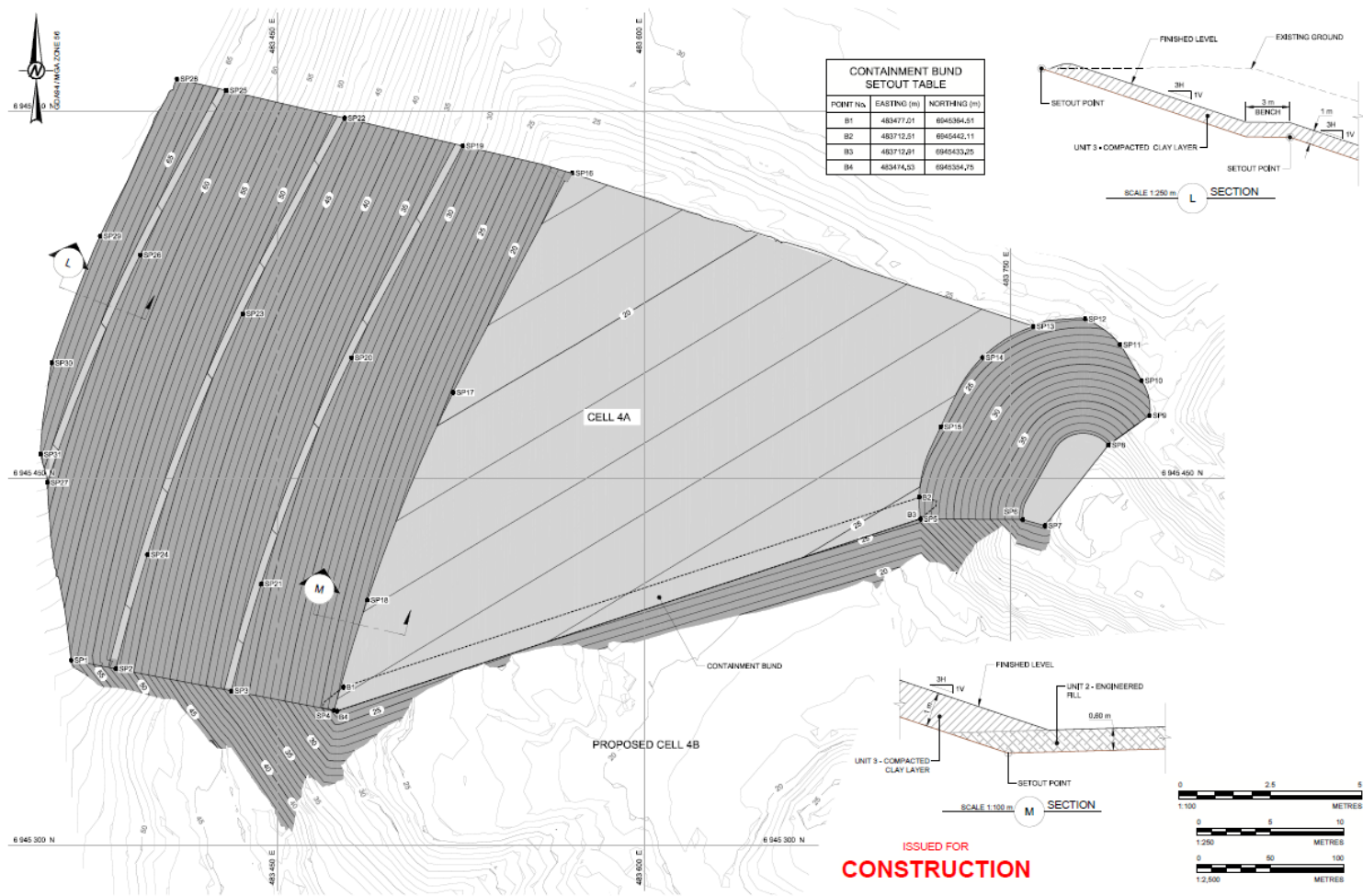


# ***New Chum Landfill***

*Cell 4a*

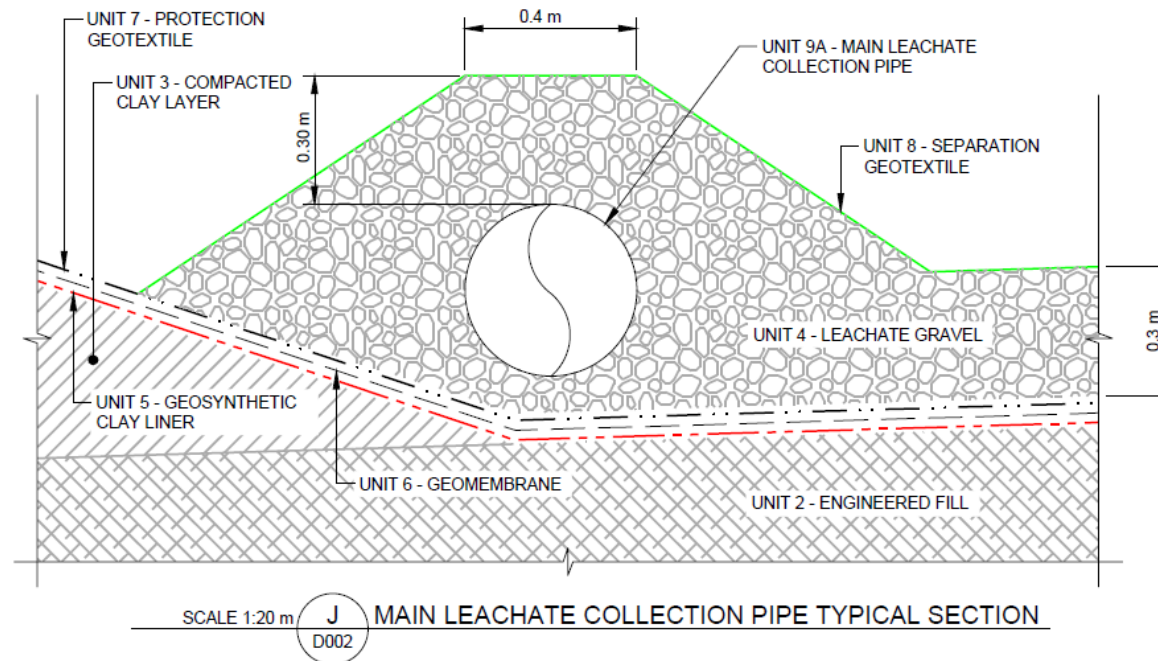
# New Chum Landfill – Cell 4a

## Layout



# New Chum Landfill – Cell 4a

## Lining System



### LEGEND

- UNIT 7 - PROTECTION GEOTEXTILE
- UNIT 6 - GEOMEMBRANE
- UNIT 5 - GEOSYNTHETIC CLAY LINER

# New Chum Landfill – Cell 4a

## Clay lining specification

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### 2.2.3 Unit 3 – Compacted Clay Layer

Unit 3 – Compacted Clay Layer shall have the same material testing requirement and properties of Unit 2 – Engineered Fill, with the exception of the following properties:

- Particle size passing a 2.36 mm sieve > 90%
- Particle size passing a 0.075 mm sieve > 40%
- Have a coefficient of permeability of  $\leq 1 \times 10^{-9}$  m/sec as measured in a triaxial cell when remoulded to a dry density ratio of 95% Standard Dry Density Ratio (SDDR) at Optimum Moisture Content (OMC) and a confining pressure of 150 kPa, back pressure of 50 kPa, and effective pressure of 100 kPa.

