and shall not be exposed to direct sunlight for prolonged periods and shall be protected from mechanical damage during installation and construction.

PSLB 8 MEASUREMENT AND PAYMENT

PSLB 8.2 Scheduled Items

PSLB 8.2.2 Supply of bedding by importation

PSLB 8.2.2.3 From commercial sources

The tendered rate shall also include for the placing and compaction of the material in the trenches and the levelling of the materials to the required level.
SABS 1200 ME - 1981: SUBBASE

PSME 3 MATERIALS

PSME 3.1 Classification for Excavation Purposes

Irrespective of the classification of excavation contained in the SABS Specifications, all excavated material shall be classified as that stated in PSDB 3.1 of this Document.

PSME 3.2 Physical Properties

PSME 3.2.1 Subbase Material

Replace Subclause 3.2.1 with the following:

a) “The nomenclature used for the classification of the various material types to be used in the designed pavement layers is that defined in the NITRR documents TRH 4 and TRH 14”.

b) Where G5 material is called for in these Project Specifications, the material shall conform in all respects to the requirements of a G5 material as described in TRH 14 in preference to the material properties given in Subclause 3.2.1 and 3.2.2.

c) Where a G5 natural gravel wearing course is called for, the material properties shall satisfy all the requirements of “Table 2: Recommended Material Specifications for Unpaved Roads in Urban Areas” of TRH 20 with the following amendment:

CBR: ≥ 45 at 95% mod AASHTO compaction and OMC

d) “The region factor (see drawing ME-2) shall be 0.75”.

PSME 5 CONSTRUCTION

PSME 5.4 Placing and Compaction

PSME 5.4.4 Compaction

Amend Subsubclause 5.4.4.2 to read “…and subbase shall be compacted to a density of at least 95% or modified AASHTO maximum density”.

Also amend the following to read “…and any gravel wearing course shall be compacted to a density of at least 95% of modified AASHTO maximum density.” In subsubclause 5.4.4.2.

PSME 5.7 Transport

Except where otherwise specifically stated, the provisions of subclause PSD 5.2.5 of SABS 1200 D shall apply to this clause.
PSME 8  MEASUREMENT AND PAYMENT

PSME 8.3  Scheduled Items

PSME 8.3.3  Construct sub base / gravel wearing course / shoulders with the following material from Commercial sources

The tendered rates for construction of the sub base/gravel wearing course/shoulders with materials from commercial sources shall include for haulage and for any restricted work and work up against existing structures and obstructions.
C.3.3. PARTICULAR SPECIFICATIONS

C.3.3.5 GEOSYNTHETIC CLAY LINER
C.3.3.6 SHAPING OF WASTE
C.3.3.8 FENCING INCLUDING VEHICULAR GATE
C 3.3.5 GEOSYNTHETIC CLAY LINER (GCL)

PS 5 GEOSYNTHETIC CLAY LINER

PS 5.1 Scope

This specification covers the supply, storage, delivery and installation of a low shear geosynthetic clay liner (GCL).

PS 5.2 Definitions

For the purposes of this specification, the following definitions shall apply:

a) Manufacturing Quality Control (MQC): A planned system of inspections that is used to directly monitor and control the manufacture of a material that is factory originated. MQC is normally performed by the manufacturer of geosynthetics materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications.

b) Manufacturing Quality Assurance (MQA): A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetics products to assess the quality of the manufactured materials. MQA refers to measures taken by the GCL installation contractor and/or Engineer as applicable to determine if the manufacturer is in compliance with the product certification and contract specifications for a project.

c) Construction Quality Control (CQA): A planned system of inspections that is used to directly monitor and control the quality of a construction project. Construction quality control should be performed by the GCL installation contractor and is necessary to achieve quality in the constructed or installed system. Construction Quality Control (CQA) refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the drawings and specifications for the project.

d) Construction Quality Assurance (CQA): A planned system of activities that provides the Employer, Engineer and permitting authorities assurance that the facility was constructed as specified in the design. Construction Quality Assurance (CQA) includes inspections, verifications, audits and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. Construction Quality Assurance (CQA) refers to measures taken by the Engineer to assess if the GCL installation contractor is in compliance with the drawings and specifications for the project.

