



EAST GIPPSLAND SHIRE COUNCIL

SPECIFICATIONS

CONTRACT NO. XXX/XXX

**CONSTRUCTION OF CELL 3
BAIRNSDALE REGIONAL LANDFILL
JOHNSONS ROAD, BAIRNSDALE**

Closing Date: XXXXXXXXXXXXXXXXXXXXXXXX



Our Vision, Our Values

OUR VISION

The East Gippsland Shire will provide strong and inclusive leadership and, through a shared commitment with our diverse communities, nurture our healthy lifestyle and environment, supporting a sustainable economy

OUR VALUES

- Transparency and accountability
- Decision making framework that considers financial, environmental and social consequences
 - Community engagement
- Professionalism and commitment
 - Teamwork
- Innovation and excellence
- Responsible financial management

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SECTION 3 - SPECIFICATION

1 General

1.1 Drawings

The following drawings shall be used in conjunction with this Specification and will form part of the Contract Documents.

Drawing No. **Title**

INSERT DRAWING NUMBERS AND TITLES

1.2 General

The works of this Contract shall be carried out in accordance with this Specification, the accompanying drawings and General Conditions of Contract AS2124-1992. An extract of Annexure A of AS2124-1992 is attached.

1.3 Scope of Work

The works under this Contract comprise the supply of all labour, materials and equipment necessary for construction and testing of all works associated with the development of Cell 3 of the Landfill located at the Bairnsdale Regional Waste Management Facility, Johnston's Road, Forge Creek.

The works will include, but are not limited to:

- Preliminary works including relocation of vermin proof fence and mulch stockpile and stripping of topsoil.
- Bulk earthworks to create the Cell 3 void to the design sub-grade line and levels
- Screening and stockpiling material from the bulk earthworks to obtain sufficient material for placement of a drainage filter over the clay liner.
- Development of a clay borrow pit and placement of a compacted clay liner, including haul road and erosion control.
- Installation of a 2mm thick HDPE liner and geo-textile to the base and sides of Cell 3.
- Placement of leachate collection pipes, and drainage filter blanket on top of the liner, and connection into the drainage sump located within Cell 2.
- Other miscellaneous works.

The whole of the works will be carried out in strict accordance with and to the true intent and purpose of the accompanying drawings and specifications and under the supervision of the Superintendent.

1.4 Contract Times

- a) Time for Commencement

The works under this contract shall commence within fourteen (14) days from the date of notification of acceptance of tender.

b) Time for Completion of Contract

The whole of the works shall be completed within Thirty (30) weeks from the date of Notification of Acceptance of Tender, inclusive of all public and industry holidays. This time also includes a provision time of six (6) working days for time lost during or as a consequence of adverse weather conditions.

The Principal shall be entitled to deduct or set off as and by way of liquidated damages, the sums noted in Annexure A of the General Conditions of Contract for any delay in the completion of works beyond the stated time of completion.

1.5 Adverse Weather Conditions

Time lost due to adverse weather conditions is defined for the purpose of this contract as time lost due to wet weather or excessively hot or dusty conditions and to the effects of these adverse conditions, eg. wet site conditions following rain.

The Contractor's site representative shall notify the Superintendent immediately of any time lost due to adverse weather conditions and shall confirm such notification in writing within 7 days. This confirmation shall provide details of the nature and extent of delays and the construction activities affected. The Superintendent, if satisfied that the Contractor has taken reasonable steps to minimise the period of delay, will certify within 7 days an appropriate period of time lost. The Superintendent will only certify time lost during customary working hours as defined in the General Conditions of Contract. The maximum period of time, which will be certified on any working day, will be eight hours.

Only delays affecting critical activities included in the approved construction program shall be considered as time lost due to adverse weather conditions.

If, subject to the above, the total period of time certified exceeds the total allowance for the Contract the Superintendent will, in accordance with General Conditions of Contract, grant an extension of time for completion on the basis of one (1) working day for each eight (8) hours of certified time in excess. No extension of time will be granted until the total excess period equals eight (8) hours or a multiple thereof. Periods of less than eight (8) hours duration shall accrue to form part of a subsequent extension of one working day when the total excess equals the next successive multiple of eight (8) hours.

No payment of any kind will be made for the granting of extension of time due to adverse weather conditions.

1.6 Contractor's Establishment

The Contractor shall erect his site establishment adjacent to the area of the Works at a location approved by the Superintendent.

Upon receipt of notice to remove his site establishment at the completion of the Contract, the Contractor shall immediately remove all sheds, temporary fencing, buildings, equipment, surplus materials, etc., and restore the area used to its original condition to the satisfaction of the Superintendent.

The Contractor shall at his own expense provide any necessary temporary access facilities to this site establishment and remove these at the completion of the works of the Contract, restoring the site to its original condition and to the satisfaction of the Superintendent.

1.7 Time and Performance Schedule

Within seven (7) days of the Date of Letter of Acceptance of Contract, the Contractor shall prepare and submit to the Superintendent a construction program for the orderly completion of the works.

During the initial preparation of the construction program the Contractor shall confer with the Superintendent to ensure that agreement is reached regarding layout and conventions.

At fortnightly intervals during the construction period the Contractor shall lodge with the Superintendent two (2) copies of the time and progress schedule showing the percentage of progress made in each section of the work.

1.8 Site Conditions

The Contractor must satisfy himself as to the different sub-surface, ground and groundwater conditions likely to be encountered during construction and shall be deemed to have made full allowance for contingencies arising there from in the tendered price.

A Geotechnical report by Coffey Geosciences is attached to this specification as information only.

It shall be the responsibility of the Tenderer to ascertain the ground conditions to the full extent of the proposed excavation.

The associated tender amount shall remain firm irrespective of the type of material or excavation conditions actually encountered during construction.

1.9 Covering Letter

If the Tenderer deems it necessary to submit qualifying conditions or exceptions with his Tender, then all these qualifying conditions and exceptions shall be contained in a single covering letter, giving where possible the sums of money which would be required in lieu of these qualifying conditions and exceptions.

1.10 Definitions

References to "the Engineer" herein shall refer to the Superintendent except where it is intended to refer to the Municipal Engineer. The Municipal Engineer is the Manager, Projects of the East Gippsland Shire Council. The Municipality is the East Gippsland Shire Council or its Authorised Representative.

Where the word 'approved' is used in this Specification, it shall mean approved by the Superintendent.

1.11 Standard Specification

All materials, equipment and fittings supplied under this Contract shall be new and in accordance with the requirements of the relevant Australian Standard Specifications where such exist or, in their absence, with the relevant British Standard Specifications or American Society for Testing and Materials (ASTM) Specifications.

If any requirements of this Specification conflict with the Standard requirements, then the specified requirements shall apply.

Wherever a Standard Specification or Code is specified herein, it shall mean the latest edition and/or amendment of that Specification or Code at the date of calling of tenders for this Contract.

1.12 Trade-Named Items

Trade names, brands and catalogue numbers specified herein are intended as an indication of the quality, appearance, type, finish, and/or method of construction which will meet the approval of the Superintendent.

Any alternative offered by the Contractor must be equivalent to that specified and to the approval of the Superintendent.

An alternative item to a specified item will be approved by the Superintendent provided the alternative item can be shown to:

- a. be at least equal in quality, durability, appearance, strength and design to the specified item; and
- b. perform at least equally the specific function imposed by the general design; and
- c. conform substantially even with deviations to the detailed requirements for the item in the Specification; and
- d. have at least an equal operational performance record.

1.13 Co-Operation With Other Contractors

During the progress of this Contract, work may be undertaken by others in the vicinity of the works. Access to the existing landfill cell must be maintained at all times between 8am to 5pm daily for waste contractors.

It is expected that the Contractor will liaise with others concerning access, construction schedules, etc. and should at all times co-operate with other personnel in the execution of their work.

The Contractor shall avoid interference with the work being carried out by others in the vicinity of the site and shall co-operate in order to prevent any delays to the progress of the project. Should the Contractor damage any adjacent work being carried out by others, he shall at his own expense make good such damage as directed by the Superintendent.

1.14 Fires

No fires shall be lit for any purpose in connection with this Contract unless authorised in writing by the Superintendent and not forbidden by any current Government Regulations. The Contractor shall give occupiers of adjoining properties and other contractors forty-eight (48) hours' notice of his intention to burn.

The Contractor shall be responsible for all damage to fences, grass cultivation, buildings or other property occasioned by fires lit for any purpose in connection with this Contract.

1.15 Measurement Of Quantities

All quantities are to be measured in accordance with the AS1181-1971 "Measurement of Civil Engineering Quantities".

a) Volume

Each quantity relating to volume shall be defined as being the volume, which it occupies or will occupy in the present proposed location. All volumes stated in the schedule refer to solid volumes; no allowance is made for bulking or compaction.

b) Area

Each quantity relating to area shall be defined as being the plan area for the item being measured except for:

- i) Surface treatment of concrete or masonry surfaces other than those directly associated with excavation or earthworks, and
- ii) Any other items which the Superintendent considers reasonable.

All of which shall have their areas measured in the plane of the item being considered.

Payment for all earthworks items shall be made based on as constructed survey results received from the contractor's licensed surveyor. Measurement of quantities shall be undertaken utilising the Superintendent's mathematical and computing tools.

1.16 Testing Of Works

All materials, equipment, installation and workmanship included in the works of this Contract, if so requested by the Superintendent, shall be tested and inspected to provide compliance with the Contract requirements.

Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the relevant standards of the Australian Standards Association or those of the British Standard Institution or American Society for Testing and Materials.

At all times when tests are in progress, the Contractor shall have at least one qualified and approved representative present. In the case of tests on works of Sub-Contractors a qualified and approved representative of the Sub-Contractor shall also be present for the duration of the tests.

Testing of all earthworks shall be undertaken by the Contractor in accordance with Section 2.3 of this specification

In the event that any tests fail and additional retesting is required, then the cost of this additional retesting shall be borne by the Contractor.

1.17 Provision Sum

The provision sum specified in this clause shall be added by the Contractor and included in a schedule and in his Tender amount. The whole, part or no part of any provision sum may be expended, as the Superintendent may, at his discretion deem advisable. The Contractor will be paid only for work actually ordered in writing and carried out and the Contractor will have no claim in respect of any provision sum except as to the portion of it actually expended under written order by the Superintendent.

1.18 Provisional Quantities

Any provisional quantities specified in this clause shall be added by the Contractor and included in a schedule and in his Tender amount.

More than or the whole, part or no part of any provisional quantity may be ordered as the Superintendent may, at his discretion, deem advisable. The Contractor will have no claim in respect of any provisional quantity, except as to the amount actually authorised under a written order by the Superintendent.

1.19 Instructions

The Contractor shall at all times give immediate effect to the Superintendent's instructions, whether written or verbal. The Superintendent shall be in sole control of the Contract. He shall define the order or work or the program of construction which the Contractor shall strictly observe.

In reply to the Superintendent's absence, the Contractor shall fulfil the instructions of the Superintendent's nominated representative.

