

TECHNICAL SPECIFICATION

FOR

SEAWALL, BEACH ACCESS ROAD AND CLIFF STABILITY

AT

BALGOWAN
SOUTH AUSTRALIA

Project No: 16533
APRIL 2017

CONTENT OF SPECIFICATION

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GENERAL

1.1 Co-ordination

The Contractor shall coordinate his construction with Government Instrumentalities and provision of their services (telephone, water supply, sewer, electricity) and with the Superintendent.

1.2 Inspection

The Contractor shall provide 24 hours notice to the Superintendent so that he may arrange inspection of the following stages of work:

- Completion of excavation prior to placing of fill.
- Completion of compacted fill and placement of geotextile, prior to placement of rock armour.
- Completion of placement of rock armour.
- As otherwise noted in the specification or requested by the Superintendent.
- Completion of placement of fill and topsoil on embankment, prior to placement of Jute Mesh.
- Completion of planting works.

1.3 Survey

The Contractor shall be responsible for the following survey works to be carried out by a licensed surveyor:

- Setting out the works.
- "As Constructed" survey, which shall be submitted to the Superintendent prior to demobilising from site.

1.4 "As Constructed" Drawings

The Contractor shall supply a set of As Constructed Drawings to the Superintendent electronically in format AutoCAD indicating all variation and departures from the Contract Drawings or where particular locations or information have not been shown.

1.5 Existing Services

All existing services are to be located prior to construction commencing. All services to existing buildings must be maintained at all times, except when it becomes necessary to cut into or alter them; in which case the Contractor will be required to confer with the Superintendent to obtain the most suitable times to carry out such work. The Contractor must allow for all cost, which may be incurred or temporary services to carry out the above.

1.6 Hours of Work

The Contractor shall not undertake work on site prior to 7am or after 6pm, or anytime on a Sunday, or public holiday without prior written permission from the Superintendent.

1.7 Insurances

The Contractor shall obtain all insurances as required by the contract prior to commencing on site, and shall forward certificates of currency of these to the Superintendent prior to taking possession of the site.

1.8 Fencing and Security

The Contractor shall erect fencing around the site and shall ensure it is secure from unauthorised entry by the public. The Contractor shall be responsible for site security.

2 SCOPE OF WORKS

The Contractor shall supply all materials, labour and plant necessary to complete the works listed below and described in the drawings:

- | | | |
|-----------|--------|----------------------|
| • 16533-1 | Rev. C | Notes Page |
| • 16533-2 | Rev. C | Site Plan |
| • 16533-3 | Rev. C | Sections and Details |
| • 16533-4 | Rev. C | Sections |

All materials shall be new and first grade, and in good condition when delivered to and installed on site.

The work at this site includes the following:

- Demolition and disposal of:
 - Existing temporary erosion protection treatment at base of cliff (rocks). Clean rocks may be re-used if suitable.
- Construction of a new seawall along the base of the embankment on the beach, including:
 - Clearing/trimming existing vegetation where required
 - Excavation to good ground and disposal of spoil
 - Supply and compaction of general fill
 - Supply and placement of geotextile underlay
 - Supply and placement of rock armour (secondary followed by primary armour on top)
- Erosion control and planting
 - Supply and compaction of fill to eroding areas of cliff face to achieve 1:1.5 slope. Excavate top of the cliff to achieve 1:1.5 slope. Extent of cut and fill is shown indicatively on the site plan and sections. This shall be verified on site by the contractor.
 - Installation of new top soil and seed over all areas of cliff face de-void of vegetation.
 - Installation of Geofabrics Jute Mesh. Water to promote germination and plant growth.
- Rubble access road and concrete spoon drain
 - Cut and fill as required to achieve the required grades as indicated on the site plan and sections. Compact subgrade for road to 95% MDD (modified).
 - Install 150mm (min.) layer of cement stabilised quarry rubble (PM3/40QG) compacted to 95% MDD (modified). Provide 1:50 cross fall to the east.
 - Install 600mm wide concrete spoon drain along the eastern side of the road.
- Construction of 27m long concrete ramp, 1:8 slope
 - Construct 200mm thick concrete slab in two separate pouring operations, with construction joint at the centre. Bottom of the ramp to have edge beam, as per dwg. 16533-4 detail 1.
 - Install sawn joints to the top of the slab at 6.75m max. centres.
 - Install 25x25mm tapered grooves (at 45 degrees to the roadway) to the top of the slab.
 - Provide 400-500mm diameter spalls at base of the ramp
- Supply and installation of all ancillary items and labour necessary for the undertaking of the work.