e) Geosynthetic Clay Liner (GCL): A factory manufactured hydraulic barrier consisting of Sodium Bentonite clay sandwiched between, supported and encapsulated by two geotextiles, held together by needle punching.

f) Woven or nonwoven fabrics: used to contain the Bentonite used in a GCL.

g) Sodium Bentonite: The high swelling clay component of GCL’s consisting primarily of the mineral Montmorillonite.
h) **Needle punching:** A GCL manufacturing process whereby boards of barbed needles incorporate the staple fibres from a nonwoven geotextile, through a Sodium Bentonite clay layer, into the matrix of a second or more geotextile layers.

**PS 5.3 Materials**

The GCL must comply with the following specifications:

a) The GCL shall be manufactured by mechanically bonding the cover and carrier geotextiles using a needle punching process to enhance frictional and internal shear strength characteristics.

b) In order to maintain these characteristics, no glues, adhesives or other non-mechanical bonding processes shall be used instead of the needle punching process.

c) The needle punched GCL shall be locked to prevent fibre pullout under continuous, long-term strain. The lock process must set the nonwoven fibres where they protrude from the carrier geotextile (woven or nonwoven depending upon product) to secure the reinforcement in place more permanently.

d) No other manufacturing techniques shall be approved unless it can be suitably demonstrated that the GCL exhibits uniform shear strength characteristics across the entire width of the panel. Isolated sewn, stitched or stapled rows do not constitute uniform reinforcement for the purposes of this specification.

e) The minimum acceptable dimensions for the GCL panels shall be 4.5 metres wide and 30 metre long. Short rolls (rolls less than 30 metres long) may be supplied, but at a rate not to exceed 5% of the total product area produced for this project.

f) To demonstrate the uniformity of the manufacturing process, no delamination of the geotextile components from the Bentonite core shall occur when samples of the GCL are immersed in tap water at ambient temperature of one hour.
## GCL: PARTICULAR SPECIFICATION

<table>
<thead>
<tr>
<th>STANDARD GRADES</th>
<th>UNIT</th>
<th>LOW SHEAR</th>
<th>MEDIUM SHEAR</th>
<th>HIGH SHEAR</th>
<th>M Q TESTING (m²)</th>
<th>TEST METHOD</th>
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<tbody>
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<td>GEOTEXTILE COVER LAYER</td>
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<td>4 350</td>
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<td>≥ 20</td>
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<td>HYDRAULIC CONDUCTIVITY</td>
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<td>≥ 50</td>
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<td>≥ 270</td>
<td>≥ 450</td>
<td>4000</td>
<td>ASTM D6496</td>
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</table>

Notes:

1) Minimum Average Roll Values (MARV) are reported unless otherwise stated.
2) A low shear grade GCL is required for this Contract.

Acceptable GCL’s for this Contract include any needle punched GCL’s that meet all the requirements of this specification.

Before considering an alternative GCL material to that specified in the Contract Documents, the Contractor shall submit with his Tender certified test results and statements of quality from the proposed GCL supplier to the Engineer, indicating without exception that the proposed GCL meets the requirements of the specification.

**PS 5.4 Quality Control**

a) The GCL shall be tested for compliance with this specification by the test methods indicated on the material specification. During production needle punched GCL’s
shall be continuously inspected for broken needles using an in-line metal detector and broken needles shall be removed. GCL’s produced on a line that is not equipped with on-line needle detection facilities will not be considered for acceptance. Candidate GCL materials may be tested and pre-approved at the manufacturing location.

b) The GCL manufacturer shall issue Quality Control Certificates to the Project Engineer, CQA Inspector or other designated party for each delivery of material. The certifications shall be signed by the quality control manager of the GCL manufacturer or other responsible party and shall include the following information:

i) Shipment Packing List. A list indicating the rolls shipped on a particular truckload.

ii) Bill of Lading. The shipping documents for the truck used for the shipment.

iii) Letter of Certification. The letter indicating the material is in conformance with the physical properties specified.

iv) Physical Properties Sheet. The material specification for the GCL supplied in accordance with this specification.

