

Opal Vale Class II Landfill Chitty Road Toodyay

Construction Quality Assurance Plan December 2014

1. Introduction

The Construction Quality Assurance (CQA) is defined as a planned system of activities that provide assurance that the landfill was constructed as specified in the design and documentation. It is an important factor in ensuring that design and installation of the works is done in accordance with the standards and Specifications agreed with the Department of Environment Regulation (DER).

For this purpose, an independent third party CQA consultant with experience in landfill construction and more specifically geomembrane and geotextile performance characteristics will be appointed to verify that the works have been carried out to the agreed standards. The duties of the third-party CQA consultant will include:

- Inspections;
- Verification:
- Audits and evaluation of materials and workmanship;
- Provision of advice on installation, testing, repair and covering of the critical aspects of construction; and,
- Issuing a final CQA report documenting the quality of the constructed facility.

The CQA Plan will verify that:

- Materials used comply with Specifications; and,
- Method of construction/installation is appropriate and, as a result the design requirements have been met.

The CQA Plan including reference to the construction Specifications contains the material/construction Specifications, testing methods, testing frequency, corrective action and provides for appropriate documentation procedures.

The final CQA report will be prepared by the CQA consultant in accordance with the requirements of the *Victorian EPA Siting, Design, Operation and Rehabilitation of Landfills - October 2014*, to demonstrate that all requirements of the project Specifications and CQA Plan have been complied with.

2. Critical Aspects of Construction

The critical aspects of construction relating to this particular project include the following:

- Confirmation of the actual material properties in comparison to the design assumption material properties used during the design stability assessment.
- Infill of monitoring bores.
- Sub-Grade preparation.
- Geosynthetic Clay Layer (GCL)
- Geomembrane installation.
- Geotextile installation.
- Leachate collection system.
- Leak detection.

3. Exclusions

Works not include in this CQA Plan include:

- Groundwater monitoring bores – as there are no additional bores required around the landfill perimeter; and,
- Landfill gas infrastructure – as this will form part of a separate Works Approval application process and consequently covered under a separate CQA Plan.

4. Construction Specification

The construction Specifications forming part of the construction works set out the following requirements:

- Material and construction Specifications;
- Applicable Standards;
- Testing methods and procedures;
- Inspections;
- Testing Frequencies;
- Corrective actions; and,
- Documentation Procedures.

The construction Specifications are to be read in conjunction with this CQA Plan. The CQA consultant is to confirm that the works are carried out in accordance with the construction Specifications. The construction Specifications are not repeated within this CQA Plan.

5. Confirmation of Material Properties

The design stability analysis was carried out by Golder Associates, based on assumptions of theoretical material properties. To confirm the appropriateness of these assumptions, the CQA consultant is to liaise with Golder Associates to determine which materials need to be sourced in order for Golder Associates to undertake the necessary site-specific materials testing to confirm their design assessment assumptions.

The CQA consultant is to:

- Liaise with Golder Associates on the type and quantity of site-specific materials required for testing.
- Source the necessary materials and deliver them to Golder Associates;
- Obtain testing outcome results from Golder Associates;
- If the results are acceptable to Golder Associates, include the results and Golder Associates conclusion in the CQA Report;
- If the results are not acceptable, liaise with Golder Associates, the landfill designer and the Superintendent to identify the preferred way forward.
- Document the ultimate outcome in the CQA Report.

6. Infill of Monitoring bores

The CQA consultant is to confirm that all five of the monitoring bores within the clay pit are appropriately infilled and sealed in accordance with the construction Specifications and that during decommissioning the Contractor records the following data for each bore:

- Date/time;
- Bore number;
- Bore depth;
- Bore volume (calculated based on diameter and depth);
- Volume of bentonite pellets poured into the bore void; and,
- Volume of fresh water poured into the bore for it to hydrate the bentonite pellets.

7. Sub-Grade Preparation

Because of the importance of the sub-grade integrity in the overall liner performance, construction of these components must be accompanied by geotechnical testing as set out in the Specifications and AS 1289 Methods of Testing Soil for Engineering Purposes. This entails, among other requirements, full-time testing and inspection of all earthworks by the geotechnical testing authority, a geotechnical engineer independent of the liner constructor. The geotechnical testing authority must provide a report of all testing and, prior to the liner being accepted as appropriately constructed, must express the opinion that the works comply with the requirements of the Specifications and drawings.