# New Chum Landfill – Cell 4a

## Geosynthetic Clay Liner (GCL) specification

**Table 7: Unit 5 GCL Properties**

| Property                                                 | Units                         | Type 1<br>(floor)<br>Value<br>(MARV) <sup>1</sup> | Type 2<br>(batters)<br>Value<br>(MARV) <sup>1</sup> | Test                        | Independent testing<br>frequency (GITA) | MQC testing<br>frequency            |
|----------------------------------------------------------|-------------------------------|---------------------------------------------------|-----------------------------------------------------|-----------------------------|-----------------------------------------|-------------------------------------|
| GCL Mass                                                 | g/m <sup>2</sup>              | ≥ 4350                                            | ≥ 4350                                              | ASTM D 5993                 | 1 test per 500 m <sup>2</sup>           | 1 test per 4,000 m <sup>2</sup>     |
| Bentonite Mass<br>(measure at 0%<br>moisture content)    | g/m <sup>2</sup>              | ≥ 4000                                            | ≥ 3700                                              | ASTM D 5993                 | 1 test per 2,500 m <sup>2</sup>         | 1 test per 4,000 m <sup>2</sup>     |
| Bentonite Particles<br>passing 0.075 mm sieve            | mm                            | ≥ 75 %                                            | ≥ 75 %                                              | AS 1289.3.6.1               | 1 test                                  | NA                                  |
| Cation exchange<br>capacity of Bentonite                 | M eq/100<br>g (or<br>cmol/kg) | ≥ 70                                              | ≥ 70                                                | Methylene<br>Blue<br>Method | 1 test per 500 m <sup>2</sup>           | NA                                  |
| Montmorillonite Content                                  | % by<br>weight                | ≥ 70                                              | ≥ 70                                                | X-ray<br>diffraction        | 1 test per 10,000 m <sup>2</sup>        | NA                                  |
| Additional Bentonite in<br>edge overlap @ 0%<br>moisture | g/m <sup>2</sup>              | ≥ 800                                             | ≥ 800                                               | ASTM D 5993                 | 1 test per 40 m<br>overlap              | NA                                  |
| Strip Tensile Strength                                   | kN/m                          | ≥ 8                                               | ≥ 12                                                | ASTM D 6768                 | 1 tests from 2 different<br>rolls       | 1 test per<br>20,000 m <sup>2</sup> |
| CBR Elongation                                           | %                             | ≥ 30                                              | ≥ 30                                                | AS 3706.4                   |                                         |                                     |
| CBR Strength                                             | N                             | ≥ 1500                                            | ≥ 3900                                              | AS 3706.4                   |                                         |                                     |
| Peel Strength                                            | N/m                           | ≥ 360                                             | ≥ 360                                               | ASTM D 6496                 | 1 test per 500 m <sup>2</sup>           | 1 test per<br>4,000 m <sup>2</sup>  |
| Swell Index                                              | mL/2g                         | ≥ 24                                              | ≥ 24                                                | ASTM D 5890                 |                                         | 1 test per 50<br>tonnes             |
| Fluid Loss                                               | mL                            | ≤ 15                                              | ≤ 15                                                | ASTM D5891                  |                                         | 1 test per 50<br>tonnes             |
| Hydraulic conductivity                                   | m/s                           | ≤ 3 x 10 <sup>-11</sup>                           | ≤ 3 x 10 <sup>-11</sup>                             | ASTM D 5887                 | 1 test per 10,000 m <sup>2</sup>        | Manufacture<br>r's data             |

Notes: 1. MARV = Minimum Average Roll Value representing a confidence level of 97.5% of test results meet the required value.