c) Manufacturer Quality Control Submittal. The GCL manufacturer shall issue Quality Control submittals to the Project Engineer, CQA Inspector or other designated party for each lot of material if necessary. The submittals shall include the following information:

i) Bentonite Manufacturer Certification. Bentonite manufacturer quality documentation for the particular lot of clay used in the production of the rolls delivered.

ii) Geotextile Manufacturer Certification. Geotextile manufacturer quality control documentation for the particular lots of geotextiles used in the production of the rolls delivered.

iii) GCL Manufacturer Tracking List. Cross-referencing list delineating the corresponding geotextile and Bentonite lots for the materials used in the production of the rolls delivered.

iv) Manufacturing Quality Control Data. The manufacturing quality control test data indicating the actual test values.

d) Packaging. All GCL rolls shall be packaged in opaque moisture resistant plastic sleeves. The roll cores shall be sufficiently strong to resist collapse during transit and handling.

e) Roll Identification and Labelling. Before shipment, the manufacturer shall label each roll, both on the GCL roll and on the surface of the plastic protective sleeve. Labels shall be resistant to fading and moisture degradation to ensure legibility at the time of the installation. At a minimum, the roll labels shall identify the following:

i) Product name and grade

ii) Length and width of roll

iii) Total weight of roll

iv) Production lot number and individual roll number

f) Any accessory Bentonite used for sealing seams, penetrations or repairs, shall be high-quality powdered Sodium Bentonite from a recognised producer.
PS 5.5 Delivery and Storage

The following operational procedures are as specific as possible while recognising that the specific requirements of the project may necessitate minor modifications. Significant deviations from these procedures shall be pre-approved by the Project Engineer or other designated party.

a) Shipping and Handling Equipment. The party responsible for unloading the GCL shall contact the supplier before shipment to determine the correct unloading methods and equipment if different from the pre-approved and specified methods.

b) GCL’s must be supported during handling to ensure worker safety and prevent damage to the product. Under no circumstances should the rolls be dragged, lifted from one end, lifted with only the forks of a lift truck or dropped on to the ground from the delivery vehicle.

c) The QCA Inspector shall verify that proper handling equipment exists which does not pose any danger to installation personnel or risk of damage or deformation to the liner material itself. Suitable handling equipment is described below:

i) Spreader Bar Assembly. A spreader bar assembly shall include both a core pipe or bar and a spreader bar beam. The core pipe shall be used to uniformly support the roll when inserted through the GCL core, while the spreader bar beam will prevent chains or straps from chafing the roll edges.

ii) Carpet Spike. A carpet spike is a rigid pipe or rod with one end directly connected to a forklift or other handling equipment, and the other end rounded off to allow easy insertion into roll material cores. If a carpet spike is used, it should be at least 3.0 metres long and inserted to its full length into the roll core to prevent excessive bending of the roll when lifted.

iii) Roller Cradles. Roller cradles consist of two large diameter rollers spaced approximately 75mm apart, which both support the GCL roll and allow it to unroll freely. The use of roller cradles shall be permitted if the rollers support the entire width of the GCL roll.

iv) Straps. Straps may be used to support the ends of spreader bars but are not recommended as the primary support mechanism. As straps may damage the GCL where wrapped around the roll and generally do not provide sufficient uniform support to prevent roll bending or deformation, great care must be exercised when this option is used.

d) GCL Inspection Upon Delivery. Each roll shall be visually inspected when unloaded to determine if any packaging or material has been damaged during transit.

i) Rolls exhibiting damage shall be marked and set aside for close examination during deployment.

ii) Minor rips or tears in the plastic packaging shall be repaired with moisture resistant tape before being placed in storage to prevent moisture damage.

iii) The presence of free flowing water within any roll packaging shall require that roll to be set aside for further examination to ascertain the extent of any damage.
### PS 5.6 Measurement and Payment

#### PS 5.6.1 Geosynthetic Clay Liner (GCL)

**PS 5.6.1.1 Supply and install low shear GCL to landfill Cell**

The unit of measurement shall be the **square metre (m²)** of GCL installed in plan on the Landfill Cell, including anchorage.

The tendered rate shall include full compensation for all materials, plant, labour, transport and other incidentals required to supply, store, deliver and install the GCL complete to the Engineer’s satisfaction. No additional payment will be made for any storage, security, transporting, testing or control or assurance of quality.