The minimum field density test frequencies are to comply with the following:

- One test the 500 m^3 distributed evenly throughout full depth and area;
- One test $2,500 \text{ m}^2$ per layer, distributed evenly over the surface of the layer;
- One test per layer or per 300 mm thickness per 150 m length constructed horizontal layer; or
- Three tests per visit when material is placed in horizontal layers;
- Whichever frequency is agreed with the Superintendent.

For further details refer to the construction Specifications under the Earthworks section – Compaction Testing.

Due to there being no rework and subsequent compaction of the clay sub-grade for the purposes of achieving a particular permeability, there is no need to undertake any permeability testing in the laboratory and/or in the field. All compaction testing is primarily to confirm the appropriate density of the material for stability purposes.

In addition to the physical testing, visual inspections should check for the presence of oversized clods of material, poorly compacted or dry areas and the homogeneity of the sub-base.

8. GCL Installation

Manufacturing Specifications and Quality Control

The manufacturing specifications and quality control is to be in accordance with the requirements of the construction Specifications.

Non-Conformances

If there are any non-conformances identified or any changes to the construction Specifications that have a material effect on the outcome of the works, the CQA consultant is to determine:

- The nature of the non-conformance and its level of effect on the project;
- If the non-conformance is an isolated incident or a recurring problem;
- How amendments to procedures to prevent future occurrences of the non-conformance can be implemented;
- The nature of corrective action(s) to be applied to rectify the specific non-conformance;
- The procedures and persons to be notified of the non-conformance and corrective measures;
- Procedures for reporting to the DER major exceptions/variations to the approved technical Specifications.

Inspection Activities

The CQA consultant is to confirm that the following information and procedures are available and the relevant activities have been carried out in accordance with the construction Specifications:

1. Definitions to be used throughout the project to avoid confusion on acronyms and wording.
2. Descriptions of responsibilities, qualifications, and obligations for each party involved in the CQA plan.
3. The lines of communication and authority for the project. Identify and define the process for addressing request for information, design modifications or changes in the project specifications.
4. A formal process on handling deficiencies which defines responsibilities and the minimum documentation required to correct deficiencies.
5. A project meeting schedule.
6. The proposed level of supervision and quality control.
7. Verification process and review of the quality control certificates of the manufacturers of the GCL, the bentonite and the geotextile.
8. Verification process and review of the property values certified by the GCL manufacturer.
9. Verification process that the measurements of properties by the manufacturer are properly documented, test methods are acceptable, sampling procedure detailed and verification that the geosynthetic clay liner, the geotextile and the bentonite meet the project specifications.
10. Verification process and review of the quality control certificates of the geosynthetic clay liner rolls assigned to the project (note: this includes a need to agree with manufacturer on the frequency of the tests).
11. Details of the delivery, handling and storage of the geosynthetic clay liner on site prior to installation.
12. Verification process of the geosynthetic clay liner handling equipment and restraining methods used on the site.
13. Rejection criteria of the geosynthetic clay liner rolls.
14. Details of the installation staff's accreditations and verification of their experience.
15. Details of the conformance tests the CQA consultant will undertake on the geosynthetic clay liner rolls delivered to site. Any laboratory tests must be performed at an accredited, independent third-party laboratory.
16. Details of actions to take if geosynthetic clay liner fails conformance tests.
17. Approval procedure of the subgrade and anchor trench including details of testing.
18. Establishment of a field geosynthetic clay liner panel identification.

