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GREAT SOUTHERN LANDFILL

Construction Quality Assurance Plan for the Construction of Cell 1 and Ancillary Works

Submitted to:
Alkina Holdings Pty Ltd
45 Clune Street
BAYSWATER WA 6053

REPORT

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Table of Contents

PART A – GENERAL	1
1.0 INTRODUCTION	1
2.0 OVERVIEW OF THE CQA PLAN	1
3.0 STRUCTURE OF THE CQA PLAN	2
PART B – QUALITY ASSURANCE PROCEDURES	3
4.0 MANAGEMENT FRAMEWORK	3
4.1 Site Management Organisation and Responsibilities.....	3
4.2 Monitoring, Testing and Inspection	3
4.3 Non-conformance Rectification.....	3
4.4 Documentation and Reporting Framework	4
4.4.1 Documentation.....	4
4.4.2 Non-Conformance/Rectification Report.....	4
4.4.3 Proposed Changes to DWER Approved Documents	4
4.4.4 Daily Reporting	4
5.0 COMPONENT 1: SITE PREPARATION	5
5.1 Procedures	5
5.2 Quality Assurance Program – Inspection and Monitoring	6
5.3 Hold Point	6
5.4 Performance Indicators.....	7
6.0 COMPONENT 2: SUBSURFACE DRAINS	7
6.1 Procedures	7
6.2 Quality Assurance Program – Inspection and Monitoring	8
6.3 Hold Point	8
6.4 Performance Indicators.....	9
7.0 COMPONENT 3: SUBGRADE CONSTRUCTION	9
7.1 Procedures	9
7.2 Quality Assurance Program – Inspection and Monitoring	10
7.3 Hold Point	10
7.4 Performance Indicators.....	11



8.0 COMPONENT 4: EMBANKMENT CONSTRUCTION 11

8.1 Procedures 11

8.2 Quality Assurance Program – Inspection and Monitoring 13

8.3 Hold Points 14

8.4 Performance Indicators..... 14

9.0 COMPONENT 5: GEOSYNTHETICS SUPPLY AND INSTALLATION 15

9.1 Procedures 15

9.2 Quality Assurance Measures – Inspection and Monitoring 16

9.2.1 Geosynthetics Inspection and Monitoring 17

9.3 Hold Points 18

9.4 Performance Indicators..... 19

10.0 COMPONENT 6: LEACHATE COLLECTION SYSTEM 19

10.1 Procedures 19

10.2 Quality Assurance Program – Inspection and Monitoring 20

10.3 Hold Points 21

10.4 Performance Indicators..... 22

11.0 COMPONENT 7: STORMWATER DAM SPILLWAY 22

11.1 Procedures 22

11.2 Quality Assurance Program – Inspection and Monitoring 23

11.3 Hold Points 23

11.4 Performance Indicators..... 24

12.0 COMPONENT 8: SEDIMENT MANAGEMENT STRUCTURE 24

12.1 Procedures 24

12.2 Quality Assurance Program – Inspection and Monitoring 25

12.3 Hold Points 25

12.4 Performance Indicators..... 26

13.0 COMPONENT 9: ANCILLARY ITEMS 26

13.1 Procedures 26

13.2 Quality Assurance Program – Inspection and Monitoring 27

13.3 Hold Points 27

13.4 Performance Indicators..... 27



PART A – GENERAL

1.0 INTRODUCTION

Alkina Holdings Pty Limited (AH) (the Principal) will issue a Contract for the construction of the Great Southern Landfill and ancillary structures; Stormwater Dam, Leachate and Retention Ponds, sediment management structure and stormwater diversion works. Golder Associates Pty Ltd (Golder) has prepared a design for the construction of the Great Southern Landfill and ancillary structures.

A Technical Specification has been prepared for the works (Golder Ref 177197-012-R-Rev0) including the design Drawings. Where the Technical Specification (Specification) is referenced in this document, the reference includes both the Technical Specification and Drawings.

This document presents the Construction Quality Assurance (CQA) Plan for the proposed construction of Cell 1, the Stormwater Dam, Leachate Pond, Retention Pond, Sediment Management Structure, Stormwater Diversion Bunds and Stormwater Management Drains.

2.0 OVERVIEW OF THE CQA PLAN

The aims of this CQA Plan are to provide test methods, frequency of testing and quality assurance procedures to construct the following components of the Works:

- Site Preparation
- Subgrade Construction
- Subsurface Drain Construction
- Embankment Construction (from Engineered Clay Fill and General Fill)
- Geosynthetic Liner Installation
- Leachate Collection System
- Stormwater Dam and Stormwater Dam Spillway
- Sediment Management Structure
- Ancillary Items (Stormwater Diversion Bunds and Stormwater Management Drains).

The CQA Plan has been prepared primarily as a construction quality assurance document for on-site use. It is envisaged that this document will be appropriate to be used as a checklist for the GITA and Superintendent to verify whether construction of the works was performed in accordance with the approved documents.

General supervision of the site works will be performed by the Superintendent and fulltime monitoring and inspection will be performed as necessary by the GITA appointed to carry out testing and provide the relevant reports. The monitoring and inspections will be documented for later presentation to third parties if required. A quality assurance program for each construction component that can be used as a checklist has been prepared and is presented in this document.

Any non-conformance to the quality activities listed in the program shall be rectified by the Contractor(s) and documented as soon as practical. The documentation shall include the nature of the non-conformance and the corrective action mechanisms implemented to rectify the issue.

Additional information is contained in the Technical Specification that is not addressed in this CQA Plan.



3.0 STRUCTURE OF THE CQA PLAN

The requirements for these works in terms:

- Material properties
- Method of placement and construction, and
- Frequency of testing.

Have been described in the Technical Specification. This CQA Plan describes the quality assurance procedures which must be followed to enable the construction of the various components of the Works to be completed in accordance with the Technical Specification. This CQA plan does not replace the Technical Specification or Drawings and should there be any discrepancy between the CQA Plan and the specification and Drawings, the Technical Specification and Drawings take precedence. Where additional information or clarification of requirements is included in the CQA Plan, they shall form part of the requirements of the Works.

The CQA Plan has been split into construction components of similar work required to construct the Works. The plan includes the procedures required in each component and lists the quality assurance activities to be conducted on site. Performance Indicators that form part of the quality assurance program are listed for each component.

The person responsible for each procedure and activity listed may delegate the on-site activity to inspect or assess the work as required, and report to the party responsible.



PART B – QUALITY ASSURANCE PROCEDURES

4.0 MANAGEMENT FRAMEWORK

The quality assurance plan has the following key components:

- Defined procedures and responsibilities for each construction component.
- Defined quality assurance program activities and responsibilities to implement the CQA Plan.
- Performance Indicators to be applied as part of the quality assurance program.

4.1 Site Management Organisation and Responsibilities

The Contractor(s) will be responsible for the construction of the Works and implementing the CQA procedure. The Contractor(s) will report directly to the Superintendent.

The roles and responsible organisations and persons are as follows:

- The Employer will be the Principal (AH).
- The Superintendent will be appointed by the Principal.
- The Contractor(s) will be appointed by the Principal.
- The Geotechnical Inspection and Testing Authority (GITA) will be an Engineer (and supporting technicians), appointed by the Principal. The GITA shall undertake all Level 1 inspection and testing of landfill earthworks in accordance with the AS3798-2007 and inspection and testing of the geosynthetic lining system. The GITA shall maintain a **full-time** presence on site for the duration of the Works and shall be independent of the Contractor. The GITA will also be responsible for compiling the Quality Assurance Completion Report.
- The required geosynthetic laboratory testing will be performed by an independent testing laboratory approved by the Principal.
- The Designer is Golder.