The tendered rate shall also include for cutting, joining, wastage and overlapping as these items will not be measured separately.

**PS 5.6.1.2 Installation only of low shear GCL to the Landfill Cell**

The unit of measurement shall be the **square metre (m²)** of GCL installed in plan on the landfill cell including anchorage.

The tendered rate shall include full compensation for all materials, plant, labour, transport and other incidentals required for providing storage once delivered to site, transport onto the cell and installation of the GCL complete to the Engineers satisfaction.

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<td>iv)</td>
<td>GCL rolls delivered to the project site shall be only those indicated on GCL manufacturing quality control certificates.</td>
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<td>e)</td>
<td>Storage / Stockpiling / Staging. Storage of the GCL rolls shall be the responsibility of the supplier. All GCL rolls shall be stockpiled and maintained dry in a well-drained flat location area away from high-traffic areas. The Client and Engineer must be given full access to view and test the GCL at appropriate agreed times. The supplied GCL is not to be used and/or replaced by any other rolls of GCL once the inspection and payment for the GCL has been made.</td>
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<td>Rolls shall not be stacked on uneven or discontinuous surfaces, in order to prevent bending, deformation, and damage to the GCL or cause difficulty inserting the carpet spike or core pipe.</td>
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<td>GCL’s should be stored no higher than four rolls high, or limited to the height at which installation personnel may safely manoeuvre the handling apparatus. Stacks or tiers of rolls should be situated in a manner that prevents sliding or rolling by chocking the bottom layer of the rolls.</td>
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<td>An additional tarpaulin or plastic sheet shall be used over the stacked rolls to provide extra protection for GCL material stored outdoors.</td>
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<td>iv)</td>
<td>Bagged Bentonite material shall be stored under cover. Bags shall be stored on pallets or other suitably dry surfaces that will prevent prehydration.</td>
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<td></td>
<td>Manufacturing Quality Assurance Documentation. Third party GCL MQA sampling and testing for compliance with this specification shall be co-ordinated by the third party CQA inspector as necessary to support the manufacturer’s MQC data.</td>
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The tendered rate shall also include for cutting, joining, wastage and overlapping as these items will not be measured separately.
C 3.3.6 SHAPING OF WASTE

PS 6 REMODEL LANDFILL

PS 6.1 Scope

The purpose of this contract is to reshape this waste as shown on the drawings. All operations shall be in accordance with the “Minimum Requirements for Disposal by Landfill Second Edition 1998”.

PS 6.2 Daily Cover

Daily cover may be required to control litter, vectors and fire. Daily cover must be of G9 or G10 quality material as per NITRR documents TRH 4 and TRH 14 and to be placed to a minimum compacted thickness of 150mm. Demolition material, waste soil or other inert waste at the landfill may also be applied as cover material. Daily cover may be removed before placing additional waste during the next day’s operation.

The need for daily cover will depend on the state of desiccation of the waste. It is anticipated that daily cover will not be required, but the decision is entirely at the discretion of the engineer. The cover material should have a minimum compaction of 90% modified AASHTO density.

PS 6.3 Waste Deposition

Waste deposition will be conducted in adherence with the proven sanitary landfill principles of spreading, compacting and daily covering of waste if required. In order to achieve this, a single cell shall be constructed and enclosed by cover material if required at the end of each operating day. In order to expose as little waste as possible to rainfall and the environment and to afford the best compaction, waste cells will be as narrow as conditions permit. The size of the cell will be determined by the volume of waste handled during the operating day.

The cell shall be constructed as follows:

- The area shown on the drawing will be used for stacking the waste.
- Waste shall be deposited at the toe of the designated area and worked upwards, forming 1:3 slopes on all sides, by spreading in approximately 250mm thick layers and compacted by using four passes of a landfill compactor per layer of waste to a density of at least 950kg / m³ (excluding cover material). Down ramping will be permitted in restricted areas with the approval of the engineer. Once compacted, the height of the landform will not exceed 2.35m (excluding capping layers) in any situation.
- In order to maximise the compactive effort, the slope of the working face shall be at an appropriate angle of between 1:3 and 1:6 to enable the plant to spread and compact the waste deposited at the toe of the cell. The slope shall, however, not be so steep as to induce slipping of the driving wheels or track of the plant.
- The upper horizontal surface of the landform shall be finished such that it has a 0.5% fall as shown on the drawing.
- Capping layers shall be constructed on the waste surface of the landform to close off the landfill with the 0.5% fall being maintained.
At the end of the operating day all waste must be contained within the designated area. The entire waste surface area shall then be enclosed by cover material, if required, having a compacted thickness of 150mm above the mean surface of the waste.