At his discretion and at no additional cost to the Principal the Superintendent can order one portion of the Contract to be proceeded with before another part is completed. The Superintendent has power to amend the designed layout and Contract Drawings, as he may deem necessary on the site. The order of the work can be amended by the Superintendent if he deems it will quicken the completion of the Contract or is necessary in the interest of completing the other contracts.

1.20 Variations On Contract

No extra work shall be done by the Contractor and no section of the works omitted, without a written direction from the Superintendent being first obtained. Such direction shall be on the Superintendent's Variation Order form. The Contractor shall check the quantities shown on such orders and shall ensure that they are correct before commencing any extras ordered. Payment shall not be made for any extras performed in excess of those ordered.

1.21 Hours Of Work

The hours of work shall be restricted to 7:00am to 6:00pm, Monday to Saturday inclusive. Should the Contractor wish to perform any work, including plant maintenance, outside these hours he shall first obtain the permission of the Superintendent to do so.

The Superintendent reserves the right to restrict the Contractor's use of public roads during hours of peak traffic flows. Such restrictions will not be unnecessarily imposed.

The time for Practical Completion is inclusive of all industry Rostered Days off and Public Holidays. Should the Contractor wish to work on these days, he shall first obtain the permission of the Superintendent.

When construction works are carried out on industry Rostered Days Off and Public Holidays, it may be necessary, at the Superintendents discretion, for the Contractor to pay to Council or the Superintendent the cost of supervision at the current rates which can be obtained from the Superintendent.

In this regard the Contractor will-be required to give 48 hours notice of this intention to work so that the necessary arrangement of staff may be carried out.

No payment of any kind will be made for overtime rates or site allowances.

1.22 Safety Of Contractor Personnel

It is the Contractors responsibility to be informed of the provisions of the Occupational Health and Safety Act 2004. The duties and all other obligations that the Act placed on an employer shall be properly discharged by the Contractor.

The Contractor shall take all necessary precautions to ensure the safety of personnel employed on the works site and shall bear sole responsibility for giving effect to such precautions and for any damage or injury to personnel. Contractor personnel employed in excavations or required to work within the operating radius of a crane, backhoe or excavator shall be equipped with safety helmets.

The Contractor shall be required to provide the Superintendent with a detailed Occupational Health and Safety Plan prepared by a registered Occupational Hygienist which addresses the provisions of the Occupational Health and Safety Act 2004. In particular, the Contractor shall be required to provide details of procedures which comply Section 21 of the Act: Duties of Employers, and evidence of compliance with these procedures. The Superintendent will conduct random checks to confirm compliance with the Health and Safety Plan.

The Contractor shall ensure that all employees on site wear approved safety footwear and high visibility clothing at all times.

The Contractor shall take all precautions considered necessary by the Superintendent, to prevent the entry of unauthorised persons into the construction areas.

1.23 First Aid

The Contractor shall provide, equip and maintain an adequate first aid treatment centre on the site and shall have an experienced first aider available at all times when work is in progress.

1.24 Safety Of The Public And Protection Of Works

The Contractor shall, to the satisfaction of the Superintendent, erect and maintain all necessary warning signs, barricades and lights and take all necessary precaution for the safety of the public and protection of the works.

All works adjacent to access roads shall be cordoned off and appropriately lit to the satisfaction of the Superintendent.

1.25 Injury To Persons

The Contractor shall be solely liable for and shall indemnify the Principal in reply to respect of and shall insure against any liability, loss, claim or proceedings whatsoever arising under any statute (other than as provided in the previous clause dealing with Worksafe) or at Common Law in respect of personal injury to or death of any person whomsoever arising out of or in the course of or caused by the execution of the works.

1.26 Liability Of Contractor For Actions, Suits, Claims, Etc.

The Contractor shall be liable for and shall indemnify the Principal against all liability, loss, actions, suits, claims and demands whatsoever directly or indirectly arising out of or in respect of any accident to or damage suffered by any person in consequence of any works carried out under this contract or upon the site of such works whether or not such accident or damage were caused by the negligence of the Contractor or of any of his servants, agents, sub-contractors, or of any other person whatsoever including the Principal, its officers, servants or agents.

The Contractor shall take out and maintain insurance policies in accordance with the Conditions of Contract (and Annexures).

1.27 Temporary Storage And Amenities

The Principal will make a suitable area available for the Contractor to provide temporary building and storage. The Contractor shall not occupy an area outside the limits set down by the Superintendent. In addition to facilities required for his own use, the Contractor is not required to provide facilities for use by the Superintendent.

The Contractor shall provide all statutory and necessary amenities and sanitary facilities for personnel and other persons lawfully upon the site and remove on completion of the Works.

The Contractor at his own expense shall provide for any temporary electrical power supply, telephone and other necessary requirements.

1.28 Datum Marks

The Contractor shall carefully preserve all datum marks at all times. Should any become disturbed by the Contractor's operations, these must be immediately replaced by a Licensed Surveyor approved by the Superintendent and at the Contractor's expense.

1.29 Setting Out The Works

The Contractor shall set out the works and be responsible for the accuracy of such setting out as provided in the General Conditions of Contract, at his expense.

The Contractor shall provide a suitably qualified and experienced licensed surveyor to set out and check the work during construction and to supply an accurate record of the locations and levels of all works as constructed.

The Contractor shall arrange for the licensed surveyor to survey the site and verify the accuracy of the existing survey details.

Should the Contractor discover any error or discrepancy in the lines of levels, or the plans, or the site, he shall immediately notify the Superintendent before proceeding with the work.

The cost of re-pegging or additional survey as a result of discrepancies or error made by the Contractor shall also be paid for by the Contractor.

A series of temporary benchmarks shall be pegged by the Principal's surveyor prior to the commencement of works. Any re-pegging for any reasons whatsoever that is required by the Contractor during the period of the Contract shall be undertaken by the Principal's surveyor or by a licensed surveyor approved in writing by the Superintendent and the costs so incurred by these works shall be wholly met by the Contractor.

The costs associated with any title survey re-establishment, which was brought about by the Contractor's negligence or failure to take adequate precautions, shall be met by the Contractor.

The Contractor shall also supply and maintain on the works approved straight edges, levels, templates, ranging rods, survey tapes and other equipment and instruments to enable Contractor personnel to set out the work accurately and those instruments and templates in particular shall be used throughout as the work proceeds.

The Contractor shall see that the work is accurately done in all respects by the use of such templates and other instruments and shall correct any errors or inaccuracies before other work is done.

The Contractor shall, when required by the Superintendent or his representative, either personally or by his representative test the accuracy of the work and if necessary, retest the same when any adjustments have been made.

The Contractor shall take adequate precautions to protect all survey pegs and marks and shall not disturb any such without prior consent of the Superintendent.

The benchmarks to be used for the setting out of levels shall be as indicated on the drawings.

The work of additional setting out shall be kept at least two days ahead of the work done or being done.

The Contractor shall arrange at his cost for a licensed surveyor to undertaken a level survey prior to:

- i) Commencement of work in cell and borrow area;**
- ii) Completion of subgrade before placement of the clay liner; and**
- iii) Immediately after the liner is completed and borrow area.**
- iv) The surveyor will provide a contour plan for each condition to the Superintendent in both hardcopy and digital form.**

1.30 Use of Public Roads

Access to the site shall be via Johnston's Road. The Contractor shall be responsible for cleaning up to the satisfaction of the Superintendent any material spilled by him or his subcontractors on the works, on access and public roads. All costs associated with the above requirements shall be deemed to be included in the contract rates and the work shall be carried out immediately such spillage occurs.

The Contractor shall be responsible for the maintenance of all access / haul roads for the duration of the Contract. The cost of this above work shall be deemed to be included in the Contract Sum.

1.31 Structures to Drainage Works

Structures on or to drainage works shall be installed as the construction of the drain proceeds and completed immediately and erosion protection devices installed to prevent soil and silt entering existing drainage systems.

1.32 Existing Services, Structures And Property Of The Principal

The Contractor shall make himself fully conversant with all existing services, structures and property of the Principal within and adjacent to the site of the works and shall be responsible for the continuous maintenance of these services during the currency of the Contract.

The locations of the various underground and overhead structures and services or other property shown on the plans and dimensions of such are believed to be correct by reference to the various authorities, but cannot be guaranteed to be exactly so. These have been plotted for the information of the Contractor and information so given is not to be construed as being complete and accurate. The Contractor shall check with the Principal's staff and other statutory authorities to ascertain the exact location of all existing services and assets.

In the event of damage by the Contractor or any Sub-Contractor to any services, structures or property of the Principal, the Contractor shall effect immediate repair of same, which shall be carried out at no cost to the Principal.

1.33 Removal of Existing Structures

Except where relocation and extension of fencing is specified in these works , perimeter fences are to be maintained in their present condition for the duration of the Contract.

Any fence requiring removal to allow construction to progress shall only be removed with the Superintendents permission and such fences shall be replaced with fences of equal quality and condition as that which existed.

The Contractor is responsible for damage to all fences within the scope of works over the duration of the Contract.

1.34 Trenches To Be Timbered

Whenever and wherever it is necessary that the sides of any trench or other excavation be held up by timbering or means to ensure the safety of the public of adjoining ground or property, the Contractor shall, as the work proceeds, carry out such shoring up and timbering and other works required for the purpose indicated as part of this contract and without any special or extra payment for the same and shall maintain such timbering, shoring up or other works in a safe and secure condition until they can be removed without the safety of the public or the stability of the adjoining ground or property being prejudiced by such removal.

The Contractor shall keep sufficient timber on the job to meet any emergency.

Where ordered by the Superintendent, the Contractor shall leave timbering in position. Such timbering shall be cut off 0.60 metres below the surface. The timber (including that cut off) shall be paid for at the market price fixed by the Superintendent, less 10%.

1.35 Explosives

The Contractor shall not use any explosives in the execution of the works except where, when and under such conditions as shall be previously approved by the Superintendent. The Contractor shall provide himself with the necessary licence from the appropriate authority and shall conform to all Government regulations and instructions, relating to the transport, storage, handling and use of explosives.

The Contractor shall be liable for any accident, damage or injury to any person or thing resulting from the use of explosives.

The Contractor shall notify the Superintendent and other relevant authorities in writing of his intention to use explosives at least 48 hours prior to commencement of any works involving explosives.

1.36 Maintenance – During Construction

The Contractor and Sub-Contractors shall keep the site of the works clean and tidy at all times and pay continuous attention to the removal of litter and waste materials.

Under no circumstances will the Contractor or Sub-Contractors dispose of any material or goods, construction debris, rubbish or like material on or about the site.

During the progress of the work until the date of certification by the Superintendent that the work is complete, the Contractor shall maintain the works for the time being, in a careful and workmanlike manner so that the excavations, fills, formations, sub-grades, sub-base and base always present a smooth, even surface.

All subsidence and failures shall be filled, made good and compacted as hereinafter specified by the Contractor at his own expense.

All drains shall be kept clear at all times so that no obstruction or impediment is presented to the flow of water.

The road pavement and site formations shall be maintained in such a condition that it is well drained at all times. No ruts, waves or soft spots shall be allowed to remain and the Contractor shall keep the formations trimmed to the required level and grade by constant use of an approved grader.