It is the Contractor(s)'s responsibility to request inspections by the Superintendent and GITA, as required. The Contractor(s) shall keep the Superintendent and GITA informed (by e-mail or telephone) of the required inspections. The GITA, Superintendent and the Designer shall perform their respective roles in the capacity of Principal's Representative, and will report directly to the Principal as required. Meetings will be as required by any organisations or persons.

4.2 Monitoring, Testing and Inspection

General supervision of the site will be carried out by the Superintendent, their staff and monitoring and inspection of the Works, as outlined in the Specification, as well as testing and completion of relevant documentation and reports shall be conducted by the GITA. The monitoring, testing and inspections will be documented and included in the Construction Completion Report.

This document contains a quality assurance program for each construction component that can be used as a checklist.

4.3 Non-conformance Rectification

Any non-conformance to the quality assurance activities and performance indicators listed will be rectified and documented as soon as is practical.



4.4 Documentation and Reporting Framework

4.4.1 Documentation

The following documents concerning Quality Assurance performance will be produced for the Works:

- The CQA Plan and any revisions.
- Monitoring, testing and inspection records and reports sufficient to demonstrate compliance with the technical Specification. These records or a summary of them will be submitted to the Principal and shall be included in the Construction Completion Report.
- The Quality Assurance Completion report shall be produced by the GITA for submission to the Principal.
- A Construction Completion Report shall be produced by the GITA for submission to the Department of Water and Environment Regulation (DWER).

The documentation related to the quality control of materials supplied by the Contractor(s) shall be provided to the Principal by the GITA. Documentation related to the quality control of the earthworks and the installed geosynthetics shall also be prepared by the Contractor and provided to the Principal by the GITA. Survey of completed works shall be arranged and provided to the Superintendent by the Contractor(s). The Superintendent shall forward the survey information to the GITA, Designer and Principal.

4.4.2 Non-Conformance/Rectification Report

Any non-conformance will be documented including the nature of the non-conformance and the mechanisms implemented to rectify the issue. The Contractor(s) shall develop a Corrective Action Report, which will be used to document any non-conformances. As a minimum the Corrective Action Report shall report the type and extent of the non-conformance, the proposed method of rectification of the non-conformance, the date of rectification and suggested measures to avoid a similar non-conformance in the future.

The Contractor(s) shall forward a summary of any non-conformance and the proposed method of rectification to the Superintendent within **three days** of occurrence.

4.4.3 Proposed Changes to DWER Approved Documents

If a modification is proposed which affects the design intent reflected in the Technical Specifications or Drawings the Superintendent shall contact the Designer and the Principal. The Designer shall assess whether the proposed change requires DWER approval. No change shall be implemented without the assessment of the Designer or the DWER.

Any proposed change shall be documented with the appropriate justification by the Designer, for inclusion in the As-Built Report for the Works.

4.4.4 Daily Reporting

The GITA shall issue a daily report of construction activities. These reports shall contain, at a minimum, the following information:

- Date, project name, location, weather and other information as appropriate.
- Description and locations of on-going construction.
- Equipment used.
- CQA Testing performed.
- Description of materials received, areas tested and sampled.
- Description of areas requiring reconditioning, retesting and procedures followed.
- Summary of Work area locations and conditions.



- Summary of site meetings held.
- Description of non-conformances with Specifications or Drawings.
- Signature of GITA.

Photographs shall be taken with a date back camera to document observations, and provide representation of all elements of construction. The photographs will be captioned and compiled in a photograph album in chronological order by the GITA. Copies of the album shall be kept in the Superintendent’s project file.

5.0 COMPONENT 1: SITE PREPARATION

Aim: *To ensure that the Site is prepared for the construction of the Subgrade and meets the requirements specified in the Technical Specification.*

5.1 Procedures

The following includes a list of procedures that require quality assurance measures for the Site Preparation of the Works footprint and includes the party responsible for performing each procedure. The Works include the Cell 1 and 2, Stormwater Dam, Leachate Pond, Retention Pond and ancillary structures.

Procedure	Responsibility
1) A survey of the existing conditions shall be performed on the surface handed over by the Principal prior to the commencement of the construction Works. (HOLD POINT)	Contractor
2) Decommissioning of Monitoring Bores MB12 and MB13 in Cell 1 and GMB6 in Cell 2, in accordance with the Specification.	Contractor
3) Clear and grub all vegetation and debris for the full extent of the areas shown on Drawings. (HOLD POINT)	Contractor
4) Excavate topsoil (Unit 1 materials) from the Works footprint area and stockpile in accordance with the Specification.	Contractor
5) Excavate the <i>in situ</i> material for Cell 1, Leachate Pond and Retention Pond to depths in accordance with the Specifications and Drawings.	Contractor
6) Excavate all Subsurface Drain Trenches and Unit 7 – Subsurface Drain Sump to the lines, depths and grades shown in Drawings and in accordance with the Specifications.	Contractor
7) Excavate the Leachate Collection Sump to the lines, depths and grades shown in Drawings and in accordance with the Specifications.	Contractor
8) Excavate the Stormwater Dam embankment key-in trench to lines, depths and grades in accordance with the Specifications. (HOLD POINT)	Contractor
9) Proof roll and smooth the: <ul style="list-style-type: none"> a) The Stormwater Dam footprint and Key-in trench. b) Cell and Ponds base prior to the installation of subgrade for Cell 1, Leachate Pond and Retention Pond. This excludes the embankments footprints. Check for soft spots and Unit 2 – Unsuitable materials.	Contractor
10) Excavate all soft spots and Unit 2 – Unsuitable materials to depths in accordance with the Specifications and backfill with Unit 3 – Engineered Clay materials.	Contractor
11) All suitable material from excavations to be used in the Works shall be separated into three stockpiles for Unit 2, Unit 3 or Unit 4 materials or placed in locations as directed by the Superintendent.	Contractor



5.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Survey of the existing conditions on the Works surface prior to the commencement of construction works is in accordance with design Drawings.	At the start of construction	Contractor Superintendent
2) Inspect the decommissioning of Monitoring Bores MB12, MB13 and GMB6.	Upon Completion	Superintendent
3) Inspect the clearing and grub of vegetation and other debris.	Upon Completion	Superintendent
4) Inspect topsoil to ensure it has been removed to the depths and is stockpiled in accordance with the Specifications.	Upon Completion	Superintendent
5) Inspect excavation of <i>in situ</i> materials for Cell 1, Leachate Pond and Retention Pond to depths and lines in accordance to Specifications.	During construction	Superintendent
6) Inspect excavation of Subsurface Drain Trenches and Unit 7 – Subsurface Drain Sump to the lines, depths and grades shown in Drawings and in accordance with the Specifications.	During Construction	Superintendent
7) Inspect excavation of the Leachate Collection Sump to lines, depths and grades shown in Drawings and in accordance with the Specifications.	During Construction	Superintendent
8) Excavate Stormwater Dam key-in trench to lines, depths and grades specified in Drawings. (HOLD POINT)	During construction	Superintendent GITA
9) Inspect proof roll and smoothing of footprint surfaces.	During construction	GITA
10) Inspect the excavation of soft spots or Unit 2 – Unsuitable materials and their replacement with Unit 3 – Engineered Clay.	During construction	GITA

5.3 Hold Point

The following Hold Points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Submittal of a Work Method Statement (WMS) for subgrade construction activities.	WMS includes acceptable methods for subgrade construction activities, including cutting, filling, proof rolling, undercutting and replacement.
Inspection of the Contractor's Survey markers	Excavation Works shall not commence in any zone prior to inspection and approval of the Contractor's survey markers in that zone by the Superintendent and GITA
Inspection of site clearance	Superintendent to confirm that Clear and Grub has been carried out in accordance with the Specification and Drawings.
Inspection and acceptance of lines, levels and grades of the Key-in trench.	Superintendent confirms that trench has been constructed in accordance with the Specification and Drawing requirements.
Inspection of excavations and acceptance of proof roll and smoothing of footprint surfaces	GITA to confirm that all soft spots or Unit 2 – Unsuitable materials has been excavated and replaced with Unit 3 – Engineered clay material in accordance with Specifications.