2. Type 1 shall be used on the floor only. Type 2 shall be used on the batters

# New Chum Landfill – Cell 4a

## Geomembrane

**Table 8: Unit 6 – Geomembrane material properties**

| Property                                                            | Units                    | Value for smooth            | Value for textured          | Test                       | Independent testing frequency (GITA)                                                                                                                                                | MQC Testing Frequency |  |
|---------------------------------------------------------------------|--------------------------|-----------------------------|-----------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--|
| Thickness (minimum average value)                                   | mm                       | 1.5 with a tolerance of -5% | 1.5 with a tolerance of -5% | ASTM D 5994 (textured)     | One test per 10 000 m <sup>2</sup>                                                                                                                                                  | As per GRI-GM13       |  |
| Density (min)                                                       | g/cm <sup>3</sup>        | ≥ 0.94                      | ≥ 0.94                      | ASTM D 1505 or ASTM D 792  | One test per five rolls                                                                                                                                                             | As per GRI-GM13       |  |
| Asperity Height                                                     | mm                       |                             | >0.45                       | ASTM D 7466                | 2 samples                                                                                                                                                                           | As per GRI-GM13       |  |
| Melt Flow Index                                                     | g/10 min                 |                             | < 1.0                       | ASTM D 1238                | Review MQC                                                                                                                                                                          | Manufacturer's data   |  |
| Tensile Properties (each direction)                                 |                          |                             |                             |                            | One test per five rolls                                                                                                                                                             | As per GRI-GM13       |  |
| - Strength at break                                                 | N/mm                     | ≥ 40                        | ≥ 16                        | ASTM D 6693                |                                                                                                                                                                                     |                       |  |
| - Elongation at break                                               | %                        | > 700                       | > 150                       | ASTM D 6693                |                                                                                                                                                                                     |                       |  |
| - Strength at yield                                                 | N/mm                     | > 22                        | > 22                        | ASTM D 6693                |                                                                                                                                                                                     |                       |  |
| - Elongation at yield                                               | %                        | > 12                        | > 12                        | ASTM D 6693                |                                                                                                                                                                                     |                       |  |
| Tear Resistance                                                     | N                        | > 187                       | > 187                       | ASTM D 1004                |                                                                                                                                                                                     |                       |  |
| Puncture Resistance                                                 | N                        | ≥ 480                       | ≥ 400                       | ASTM D 4833                |                                                                                                                                                                                     |                       |  |
| Carbon Black Content                                                | %                        | 2 to 3                      | 2 to 3                      | ASTM D 1603                |                                                                                                                                                                                     |                       |  |
| Carbon Black Dispersion                                             | Rating                   | <sup>1</sup>                | <sup>1</sup>                | ASTM D 5596                |                                                                                                                                                                                     |                       |  |
| Oxidative Induction Time (OIT) Standard OIT (AND) High Pressure OIT | min min                  | ≥ 100<br>≥ 400              | ≥ 100<br>≥ 400              | ASTM D 3895<br>ASTM D 5885 | One test per resin type<br>or per 10 000 m <sup>2</sup> ,<br>or per manufacturing run per geomembrane type                                                                          |                       |  |
| Oven Aging at 85°C High Pressure OIT                                | % retained after 90 days | ≥ 80                        | ≥ 80                        | ASTM D 5721<br>ASTM D 5885 | One test per resin batch,<br>or<br>as demonstrated by manufacturer data to the satisfaction of the Superintendent                                                                   |                       |  |
| Environmental Tensile Load Crack Resistance                         | Hr                       | > 300                       | > 300                       | ASTM D 5397                | One test per resin type or per 10 000 m <sup>2</sup> , or manufacturing run per geomembrane type, or as demonstrated by manufacturer data to the satisfaction of the Superintendent |                       |  |

# *New Chum Landfill – Cell 4a*

## *Protection Geotextile*

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### **2.2.7 Unit 7 – Protection Geotextile**

Unit 7 – Protection Geotextile shall be a non-woven, needle-punched polyester or polypropylene material. The Contractor shall provide a certificate confirming the geotextile is needle free. The material shall have the following properties:

- Thickness > 4 mm (Typical value)
- Mass per unit area > 550 g/m<sup>2</sup>
- Trapezoidal tear strength > 1060 N
- CBR burst strength > 6850 N
- Tensile Strength ≥ 41.5 kN/m
- Puncture Resistance ≥ 4000 N
- Grab Strength ≥ 3010 N with Elongation ≥ 50%