1.37 Clearing Up On Completion

The Contractor shall ensure that all works of the contract, including works of all sub-contractors, be absolutely complete immediately prior to the date of expiry of the contract time.

The Contractor shall remove all debris from the site and any material he may have stored conveniently adjacent to the site, and leave the area tidy to the satisfaction of the Superintendent i.e.

- Removal and disposal of all dead trees. Grading up of site to ensure it is free draining.
- Removal and disposal of all rubbish, e.g. building materials, dead wood, rocks, foundations etc.
- Topsoiling and grassing of all disturbed areas.

1.38 Maintenance - After Completion

As each section of the work as determined by Superintendent is accepted and taken over, it shall be efficiently maintained by the Contractor for a period as nominated in Annexure A from the date of certification by the Superintendent that the work or section of the work is complete.

All ruts and subsidences shall be filled and all drains shall be cleaned out on completion. All pavement failures *shall* be reinstated and road surfaces shall be true to alignment, level and left in a perfect condition.

1.39 "As Constructed" Drawings

Prior to the issuing of the Certificate of Practical Completion the Contractor shall furnish to the Superintendent "as constructed" details of the works as executed.

This requirement applies also to Sub-Contractors. Such amendments as are necessary to depict in detail the as-built condition shall be carefully and accurately prepared by competent draft persons. Where an as-built condition requires a drawing to be amended all related drawings influenced by this amendment shall be similarly amended.

Upon completion of all amendments three (3) copies of each drawing prepared pursuant to the requirements of this Contract, each clearly marked adjacent to the title block "Work-as-Executed Drawing" and a digital copy shall be delivered to the Superintendent prior to the issue of the Certificate of Practical Completion.

The Contractor shall also provide survey plans prepared by a Licensed Surveyor, showing "As Constructed" levels for the landfill and leachate pond;

- prepared foundation (pre and post) for bulk earthworks volumes,
- clay base and side liner
- filter material won from on site

This information shall be provided in AutoCAD, 12D or similar format (on disk) together with an accompanying hard copy, prior to filling with the next layer of material.

The cost of preparing and printing the above work-as-executed drawings, notwithstanding that some amendments may have been required as the result of instructions issued by the Superintendent, shall be deemed to be included in the Contract Sum.

1.40 Practical Completion Of Works

When the Contractor has carried out all the work, including testing and submission of "as built" drawings and, in the Contractor's opinion, the works are practically completed, he shall so advise the Superintendent in writing and, within a reasonable time but not exceeding 14 days of receipt of such advice, the Superintendent shall:

- (a) If satisfied that the works are practically complete, issue to the Contractor a Certificate of Practical Completion in accordance with the General Conditions of Contract; or
- (b) If not reasonably satisfied that the works are practically completed, give to the Contractor written notice that the Certificate of Practical Completion will not be issued until the Contractor has completed such further works and/or attained satisfactory performance results as are necessary for practical completion of the works.

The Contractor shall within 14 days of such notice issued under (b) above proceed with such further works as necessary to achieve practical completion of the works, and shall advise the Superintendent when he has completed such works and, within seven (7) days of such advice, the Superintendent shall:

- i) if satisfied that the works are practically completed, issue the Certificate of Practical Completion; or
- ii) if not satisfied that the works are practically completed, issue to the Contractor a further notice or notices. The Contractor shall then comply with the notice and advise the Superintendent when he has so complied until the Superintendent is satisfied that a Certificate of Practical Completion may be issued.

1.41 Defects Liability Period

The Defects Liability Period shall be for the period stated in the Annexure A of the General Conditions of Contract.

1.42 Final Acceptance Of Works

At the end of the Defects Liability Period and provided all defects notified to the Contractor by the Superintendent have been satisfactorily completed, the Contractor shall notify the Superintendent in writing of the completion of the work.

The Superintendent will promptly, by inspection, satisfy himself as to the actual completion of the work in accordance with the terms of the Contract and shall, if in agreement, issue a Final Certificate in accordance with the General Conditions of Contract.

The Final Certificate will not be issued until the Superintendent is satisfied that the performance of the works is in conformity with all requirements of this Specification and with all performance guarantees tendered by the Contractor.

The Contractor may during the Defects Liability Period be called upon to further amend the Works-as-Executed drawings should it be found necessary for the Superintendent to order modifications to the work.

1.43 Environmental Controls

It is the Contractors responsibility to be informed of the provisions of the Environment Protection Act 1970 and any associated regulations and policies, and to carry out all works under the contract in accordance with the requirements of the Act and any associated regulations and policies.

The Contractor shall submit with his tender a proposed Environmental Management Plan, refer to Section 6.3 for specific requirements of this plan.

1.44 Dust Suppression

The Contractor shall take all necessary measures to keep airborne dust to a minimum by watering.

The Superintendent may direct the suspension of work at any time where that work in the Superintendent's opinion creates a dust hazard or nuisance to the public, personnel working on the site or property such as crops, stock and houses in the vicinity of the work. Where the Superintendent has directed a suspension of work and considers that the Contractor could not have been expected to have adequately controlled the dust, the Superintendent may consider an extension of time due to adverse weather conditions. No claim for increased costs due to such suspension will be considered.

1.45 Control Of Soil Erosion

The Contractor shall take all measures necessary to control soil erosion and to minimise the siltation of watercourses and water storages and ensure no offsite impact. Areas that may need soil erosion control protection include but not limited to; the access track from the borrow pit,

stormwater drain discharge points to existing drainage and surface systems. Such measures shall be deemed to have been included in the lump sum and scheduled rates.

When directed by the Superintendent, temporary control works shall be removed and the area reinstated to the satisfaction of the Superintendent.

1.46 Surface Drainage During Site Operations

It is the Contractor's responsibility to undertake and maintain all works necessary, and as approved by the Superintendent, to ensure the area of works remains free from stormwater and runoff from other areas do not enter the site.

1.47 Industrial Matters

The Contractor shall keep the Superintendent informed concerning any industrial matter, which could affect the progress of the work under the Contract.

The Contractor shall inform the Superintendent immediately if bans are applied to the work under the Contract or if work under the Contract ceases due to industrial action, and shall also inform the Superintendent of measures being taken to resolve such action.

The Contractor shall make no claim against the Principal for increased labour costs, or for additional costs, loss or damage arising from increased labour costs, incurred by or as a result of:

- (a) any variation to any Award of the Australian Conciliation and Arbitration Commission or to any Award of the State Industrial Relations Commission, whether by consent or by formal arbitration;
- (b) any agreement, award, settlement, fee or like payment made by the Contractor or any organisation or any person acting on behalf of the Contractor with any union or any other body or any person;
- (c) any industrial action through which occurs a strike, work stoppage, work ban or work limitation of any kind;
- (d) any site allowance claim lodged by unions in respect of the works.

Provided that any industrial action causing lost time does not arise from factors within the control of the Contractor, the Contractor may be granted an extension of time for completion pursuant to the General Conditions of Contract, however will receive no payment of any kind for such extension.

1.48 Co-Ordination Meetings

At intervals not exceeding two weeks, the Contractor and the Superintendent shall together review the progress of the work under the Contract in comparison with the construction program. Where required by the Superintendent, such review will be conducted as a site meeting between representatives of the Principal and the Contractor held weekly or at intervals decided by the Superintendent. Site meetings will be chaired by the Superintendent and minutes will be prepared by the Superintendent and distributed to the Principal and the Contractor not later than two days prior to the next site meeting.

The Superintendent may at any time require the Contractor to submit in writing within 14 days:

- (a) an explanation of delays in execution of the work under the Contract in comparison with the construction program;
- (b) an amended construction program.

Where no current construction program has been supplied and the Superintendent at any time considers that the rate of progress is insufficient to ensure completion of the whole or any separable part of the Works by the relevant Date of Practical Completion, the Superintendent may direct the Contractor to submit within 14 days written details of the intended procedure for the execution of the remainder of the work under the Contract.

2 Earthworks

2.1 Scope

The Contractor shall provide all labour, materials and equipment necessary to clear, excavate, fill, backfill, compact and trim to grade for all earthworks included in this Contract.

2.2 Nature of the Ground

The Contractor must satisfy himself as to the different subsurface, ground and groundwater conditions likely to be encountered during construction and shall be deemed to have made full allowance for contingencies arising there from in this tendered price.

The Geotechnical report contains factual data conducted at the site and should be read in conjunction with this Specification.

The document is entitled:

- Geotechnical Assessment Report, Bairnsdale Landfill Stage 2, 25 September 2004. Author: Coffey Geoscience Pty. Ltd.

The Geotechnical report appended to this Specification provides details on clay depths at the nominated borrow area and clay permeability of the various clay layers. In addition to the geotechnical report. Two (3) test pit logs have been provided down to a depth of 4 metres in the existing excavation, and from the undisturbed ground. The location of the Coffey Geoscience test pits and these additional test pits are shown in the drawings.

2.3 Testing

Geotechnical testing required by this Specification shall be to AS1289 test methods, as set out in Table 1.

Table 1 List of Tests

Abbreviation	Description	Australian Standard
LL	Liquid Limit	1289.3.1.1/1289.3.1.2
PL	Plastic Limit	1289.3.2.1
PI	Plasticity Index	1289.3.3.1
% fines	Percent by weight passing 75um sieve	1289.3.6.1
K	Permeability - Constant head method	1289.6.7.1
	- Falling head method	1289.6.7.2
	Standard Compaction	1289.5.1.1
	Dry Density Ratio	1289.5.4.1
	Hilf Density Ration	1289.5.7.1
	Field Wet Density – Sand Replacement Method	1289.5.3.1
	Field Wet Density – Nuclear Density Gauge Method	1289.5.8.1

Sampling and in-situ density testing of fill material shall be performed by a NATA Accredited Testing Authority appointed (and managed) by the Contractor. Density tests will be carried out not later than 24 hours after compaction has been completed.

Test results shall be made available to the Superintendent in writing not later than 24 hours after the completion of the test.

The Contractor shall be responsible for giving notice to the Superintendent that areas are ready for testing, and he shall allow free and safe access for persons carrying out tests.

No additional filling or compaction shall be carried out in an area that has been tested before the Contractor is advised by the Superintendent that the test results in this area are satisfactory.

The Contractor shall allow for delays resulting from the taking of tests and shall accept the interpretation of the results by the Superintendent and the resulting directions.

In the event of failed or unsatisfactory results from the tests performed by the Geotechnical Subconsultant then all subsequent re-working and re-testing shall be at the Contractor's expense.

2.4 Safety of Earthworks

The Contractor shall be solely responsible for the security of all excavations and earthworks. The Contractor shall comply with the provisions of the Mines (Trenches) Regulations and shall submit to the Victorian Workcover Authority, a completed copy of the form "Notice of Intention to Commence Operation in Trenches, Shafts, Tunnels or other Excavations" should any proposed trench depth exceed 1.50 metres.