3 EARTHWORKS

3.1 Site Clearance

The Contractor shall remove from the area of works on the site all organic matter, tree stumps, roots, rubbish and building rubble beneath the area of the works, and dispose of off-site. The contractor is responsible for finding a disposal site, location to be approved by the Superintendent. Vegetation outside the area required for the works is not to be removed or damaged. Existing vegetation at the top of the cliff to be retained.

3.2 Excavations

The Contractor shall take all necessary action and supply all equipment to divert any surface and sub-soil water from the works, including the provision of trenches, sumps and pumps as required for excavation on land.

The Contractor shall excavate to good firm ground for founding of the fill and rock armour generally. Spoil shall be disposed of off site by the Contractor.

All excavations shall be made to the correct depth as shown on the drawings or specified in the Specification, with proper allowance for fill and road base materials as required.

The bottoms of excavations shall be kept at the required grade as shown on drawings and shall be kept free and clean of loose materials and rubbish.

Should excavation to the nominated depth reveal unstable ground, the Superintendent may order further excavation to more stable strata. The Contractor shall carry out the additional excavation and the required backfilling as directed by the Superintendent as a Variation to the Contract.

Unauthorised over-excavation shall be made good with suitable compacted backfill as directed by the Superintendent at no cost to the Principal.

The sides of all excavations made in other than competent rock, and which are cut steeper than the angle of repose of the adjacent soil shall be braced or shored up to prevent slides, slips or cave-ins.

The slope of compacted fill or excavated embankments shall not be steeper than 1.5 horizontal to 1 vertical unless shown otherwise on the Drawings.

The surface of the subgrade under concrete or road base at any point shall allow for the design finished surface level, as shown on the Drawings.

3.3 Filling

General Fill

Fill material shall be clean site excavated soil, which does not contain organic or other deleterious matter, or building material or vegetative matter.

The Contractor shall win, transport, place and compact all required filling material, unless specified otherwise in the Specification, or shown on the Drawings.

The Superintendent shall approve the suitability of material for fill or backfill before such fill is placed.

Excavated Material

The Contractor shall allow for selective use of approved excavated material for backfill or fill where possible unless noted otherwise.

General

Fill material shall be free from roots, rubbish, building rubble, organic matter, large stones, and excessive clay or silt.

Filling shall not be commenced nor shall the next layer be spread on newly compacted fill, until the area has been inspected and approved by the Superintendent.

All fill material, whether from site excavations or not, shall be blended with water to achieve a moisture content at or near the optimum moisture content prior to laying or compacting.

Where existing surfaces are to be covered with less than 150mm of fill, the surface shall be scarified and recompacted to the same density as specified for filling.

3.4 Compaction

Fill material shall be placed in a systematic manner in layers not exceeding the depth for which satisfactory compaction can be guaranteed using the proposed plant and in any case shall not exceed the thickness provided below.

Material shall be compacted in accordance with the Table below:

COMPACTION OF FILL MATERIAL

ROLLER CLASSIFICATION (AS 2868)*	MAXIMUM LAYER THICKNESS	MINIMUM NUMBER OF PASSES
VR14	300	6
VR22	500	6
VR35	750	6

* the minimum static mass on the vibrating drum shall be 4.5 tonnes.