The contractor is expected to cover the waste exposed in the working face, including the sloping face where disposal is due to continue the following day, at the end of each day. Use of cover sheets will not be permitted on this contract. All efforts should be made to achieve a cover to waste ratio (v/v) of 1:6, if this cover is required.

The finished cover surface shall be sufficiently uniform to ensure that runoff is encouraged and that the ponding of water cannot take place.

All plant used on the site shall be suitable for the application and prevailing site conditions, of adequate rated capacity, in good working condition and shall be so designed and constructed as to cause a minimum of dust, noise and air pollution. The plant shall be operated by properly qualified and experienced operators. In the event of a breakdown occurring, the contractor shall be capable of calling upon such back-up plant as is necessary to ensure that the proper operation and maintenance of the site is not placed in jeopardy. Only plant and equipment approved by the engineer shall be used on site.

The co-ordinates and levels of the final landform are shown on the drawings. Although, in this case, waste is not being transported to site from outside sources, the deposition of the relocated waste must be treated in exactly the same manner as per normal landfilling operations.

If the contractor wishes to use other variations to landfilling this shall be firstly approved by the engineer.

**PS 6.4 Cautionary Note**

The existing landfill may contain landfill gases and leachate. Excavation into the existing waste could expose these elements. These gases are potentially lethal and the relocating of waste must be carried out by firms suitably experienced in this type of work. Offensive odours are expected, but these must be acted against and kept to a minimum. Extreme care is to be taken when dealing with these elements. Any uncertainty or uncontrolled risk is to be brought of the attention of the engineer as soon as possible. No claims against the engineer or employer will be entertained for negligence by the contractor in dealing with these items.

All personnel on site are to be adequately protected against these elements by suitable footwear, clothing, masks etc. and it is the contractor’s responsibility to ensure compliance by visitors to the site.

**PS 6.5 Measurement and Payment**

**PS 6.5.1 Reshape and Remodel Landfill**

The unit of measurement shall be the **cubic metre (m³)**.

Before operations commence, the entire site is to be surveyed and co-ordinated. After completion of the remodelling, i.e. before construction of the final desiccation layer, the site shall be resurveyed. The volume difference of fill between the surveys shall be calculated and payment made on the cubic metre by volume of airspace.
Note that the levels given on the drawings are finished floor levels.

The tendered rate shall include for full compensation for the remodelling including for survey, restricted work, any temporary stockpiling, provision of temporary access roads, all work with regard to reshaping the existing landfill to the new landform, control of pests, landfill gas, windscatter, dust, security, protection and working around of existing services, trimming and shaping the final landform, tidying up excavated areas and any other work required to complete the new landform. The areas to be excavated or relocated are shown on the attached drawings.

The tendered rate is all inclusive and all work for this operation is to be to the engineer's requirements and approval.
C 3.3.8 FENCING INCLUDING VEHICULAR GATE

PS7. DISMANTLE EXISTING FENCE AND REPLACE WITH NEW FENCING MATERIAL INCLUDING VEHICULAR GATE

PS8.1 Scope

Dismantle the existing fence and gate and replace with new predator proof fence and vehicular gate around the landfill area.

PS8.2 Measurement and Payment

PS8.2.1 Dismantle existing fence and gate and replace with new fencing material and vehicular gate

The unit of measurement shall be the metre (m).

The tendered rate shall include full compensation for all plant, accessories, equipment, materials, labour, transport etc. to supply and erect the new predator proof fence and gate complete as shown on the drawings or as approved by the Engineer as well as to dismantle the existing fence and the disposal thereof.

The rate is to also include for clearing of the fence line, excavation of postholes, foundation concrete, backfilling, trimming and clearing after completion of work.