19. Details of actions to take to insure that field panels and overlap orientation are as indicated in the layout plan.
20. Measures to take to protect the liner if inclement weather occurs during installation.
21. Procedure for sampling and evaluation.
22. Procedures for inspecting overlaps preparation.
23. Details of actions to take in case of defects and or damages to the surface of the laid geosynthetic clay liner are identified and corrective measures.
24. Details of actions to take to minimise geosynthetic clay liner wrinkles and bridging.
25. Verification process of the geosynthetic clay liner installation around areas of protrusions and penetrations is made according to specifications.
26. Details of actions and procedure to take to protect and to confine the geosynthetic clay liners following installation.
27. Procedure for ensuring that the GCL does not exceed the manufactured moisture content.
28. CQA consultant daily recordkeeping. The daily log should contain the following:
 - Weather and site conditions
 - Records of the delivery handling and storage o quality of subgrade
 - Description of any material received at the site, including quality control data provided by suppliers
 - Location of daily construction activities and progress
 - Conformance to panel layout design
 - Recording of installation activities consisting of panel placement, roll numbers, overlap locations, repairs and testing results for all works
 - Records (including photos) of the geosynthetic clay liner at the time that cover soil or geomembrane is placed over the geosynthetic clay liner
 - Photographs of construction works and any items of specific interest. The captions of all photographs should contain the name of the project, the date on which the photograph was taken and the identity of the feature being photographed
 - Type of equipment used in each work task (e.g. handling equipment)
 - Testing conducted and test methods used o remedial action on GCL defects or overlap defects
 - Placement of temporary protection to installed GCL
 - Record of any material or workmanship that does not meet specified designs and corrective actions taken to remediate the problem
 - Details of site visits
 - Summaries of any meetings held and action taken
 - Signature of CQA engineer
29. Periodic acceptance reports summarising daily reports.
30. Confirmation that all areas of GCL installed within the Works is surcharged by the leachate drainage aggregate within two weeks of installation.

The contractor shall provide the CQA authority with the following listed test certificates and records prior to, during and at the completion of the works as each report and record is required:

- Certification and test results of bentonite used in the production of the rolls from bentonite material supplier
- Certification and test results of geotextiles, fibres used in the production of the rolls
- Roll test data reports, for each roll of material
- Accessory bentonite test reports
- Completed as-built drawing, including roll numbers, panel layout, overlap locations and repair locations.

Any deviations from the approved CQA Plan must be noted and explained and approved by the DER.

CQA Testing

Table 1 – GCL CQA Testing provides the test properties and minimum testing frequencies. Higher testing frequencies might be required in certain applications (i.e. need to identify the importance of the GCL for the safety of the works, construction and stability included). The onus is on the engineer of record to establish if higher requirements are more appropriate.

Table 1 – GCL CQA Testing

Item	Property	Standard	Frequency
Conformance testing (upon shipment of GCL to the Site)	Thickness (dry)	ASTM D1777	Each roll
	Mass per unit area of bentonite component of GCL	ASTM D5993	1 sample per 2,500 m ²
	Mass per unit area of GCL	ASTM D5993	1 sample per 500 m ²
	Montmorillonite content (X-ray diffraction method)		1 sample per 10,000 m ²
	Cation exchange capacity of bentonite (methylene blue method)		1 sample per 500 m ²
	Mass/unit length of bentonite in overlaps (visual inspection and weighting)		1 sample per 40 m overlap
	Moisture content of bentonite	AS 1289.2.1.1	1 sample per roll or 500 m ²
	Swell index/free swell of clay	ASTM D5890	1 sample per roll or 500 m ²
	Water absorption	ASTM D5891	1 sample per roll or 500 m ²
	Peel strength (for needle-punched products only)	ASTM D6496	1 sample per roll or 500 m ²
	Tensile strength	ASTM D4595	1 sample per 10,000 m ²
	CBR of geotextile	AS 3706-4	1 sample per 10,000 m ²
	Puncture resistance of geotextile	AS 3706-5	1 sample per 10,000 m ²
	Index flux	ASTM 5887	1 sample per 10,000 m ²
Visual inspection of GCL	Colour, thickness, needle punching, presence of needles or broken needles, and sewing density or other faults in the material.		Every roll
Thickness of GCL (i.e. uniformity of bentonite distribution) and apparent variations in the as placed moisture distribution.	On-site		Each roll during placement. If thickness appears to be variable a check of the variability of the mass per unit area should be conducted

Note:

All conformance tests must be reviewed, accepted and reported by the Superintendent before deployment of the GCL.