All excavations shall be carried out in such a manner that the surrounding materials receive the minimum amount of disturbance. Any damage or disturbance caused to materials, whether or not within the area of operations, will be made good by the Contractor at his own expense, in accordance with the Superintendent's instructions.

Excavations shall be timbered or supported as necessary so as to ensure minimum disturbance to the surrounding ground and to ensure the safety of personnel, adjacent structures and the Works. The sides of excavations may be battered if approved or directed.

If, in the opinion of the Superintendent, the Contractor's method of support of an excavation is inadequate then the Contractor shall alter or increase the support at his own expense as directed. Any direction so given will in no way relieve the Contractor of his responsibilities under the Contract.

2.5 Clearing, Grubbing and Topsoil Stripping

Prior to the commencement of any earthworks, the limit of such earthworks shall be cleared of all vegetation, refuse and obstructions, and stripped of all topsoil to a nominal depth of 200 mm. Hard waste materials such as rock shall be disposed of on-site as directed by the Superintendent.

All vegetation such as trees, shrubs or grasses shall be cleared and grubbed and removed from site.

The Superintendent may direct that any designated tree or shrub shall be retained.

2.6 Landfill Site Earthworks

2.6.1 Preamble

The Contractor should note that the base and side liner of the landfill must be constructed so as to ensure that the permeability achieved is not greater than 1×10^{-9} metres per second and a minimum clay liner thickness of 1.0m shall be maintained throughout the cell.

To ensure that the technical requirements for the base and side liner of the landfill are satisfied the Contractor is to seek the specialist advice of a Geotechnical Subconsultant to monitor the placement of the clay base and side liner. The subconsultant's role will comprise density and compaction testing of each progressively placed clay layer to ensure the specified standards are met. Also ensuring that the mixing of clay from the borrow pit retains a permeability not greater than 1×10^{-9} m/s. Any clay placed in the liner that does not meet the permeability test standard shall be removed and replaced with suitable clay at the contractors cost. The overall responsibilities in the supervision of the works covered by this Specification are however, retained by the Contractor.

2.6.2 Testing and Certification

All testing of earthworks shall be undertaken in accordance with the specification and included in the applicable rates for each item of work.

The Contractor shall obtain the specialist advice of an independent Geotechnical Subconsultant to monitor all earthworks. The Contractor shall submit with his tender, details of the proposed Geotechnical Subconsultant together with a proposed Construction Quality Assurance Plan. This plan shall include details of the nature and frequency of proposed testing.

The Construction Quality Assurance Plan shall conform to the requirements described herein with regard to compliance testing, inspection and reporting procedures.

The Contractor shall nominate in the Quality Plan a suitably qualified and experienced Geotechnical Subconsultant who shall be responsible for the independent certification of each part of the works as appropriate, as part of the quality assurance program.

The Geotechnical Subconsultant inspections shall include, but are not limited to, the following stages of the Works:-

- i) completion of stripping for foundation preparation, but prior to or during compaction,
- ii) completion of side wall trimming before placement of liner,
- iii) construction of the base and side wall liner.

Once the Construction Quality Assurance Plan has been reviewed and approved by the Superintendent, the Contractor shall carry out all earthworks strictly in accordance with the Plan, unless otherwise directed by the Superintendent in writing.

At the completion of works, the Contractor shall provide the Superintendent with three (3) copies of a report from the Geotechnical Subconsultant certifying that earthworks have been constructed to the standard nominated in this specification. All test results must be appended to the report which clearly identified the location of the test performed. The subconsultant shall undertake sufficient testing throughout construction to enable such certification to be made. This report should form part of the Construction Quality Assurance Report required under section 6.2.

The Contract Price shall include allowances for possible time delays while samples are being collected and tested. No additional payment will be made or extension of time granted for any completed work requiring removal and/or repair as deemed by the results of any tests.

At the direction of the Superintendent, independent testing may be undertaken by the Principal's Geotechnical Subconsultant. The Contractor shall provide at his expense, all labour, materials and equipment necessary to prepare areas and assist testing. Such testing shall be at the expense of the Principal, and shall not exclude the Contractor from his testing responsibilities under the Contract.

2.7 Compaction Plant

The Contractor shall be entirely responsible for providing plant of adequate type, capacity and availability to carry out the works in accordance with the Specification.

2.8 Borrow Area and Management of Materials

2.8.1 Borrow Area

The area designated as the source of materials for the construction of the liner, known as the Borrow Area, is shown in the Drawings. The area boundaries are indicative only, and represent the region indicated by the site investigation as likely to contain material conforming to the liner specification.

Clay materials suitable for use in the liner directly underlie the topsoil to an average depth of 2.7 m below the stripped surface. Below this, material particle sizes become predominantly sand and gravel-sized, and are generally not suitable for use. This depth is indicative only, and details are provided in the test pit logs of the geotechnical report. Confirmation of the actual depth of suitable material in a particular area is the responsibility of the Contractor.

The Contractor shall make maximum use of all material to be obtained from the designated borrow area and any other suitable material clay from the cell excavation, so as to produce a sufficient quantity of material necessary for the completion of the Works.

2.8.1.1 Borrow Material

Borrow material for use as a liner in the base and side walls of the landfill shall be low permeability, essentially fine grained material and shall conform to the soil classification outlined in the geotechnical report and as specified.

2.8.1.2 Borrow Pit Configuration

Borrow pit configurations shall comply with the drawings.

The Contractor shall be responsible for providing suitable access to the borrow pits. The location of access roads should be maintained on existing, or proposed access track alignments, or otherwise within the limits of existing clearing unless otherwise approved by the Superintendent

2.8.1.3 Clearing, Grubbing and Topsoil Stripping

The Contractor shall clear and grub all vegetation, and strip all topsoil to a nominal depth of 200 mm the designated borrow area. Vegetation shall be disposed of as directed by the Superintendent. Topsoil shall be stockpiled in area(s) designated by the Superintendent.

2.8.1.4 Borrow of Construction Materials

The Contractor shall excavate, and blend if necessary, material within the borrow pits to achieve uniform material for liner construction complying with the requirements of this Specification.

The Contractor shall, at whatever location, depth and by whatever method, perform all mixing and other conditioning processes, including the addition or removal of water as necessary, to produce the required materials.

If required, moisture shall be introduced into the material at the borrow area. Watering in the borrow area shall be carried out sufficiently far in advance of excavation operations to ensure uniformity of moisture content. This time shall be at least 24 hours.

If at the borrow location there is excessive moisture, the Contractor shall make selective excavation to secure materials of suitable moisture content and shall excavate drainage channels, rip, work or aerate the material, or perform such other work as may be necessary to reduce the moisture content of the material.

2.8.1.5 Unsuitable Material

For the purposes of this Contract, the Superintendent shall have power to classify material (other than topsoil or overburden) which is excavated or taken from stockpile as unsuitable for incorporation in any particular part of the works. Such material may consist of silty deposits or excessively sandy soils and shall be designated "unsuitable material", transported to designated

spoil areas; taken for use in another particular part of the works, or stockpiled for later use, as the Superintendent may direct.

2.8.1.6 Management of Materials

While the Contractor is responsible for proper management of all materials so as to enable all the required works under the Contract to be constructed within the time required, he shall recognise that particular problems of this kind will inevitably present themselves. The constraints of space, time and the order in which materials will be excavated coupled with the requirement for moisture conditioning, may require multiple handling of materials and the use of temporary stockpiles. The Contractor shall allow for the time and work requirements to meet these needs in his construction program. Materials shall be stockpiled only in areas designated by the Superintendent.

2.8.2 Dewatering

The landfill base and borrow areas shall be kept free from water and the Contractor shall make all necessary arrangements to dispose of any water which enters the excavations. Any flow or seepage of water into excavations shall be properly diverted, pumped, drained or otherwise disposed of to the satisfaction of the Superintendent, in accordance with the EMP.

The Contractor shall, at all times, take adequate precautions and provide suitable equipment to keep all excavations dewatered and dry. Should water be allowed to accumulate on the works during construction, as a consequence of which work previously accepted as suitable are rendered unsuitable, then the Superintendent shall direct the Contractor to remove and replace at his own expense any works which have become so affected.

2.8.3 Preparation of Base liner and Side Liner Foundation

2.8.3.1 General

The base and side liner foundation shall be excavated to the profiles and levels as indicated on the Drawings and as directed on-site by the Superintendent. Where the foundation is considered by the Superintendent to be soft, wet or unstable, this material should be excavated.

2.8.3.2 Areas to be Lined

Cell areas to be lined include existing undisturbed regions as well as those areas which have been disturbed during previous quarrying and landfill activities.

Surface preparation shall involve the clearing and grubbing of all vegetation, and stripping of all topsoil to a nominal depth stated in the geotechnical report. The area shall be excavated to the profile and levels shown on the drawings. Areas undergoing preparation for final subgrade level shall be inspected by the Superintendent, who may instigate remedial works on any soft or loose areas revealed during the works.

2.8.3.3 Removal of Unsuitable Material

All unsuitable material including soft clay soil and any other foreign matter shall be removed from the base and side wall areas to the satisfaction of the Superintendent and the levels and gradings shown on the Drawings. Removal of this material shall be performed under the supervision of the Superintendent to ensure that the base and/or side walls are not damaged.

The remedial treatment used may vary depending upon conditions encountered and may consist of hard rockfill, geotextiles, geogrids and drainage geotextiles.

Payment for remedial works shall be in accordance with rates quoted in the Schedule of Prices or where no rate is given, as agreed with the Superintendent.

All removed unsuitable material shall be disposed of at the disposal area as directed by the Superintendent.

2.8.3.4 Excavation and Filling

Prior to placement of the clay liner, the existing surface shall be regraded to the grades and elevations in accordance with the formation surface levels shown on the drawings.

Where fill is placed to raise the existing surface to the formation level, such material shall be placed in layers not exceeding 250 mm loose layer thickness. Layers of soil fill shall be compacted to achieve a minimum dry density ratio of 98% Standard at optimum moisture content $\pm 2\%$ in accordance with AS1289.5.1.1 and 5.4.1. A greater loose layer thickness may only be placed if it can be demonstrated that uniform compaction can be achieved over the total layer thickness.

Should the Contractor excavate to depths greater than required, the excess excavation shall be backfilled at the Contractor's expense to the correct lines and levels with approved material and compacted to the satisfaction of the Superintendent.

Material removed during the preparation of the base and side walls shall be used to form the perimeter bunds or stockpiled at a location approved by the Superintendent, for possible subsequent reuse, or disposed of within the site in a carefully controlled manner approved, and as directed, by the Superintendent should excessive deleterious material be present.

2.8.3.5 Subgrade Preparation

The subgrade material exposed after excavation (or filling) to the design subgrade level shall be scarified to a depth of approximately 150mm and moisture conditioned to within $\pm 2\%$ of Standard Optimum Moisture Content, and then re-compacted to a minimum dry density of 98% Standard in accordance with AS1289 5.1.1, 5.4.1 or 5.7.1. Compaction testing of the subgrade is not required unless requested by the Superintendent.