5.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Initial Survey	Superintendent confirms accuracy of survey and pegged footprint of Works
2) Monitoring Bores	Superintendent confirms decommission of monitoring bores in accordance with Specifications.
3) Clear and Grub	Superintendent confirms clear and grub of vegetation and debris within Work areas.
4) Topsoil	GITA confirms all topsoil has been stripped and stockpiled in accordance with the Specification.
5) Subsurface Drain Trench	GITA confirms that lines, levels and grades of excavation are in accordance with design Drawings.
6) Subsurface Drain Sump	GITA confirms that lines, levels and grades of excavation are in accordance with design Drawings.
7) Leachate Collection Sump	GITA confirms that lines, levels and grades of excavation are as per design Drawings.
8) Subgrade footprint surface	Firm and clean subgrade footprint surface observed. All soft spots and Unit 2 – Unsuitable materials excavated and backfilled with Unit 3 – Engineered Clay material.
9) Stormwater Dam Key-in trench	GITA confirms that lines, levels and grades of excavation are in accordance with design Drawings.
10) Subgrade shape	Elevations, grades and slopes meet tolerances, and no significant ponding of stormwater is visible.

6.0 COMPONENT 2: SUBSURFACE DRAINS

Aim: *To ensure that the subsurface drain meets the drainage and construction requirements specified in the Technical Specification.*

6.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the subsurface drain. The list includes the party responsible for performing each procedure. The majority of the works described in this section shall be undertaken by a specialist Pipe Installer (Installer) approved at the time of tender awards.

Procedure	Responsibility
1) Supply of Unit 5 – Subsurface drain pipes. Including delivery, handling, and storage in accordance with the Specifications.	Contractor
2) Supply of Unit 6.1 – Subsurface drainage aggregate and Unit 6.2 – Drainage sand in accordance with the required materials properties as specified in the Specifications.	Contractor
3) Installation of Unit 5 – Subsurface Drain pipes, including placement, joining and repair shall be in accordance with the Specifications and to the alignments and gradients shown on Drawings	Contractor (Installer)
4) Placement of Unit 6.1 – Subsurface drainage aggregate and Unit 6.2 – Subsurface drainage sand in accordance with Specifications and Drawings	Contractor
5) Construction and Installation of Unit 7 – Subsurface Drain Sump in accordance with the Specifications and Drawings.	Contractor



6.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspection of excavated Subsurface Drain trenches.	Prior to installation of Unit 5, Unit 6.1 and Unit 6.2	Superintendent
2) Inspection and acceptance of Unit 5 – Subsurface drain pipes including inspection of drilling detail and absence of 'swarf' in accordance with the Specifications.	Continuous during construction	Superintendent
3) Inspection and acceptance of materials properties and consistency of material for Unit 6.1 – Drainage aggregate and Unit 6.2 – Subsurface drainage sand, to be in accordance with the Specifications.	Continuous during construction	Superintendent
4) Monitoring of the installation of Unit 6.1 – Drainage aggregate and Unit 6.2 – Subsurface drainage sand.	Continuous during construction	Superintendent
5) Inspection of installation and joining of Unit 5 – Subsurface Drain pipes in accordance to Specifications.	All joins	Superintendent
6) Inspection of Subsurface Drain Trenches final surface after installation of Unit 5, Unit 6.1 and unit 6.2, are to the lines and gradients shown on Drawings.	At the end of works	GITA
7) Inspection of the excavated Unit 7 – Subsurface Drain Sump.	Prior to commencement of works	Superintendent
8) Inspection of manufacturer's documentation certifying the properties of the material for each component or section of Unit 7 – Subsurface Drain Sump.	At the start of works	Superintendent
9) Installation monitoring and inspection of Unit 7 – Surface Sump in accordance with the Specification and Drawings.	Continuous during construction As works are completed	Superintendent

6.3 Hold Point

The following Hold Points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Materials properties and manufacturer's documentation for the Subsurface Trenches and Sump.	Superintendent confirms that Materials Properties are in accordance with the Specifications requirements for Unit 5 – Subsurface Drain Pipes, Unit 6.1 – Drainage aggregate and Unit 6.2 – Subsurface drainage sand) and Unit 7 – Subsurface Drain Sump
Excavated Subsurface Drain Trenches and Sump.	Superintendent confirms that trenches and sump has been excavated in accordance with the Specification and Drawing requirements.
Constructed Subsurface Drain Trench	Superintendent confirms installation of Unit 5 – Subsurface Drain Pipes to lines, levels and grades in accordance to Drawings, with constructed final trench elevation to the base of the FSL.
Constructed Subsurface Drain Sump	Superintendent confirms that installation of Unit 7 – Subsurface Drain Sump, has been installed in accordance with the Specification and Drawings.



6.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Unit 5 – Subsurface drain collection pipes	Superintendent confirms pipes meet Specification based on documentation and ‘swarf’ has been removed.
2) Unit 6.1 – Subsurface aggregate and Unit 6.2 – Subsurface Drainage Sand	Superintendent approves material based on grading curve provided by the Supplier.
3) Unit 5 – Subsurface drain collection pipes installation	Superintendent confirms subsurface drain pipe installed to lines and levels in accordance with Drawings and Specification.
4) Unit 6.1 – Subsurface aggregate and Unit 6.2 – Subsurface Drainage Sand Installation	Superintendent confirms installation in accordance with Drawings and Specification, with appropriate control over construction equipment during placement. Final constructed trenches are to levels to coincide with the base of the FSL.
5) Unit 7 – Subsurface sump installation	Superintendent monitors installation and confirms and records that sump has been installed in accordance with the Technical Specification requirements.

7.0 COMPONENT 3: SUBGRADE CONSTRUCTION

Aim: To ensure that the subgrade material (Unit 3 Engineered Clayey Material) meets the construction requirements specified in the Technical Specification.

7.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the subgrade surface for the Works and includes the party responsible for performing each procedure. The Works where subgrade construction is required include the Cell 1 and 2, Stormwater Dam, Leachate Pond and Retention Pond.