All testing must be performed on samples taken from the GCL delivered to site under the Superintendent's supervision.

All laboratory tests must be performed in a third party independent accredited laboratory.

9. Geomembrane Installation

Manufacturing Specifications and Quality Control

The manufacturing specifications and quality control is to be in accordance with the requirements of the construction Specifications.

Non-Conformances

If there are any non-conformances identified or any changes to the construction Specifications that have a material effect on the outcome of the works, the CQA consultant is to determine:

- The nature of the non-conformance and its level of effect on the project;
- If the non-conformance is an isolated incident or a recurring problem;
- How amendments to procedures to prevent future occurrences of the non-conformance can be implemented;
- The nature of corrective action(s) to be applied to rectify the specific non-conformance;
- The procedures and persons to be notified of the non-conformance and corrective measures;
- Procedures for reporting to the DER major exceptions/variations to the approved technical Specifications.

Inspection Activities

The CQA consultant is to confirm that the following information and procedures are available and the relevant activities have been carried out in accordance with the construction Specifications:

1. Definitions to be used throughout the project to avoid confusion on acronyms and wording.
2. Descriptions of responsibilities, qualifications, and obligations for each party involved in the CQA Plan.
3. The lines of communication and authority for the project. Identify and define the process for addressing request for information, design modifications or changes in the project Specifications.
4. A formal process on handling deficiencies which defines responsibilities and the minimum documentation required to correct deficiencies.
5. A project meeting schedule.
6. The proposed level of supervision and quality control.
7. Verification process and review of the quality control certificates of the resin and the quality of the resin used to manufacture the geomembrane rolls assigned to the project. Same applies to the extrudate rod.
8. Verification process and review of the property values certified by the manufacturer. Same applies to the extrudate rod.
9. Verification process that the measurements of properties by the manufacturer are properly documented, test methods are acceptable, sampling procedure detailed and verification that the geomembrane meets the project Specifications. Same applies to the extrudate rod.
10. Verification process and review of the quality control certificates of the geomembranes rolls assigned to the project (note: need to agree with manufacturer on the frequency of the tests).
11. Details of the planned geomembrane storage on site prior to installation.
12. Verification process of the geomembrane handling equipment used on the site.
13. Rejection criteria of the geomembrane sheets.
14. Details of the installation staff's accreditations and verification of their experience.
15. Details of the conformance tests the CQA consultant will undertake on the geomembrane delivered to site. Any laboratory tests must be performed at a third-party independent accredited geosynthetics laboratory.
16. Details of actions to take if geomembrane fails a conformance tests.
17. Approval procedure of the subgrade and anchor trench.
18. Establishment of a field geomembrane panel identification.

19. Details of actions to take to insure that field panels and seam orientation are as indicated in the layout plan.
20. Measures to take to protect the liner if inclement weather occurs during installation.
21. Frequency of trial welds and procedure for sampling and evaluation.
22. Procedures for inspecting seam preparation, trial welds, welds, testing and sampling welds. including the details of the nominated geosynthetic accredited laboratory for offsite testing.
23. Verification process of welding equipment, calibration and welding conditions.
24. Details of actions to take after cutting of each destructive test sample from the production seam.
25. Details of actions to take in the event of a defective weld, including retesting procedures.
26. Rejection criteria of the laid geomembrane if test results indicated failure.
27. Details of actions to take in case of defects and or damages to the surface of the laid geomembrane are identified and corrective measures.
28. Details of actions to take if geomembranes have been damaged due to shifting by wind.
29. Details of actions to take to minimise geomembrane wrinkles and bridging.
30. Verification process of the geomembrane installation around areas of protrusions and penetrations is made according to Specifications.
31. Details of actions to take to protect the geomembrane following installation.
32. CQA consultant daily recordkeeping. The daily log should contain the following:
 - Weather and site conditions
 - Quality of subgrade
 - Description of any material received at the site, including quality control data provided by suppliers
 - Location of daily construction activities and progress
 - Conformance to panel layout design
 - Recording of installation activities consisting of panel placement, roll numbers, seam/weld locations, repairs and testing results for all works
 - Records(including photos)of the wrinkling in the geomembrane at the time that cover soil is placed over the geomembrane
 - Photo graphs of construction works and any items of specific interest. The captions of all photographs should contain the name of the project, the date on which the photograph was taken and the identity of the feature being photographed
 - Type of equipment used in each work task (e.g. handling equipment, welding equipment, on-site testing equipment)
 - Calibrations or recalibration of test equipment and weld equipment
 - Testing conducted and test methods used
 - Record of any material or workman ship that does not meet specified designs and corrective actions taken to remediate the problem
 - Details of site visits
 - Summaries of any meetings held and action taken
 - Signature of CQA consultant.
33. Periodic acceptance reports summarising daily reports.