The top 200mm of subgrade or fill under the road base and concrete ramp layer shall have a maximum particle size of 100mm and shall be compacted to 95% modified MDD as provided under AS1289 Parts E2.1 and E3.1.

To achieve the above compaction requirements, vibrating smoothdrum rollers (for granular materials) or vibrating sheepsfoot rollers (for clays) are required.

Each layer shall be compacted in turn and no layer shall be placed over any uncompacted layer.

The Contractor shall be responsible for quality control to ensure that all work complies with this Specification. When, in the opinion of the Contractor, the specified compaction has been achieved for a section of, or all of the work, he shall arrange for compaction testing to be undertaken. The Superintendent shall have the right to nominate exact locations at which samples are to be taken or testing is to be carried out.

The frequency of testing shall be as follows:

Subgrade – One test per 400 square metres. For areas of subgrade less than 400 square metres a minimum of two tests per layer shall be undertaken.

The Contractor shall rework and retest any areas that do not achieve the specified density until that density is achieved. This shall be at the expense of the Contractor.

3.5 Finishing and Tolerances

Earthworks shall be finished to a tolerance of ± 10 mm (from finished level specified).

The average slope of batters shall be not greater than 1 vertical to 1.5 horizontal. At no point on the completed batter shall the ground vary from the average plane by more than 100 mm.

4 CONCRETE

4.1 Scope

This section covers the requirements for the concrete ramp and concrete spoon drain.

4.2 Site Preparation

All vegetation and topsoil containing organic matter shall be removed from the area to be covered by the concrete. Any tree roots shall be removed and all over-excavation thus caused shall be backfilled with suitable soils from site or quarry rubble compacted to the same standard specified on the drawings.

Provide a working surface of a minimum compacted thickness of 200mm of quarry rubble or other approved material. The selected material must be free at the surface of any sharp aggregate which could damage the geotextile membrane. If necessary, blind surface with sand.

4.3 Base Course

Filler material shall be 20mm quarry rubble consisting of durable quartzite, limestone or other suitable stone. It shall be substantially free from any weathered or disintegrated stone, and shall not contain clay lumps, vegetable matter or other deleterious materials. The material shall comply in all respects with the Transport SA, Specification No.PM21.

4.4 Grade of Concrete and Testing

The grade of concrete to be used in the works shall be as designated below:

- Grade Designation S50
- Specified Characteristic Strength at 28 days 50 MPa
- Nominal size of Course Aggregate 20mm

Workability shall be measured by the use of a slump test. The concrete 'design slump' shall be between 60mm and 90mm.

S50 concrete is to have Fly-ash as 25% by weight of cementitious material.

The concrete for the ramp shall have 6kg/m³ of Barchip Macrofibre (or equivalent).

4.5 Placing Concrete

All work shall be in accordance with the requirements of AS 3600.

The placing of concrete for the ramp shall be carried out continuously either side of the construction joint. The construction joint shall be as per the detail on dwg. 16533-3.

All concrete shall be fully compacted by means of power driven vibrators operating at a frequency exceeding 8000 cycles per minute. Concrete shall be worked thoroughly against the formwork and around any reinforcement without displacing them.

4.6 Surface Finish

Formwork shall comply with AS 3610. Unformed surfaces shall be as noted on the drawings.

The top of the ramp slab shall have grooves at 45 degrees to the roadway, as per typical groove detail on dwg. 16533-3.

Sawn joints shall be provided in locations as specified on the drawing.

4.7 Curing of Concrete

Curing of concrete shall be carried out strictly in accordance with the requirements of AS 3600. When hot and/or windy conditions prevail the Builder shall ensure that every precaution is made to prevent premature drying of the concrete surface.