Procedure	Responsibility
1) Source Unit 3 – Engineered Clayey material from cut and fill activities, on-site borrow pits or from nominated stockpiles.	Contractor
2) Rip, moisture condition and compact Unit 3 <i>in situ</i> material or place Unit 3 material (to RL -250 mm of FSL or as agreed with the Superintendent) across Cell 1, Retention Pond and Leachate Pond (excluding embankment footprints) to achieve the lines, levels and grades presented in the Drawings.	Contractor
3) Place Unit 3 material in 250 mm layers to achieve top of FSL for Cell 1, Retention Pond and Leachate Pond in accordance with the Specifications.	Contractor
4) Shape the subgrade surface to the grades and elevations on the Drawings and verify by survey. (HOLD POINT)	Contractor
5) Integrity and moisture content of the final subgrade level (FSL) shall be maintained until such time as it is covered with overlaying layers or Unit 9 (GCL).	Contractor



7.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspect proof rolling of base of subgrade surface.	Upon completion	GITA
2) Inspection of material testing on Unit 3 – Engineered Clayey borrow and stockpiled material.	Prior to Construction and During Construction	GITA
3) Inspect that subgrade is constructed to the FSL in accordance with the Specifications and Drawings.	During Construction	GITA
4) Inspect and review survey of FSL. (HOLD POINT)	Upon completion	GITA
5) Inspect proof rolling of the final surface and assess the condition of the final surface, to main the integrity of the overlaying liner. (HOLD POINT) .	During construction and Prior to placing overlaying material	GITA

7.3 Hold Point

The following Hold Points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Submittal of a Work Method Statement (WMS) for subgrade construction activities.	WMS includes acceptable methods for subgrade construction activities, including cutting, filling, proof rolling, undercutting and replacement.
Inspection and acceptance of constructed Subsurface Drain Trenches and Sump	Superintendent confirms that the Subsurface Drains Trenches and Subsurface Drain Sump have been constructed in accordance with the Specification and Drawing requirements prior to construction of the subgrade.
Submittal of Compliance material testing on Unit 3 – Engineered Clay material borrow pits.	Contractor to submit and GITA to confirm Unit 3 – Engineered Clay material compliance testing prior to commencement of the works.
Inspection of the Finish Subgrade Level (FSL)	As-built survey meets elevations, grades and slopes in accordance to Design Drawings, and the minimum subgrade compacted Unit 3 – Engineered Clay material in accordance with Specifications.



7.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Subgrade base of FSL	Firm and clean surface. GITA confirms elevations, grades and slopes meet tolerances, and no significant ponding of stormwater is visible.
2) Subsurface Drain Trenches	Final constructed Trench elevation match the base of the FSL.
3) Unit 3 – Engineered Clay borrow material	GITA confirms that Unit 3 – Engineered Clay sources of borrow material meets the materials Specification’s criteria in accordance with the Specifications.
4) Subgrade Compaction	Field moisture and density tests meets Specification’s criteria for subgrade Unit 3 – Engineered Clay materials.
5) Subgrade thickness and geometry (HOLD POINT)	As-built survey records of subgrade and top of Unit 3 material confirms the subgrade thickness (for Cell 1, Leachate Pond and Retention Pond) has been achieved in accordance to the Specifications and Drawings.
6) Subgrade FSL competence and integrity	GITA confirms that subgrade FSL is moist and competent support to GCL, without damage.

8.0 COMPONENT 4: EMBANKMENT CONSTRUCTION

Aim: *To ensure that the embankment construction meets the requirements specified in the Technical Specification.*

8.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the embankments and includes the party responsible for performing each procedure. This section includes the construction of the Cell 1 embankments, the Stormwater Dam embankment including the Key-in trench, the Leachate Pond embankment and Retention Pond embankment.

The following lists the fill material requirements for the following structures:

- Cell 1 embankments: Unit 4 – General Fill for the embankments and Unit 3 – Engineered Clayey Material for a 500 mm thick layer (where in fill) on the upstream slope of the embankments
- Stormwater Dam and Key-in trench: Unit 3 – Engineered Clayey Material.
- Leachate Pond: Unit 4 – General Fill for the embankments and Unit 3 – Engineered Clayey Material for a 500 mm thick layer (where in fill) on the upstream slope of the embankments
- Retention Pond: Unit 4 – General Fill for the embankments and Unit 3 – Engineered Clayey Material for a 500 mm thick layer (where in fill) on the upstream slope of the embankments.



GREAT SOUTHERN LANDFILL CELL 1 AND ANCILLARY WORKS CQA PLAN

Procedure	Responsibility
1) Prepare embankment foundations for construction, including rip, moisture condition and compaction of <i>in situ</i> in accordance with Specification.	Contractor
2) The excavated Stormwater Dam Key-in trench lines, levels and grades shall be accepted prior to the start of construction on the Stormwater Dam. (HOLD POINT)	Contractor
3) Embankment fill (Unit 3 – Engineered Clay and Unit 4 – General Fill materials) shall be sourced from on-site borrow pits or nominated stockpiles identified by the Superintendent. Any Unit 2 – Unsuitable material shall be removed from the borrow pits and stockpiles to an area nominated by the Superintendent.	Contractor
4) Borrow pit and stockpiles materials used fill construction shall be tested for compliance in accordance with the Specifications.	Contractor
5) Provide a Work Method Statement for the proposed methods for embankment construction activities in accordance with the Technical Specifications. (HOLD POINT)	Contractor
6) Embankment fill material distribution of Unit 3 – Engineered Clay and Unit 4 – General fill shall be in accordance to Specifications and Drawings.	Contractor
7) Embankment fill material shall be moisture conditioned, loaded, transported and placed in a manner such that: <ul style="list-style-type: none"> ▪ The distribution and gradation of materials in the embankment are free from lenses, pockets, streaks or layers of sand. ▪ Ensure that all large lumps or clods are broken down. ▪ Hard crusts encapsulating soft and wet materials are not allowed to form. ▪ Materials do not differ substantially in texture and gradation from the surrounding material within that zone. 	Contractor
8) The embankment fill shall be placed in layers and compacted to achieve the target minimum density ratios and target moisture contents. These shall be maintain until the layer is covered by the next layer, in accordance with the Specifications.	Contractor
9) Compliance testing shall comprise of field density tests (<i>in situ</i> dry density and moisture content) on undisturbed compacted samples. This testing shall be carried out on each placed layer in accordance with the Specifications. No subsequent layer shall be placed until the preceding layer has met the compaction standards. (HOLD POINT)	Contractor
10) Where the compacted fill does not meet the specified requirements it shall be ripped, moisture conditioned and re-compacted in accordance to the Technical Specifications.	Contractor
11) Earthworks shall be suitably maintained during the construction period to avoid excess drying or wetting up and the surface cut to be free draining when rain is expected.	Contractor
12) Prior to the placement of each consecutive layer of fill, the top of the previous layer shall be scarified and if required moisture treated, to key each layer together and to prevent laminations at layer interfaces.	Contractor
13) The final embankment shall be cut, proof rolled and sealed to the final lines, levels and grades in accordance with the Drawings and Specifications. (HOLD POINT) .	Contractor
14) The final embankment bench crest elevations and alignments shall be surveyed.	Contractor
15) All compaction test logs shall be submitted to the Superintendent and GITA as the work is completed. (HOLD POINT)	Contractor
16) Source and place Unit 18 – Wearing Course material to all embankment crests, in accordance with the Specifications and Drawings	Contractor
17) Place Unit 1 – Topsoil material to the outer slopes of all embankments, in accordance with the Specification.	Contractor