The contractor shall provide the CQA consultant with the following listed test certificates and records prior, during and at the completion of the works as each report and record is required:

- Certification and test results of raw materials from raw material supplier.
- Certification and test results of raw materials from membrane manufacturer.
- Roll test data reports, for each roll of material.
- HDPE/LLDPE welding granulate test reports.
- Daily installation reports for each welder and technician —
 - Trial test weld record
 - Wedge weld records
 - Surface extrusion weld records
 - Weld peel and tensile test records
 - Wedge air-tunnel pressure test records
 - Vacuum box test records
 - Repair records.
- Completed as-built drawing, including roll numbers, panel layout, seam locations and repair locations.

Any deviations from the approved CQA Plan must be noted and explained and approved by the DER.

CQA Testing

Table 2 – Geomembrane CQA Testing provides the test properties and minimum testing frequencies. Higher testing frequencies might be required in certain applications (i.e. need to identify the importance of the geomembrane for the safety of the works, construction and stability included). The onus is on the engineer of record to establish if higher requirements are more appropriate.

Table 2 – Geomembrane CQA Testing

Item	Property	Standard	Frequency
Conformance testing (upon shipment of Geomembrane to the Site)	Thickness	ASTM D5994	Each roll
	Density	ASTM D1505, ASTM D792	One sample per 5,000 m ² , or every five rolls delivered to Site whichever is the greatest number of tests
	Tensile properties (yield and break stress, yield and break elongation)	ASTM D6693 type IV	
	Puncture resistance	ASTM D4833	
	Tear resistance	ASTM D1004	
	Carbon black content	ASTM D1603	
	Carbon black dispersion	ASTM D5596	
	Axi-Symmetric Break Resistance Strain (min.) (LLDPE only)	ASTM D5617	Per formulation
	Stress crack resistance (HDPE only)	ASTM D5397	One sample every 10,000 m ² , or resin type or manufacturing run
	Oxidative induction time	ASTM D3895, ASTM D5885	
Start-up test weld	Welding equipment		Checked daily at start of Works, and whenever the welding equipment is shut-off for more than one hour. Also after significant changes in weather conditions

	Weld conditions		Test weld strips will be required whenever personnel or equipment are changed and/or wide temperature fluctuations are experienced. Minimum 1.5 m continuous seam
Destructive weld testing	On-site, hand tensiometer in peel and shear	ASTM D6392	Every weld
	Off-site — weld seam strength in peel and shear	ASTM D6392	Every 150 m (if fusion weld), every 120 m (if extrusion weld) for HDPE Every 300 m (if fusion weld), every 150 m (if extrusion weld) for LLDPE
Non-destructive weld testing		Air pressure test, ASTM D5820 Vacuum box test, ASTM D5641	All seams over full length
Visual inspection of geomembrane	Tears, punctures, abrasions, cracks, indentations, thin spots, or other faults in the material.		Every roll
Thickness of geomembrane	On-site		Five per 100 m, 20 m apart, taken at the edge of the sheet

Note:

All conformance tests must be reviewed, accepted and reported by the Superintendent before deployment of the geomembrane.

All testing must be performed on samples taken from the geomembrane delivered to Site under the Superintendent supervision.

All laboratory tests must be performed in a third-party independent accredited geosynthetics laboratory. The required testing frequencies may be revised by the Superintendent to conform with improvements in testing methods and/or in the state of the art practice and/or to account for the criticality of the application (i.e. to account for the importance of the geomembrane for the safety of Works). Revisions must be approved by the relevant authorities before application.