Following compaction of the subgrade and prior to the placement of the clay liner, the Contractor shall prepare the subgrade surface such that it is smooth and hard in preparation for proof rolling. The proof roll shall be conducted in the presence of the Superintendent with a 10 tonne equivalent smooth wheeled roller or loaded truck with an intensity of contact pressure on the rear wheels of not less than 6 tonne per metre, without visible deformation.

Any soft or weak areas encountered during proof rolling that do not respond to further compaction shall be removed and replaced with suitable site material in layers not exceeding 250mm thickness (loose), and compacted and re-tested to the above criteria.

Following rolling, the Superintendent shall inspect and approve the prepared surface prior to the clay liner being placed. The Superintendent shall satisfy himself that no deflection of the subgrade is visible during proof rolling, and may direct further rolling of the formation surface to be undertaken at the expense of the Contractor.

The Contractor shall arrange for a detailed feature survey of the prepared surface to be undertaken by an independent licensed surveyor following the completion of proof rolling and prior to the placement of the clay liner.

2.8.4 Construction of Base and Side Liner

2.8.4.1 Liner Compaction Requirements

The required compaction for lining material shall be a Dry Density Ratio of not less than 98% of the standard maximum dry density (AS1289.5.4.1) or a Hilf Density Ratio of not less than 98% (Standard Compaction) (AS1289.5.7.1). The moisture variation ($w_0 - w_f$) shall be maintained in the range $\pm 2\%$ of optimum moisture content. The clay must achieve a permeability of 1×10^{-9} m/s or better. Clay material is to be tested for permeability in accordance with (AS1289.6.7.1 & 2).

2.8.4.2 Preparation of Trial Liners

The contractor must win at least 40 cu.m of clay won from the cell excavation and from at least 6-8 different locations in the borrow pit area. The trial liners must be representative of the full depth of clay determined in the borrow pit area. The clays must be mixed, moisture

conditioned, spread in 200mm thick layers and compacted until a 1.0m thick liner depth is achieved.

The Geotechnical Subconsultant is required to ensure sufficient representative clay has been sourced for the trials and undertake appropriate moisture, density and permeability samples and tests in accordance with the Specification and Australian Standards. The Geotechnical Subconsultant is required to certify all results and submit a report to the Superintendent for approval. The Contractor shall not commence placement of the clay liner until such approval in writing has been obtained from the Superintendent. Between two and four trial liners are recommended so that a number of clay mixture and compaction level options can be analysed, providing the Contractor with more flexibility during the construction of the compacted clay liner. Provision for four (4) permeability tests on the trial liners has been included in the Bill of Quantities.

When the mixture(s) of clay identified as passing the permeability requirement have been established and approved by the Superintendent, the Contractor and Geotechnical Subconsultant shall ensure that all clay being used to construct the liner is at least of equivalent quality.

2.8.4.3 Placement

- i) The clay lining material to form the base and side wall liners shall be constructed to the lines, levels, grades and cross-sections as shown on the Drawings.
- ii) Before placing lining material, the surface of the previously compacted layer shall be scarified to a depth of at least 50 mm. If the surface has dried out and/or cracked, it shall be ripped or disc-ploughed to at least 50 mm below the depth of drying or cracking, then watered and mixed, lining material shall not be placed on a surface on which free water has ponded.
- iii) The lining material shall be placed in near horizontal layers which are longitudinally and transversely continuous. The layers shall be of uniform loose thickness not greater than 250 mm. Rolling shall be conducted in at least two different directions for the base liner, and in a direction parallel to the longitudinal axis of the side wall liner. The liner shall be placed to the cross falls and levels specified on the Drawings.
- iv) At the completion of each day's work, or if adverse weather conditions are imminent and the Contractor intends to suspend operations, the surface shall be graded to a self shedding profile and sealed with a smooth drum roller or equivalent.
- v) If the required density and moisture is not achieved the compacted material shall be reworked in accordance with the standard to meet the density and moisture content requirements. If the density and moisture content requirements again cannot be achieved, the failed lift shall be removed at the Superintendent's direction for either moisture conditioning in a borrow area before reuse or stockpiled if still considered unsuitable.
- vi) The Superintendent may order trafficked sections to be ripped and recompact if he deems that the quality of these sections has deteriorated due to construction traffic.
- vii) The Contractor shall arrange with their Geotechnical Subconsultant to take clay liner samples for permeability testing. Results are to be forwarded to the Superintendent. Areas of the clay liner that fail to meet 1×10^{-9} m/s permeability have to be reworked or removed and suitable clay placed as specified and retested at the Contractors expense.

2.8.4.4 Moisture Conditioning

The Contractor's attention is drawn to the fact that meeting the specified moisture condition of this Specification is equally as important a compaction requirement as the specified Density Ratio.

Tests at the time of the site investigation (September 2004) showed that the in-situ moisture contents of liner borrow materials were generally between $\pm 2\%$ of optimum moisture content. Water addition or drying out that may be required in excess of this shall be carried out in the borrow area or at a temporary stockpile. After such moisture content adjustment in the borrow area or at a temporary stockpile, the lining material shall be stockpiled and allowed to cure for 24 hours prior to placement.

The compacted surface of each layer of the liner should be kept moist by frequent watering until subsequent layers or the HDPE Liner is placed.

2.8.4.5 Filter Blanket

The entire exposed surface area of the clay liner base and sides is to be lined with a 2mm thick HDPE liner covered by a geotextile fabric (refer section 3). The base of the cell shall be protected by the placement of a minimum thickness of 300mm filter blanket, being a aggregate free of organic material, sticks, roots, sharp objects or debris of any kind. Particle size of the aggregate screened from the excavated material shall be between 20mm and 75mm with a fines content of less than 1%.

Previous screening of material from the site has indicated that between 20 to 25% of material screened would meet the required aggregate size. A second screening of the filter blanket stockpile is normally required to ensure the 1% or less of fines is achieved.

2.8.4.6 Protection Cover

The entire exposed surface area of the HDPE and geotextile side wall liner and top of batter shall be protected by the placement of a minimum thickness of 300mm road gravel (by-product of screening filter blanket material) as protective cover (measured normal to the exposed surface) as specified in the construction drawings.

2.8.5 Placement of Leachate Collection System

The Contractor shall, at all times, take adequate precautions during the laying of the leachate pipe to prevent damage to the base. A minimum of 50mm of bedding material will be placed on the geotextile-covered HDPE Liner directly beneath the HDPE collection pipe. Further bedding material will be placed around and above the pipe to ensure that a minimum of 100mm surrounds the top and sides of the pipe. The sides shall be haunched with care to ensure crushing of the pipe is avoided. The pipe may need to be sandbagged to prevent it from moving during placement of filter medium. If, in the opinion of the Superintendent, the compacted clay liner or HDPE liner has been damaged during excavation, remedial work shall be carried out to the satisfaction of the Superintendent by the Contractor at his own expense.

The Superintendent shall inspect all installed leachate collection pipes prior to placement of the filter medium.

2.8.6 Temporary Earthen Banks

The Contractor shall construct temporary earthen banks to the lines, levels and grades shown on the Drawings and shall construct associated stormwater drains.

Spoil from the excavation of the temporary stormwater drains which, in the opinion of the Superintendent, is unsuitable for the construction of the bank shall be disposed of on site as directed.

Prior to the placement of fill material, the surface of the liner base on which the bank is to be constructed, shall be thoroughly scarified. The fill material shall be placed in uniform 250mm loose thickness layers and compacted in successive layers to the requirements specified in 2.8.4.1

2.8.7 Acceptance Testing

The Contractor shall test for compliance with the requirements of Clause 2.8.4.1 herein strictly in accordance with the approved Construction Quality Assurance Plan.

Notwithstanding the above, the following criteria for acceptance shall be taken as minimum requirements:

- i) Base and Side Wall liner compaction/moisture content testing frequency:
 - The minimum overall frequency for testing shall be one test per 1,000m³,
 - Two tests per 250mm thick (loose) layer (if the compacted volume of a layer is less than 2,000m³)
- ii) Each test location shall be selected by the contractors geotechnical sub-consultant. Should a test fail to meet the specified density or moisture content then remedial action shall be carried out as described in Table 2. The Superintendent may select a test location at his discretion.
- iii) Should the Superintendent consider the depth of non conforming material to be greater than can be effectively compacted from the surface, material shall be removed to a depth at which compaction is satisfactory and replaced and compacted in layers.

Table 2 – Remedial Action for Compacted Fill

Category	Density Ratio Result	Moisture Result	Remedial Action
A	Fail by less than 1%	Pass	RE-roll (no. of passes to be specified by the Superintendent – max. 3)
B	Fail by 1% or more	Pass, but not more than 1% wet of OMC	Rip, re-water, re-roll and re-test
D	Fail by 1% or more	Pass by 1% or more wet of OMC	Rip, re-roll and re-test
E	Pass	Fail, but no more than 2% dry of OMC	Rip, water re-roll and re-test
F	Fail	Fail: more than 2% dry or more than 3% wet of OMC	Remove fill, replace and re-test

In addition to the compaction testing described above, routine compliance testing with regard to the criteria specified shall be conducted on samples taken for compaction testing, in accordance with the approved Construction Quality Assurance Plan, but not less than the following:

Testing frequency - 1 group of compliance testing per 5,000m³ (minimum number for Cell 2 shall be 4).

Required tests (other than compaction test)

- % fines (Grading Analysis)
- Plasticity Index (PI)
- Permeability (k)

Permeability compliance testing shall be carried out on samples prepared at a Dry Density Ratio and Moisture Content equivalent to that which was obtained from the compaction test for that sample.

Notwithstanding the compliance testing described above, the Superintendent reserves the right to reject incoming material based upon a field assessment of sand content (% fines) or silt content (PI).

The Superintendent may authorise the nominated Testing Authority to perform % fines and/or PI testing on selected samples. When such testing is being carried out the requirements of Section 2.3 and Clause 2.6.2 shall be followed.

2.9 Other Site Earthworks

Material for the construction of general filling layers shall be sourced, as far as practical, from on site, or other area on site as directed by the Superintendent. The material shall be clean well graded material, unless notified otherwise by the Superintendent in writing. The materials used shall be free of stones larger than 20mm, rock, cobbles, boulders, roots, sticks or any sharp objects or debris of any kind.

Any material which fails to comply with these requirements, or is otherwise considered unsuitable by the Superintendent, shall be reused elsewhere on site or disposed of on site as directed by the Superintendent at the Contractor's expense.

2.10 Topsoiling and Grassing

2.10.1 Scope

This section covers the requirements for topsoiling and grassing, including the control of weeds and erosion and promotion of grass cover.

The Contractor shall topsoil and grass all disturbed areas within the limit of works. Topsoil stripped as part of the works shall be stockpiled and reused as part of these works in the first instance. The written approval of the Superintendent is required prior to the importation of topsoil. Imported topsoil will only be considered if there is a deficiency of available topsoil from within the site.

The Contractor shall provide all labour, materials and equipment necessary to undertake the works detailed in this section.

2.10.2 Topsoiling

2.10.2.1 Materials

All topsoil shall be free from perennial weeds and their roots, stone or rubble, clods of subsoil and other extraneous material.