8.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspect Stormwater Dam Key-in trench lines, levels and grades. (HOLD POINT)	Prior to construction	GITA
2) Inspect embankment foundation and preparation for construction.	At the start of construction	Superintendent
3) Inspect borrow pits and stockpiles for Unit 3 and Unit 4 materials.	Prior to use and as frequently as defined in the Specification ore required	Contractor Superintendent GITA
4) Carry out compliance testing of borrow pits and stockpiles for Unit 3 and Unit 4 materials.	Prior to use and ongoing	Contractor GITA
5) Undertake all compliance testing for the <i>in situ</i> compacted embankment fill layer in accordance with the Specifications	Within 48 hours of compaction of layer	Contractor
6) Inspect and monitor the compliance testing of the compacted fill layers and carry out additional testing if required	Ongoing and Testing as required	GITA
7) Monitor placement of embankment fill material and inspect that embankment fill is compacted in layers to the compaction standard and moisture content, in accordance with the Specification.	During Construction	Superintendent
8) Inspect placed embankment fill material to check for laminations or defects between layers. Shall have no joining.	During Construction	Superintendent GITA
9) Provide go ahead on placement of subsequent layer.	Prior to placement of subsequent layer	GITA
10) Supervise re-work and re-compaction of layers that fail the compliance testing or do not meet the specified requirements.	During construction	Superintendent
11) Monitor the proof rolling of the completed embankment surface.	Upon Completion	Superintendent
12) Provide survey of the embankment crest elevations and alignments.	Upon Completion	Contractor
13) Inspect placement of Unit 18 – Wearing course material.	During construction	Superintendent
14) Inspect placement of Unit 1 – Topsoil material	During construction	Superintendent



8.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Submittal of a Work Method Statement (WMS) for embankment construction.	WMS includes acceptable methods for construction activities, this shall include methods for placing and compacting the embankment fill in accordance with the Specification.
Inspection and acceptance of lines, levels and grades of the key-in trench.	Superintendent confirms that trench has been constructed in accordance with Technical Specification and Drawing requirements.
Inspection of borrow pit and/or stockpile material	GITA to confirm that borrow pit and stockpiles materials has been tested for material compliance in accordance with the Specifications.
Placement of embankment fill layers	GITA shall carry out compliance testing of each placed and undisturbed layer. Contractor shall make sure that compliance testing is carried out within 48 hours of the compaction of the layer. No subsequent layer shall be placed until the preceding layer has meet the compaction standards in accordance with the Specifications.
Embankment final surface survey	Superintendent to confirm that the final embankment crest elevations and alignments are within tolerance and in accordance with Specifications and Drawings
Anchor trenches	Superintendent to confirm that anchor trenches have been cut to the alignment and levels specified in the Drawings and in accordance with the Specifications.

8.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Key-in Trench	GITA confirms that lines, levels and grades of the Key-in trench excavation are as per design.
2) Material Selection	Contractor selects general fill material that meets the specification.
3) Material compliance (HOLD POINT)	Pre-construction compliance testing on borrow pit or stockpiles demonstrates the Unit 3 – Engineered Clay and Unit 4 – General Fill materials meets the requirements in accordance with the Specification
4) Embankment foundation	GITA confirms that a firm and clean footprint surface is observed. Suitable for placement of embankment fill materials.
5) Embankment fill layers	Embankment fill is placed in layers in accordance with the Specifications. Appears moist, free of large lumps, free of hard crust, free of pockets or lenses of sand and similar in appearance to the surrounding fill materials within that zone.
6) Compacted fill layer surface	Firm and clean compacted surface observed.
7) Embankment fill Compaction	GITA confirms field moisture and density tests meets criteria of Specification.
8) Embankment fill re-compaction	Confirmation that fill layer has been ripped to specified depth and re-compacted ready for compliance testing



Item	Performance Indicator
9) Fill lamination	GITA confirms material handling eliminates material segregation and laminations
10) Embankment geometry (HOLD POINT)	As-built survey records of the embankment fill confirms the specified design elevations, slopes and alignments have been achieved.
11) Anchor trenches	Anchor trenches are excavated to the alignments and levels in accordance with the Drawings and Specifications.
12) Wearing Course surface	Confirm placement of Unit 18 – Wearing Course material to the specified thickness.

9.0 COMPONENT 5: GEOSYNTHETICS SUPPLY AND INSTALLATION

Aim: To install the geosynthetic layers above the completed subgrade and embankments in accordance with the Technical Specification.

9.1 Procedures

The following includes a list of procedures that require quality assurance measures for the supply and installation of the various geosynthetic components. The list identifies the party responsible for performing each procedure. The geosynthetic components listed include Unit 9 – Geosynthetic Clay Liner (GCL), Unit 10 – 2 mm HDPE Geomembrane Liner (both textured and smooth), Unit 11 – Cushion Geotextile and Unit 12 – Separation Geotextiles.

The following lists the geosynthetic components required for the construction of each of these structures:

- Cell 1 and 2: Unit 9, Unit 10, Unit 11, Unit 12
- Leachate Pond: Unit 9, Unit 10
- Retention Pond: Unit 10.

Procedure	Responsibility
1) Excavate Anchor Trenches into <i>in situ</i> material to be backfilled with suitable excavated material after placement of the geosynthetic liner(s). (HOLD POINT)	Contractor
2) The contractor shall supply the manufacture's quality control results for all the geosynthetic materials required for the Works.	Contractor
3) Interface shear testing shall be conducted in accordance with the technical Specifications and prior to the shipping of material to the site. These results shall be submitted to the GITA for approval prior to shipment.	Contractor
4) Supply of Geosynthetics and un-loading containers.	Contractor
5) Approval of supplied geosynthetics. (HOLD POINT)	GITA
6) Approval of completed subgrade surface prior to placement of geosynthetic components. (HOLD POINT)	GITA
7) Receipt, handling and storage of geosynthetics	Contractor
8) Preparation of surface for installation of geosynthetics	Contractor
9) Contractor shall submit the Quality Control Procedures Manual to the Superintendent 5 days prior to commencement of lining activities.	Contractor
10) Geosynthetic site testing shall be conducted for properties and frequencies specified in accordance with the Specifications.	Contractor GITA
11) Installation, anchorage, joins and field testing of geosynthetics. (HOLD POINT)	Contractor
12) As-build liner drawings and report shall prepared and submitted by the installer for each of the geosynthetic liners in accordance with the Specifications.	Contractor



9.2 Quality Assurance Measures – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be reviewed and recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspect the excavated anchor trenches. Review the survey of the alignment of the edges of the anchor trenches. (HOLD POINT)	During construction	Superintendent GITA
2) Inspect the manufacturer's Quality Control (QC) results	Prior to delivery	Superintendent GITA
3) Inspect supplied geosynthetic materials for damage upon delivery to site and unloading.	Once delivered	Superintendent
4) Provide the Quality Control Procedures Manual	5 days prior to commencement of lining activities	Contractor
5) Inspect storage conditions of geosynthetic materials	Daily	Superintendent GITA
6) Inspect the prepared subgrade surface.	Daily	GITA
7) Inspect geosynthetic materials for damage or manufacturing defects.	Continuous during and after installation, until covered by following material	Contractor and GITA
8) Monitor installation of geosynthetics (See table below for a detailed Inspection and Monitoring requirements)	Continuous during installation	GITA
9) Monitor testing of geosynthetic joins	Continuous during installation	GITA
10) Sample geosynthetic materials and undertake independent testing.	Prior to use	GITA
11) Independent Laboratory testing	In accordance with Technical Specification	GITA
12) Inspection of overlying protective layers (gravel and geotextile).	Continuous during installation	GITA
13) Inspection of the anchoring and compacted fill in anchor trenches is in accordance with the Specifications and Drawings.	During anchoring	Superintendent
14) As-build liner drawings and reporting for each of the placed geosynthetic liner in accordance with the Specifications.	At the completion of the liner's installation	Installer Contractor