10. Geofabric Installation

Manufacturing Specifications and Quality Control

The manufacturing specifications and quality control is to be in accordance with the construction Specifications.

Non-Conformances

If there are any non-conformances identified or any changes to the construction Specifications that have a material effect on the outcome of the works, the CQA consultant is to determine:

- The nature of the non-conformance and its level of effect on the project;
- If the non-conformance is an isolated incident or a recurring problem;
- How amendments to procedures to prevent future occurrences of the non-conformance can be implemented;
- The nature of corrective action(s) to be applied to rectify that specific non-conformance;
- The procedures and persons to be notified of the non-conformance and corrective measures;
- Procedures for reporting to the DER major exceptions/variations to the approved technical Specifications.

Inspection Activities

The CQA consultant is to confirm that the following information and procedures are available and the relevant activities have been carried out in accordance with the construction Specifications:

1. Definitions to be used throughout the project to avoid confusion on acronyms and wording.
2. Descriptions of responsibilities, qualifications and obligations for each party involved in the CQA Plan.
3. The lines of communication and authority for the project. Identify and define the process for addressing request for information, design modifications or changes in the project Specifications.
4. A formal process on handling deficiencies that defines responsibilities and the minimum documentation required to correct deficiencies.
5. A project meeting schedule.
6. The proposed level of supervision and quality control.
7. Verification process and review of the quality control certificates of the geotextile manufacturers, the fibre suppliers and the polymer manufacturers, with a list of characteristics of the material.
8. Verification process and review of the property values certified by the geotextile manufacturer.
9. Verification process that the measurements of properties by the manufacturer are properly documented, test methods are acceptable and sampling procedure detailed, and verification that the polymer, fibres and geotextile meet the project Specifications.
10. Verification process and review of the quality control certificates of the geotextile rolls assigned to the project (note: need to agree with manufacturer on the frequency of the tests).
11. Details of the delivery, handling and storage of the geotextile on site prior to installation.
12. Verification process of the geotextile handling equipment and restraining methods used on the site.
13. Rejection criteria for the geotextile rolls.
14. Details of the installation staff's accreditations and verification of their experience.
15. Details of the conformance tests the CQA consultant will undertake on the geotextile rolls delivered to site. Any laboratory tests must be performed at an accredited, independent, third- party laboratory.
16. Details of actions to take if geotextile fails conformance tests.

17. Approval procedure of the underlying geomembrane and anchor trench, including details of testing.
18. Establishment of a field geotextile panel identification.
19. Details of installation and jointing techniques.
20. Details of actions to take to ensure that field panels and jointing orientation are as indicated in the layout plan.
21. Procedure for inspecting, testing and sampling joints, if appropriate.
22. Measures to take to protect the geotextile if inclement weather occurs during installation.
23. Procedure for sampling and evaluation.
24. Procedures for inspecting jointing preparation.
25. Details of actions to take in case defects and/or damage to the surface of the laid geotextile are identified, and corrective measures.
26. Details of actions to take to minimise geotextile wrinkles and bridging.
27. CQA consultant daily recordkeeping. The daily log should contain the following:
 - Weather and site conditions records of the delivery, handling and storage quality of underlying geomembrane
 - Description of any material received at the site, including quality control data provided by suppliers
 - Location of daily construction activities and progress
 - Conformance to panel layout design
 - Recording of installation activities, consisting of panel placement, roll numbers, overlap locations, repairs and testing results for all works
 - Records(including photos)of the geotextile at the time that cover soil is placed over the geotextile
 - Photographs of construction works and any items of specific interest. The captions of all photographs should contain the name of the project, the date on which the photograph was taken and the identity of the feature being photographed
 - Type of equipment used in each work task (e.g. handling equipment)
 - Testing conducted and test methods used
 - Remedial action on geotextile defects or jointing defects
 - Placement of temporary protection to installed geotextile
 - Record of any material or workmanship that does not meet specified designs and corrective actions taken to remediate the problem
 - Details of site visits
 - Summaries of any meetings held and action taken
 - Signature of CQA consultant.
28. Periodic acceptance reports summarising daily reports.