4.8 Hot and Cold Weather Concreting

Concrete shall not be placed in the Works if the temperature of the surrounding air falls below 5° C, or is higher than 32° C or wind speeds exceed 25km/hr unless special precautions are taken, as follows:

Cold Weather

- The concrete shall be prevented from freezing at any time during the curing period;
- The concrete shall have a temperature not lower than 10 C when placed in the forms;
- The concrete shall be maintained at a temperature not below 5 C until the expiration of a curing period of at least seven days;
- Salts or chemicals shall not be used to prevent freezing;

Hot Weather

- The forms and reinforcement shall be cooled with a cold water spray in advance of the placing of the concrete and excess water shall be removed immediately prior to concreting;
- The reinforcement, forms and freshly placed concrete shall be protected from the effects of hot winds and direct sunlight and suitable barriers;
- The concrete shall be maintained at a temperature not higher than 32 C when placed in the forms and shall be covered with hessian (kept wet) until moist curing begins or alternatively continually wetted by fog water spray.

5 ROCK ARMOUR

5.1 Scope

This section covers the requirements for the rock armour. The rocks are to be placed after the compacted fill has been placed.

5.2 Material

All rock on seaward face is to be rough stacked and randomly placed. Contractor is to avoid even or smooth placement.

Fill is to have Terrafix 1200R non-woven geotextile placed over, prior to the rocks being placed on fill.

Fill is to be a granular fill, to be compacted to 95% MDD (modified dry density).

Secondary Armour Rock

A hard igneous rock, which is angular and rough broken, is to be used. Rocks are to be washed prior to placement on wall. Rocks are to have a unit weight of 26 kN/m³.

Average rock size is to be as shown on the drawings, with all rock within ±50% by weight of that nominated. Rock is to be two layers thick generally.

Primary Armour Rock

A hard igneous rock, which is angular and rough broken, is to be used. Rocks are to be washed prior to placement on wall. Rocks are to have a unit weight of 26 kN/m³.

Average rock size is to be as shown on the drawings, with all rock within ±50% by weight of that nominated. Rock is to be two layers thick generally.

6 LANDSCAPE AND PLANTING WORKS

6.1 Site Preparation/cleaning

6.1.1 Site Cleaning

Clear only the site areas to be occupied or affected by the Landscape Works.

General Clearing: Remove everything on or above the site surface that may negatively affect the Landscape Works, including rocks, rubbish, vegetable matter, scrub, timber, stumps, rubble building debris or the like.

If not included within the areas specified above, clear generally only to the extent necessary for the performance of the Works. Negotiate with the Council defined Contractors Areas to be cleared.

6.1.2 Site Restoration of Disturbed Ground Surfaces

Where existing ground surfaces are unnecessarily disturbed or altered during the course of site works by the Contractor, remediate to the original levels and make good any damage at no cost to the Principal.

6.1.3 Imported Topsoil

Topsoil is to be imported onto site prior to the commencement of Landscape Works. Generally topsoil will be equal to the existing site topsoil if approved for use; or meet the following criteria:

- Consist of approximately 60% coarse sand and 40% loam (silt and clay)
- Contain not less than 5% by mass of organic matter
- Have a PH in the range of 5.0 to 8.5
- Have a total salt content of less than 0.1% by dry weight.
- Be free of any concentration of toxic material, that is harmful to plants.
- Be free from debris, stones, roots clay lumps or other foreign materials.
- Be free from weeds such as couch, knot weed, nut grass, oxalis, three cornered jack or any prescribed weed species.
- Be free from any root fungal spores (*Phytophthora cinnamomi*)
- Comply with AS 2223

6.1.4 Preparation for Planting

After the removal of any existing weed growth and removal of debris, cultivate the existing ground surface to a depth of 150mm in preparation for the placement of onsite stockpiled or imported topsoil. Check for existing and proposed utility service runs.

During cultivation thoroughly mix in specified fertilisers and the "Terracottem" water soil conditioner to the manufacturers specifications. Remove stones of 50mm or more, any root debris materials, sticks or clay lumps that may cause problems in mixing in the imported topsoil. Trim and shape the cultivated area to suit the required levels, form swales or graded planting beds proposed. Rake out any obvious clods or foreign debris before lightly rolling the areas to be grassed.