9.2.1 Geosynthetics Inspection and Monitoring

The following quality assurance program will be conducted for the installation of the various geosynthetic components. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Inspect Unit 9 – GCL covered without hydrating	Continuous	Contractor and GITA
2) Inspect Unit 9 – GCL panels overlap as required by Specification	All panels	Contractor and GITA
3) Inspect Unit 9 – GCL defects patched as required by Specification	Continuous during installation	Contractor and GITA
4) Inspect Unit 9 – GCL anchored as required by the Specification	Continuous during installation	Contractor and GITA
5) Inspection and approval of the final surface for Unit 9 – GCL.	At the end of placement	GITA
6) Inspect Unit 10 – Geomembrane panels installed in accordance with approved Panel Layout Drawing	All panels	Contractor and GITA
7) Inspect Unit 10 – Geomembrane panels installed with no cross seams	All panels	Contractor and GITA
8) Inspect Unit 10 – Geomembrane seams and welds are tested in accordance with the Specification	All seams (Continuous)	Contractor and GITA
9) Inspect results of seam and weld testing meet the Technical Specification requirements	As seams are tested	Contractor and GITA
10) Inspect Unit 10 – Geomembrane defects are patched	All defects	Contractor and GITA
11) Inspect Unit 10 – Geomembrane panels anchored as required by the Specification	Continuous during installation	Contractor and GITA
12) Inspect and approve of the final surface for Unit 10 – Geomembrane. (HOLD POINT)	At the end of placement	GITA
13) Inspect Unit 11 – Cushion geotextile panels overlap as required by the Specification	Continuous during installation	Contractor and GITA
14) Inspect Unit 11 – Cushion geotextile panels are joined as required by the Specification	All joins	Contractor and GITA
15) Inspect defects in the Unit 11 – Cushion geotextile are patched	All defects	Contractor and GITA
16) Inspect Unit 11 – Cushion geotextile panels anchored as required by the Technical Specification	Continuous during installation	Contractor and GITA
17) Inspection and approval of the final surface for Unit 11 – Cushion geotextile. (HOLD POINT)	At the end of placement	GITA
18) Inspect final surface of the Unit 8 – Drainage layer, placed over Unit 11 – Cushion geotextile prior to the overlay of Unit 12 – Separation geotextile.	At the end of placement	GITA
19) Inspection of geomembrane Leak Detection Testing carried out after the placement of Unit 8 – Drainage later	At end of placement	GITA
20) Inspect Unit 12 – Separation geotextile overlap as required by Specification.	All panels	Contractor and GITA
21) Inspect Unit 12 – Separation geotextile panels are joined as required by the Specification	All joins	Contractor and GITA



GREAT SOUTHERN LANDFILL CELL 1 AND ANCILLARY WORKS CQA PLAN

Activity	Frequency	Responsibility
22) Inspect defects in the Unit 12 – Separation geotextile are patched	All defects	Contractor and GITA
23) Inspect Unit 12 – Separation geotextile panels anchored as required by the Technical Specification	Continuous during installation	Contractor and GITA
24) Inspect and approve of the final surface for Unit 12 – Separation geotextile. (HOLD POINT)	At the end of placement	GITA
25) As-build liner drawings and reporting as required by the Technical Specifications	At the end of placement of each liner	Installer Contractor

9.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent in conjunction with the GITA has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Geosynthetic materials supplied	MQA and independent quality control tests results meet the Technical Specification
Subgrade condition	Subgrade progressively prepared and approved by GITA before placement of geosynthetics
Submission of Panel Layout Drawings	Submission of panel layout drawings for the GCL and geomembrane to the Superintendent and approval by the GITA.
Submission of Quality Control Procedures Manual	Submission of Quality Control Procedures Manual to the Superintendent.
Unit 10 – Geomembrane installed	Inspection of the surface of the geomembrane shall be inspected and signed off by the GITA prior to installation of the cushion geotextile. Seam and Repair QC data reviewed and approved by GITA.
Anchor trench	Inspection and approval of the surface of the prepared anchor trench excavation by the Superintendent.
Installation of geosynthetic components in anchor trench	Inspection and approval of installation of the geosynthetic liners in anchor trenches, in accordance with the Specifications and Drawings.
Anchor trench backfilled	Anchor trench inspected and approved by the Superintendent prior to being backfilled. Anchor trench is backfilled in accordance with the Specifications.
Geosynthetics covered	GITA confirm the installed geosynthetics covered under full time supervision with any observed damage repaired, recorded and reported in the As-build liner drawings and in accordance with the Specifications.



9.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Geosynthetic material	GITA confirms all materials testing and testing results conform to the Specification requirements prior to materials arriving on site.
2) Geosynthetic material storage	Superintendent confirms that material is stored in accordance with Specification requirements.
3) Geosynthetic installation and anchorage	GITA monitors installation and anchorage, and confirms and records that geosynthetic materials have been installed and covered in accordance with the Specification requirements.
4) Geosynthetic installation testing	GITA monitor on-site testing and confirm that testing methods and testing results are in accordance with the requirements listed in the Technical Specification.
5) Independent Laboratory testing of geosynthetic materials	GITA approves laboratory results in accordance with the Technical Specification criteria.

10.0 COMPONENT 6: LEACHATE COLLECTION SYSTEM

Aim: *To install the leachate collection system to meet the requirements of the Technical Specification and without damage to underlying layers.*

10.1 Procedures

The following includes a list of procedures that require quality assurance measures for the placement and installation of the various components of the leachate collection system of Cell 1. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Supply of Unit 13 – Leachate collection pipes (Unit 13.1 – Perforated Header Pipe – 250 mm diameter; Unit 13.2 – Perforated Collection Pipe – 150 mm diameter; Unit 13.3 – Solid Header Pipe – 250 mm diameter) in accordance with Specifications	Contractor
2) Supply of Unit 14.1 – Reinforced Concrete Slab, Unit 14.2 – Leachate Sump Outlet Sleeves and Unit 14.3 – Transducer Riser Pipe	Contractor
3) Supply and sample of Unit 8 – Leachate drainage aggregate in accordance with Specifications	Contractor
4) Prepare a Work Method Statement for the installation of the welded Unit 13 – Leachate Collection Pipes onto the Unit 11 – Cushion Geotextile	Contractor
5) Prepare a Work Method Statement for handling and placement of Unit 8 – Leachate Drainage aggregate for handling and placement of Unit 8 – Leachate Drainage aggregate	Contractor
6) Prepare a Work Method Statement for the installation and construction of the Unit 14 – Leachate Collection sump	Contractor
7) Installation of Unit 13 – Leachate collection pipes in accordance with the Specifications and drawings. A survey of the pipe alignments shall be provided at the completion of the installation. (HOLD POINT)	Contractor
8) Placement of Unit 8 – Leachate drainage aggregate shall be carried out under full time supervision in accordance to Specifications and Drawings.	Contractor GITA