2.10.2.2 Ground Preparation

Prior to the placement of topsoil, the surface for topsoiling shall be lightly cultivated across the slope to achieve a coarse surface texture which will assist in retaining topsoil on sloping ground.

2.10.2.3 Spreading of Topsoil

Topsoil shall be spread:

Where petrol, oil, lime or other harmful materials have been spilt on the subgrade or topsoil, the affected material shall be excavated and removed from site.

Finished surface levels of topsoiled areas shall be graded evenly toward drainage structures, and shall be finished flush with paved surfaces and kerbs. Following spreading and grading, the surface of topsoiled areas shall be tine harrowed across the slope.

Grassing Scope

All topsoiled areas, drainage channels and open drains shall be grassed. This includes:

- Final preparation of seed bed as required.
- Sowing by broadcasting
- Protection and maintenance.

2.10.2.4 Seed Bed Preparation

Ensure areas to be seed have been brought to a suitable tilth before sowing and is free of major weed infestations.

Soil shall not be worked under unfavourable moisture conditions that may not allow proper cultivation or that may damage the soil structure. Final cultivation shall be by tine harrow across the slope of the land, ie. along the contours.

2.10.2.5 Seed Mix

All grass seed shall be a prepared mix of:

- Valda Hard Fescue
- MX86 Sheeps Fescue
- Delaware Dwarf Fine Rye Grass

Sow Valda and MX86 as a 50/50 mix at 50kg per hectare and Delaware Rye at 70kg per hectare, (total rate 120kg per hectare).

2.10.2.6 Sowing and Subsequent Treatment

Sow only on a calm day and do not sow when seed bed is in a muddy condition. Seeding shall be carried out only at times of the year when a good result can be reasonably expected, ie. The months of April, May, September and October.

For sowing outside these times as may be required for surface stabilisation seed shall be sown by machine in two equal sowing in a transverse direction.

Protect newly-grassed areas against traffic or stock access.

Re-seed all areas where grass fails to germinate within one month of the original seeding.

3 HDPE Liner Supply & Installation

3.1 General

The area to be lined is the internal surface of Cell 3. The cell base shall be lined with 2mm thick smooth HDPE and the permanent cell walls shall be lined with 2mm thick textured HDPE. After installation the liner will be completely covered with a non-woven needle punched geotextile (Bidim A24 or approved equivalent). A 300mm thick drainage aggregate will be placed on the base of the cell, and a 300mm thick protective gravel cover layer will be placed on the sides.

The contractor shall examine drawings provided and submit with the tender details of any design amendments required to suit the HDPE membrane lining. In particular, details affecting the surface finish under the liner, slope transitions and anchoring should be considered.

3.2 Trimming & Compaction

The Contractor shall trim the floor and embankments of the cell to the lines and levels indicated on the drawings and compact with a smooth flat drum roller to provide a smooth dense finish.

Embankment tops are to be trimmed prior to construction of anchor trench to ensure minimum fall of 1:30 towards the outside batter slope.

3.3 Anchor Trench

The Contractor is to excavate the anchor trench on the outside embankments and temporary bund to the lines and levels indicated on the drawings.

Following the installation of the HDPE membrane liner the anchor trench shall backfill and compacted with approved material.

The backfill material shall be placed in layers not exceeding 200mm loose depth. Each layer shall be compacted by means of mechanical compactor to achieve 90% Standard Dry Density.

3.4 Area To Be Lined

The area to be lined consists of the base and sides of the cell. The true areas of the lined areas are represented in the Bill of Quantities, meaning that the contractor does not need to allow additional area for the 1 in 3 slope on the walls or the peaks and troughs of the floor.

The schedule does NOT make allowance for the following:

- Joints, overlaps and expansion or contraction of material;
- Edge treatment required beyond the 2.1m wide strip specified for anchor trenches on top of the embankments.

Contractors are to make their own assessment of the quantity of liner required, based on the drawings attached to this Specification.

3.5 Experience

The Contractor shall provide with their tender, evidence of their (or their subcontractor's) ability and experience to supply and install HDPE membrane lining. A minimum of five years continuous experience in the manufacture and installation of HDPE membrane lining is required.

A list of similar past projects including relevant details of each installation and a Client contact is to be provided.

3.6 Material Specifications

The liner shall be a premium grade High Density Polyethylene and shall be manufactured of new, first quality products designed and manufactured specifically for the purpose of liquid containment in hydraulic structures and landfills.

The liner shall have nominal thickness of 2mm minimum.

The liner shall be free of surface striations or roughness (apart from those inherent in the textured liner), holes, blisters, undispersed raw materials, bubbles or any sign of contamination by foreign matter.

The lining materials shall be provided in rolls of a minimum width of 6.0 metres and each roll shall be labelled identifying the following data:

- Name of Manufacturer
- Product Identification;
- Material thickness;
- Roll Length, Width and Weight;
- Year of Production and manufacturer's roll number.

There shall be no factory seams.

Contractors may offer an equivalent to the 2mm HDPE liner for assessment by the Principal. Details of the alternative offer including any supporting technical literature is to be included in the tender.

3.7 Factory Quality Control

3.7.1 Raw Material

Prior to the production of the liner, the liner manufacturer shall test the raw material batches to certify the raw material suppliers test results and entity of the singular resin.

The liner manufacturer shall provide certification and all test results for raw materials prior to the delivery of materials to site.

3.7.2 Manufactured Material

The manufacturing process must provide for the continuous monitoring of thickness and sheet quality.

Details of testing methods shall be provided with each roll delivered to the site and shall include the following information and test results:

- Thickness (ASTM D 1593)
- Tensile Properties (ASTM D 638)
- Tensile Strength at Yield and Break
- Elongation at Yield and Break
- Tear Resistance (ASTM D 1004, Die C)
- Puncture Resistance (FTMS 101C 2031/FTMS 101C 2065)
- Carbon Black Content (ASTM D 1603)
- Density (ASTM 1505)
- Melt Index (ASTM D 1238)
- Brittleness (ASTM D 746)

The Superintendent and the Contractor shall jointly inspect any material rejected on site by the Superintendent. If required, the material shall be tested at the Contractors expense. If the material fails to meet the Specification, the Contractor at his cost shall replace it.

3.8 Subgrade Preparation

The surfaces to be lined shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind. The surface should provide a firm, unyielding foundation for the membrane with no sudden, sharp or abrupt change or break in grade. No standing water or excessive moisture shall be allowed. The Contractor shall certify in writing the surface on which the membrane is to be installed is acceptable before commencing works. The Contractor's Quality Assurance Program shall allow for submission of the certification to the Superintendent prior to laying the liner. The Superintendent shall also inspect the entire subgrade surface area of the cell prior to commencement of liner placement.

3.9 Liner Installation

The liner shall be placed in a manner, which minimises handling and wrinkling of the liner. Due allowance shall be made for shrinkage and thermal expansion and contraction of the liners. The membrane panel layout is the responsibility of the Contractor.

The liner shall be terminated with anchor trenches as shown in the drawings. The anchor trench shall be continuous around the perimeter of the cell. Once the membrane liners are in place the anchor trench shall be backfilled and suitably compacted to prevent slippage of the liner. The contractor is to make allowance for any temporary ballasting required to hold the liner in place in the anchor trench prior to backfilling the anchor trench.

The full cost of this joint or edge treatment including excavation and backfilling of the anchor trenches shall be deemed to be included in the Contract Sum.

The Contractor shall allow for any works required to hold the installed liners in position against the action of wind prior to placement of the leachate collection system, filter blanket aggregate and protective gravel cover.

The Contractor shall ensure that no vehicles or mobile equipment is permitted on the liner until the full depth (300mm) of protective cover or filter blanket has been placed.

The Contractor shall be responsible for making allowance considered necessary to accommodate variations in temperature and weather conditions.

3.10 Field Seams

Seams are to be orientated down the slope, not across it. The layout of the liner will be such to minimise the number and length of seams.

All welds require a minimum of 100mm overlap.

Two types of welds shall be used, Hot Wedge Welding and Extrusion Welding.

Extrusion Welding shall be kept to a minimum and should only be used in 'non stressed' locations.

Extreme care shall be taken by the installer in the preparation of the areas to be welded. The area to be welded shall be cleaned and prepared according to the procedures laid down by the material manufacturer.

The welding equipment used shall be capable of continuously monitoring and controlling the temperatures in the zone of contact when the machine is actually fusing the lining material so as to ensure changes in environmental conditions will not affect the integrity of the weld.

The Contractor shall submit his weld procedure as part of the Quality Assurance/Quality Control Program before any welding is commenced.

3.11 Field Seam Testing

On site physical non destruction testing shall be conducted on all welds by air pressure testing and/o vacuum box. The testing methods shall be included in the Quality Control program submission.

Any area showing a defect shall be marked and repaired in accordance with HDPE repair procedures at the Contractor's expense.

Prior to the beginning of each weld period, trial welds, shall be made on fragment pieces of membrane. Destructive seam tests will be carried out on these samples. Additional destructive seam tests will be performed at random selected locations during installation. These tests are conducted to confirm and evaluate seam strength and continuity during the field seaming.

In the event of failure, all prior welds shall be tested back to the last test which passed. All repairs necessary to make good the seams to the Principal's satisfaction, including additional testing shall be carried out by the Contractor at his own expense.

3.12 Quality Assurance Certificates and Records

The Contractor shall provide the Superintendent 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 & Test Results of Raw Materials from Raw Material Supplier
- Certification & Test Results of Raw Materials from Membrane Manufacturer
- Roll Test Date Reports, for Each Roll of Material
- HDPE 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 & 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.

3.13 Protection of Works

As soon as possible after installation of the liner, the Contractor shall provide protection of the liner by placement of the specified geotextile (Bidim A24 or equivalent) protective cover material and drainage aggregate. If a crusher run filter blanket material is used, the geotextile grade shall be increase to Bidum A34 or equivalent to provide greater protection to the HDPE liner.

Extreme care must be taken at all times to avoid damage to the liner.

No equipment is permitted to operate on the unprotected liner. Personnel walking on the liner should be kept to a minimum, and footwear must be checked prior to accessing the liner to ensure rocks or other sharp objects are not embedded in the sole.

Formwork for the sump slab shall be pre-fabricated in a location external to the lined cell and assembled at the location site. The formwork may only be held in place with screened filter blanket material placed around its perimeter. Under no circumstance should the formwork be staked to the ground. Bar chairs used in the slab construction shall be of a flat based plastic type so as to not damage the HDPE liner.

3.14 Warranty

The Contractor shall provide a written 10 year warranty for the liner material. The warranty shall include all labour and materials required to effect any repair under warranty.

4 CONCRETE

4.1 General

This section specifies concrete for use in the Leachate Collection Sump.

4.2 Standards

The latest editions of the following Australian Standard shall form part of this specification:-

AS 3600	Concrete structures.
AS 3972	Portland and blended cements
AS 2758.1	Aggregates and rock for engineering purposes - Concrete aggregates
AS 1012	Methods of testing concrete.
AS 1379	Specification and supply of concrete
AS 1303	Steel reinforcing wire for concrete
AS 1302	Steel Reinforcing bars for concrete
AS 1304	Welded wire reinforcing fabric for concrete

4.3 Materials

(a) Portland Cement

Portland Cement shall comply with the requirements of Australian Standard AS 3972.