The contractor shall provide the CQA authority the following listed test certificates and records prior to, during and at the completion of the works as each report and record is required:

- Certification and test results of geotextiles, fibres and polymer used in the production of the rolls
- Roll test data reports, for each roll of material
- Completed as-built drawing, including roll numbers, panel layout, overlap locations and repair locations.

Any deviations from the approved CQA Plan must be noted and explained, and approved by EPA and the EPA-appointed auditor.

CQA Testing

Table 3 – Geotextile CQA Testing provides the test properties and minimum testing frequencies. Higher testing frequencies might be required in certain applications (need to identify the importance of the geotextile for the safety of the works, construction and stability included). The onus is on the engineer of record to establish whether higher requirements are more appropriate.

Table 3 – Geotextile CQA Testing

Item	Property	Standard	Frequency
Conformance testing (upon shipment of geotextile to the Site)	Wide Strip Tensile Strength	AS 3706–2	1 sample per 5,000 m ²
	Grab Tensile Strength	AS 3706–2	1 sample per 5,000 m ²
	Trapezoidal Tear Strength	AS 3706–3	1 sample per 5,000 m ²
	CBR Burst Strength	AS 3706–4	1 sample per 5,000 m ²
Destructive tests	Tensile tests for joints.	AS 3706–6	As required.
Visual inspection of geotextile	Colour, thickness, tears, holes, punctures, needle-punching, presence of needles or broken needles, and other faults in the material.		Each roll during placement.

Note:

All conformance tests must be reviewed, accepted and reported by a Superintendent before deployment of the geotextile cushion material. All testing must be performed on samples taken from the geotextile delivered to Site under the Superintendent's supervision.

All laboratory tests must be performed in an accredited, independent, third-party laboratory.

The required testing frequencies may be revised by the Superintendent to conform with improvements in testing methods and/or in the state-of-the-art practice and/or to account for the criticality of the application (i.e to account for the importance of the geotextile for the safety of Works). Revisions must be approved by the relevant authorities before application.

11. Leachate Collection System

Specifications and Quality Control

The Specifications and quality control is to be in accordance with the construction Specifications.

Inspection Activities

The CQA consultant is to confirm that the drainage layer materials have been placed in a manner stated in the Specifications that avoids damage to the low-permeability liner and have the following properties:

- Appropriate particle size to provide design hydraulic conductivity
- Placed so that no damage occurs to the landfill liner
- Placed within two weeks of GCL installation
- Avoid trafficking with heavy machinery after placement
- Correct grades on all surfaces achieved
- Correct thickness of material
- Pipes placed on an even bed
- Proper joining of pipes.

12. Leak Detection

Specifications and Quality Control

The Specifications and quality control is to be in accordance with the construction Specifications.

Inspection Activities

The CQA consultant is to confirm that the leak detection test has been undertaken and the relevant activities have been carried out in accordance with the construction Specifications:

- The party undertaking the testing is suitably qualified
- That the necessary equipment has been installed in the Works in the appropriate location (some test methods require a wire grid or lines to be installed under the geomembrane)
- That the test is carried out in accordance with the equipment manufacturer's instructions
- All leaks that are detected are recorded appropriately
- During repair, that the leachate drainage aggregate is removed carefully so as not to further damage the liner
- That each leak is investigated and repaired appropriately, including the appropriate weld testing
- That the aggregate later is replaced carefully so as not to further damage the liner
- That if deemed necessary, the area is retested for leaks.

13. CQA Report

On completion of the above CQA activities, a CQA report is to be prepared by the CQA consultant in accordance with the requirements of the *Victorian EPA Siting, Design, Operation and Rehabilitation of Landfills - October 2014*, to demonstrate that all requirements of the project Specifications and CQA Plan have been complied with.

The report is to include any variations from the construction Specifications or the above CQA Plan and contain explanations of why the variations occurred and the potential impact on the construction works.

The CQA Report is to be provided to the DER as part of the Compliance Certificate at the end of the landfill cell construction works.