GREAT SOUTHERN LANDFILL CELL 1 AND ANCILLARY WORKS CQA PLAN

Procedure	Responsibility
9) Construct leachate collection sump in accordance to Specifications and Drawings. This includes Unit 14.1 – Reinforced Concrete Slab, Unit 14.2 Leachate Sump Outlet Sleeves, Unit 14.3 – Transducer Riser Pipe and Anchor block on embankment crest.	Contractor
10) Placement and spreading of Unit 8 – Leachate drainage aggregate.	Contractor
11) Undertake a Leak Detection Testing prior to the placement of Unit 12 – Separation geotextile in accordance with the Specifications.	Contractor
12) Place and secure Unit 12 – Separation Geotextile in accordance with the Specifications and Drawings.	Contractor
13) Survey of the finished surface shall be carried out to demonstrate that the drainage layer design thickness has been achieved and the leachate sump geometry is in accordance with the Specifications and Drawings.	Contractor

10.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

Activity	Frequency	Responsibility
1) Approval of Unit 13 – Leachate collection pipes	Prior to commencement of Work	Superintendent
2) Approval of Unit 8 – Leachate drainage aggregate	Prior to commencement of Work	Superintendent
3) Inspection of installed Unit 13 – Leachate collection pipes, Unit 14.2 – Leachate Sump Outlet Sleeve and Unit 14.3 – Transducer Riser Pipe, including inspection of drilling details to be in accordance with Drawings and absence of ‘swarf’.	Continuous during construction	Superintendent
4) Monitoring of Unit 13 – Leachate collection pipe installations.	Continuous during construction	Superintendent
5) Survey of installed Unit 13 – Leachate collection pipe alignments	At the end of installation	Contractor
6) Inspect joins of pipes	All joins	Superintendent
7) Inspection of Unit 8 – Leachate drainage aggregate material.	Continuous during construction	Superintendent and GITA
8) Monitoring of Unit 8 – Leachate drainage aggregate installation.	Continuous during construction.	GITA
9) Survey of top of leachate collection pipes and top of leachate collection aggregate	As works are completed	Contractor
10) Inspection of the geosynthetic lining system within the sump in accordance with Component 5.	Continuous during construction.	GITA
11) Inspect and monitor the construction of Unit 14.1 Reinforced Concrete Slab.	Continuous during construction.	Superintendent



GREAT SOUTHERN LANDFILL CELL 1 AND ANCILLARY WORKS CQA PLAN

Activity	Frequency	Responsibility
12) Inspection and monitoring of installation and placement of the: <ul style="list-style-type: none"> ▪ Unit 14.2 – Leachate Sump Outlet Sleeves (including inspection of the pipe perforation) and ▪ Unit 14.3 – Transducer Riser Pipe. ▪ Anchor block. In accordance with the Specifications and Drawings	Continuous during construction.	Superintendent
13) Carry out a geomembrane Leak Detection Testing.	At the end of aggregate placement	Contractor
14) Inspect placement of Unit 12 – Separation geotextile in accordance with the Specifications and Drawings.	Continuous during construction.	Superintendent
15) Survey of finish surface level	A the end of construction	Contractor

10.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Unit 8 – Leachate Drainage aggregate material	PSD tests and material properties of Unit 8 stockpile meets specification
Submission of Work Method statement for installation of Unit 13 – Leachate collection pipes	Submission of WMS for installation of the welded Unit 13 – Leachate Collection Pipes onto the Unit 11 – Cushion Geotextile, by the Contractor(s) to the Superintendent for approval by the Superintendent and Designer.
Submission of Work Method Statement for placement of Unit 8 – Leachate Drainage aggregate	Submission of WMS for handling and placement of Unit 8 – Leachate Drainage aggregate by the Contractor(s) to the Superintendent and approval by the Superintendent and Designer.
Submission of Work Method statement for construction of the Leachate Collection Sump	Submission of WMS for the installation and construction of the leachate sump by the Contractor(s) to the Superintendent and approval by the Superintendent and Designer.
Unit 13 – Leachate collection pipes	Submission of survey of installed Unit 13 – Leachate Collection Pipe alignments prior to covering with Unit 8 – Leachate drainage aggregate, by the Contractor for approval by the Superintendent.
Unit 8 – Leachate drainage aggregate placement	Confirmation that aggregate has been placed under the full time supervision of GITA
Geomembrane Leak Detection Testing	Confirmation by GITA that the testing has been carried out in accordance with the Specification, with leaks investigated, repaired and re-tested if required by the Superintendent.
Survey of finished surface levels	Submission of survey by the Contractor of finished surface levels conducted on an approximate 10 m grid, with detail survey of the Leachate Sump.



10.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Unit 13 – Leachate collection pipes	Superintendent confirms pipes meet specification based on documentation. Superintendent confirms leachate collection pipes are perforated as required by Technical Specification and Drawings, and 'swarf' has been removed prior to placement.
2) Unit 8 – Leachate drainage aggregate	Superintendent approves material based on grading curve provided by the Supplier/Contractor. GITA and Superintendent confirm consistency of material by continuous monitoring and inspections on site.
3) Unit 13 – Leachate collection pipe installation	Superintendent reviews survey and confirms that Unit 13 – Leachate collection pipe has been installed to the alignments and grades specified in the Drawings and in accordance with the Specification.
4) Unit 8 – Leachate drainage aggregate layer installation	GITA and Superintendent confirms installation as per Technical Specification and Drawings, with appropriate control over construction equipment during placement.
5) Leak Detection Testing	GITA and Superintendent confirms the integrity of the geomembrane after Unit 8 – Leachate drainage aggregate layer installation, by the results of the Leak Detection Testing carried out in accordance with the Specifications.
6) Unit 12 – Separation Geotextile	Superintendent confirms that Unit 12 – Separation Geotextile has been placed and secured over Unit 8 – Leachate drainage aggregate in accordance with Specifications and Drawings.
7) Unit 14 – Leachate Collection Sump	Superintendent confirms construction and placement in accordance with Specification and Drawings for: <ul style="list-style-type: none"> ■ Unit 14.1 – Reinforced Concrete Slab. ■ Unit 14.2 – Leachate Sump Outlet Sleeves and ■ Unit 14.3 – Transducer Riser Pipe and ■ Anchor blocks.
8) Finish surface levels	Superintendent reviews as-built survey information provided by Contractor and confirms thickness requirement for Unit 8 – Leachate drainage aggregate, has been meet in accordance with the Technical Specification and Drawings.

11.0 COMPONENT 7: STORMWATER DAM SPILLWAY

Aim: To ensure that the stormwater dam spillway meets the construction requirements specified in the Technical Specification.

11.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the Stormwater Dam spillway. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Construct the subgrade with Unit 3 – Engineering clay material, to the lines and levels shown on Drawings and in accordance with the Specifications	Contractor
2) Install Unit 12 – Separation Geotextile over the prepared subgrade in accordance with the Specifications.	Contractor



Procedure	Responsibility
3) Construct Unit 14.1 – Reinforced Concrete Slab over Unit 12 – Separation Geotextile to the lines and levels shown on drawings.	Contractor
4) Install Unit 19.1 – Concrete Spillway and Dissipater blocks at the embankment crest and down the slope as shown on the Drawings, to the satisfaction of the Superintendent	Contractor
5) Place Unit 19.2 – Loosely placed rock along the width of Stormwater spillway channel to a depth and length as specified by the Superintendent	Contractor
6) Construct stormwater dam channel to the lines and levels shown on Drawings.	Contractor
7) Install Unit 19.3 – Erosion protection mat in the stormwater channel in accordance with the Specifications	Contractor

11.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

The Quality Assurance program for subgrade and embankment construction shall be as required by Component 1 and Component 3 respectively. The Quality Assurance program for installation of the separation geotextile shall be as required by Component 4.