(b) Fine Aggregate

Fine aggregate for concrete shall be sand or fine gravel from an approved source to be thoroughly clean and free from clay, loam or organic impurity and shall comply with the Australian Standard AS 2758.

(c) Course Aggregate

Course aggregate for concrete shall be gravel or screenings from an approved source and shall comply with the Australian Standard AS 2758.

(d) Water

All water shall be free of matter harmful to concrete and its reinforcing.

(e) Reinforcing

Steel reinforcement shall comply with the respective Australian Standards AS 1302, AS 1303 and AS 1304.

4.4 Storage of Materials

Any material that has deteriorated or has been damaged shall not be used for construction purposes. Cement and aggregates shall be stored separately in a manner such as will prevent deterioration and the inclusion of foreign materials.

4.5 Mixture

The concrete shall consist of a mixture of cement, fine aggregate,

course aggregate and water, mixed in such proportions necessary to produce concrete complying with the requirements of this Specification.

The proportion of fine aggregate to course aggregate will depend on the grading of the materials, but the amount of fine aggregate shall always be the minimum which, when combined with cement, will produce only sufficient mortar to fill the voids in the course aggregate and leave a slight excess for finishing.

The proportions of the mix will be determined by the Superintendent and shall be strictly adhered to by the Contractor.

4.6 Pre-Mixed Concrete

All concrete used on the Contract Works shall be premixed concrete, from sources approved by the Superintendent, mixed at a central mixing plant, delivered and placed in strict accordance with Australian Standards AS 1379.

It is the responsibility of the Contractor, not the concrete supplier, to ensure that requirements of this Specification are met. The concrete must be delivered to the site of the works and placed in its final position before initial set takes place and the addition of water or other retempering of the concrete before placing will not be permitted.

4.7 Mixed On-Site Concrete

Mixed on-site concrete shall not be used except when specifically approved by the Superintendent where small quantities of concrete are required. When required and approved, mixed on-site concrete shall be hand or machine mixed as specified by the Superintendent, to produce concrete complying with the requirements of this Specification.

4.8 Cement Mortar

All cement mortar shall consist of:-

One (1) part cement

One and one quarter (1 and 1/4) parts sand

One and one quarter (1 and 1/4) parts screened bluestone dust.

The materials shall be thoroughly mixed with a proper quantity of water, by a method and to a consistency approved by the Superintendent.

4.9 Additives

Additives shall not be permitted.

4.10 Consistency

The concrete to be placed in the work shall be of such consistency that it can be readily placed and compacted in the forms without causing segregation of the materials or excess free water to collect on the surface.

The consistency of the concrete shall be determined by a slump test in accordance with Australian Standard AS 1012.

The maximum slump allowable for concrete used in the works shall be 75mm.

4.11 Concrete Strength

Concrete shall develop minimum compression strength at seven (7) days of 14 Megapascals and at 28 days of 40 Megapascals.

4.12 Standard Tests For Material and Concrete

The materials and concrete will be tested as and when directed by the Superintendent in accordance with Australian Standard AS 1012.

Test cylinders shall be prepared by the Contractor when directed by the Superintendent and shall be numbered and marked with dates. The Contractor shall keep a register of such test cylinders, which shall also show the dimensions and changes of the various concrete works executed on every day and in particular those executed on the day on which the samples were taken.

The Contractor shall be responsible for having the samples tested at an approved Laboratory.

Three cylinders will be prepared and disposed of as follows:-

No.1 Tested for 7 days strength, 14 megapascals.

No.2 Tested for 28 days strength, 40 megapascals.

In the event of No.2 not reaching the required standard, No.3 will be tested. The result of this test will be binding and final on the Contractor and the Superintendent. The Contractor is to take immediate steps to remove and reconstruct any work condemned by reason of this section of the Specification.

4.13 Formwork

Formwork and framing for concrete shall be in accordance with the provision of Australian Standard AS 3600.

The forms shall be to the shape, lines and dimensions required by the Contract Drawings.

Forms shall be properly supported and braced to maintain position during and after the placing of concrete and shall not be stripped until the concrete has hardened and obtained sufficient strength to support its own weight and any construction loads, without injury to the concrete.

In no case shall the forms be removed before 12 hours after placing of the concrete.

4.14 Reinforcement

Where detailed, reinforcement shall be accurately fixed in accordance with the accompanying drawings and the provisions of Australian Standard AS 3600.

Reinforcement shall be thoroughly cleaned of all loose scale, rust and other detrimental coatings and shall be accurately placed, secured and maintained in position until incorporated in the concrete.

4.15 Inspection prior to placement of concrete

No concrete shall be placed before the formwork reinforcement and bedding, in place, have been inspected by the Superintendent.

4.16 Placing of Concrete

After mixing, concrete shall be conveyed to the place of final deposit, without delay, and placed into its final position as rapidly as possible by methods which prevent the loss or segregation of materials.

Dropping concrete a greater height than one (1) metre, depositing large quantities at any point and moving or working it along the forms will not be permitted. A plastic surface shall be maintained until the completion of the unit.

Concrete placing shall be carried on continuously up to the construction points as shown on the drawings, or as directed by the Superintendent.

Wherever the work of placing concrete is delayed until the concrete shall have taken its initial set, the point of stopping shall be deemed a construction joint. The location of construction joints shall be planned in advance and shall be made only when approved by the Superintendent. The placing of concrete shall be carried on continuously from joint to joint. These joints shall be perpendicular to the principal lines of stress and in general, shall be located at points of minimum shear.

Before placing new concrete on or against concrete which has set, the form shall be re-tightened and the surface of the set concrete shall be roughened as required by the Superintendent, thoroughly cleaned of foreign matter, laitance and loose or porous material, and saturated with water. The surface shall be then covered with a thin coat of stiff, neat cement to ensure bond and concreting shall then proceed immediately.

Precautions shall be taken in placing concrete when air temperatures are above 30°C and below 5°C. No concrete is to be placed under water unless methods used are approved by the Superintendent.

4.17 Compaction of Concrete

The concrete shall be thoroughly compacted to the satisfaction of the Superintendent, whilst it is being placed in the works. Compaction shall be by means of continuous tamping, spading and vibration with approved vibrators.

Care shall be taken to fill every part of the forms, to force the concrete under and around the reinforcement without displacing it, to work back coarse aggregate from the face and to remove all air bubbles and voids.

4.18 Curing

Concrete and rendering shall be cured so as to prevent excessive loss of moisture from the surface for at least seven (7) days continuously, following the time of placing.

In hot weather the Superintendent may direct the curing period to extend up to fourteen (14) days.

Curing shall be accomplished by one or more of the following methods:-

- (a) Covering with Hessian, plastic sheeting or similar material maintained in a wet condition.
- (b) Covering with at least 25mm thickness of sand or earth maintained in a damp condition.
- (c) Coating with approved curing compound.
- (d) New surfaces shall be effectively protected from rain until hard set has occurred.

4.19 Defective Concrete

The Contractor shall be fully responsible for employing effective methods of mixing, placing, protecting and curing concrete; and for the adequacy of falsework and forms. Approval of any such work or methods by the Superintendent will be tentative only and shall not relieve the Contractor of this responsibility. Concrete which is not placed and completed in accordance with this Specification or which is, in the opinion of the Superintendent, defective, shall be removed within the limits assigned by the Superintendent and replaced to his satisfaction.

5 Leachate Pipes and Fittings

5.1 Scope

The Contractor shall provide all materials, labour and equipment necessary to supply, install and test all pipes, fittings and valves, and all associated structural work as shown on the Drawings and as specified herein, and as required to make the work complete and operable.

5.2 Materials

5.2.1 General

The Contractor shall give the Superintendent sufficient notice to enable him to inspect any material or article that is delivered on the site of the works and all materials and articles shall be stacked in such a manner as will facilitate inspection. Materials and articles will be inspected before their use in the works of the Contract, but may be ultimately rejected if defects of any kind referred to or implied in this Specification be found before the completion of the Contract.

Samples and materials and/or articles supplied, which fail to meet the requirements of this Specification, whether definitely stated or implied, shall together with all materials and/or articles represented by such samples, be subject to rejection, and if rejected shall be replaced by the contractor at his own cost by materials and/or articles fully in accordance with such requirements of this Specification. The Contractor shall have no claim for extra payment or extension of time in respect of any such replacements.

The Superintendent may, at his discretion, require the Contractor to submit samples of any materials or articles to any test which he may prescribe for the purpose of determining whether or not they are in accordance with the requirements of this Specification. The cost of providing such samples shall be borne by the Contractor if the material is found to be unsatisfactory.

5.2.2 Leachate Pipes and Fittings

The leachate collection pipe shall be slotted 110mm nominal diameter (as specified in the drawings) Vinidex PE80B polyethylene pipe (class PN16) and fittings, or equivalent approved by the Superintendent in writing, manufactured in accordance with AS 4310.

Slots are to be 4mm x 100mm in length, with three slots staggered around the circumference of the pipe. Slots are at 300mm centres along the length of the pipe.

A filter sock is not to be fitted over the pipe.

Pipe work is to be connected to the sump within Cell 2 as per the construction drawings. Pipe ends shall protrude 50mm into the sump. Pipe penetrations shall be neatly constructed and rendered.

The Contractor shall not damage the flexible membrane liner. Any damage caused to the liner system must be repaired immediately to the satisfaction of the Superintendent.

Connections at pipe intersection shall be achieved using a single piece HDPE, Fabricated Tee constructed with an appropriate offset so as to maintain a constant pipe invert level across the transition. Alternate connection methods may only be used with the approval of the Superintendent.

5.2.3 Drainage Aggregate

Drainage aggregate for the area immediately surrounding leachate collection pipes trenches shall be 14 mm size rock of uniform grade.

Drainage aggregate for the filter blanket shall meet the requirements of clause 2.8.4.5.

Representative samples of drainage aggregate shall be provided to the Superintendent for approval, prior to material being brought to site.

5.3 Handling and Delivery of Pipes and Fittings

5.3.1 Transport and Unloading

Pipes shall be transported by an approved method which shall safeguard their condition.

Prior to commencement of deliveries, the proposed method of unloading at the site shall be in accordance with manufacturers specifications and approval by the Superintendent and no alteration of the approved method will be permitted without the further approval of the Superintendent.

When delivered all pipes are to be secured from rolling and be spaced so that free access can be obtained around them. Particular care shall be taken to avoid damage due to incorrect use of slings and pipe handling.

5.3.2 Acceptance After Delivery

Pipes and fittings will be subjected to inspection at the point of delivery and items which fail to meet the requirements of this Specification, independent of physical tests, will be rejected. Any item that is damaged beyond repair shall be removed immediately by the contractor and replaced by him at his expense.

After pipes and fittings have been delivered, unloaded, stacked and finally inspected, a Certificate of Acceptance shall be issued by the Superintendent for all items accepted, and forwarded to the Contractor. However, if the Superintendent is not satisfied that items have been delivered in accordance with this Specification, written notification of the reasons for non-acceptance will be given to the Contractor, who shall carry out forthwith such further works as are necessary for acceptance by the Superintendent.

The Superintendent may permit the repair of minor damage to the items at the delivery site if he is satisfied that the damage is superficial; otherwise the Contractor shall return the item to the factory for replacement.

Notwithstanding prior acceptance, any item which cannot be jointed properly will be rejected and shall be replaced by the Contractor at his expense.

5.4 Construction

5.4.1 General

For the purpose of this Section the term pipework shall be deemed to include all appurtenances built into or fixed on to the pipelines.

It shall be the Contractor's responsibility to ensure proper fit of all pipework. Dimensions and levels shown on the Drawings are to be retained unless such dimensions or levels result in a misfit or interference of the pipework with other pipework, structures or objects, or the dimensions given are not compatible with equipment items to be installed under this Contract, in which case the Contractor shall advise the Superintendent of changes he wishes to make to ensure proper fit and seek the Superintendent's approval to such changes. Approval to so modify such dimensions or pipework arrangements shall not constitute a Contract variation and such modifications shall be deemed to be part of the work of this Contract.

5.4.2 Leachate Collection Pipes

Before laying pipe, all dirt shall and foreign matter, etc. shall be removed from inside the pipe.

Unless otherwise approved by the Superintendent, laying shall commence at the low points of the pipeline and proceed upgrade. All pipelines shall be laid to the lines, levels and grades shown on the Drawings. Pipes must be seated on the geofabric and ballasted (commonly with sandbags) to prevent movement when aggregate is applied.

Angular changes in pipe alignment such as those required to enter the leachate sump, and transition from the base to the wall of the cell shall be achieved using the allowable bending radius of the pipe. The minimum allowable radius of a bend in HDPE pipe is 33 times the outside diameter of the pipe.

5.4.2.1 Jointing of Leachate Collection Pipes

All jointing of HDPE pipes shall be achieved by butt welding. Flanged, Victaulic, and compression fitting shall not be used without the written authority of the Superintendent. All procedures specified by the manufacturer must be followed; in particular:

- The pipe ends must be trimmed square to allow uniform pressure build up. The jointing ends must be free from dirt, grease and contamination to prevent foreign material being trapped inside the weld section.
- The heating time must not be reduced from that specified by the manufacturer and in windy or wet conditions the welding machine must be protected to prevent uneven heating or cooling around the pipe surface.
- The heating plate temperatures must not be changed from the recommended levels to ensure adequate heating and to prevent oxidation of the jointing surfaces.
- The temperature of the welding plate must be checked during the heating cycle.
- The trimmed and heated ends must be held for the appropriate time, depending on the pipe diameter and class.
- The zone must be kept under compression for the nominated period to prevent stresses being built into the joint and reducing the strength of the weld.
- The weld zone must be allowed to cool under ambient conditions and cooling by water spray should not be attempted.
- Weld beads may be left in place providing they are smooth and do not place significant pressure on the HDPE liner beneath.

The Contractor shall provide evidence in the appropriate schedule, of the experience of the pipe welding subcontractor.

Jointing may take place on the HDPE liner, providing adequate steps are taken to ensure that no damage occurs to the HDPE Liner. In the event of such damage the Contractor shall undertake repairs to the satisfaction of the Superintendent at no cost to the Principal.

After laying, jointing and inspection of the pipework, drainage stone shall be placed around the pipework as indicated on the Drawings. Approved 14 mm nominal sized drainage aggregate shall be mounded over the pipework to the cross-sections shown on the Drawings.

5.4.3 Excavation of Open Drains

The open drains shall be excavated to the lines, levels, grades and cross-sections as shown on the Drawings.

Should the Contractor excavate to depths greater than required, the excess excavation shall be backfilled at the Contractor's expense to the correct levels with approved material and compacted and tested to the satisfaction of the Superintendent.

Excavated material shall be stockpiled for possible subsequent use and placed on site as directed by the Superintendent.

6 Quality System

6.1 General

The Contractor shall for all works, plan, develop, document and implement a Quality System based on the principles and practices specified in the AS/NZS ISO 9000 series.

The Quality System shall include development and implementation of:

- Landfill Construction Quality Assurance Plan
- Environmental Management Plan (Construction Management Plan)
- Occupational Health & Safety Plan
- Construction Program

6.2 Construction Quality Assurance Plan

The Contractor shall submit with his tender details of a proposed Construction Quality Assurance Plan (CQAP) for the landfill works. This plan shall include details of the nature and frequency of proposed testing.

The Construction Quality Assurance Plan shall conform to the geotechnical testing requirements described in Section 5 with consideration to EPA Best Practice Environmental Management (Landfills) Publication No. 788.

Once the Construction Quality Assurance Plan has been reviewed and approved by the Superintendent, the Contractor shall carry out all earthworks strictly in accordance with the Plan, unless otherwise directed by the Superintendent in writing.

The Contractor shall be deemed to have made full allowances for compliance with the approved CQAP and any contingencies arising there from in his tendered price.

The CQAP shall include preparation of a Construction Quality Assurance Report at the completion of works to the satisfaction of the Superintendent. This report will provide documentary evidence and certification that the works have been constructed in accordance with the drawings, specifications and CQAP. The report will include at least the following:

- Survey data/plans confirming compacted clay liner thickness
- Survey data/plans confirming correct pipe and liner grades and levels
- Results of the trial clay liners (including compaction and permeability test results)
- Compacted clay liner density, moisture content and permeability test results and evidence of frequency and locations of tests
- Test results and quality assurance certification of the HDPE liner manufacture and installation

6.3 Environmental Management Plan (Construction)

During construction, control of drainage flows along drainage lines, erosion and sediment transportation must be controlled by the Contractor to acceptable levels.

For this reason the Contractor shall submit with his tender a proposed Environmental Management Plan (EMP) which details how all the works under the Contract are to be carried out in accordance with the requirements of the Environment Protection Act 1970 and associated regulations and policies. The Plan (EMP) shall be applied throughout the project, commencing prior to the start of construction and being maintained until the end of the maintenance period.

The EMP shall be prepared by the Contractor and submitted to the Superintendent for approval within 7 days of the notification of acceptance of tender. The Contractor shall not be given possession of the site to commence works until the Superintendent has approved the EMP.

Once the EMP has been reviewed and approved by the Superintendent, the Contractor shall carry out all works strictly in accordance with the Plan, unless otherwise directed by the Superintendent in writing.

The Contractor shall be deemed to have made full allowances for compliance with the approved EMP and any contingencies arising there from in his tendered price.

The EMP should also be prepared in accordance with the Environment Protection Authority Publications "Construction Techniques for Sediment Pollution Control" (publication 275), "Environmental Guidelines for Major Construction Sites" (publication 480), and "Siting, Design, Operation and Rehabilitation of Landfills" (publication 788) copies of which are available for viewing at the Council offices or from the Victorian EPA website www.epa.vic.gov.au.

Items to be addressed in the EMP include, but are not limited to, the following:

- Establishing a practical sequence for construction of drains to divert drainage flows around the works or take other measures as appropriate to convey drainage flows during the period of works. Existing drainage sumps and pumping capacity installed for the current landfill operation may only be used by the contractor with permission of the landfill operator.
- Turbidity testing of water in dams adjoining the construction site, daily from the date when construction commences on site. In accordance with Table 6 of EPA publication 788, the following stormwater turbidity limits shall apply. Stormwater exceeding these limits must be retained on site for either reuse or treatment prior to discharge

	Maximum NTU	Median NTU
Dry weather	50	25
Stormwater flows	100	50

- Minimising effects of runoff from upstream surfaces by locating stockpiles on flat areas, away from flowpaths and constructing perimeter diversion banks around the site boundary and stockpiles to intercept upstream flows and direct them to stable drainage routes.
- Maintaining stability of stockpiles by limiting stockpile height and side slopes.
- Trapping sediment at source by constructing silt fencing around lower edge of stockpiles or by installing other alternative types of sediment traps.
- Establishing a practical construction sequence which traps sediment and prevents it from entering drainage lines.
- Reducing lengths of exposed slopes into non-erosive segments by constructing berms at regular intervals.
- Trapping of sediment on site at strategic locations along drainage lines by installation of sediment controls such as silt fences and traps.
- Protection of soil surface from rain and runoff by early establishment of vegetation, eg.: hydroseeding.

- Reducing dust from haul roads by watering or gravelling.
- Conveyance of concentrated flows down slopes without causing erosion by installing appropriate energy dissipaters and constructing a stabilised/lined base for drainage lines.
- Minimising area of works and disturbance of soil.
- Limiting construction equipment movement by fencing off critical areas.

The Contractor's adherence to the EMP shall be monitored throughout the course of the contract. If appropriate, the approved EMP shall be amended by agreement between the Superintendent and Contractor in order to better meet the objectives of the EMP.

At his discretion, the Superintendent may instruct the Contractor, at no additional cost to the Principal, to install additional control measures in areas where sediment control is not being satisfactorily achieved. Long term treatment of these areas will then be subject to amendment of the EMP as detailed above.

The EMP shall remain in force until the issue of the Final Certificate.

6.4 Environmental Audit

As required under the conditions of the EPA Waste Discharge Licence for the landfill, the Principal shall engage the services of an Environmental Auditor to prepare an Environmental Audit Report. The Superintendent shall provide the Environmental Auditor with a copy of the CQAP, the EMP and any other data, records or details of management systems relevant to the construction of the landfill. The Contractor shall co-operate with the provision of such items if requested. The Environmental Auditor is also required to undertake one or more inspections of the site during construction.

6.5 Occupational Health and Safety

The Contractor shall submit for consideration by the Superintendent an Occupational Health and Safety Plan covering the management of occupational health and safety in accordance with the Occupational Health and Safety Act 2000. Refer to Clause **Error! Reference source not found.** for further details of the Contractors responsibility regarding Occupational Health and Safety and the OH&S Plan.

The Plan shall provide for the prompt notification to the Superintendent of any accident or injury occurring at the site.

The Contractor and the Contractor's agents shall, so far as is practicable, provide and maintain for employees and agents of the Principal and the Superintendent who, in the course of their work for the Principal, enter the site, an environment that is safe and without risks to health.

6.6 Construction Program

Within fourteen (14) days of the Date of Letter of Acceptance of Contract, the Contractor shall prepare and submit to the Superintendent a construction program for the orderly completion of the works.

During the initial preparation of the construction program the Contractor shall confer with the Superintendent to ensure that agreement is reached regarding layout and conventions.

The diagrams submitted shall be revised and resubmitted as required, until the Contractor's programmed sequence of operations, construction procedures and use of labour, materials and equipment is, in the opinion of the Superintendent, such as to ensure satisfactory progress for completion of the works within the times specified and in accordance with the requirements of

the Contract. All revisions required under this sub-clause shall be completed within four (4) calendar weeks of the Date of Letter of Acceptance of Contract.

The program shall be subject to review and acceptance by the Superintendent.