Activity	Frequency	Responsibility
1) Survey of the spillway crest elevation and alignments prior to placement of Unit 12 – Separation Geotextile.	Upon Completion	Contractor
2) Inspection and monitoring of installation of the Unit 12 – Separation Geotextile	Upon Completion	GITA
3) Inspection and monitoring of Unit 14 – Reinforced Concrete Slab construction	Continuous during construction.	Superintendent
4) Inspection and monitoring of all Unit 19 – Spillway and Stormwater Channel components, including concrete spillway and dissipater blocks, loosely placed rock and erosion protection mat.	Continuous during construction and as Works are completed	Superintendent

11.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

The hold points for site preparation, subgrade and embankment construction and geotextile installation shall be as required by Component 1, Component 3, Component 4 and Component 5, respectively.

Component	Consideration
Inspection and acceptance of lines and levels of spillway crest	Superintendent confirms that spillway has been constructed in accordance with Technical Specification and Drawing requirements.



11.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Subgrade, embankment construction and geotextile installation shall be as required by Component 3, Component 4 and Component 5, respectively

Item	Performance Indicator
1) Spillway shape	Superintendent confirms that alignment, elevations, grades and slopes meet tolerances.
2) Stormwater channel	Superintendent monitors installation and confirms and records that the spillway channel has been constructed in accordance with the Technical Specification requirements.

12.0 COMPONENT 8: SEDIMENT MANAGEMENT STRUCTURE

Aim: *To ensure that the sediment management structures meets the construction requirements specified in the Technical Specification.*

12.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the Sediment Management structure. The list includes the party responsible for performing each procedure.

Procedure	Responsibility
1) Excavate Unit 20 – Sediment Management Structure embankment key-in and anchor trenches to the dimensions and alignment shown on drawings. Place cut material in stockpiles as instructed by the Superintendent	Constructor
2) Proof roll cut areas	Constructor
3) Identify Unit 2 – Unsuitable material during proof rolling. Excavate and backfill with Unit 4 – General fill to the depths specified by GITA	Constructor GITA
4) Supply, store and place Unit 20.1 – Separation Geotextile to the extent shown on the Drawings and in accordance with the Specifications.	Constructor
5) Site testing of Unit 20.1 – Separation Geotextile shall be conducted by GITA for properties and frequencies specified in the Technical Specifications.	GITA
6) Source Unit 20.2 – Embankment Aggregate in the presence of GITA, with material gradation meetings specified aggregate properties in accordance with the Specifications.	Constructor
7) Place Unit 20.2 – Embankment Aggregate to the alignments, elevations and slopes shown in Drawings.	Constructor



12.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

The Quality Assurance program for site preparation shall be as required by Component 1.

Activity	Frequency	Responsibility
1) Inspect the footprint surface and the rolled cut key	A the start of Works	Superintendent
2) Supply Unit 20.1 – Separation Geotextile	Prior to commencement of works	Contractor
3) Carry out quality control testing on Unit 20.1 – Separation Geotextile and approve materials	Prior to placement	GITA
4) Source Unit 20.2 – Embankment Aggregate	Prior to commencement of works	Contractor Superintendent
5) Approve Unit 20.2 – Embankment Aggregate	Prior to placement	GITA

12.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

The hold points for site preparation, shall be as required by Component 1.

Component	Consideration
Submittal of a Work Method Statement (WMS)	WMS includes the installation of and protection of Unit 20.1 – Separation Geotextile as well as fines generation in the Unit 20.2 Embankment Aggregate
Key-in trench	Superintendent to inspect and approve Key-in alignment and excavation in accordance to with the Specifications and Drawings.
Anchor Trenches	Superintendent to inspect, confirm and approve that anchor trenches has been excavated and later finished and compacted in accordance to with the Specifications and Drawings.
Inspection of the finished structure	Superintend to confirm that the Sediment Management dam meets the alignment, elevation and slopes in accordance to Drawings and in accordance with Specifications.



12.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Subgrade, embankment construction and geotextile installation shall be as required by Component 3, Component 4 and Component 5, respectively.

Item	Performance Indicator
1) Key-in Trench	Superintendent confirms that lines, levels and grades of the Key-in trench excavation are as per design Drawings. Backfill of Key-in trench is finished and compacted with a firm and clean compacted surface.
2) Unit 20.2 – Embankment Aggregate material selection	Contractor, under the supervision of GITA, selects Unit 20.2 – Embankment Aggregate material that meets the specification.
3) Unit 20.1 – Separation Geotextile material selection	GITA confirms all testing and testing results conform to the Specification requirements prior to materials arriving on site.
4) Unit 20.1 – Separation Geotextile installation and anchorage	Superintendent monitors installation and anchorage, and confirms and records that Unit 20.1 – Separation geotextile materials have been installed and covered in accordance with the Specification requirements.
5) Unit 20.2 – Embankment Aggregate placement	Superintendent confirms placement of Unit 20.2 – Embankment Aggregate in accordance with Specifications, to the alignment, levels and slopes shown on Drawings.

13.0 COMPONENT 9: ANCILLARY ITEMS

Aim: *To ensure that the construction of the ancillary items meets the requirements specified in the Technical Specification.*

13.1 Procedures

The following includes a list of procedures that require quality assurance measures for the construction of the ancillary items and includes the party responsible for performing each procedure. This section includes the Stormwater Diversion Bund (SDB) and the Stormwater Management Drain (SMD).

Procedure	Responsibility
1) Construct the Stormwater Diversion Bunds to the lines, levels and slopes shown on drawings.	Contractor
2) Construct the Stormwater Diversion Bunds using Unit 4 – General Fill compacted to the satisfaction of the Superintendent	Contractor
3) Construct the Stormwater Management Drain by cut and fill methods to the lines, levels and slopes shown on drawings	Contractor
4) Construct the Stormwater Management Drains using of Unit 4 – General Fill compacted to the satisfaction of the Superintendent.	Contractor



13.2 Quality Assurance Program – Inspection and Monitoring

The following quality assurance program will be conducted at the site. The results of these activities will be recorded by the responsible party and issued to the Principal.

The Quality Assurance program for site preparation shall be as required by Component 1.

Activity	Frequency	Responsibility
1) Inspect construction of Stormwater Diversion Bund	During construction	Superintendent
2) Inspect cut and fill construction of Stormwater Management Drain	During construction	Superintendent

13.3 Hold Points

The following Hold points shall apply. The work related to the Hold Point shall not be covered until the Superintendent has agreed in writing the work has met the requirements of the Technical Specification.

Component	Consideration
Stormwater Diversion Bund (SDB)	Superintendent to confirm that SDB has been constructed to the alignment and levels specified in the Drawings and in accordance with the Specifications.
Stormwater Management Drain (SMD)	Superintendent to confirm that SMD has been cut and fill to the alignment and levels specified in the Drawings and in accordance with the Specifications

13.4 Performance Indicators

The following performance indicators shall be applied as part of the quality assurance program listed above.

Item	Performance Indicator
1) Stormwater Diversion Bund surface	Firm and clean surface, constructed to alignments and levels shown on Drawings.
2) Stormwater Management Drain surface	Firm and clean surface, excavated and constructed to alignments and levels shown on Drawings.



Report Signature Page

GOLDER ASSOCIATES PTY LTD

A blue ink signature of Pamela Soto, written in a cursive style.

Pamela Soto
Project Engineer

A blue ink signature of Liza du Preez, written in a cursive style.

Liza du Preez
Associate

PGS/LDP/hn

A.B.N. 64 006 107 857

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