6.2 Placing of Topsoil and Installation of Jute Mesh Erosion Control Matting

Place imported or onsite topsoil to the required depth of 150mm, trim and shape to provide an even graded planting bed over the prepared planting base with a 50mm edge drop at pavement edges and kerb edges.

Geofabrics Jute Mesh shall be installed in accordance with manufacturer's specifications. Install with proprietary metal pins 30mm x 300mm x 4mm Ø, at the rate of 5 pins/m² ensuring that all laps of jute are fully pinned.

6.3 Planting of Trees and Shrubs

Give notice of supply and inspection requirements prior to any planting. Planting beds are to be cultivated to 150mm depth, leave the surface raked and do not roll or compact.

Excavate a hole for each individual shrub large enough to provide not less than 100mm all around the plants root system.

Planting conditions - Do not plant in unsuitable weather conditions such as in extreme heat days, cold, wind or rain, and during frost periods. Suspend excavation in other than sandy soils when the soil is wet, or during frost periods.

Watering plants - Thoroughly water plants at least 1 hour before planting begins, immediately after planting when topsoil is backfilled and tamped, and thereafter as required to establish the plants during the specified establishment period (6 weeks), and to suit the ongoing weather conditions. Where the plant hole is obviously over wet do not water after placement in the hole.

When the plant hole is complete and watering has been done, remove the tubestock plant from its container with minimum disturbance to the root ball, place the plant into the hole centred and backfill with friable topsoil. Ensure soil backfill is firmly tamped free of air pockets moist with a final watering.

Install "MALLEE Corflute Tree Guards" plant protection. Ensure that bunting or temporary fencing is in place after planting to protect against pedestrian intrusion.

6.4 MATERIALS SUPPLY

6.4.1 Fertiliser and Soil Conditioner

Supply and deliver to the site fertiliser IF required for the planted areas. Deliver the fertiliser in sealed bags, branded with the type/mix and manufacturers name, date of manufacturer.

Supply a complete NPK mineral mix for the planting beds and grassed areas at rates as per the Manufacturer's directions.

6.4.2 Plant Supply

Final selection of plant species shall be approved by the superintendent.

Source Tubestock plants from an approved supplier of coastal planting, ensure these are free from weeds or root fungal contamination. Plants shall be vigorous, well established, hardened off, of good form consistent with species or variety, not soft or forced, free from disease and insect pests, with good root systems and no evidence of having been restricted or damaged. Trees shall have a single leader shoot unless the species is a "mallee form" plant.

Make no substitutions unless approved in writing, ensure specified supplies are sourced before commencement of the project, if unavailable then seek approval for substitutions.

Supply each scheduled species in separate boxes to the site and label the plant species using a durable readable tag.

Order sufficient quantities to allow for potential for plant failure. Replace failures or damaged plants with the same species type, the same quality and size.

Plants will be planted as soon as practical after delivery to site. Plants should be suited to the coastal environment conditions. Prevent theft, drying out or physical damage, from any cause including frost, wind, sun, vermin, animals and vandalism. Where plants are to be stored for longer than 48 hours provide a secure onsite nursery for holding plant stock with water supply and shade to suit the proper care of plants before planting occurs.

Supply MALLEE Corflute Tree Guards (code TSCOR4520) 450mm high to suit all trees and shrubs – tubestock plants.

Supply MALLEE Nature Tie (code PLHE3050E) for single leader plants requiring initial support.

Supply “EkoLog Coir Log” sediment arrestor coir logs if required , sizes- 2000x200mm diameter (code CL20020) or 3mx300mm diameter to suit site requirements. (code CL30030) + timber stakes to suit site requirements.

6.5 LANDSCAPE WORKS PRACTICAL COMPLETION AND ESTABLISHMENT PERIOD

6.5.1 Certificate of Practical Completion

At the end of the Contracted Works Period (plus any extensions of time approved), an Inspection of Works for Practical Completion will be conducted.

A Certificate of Practical Completion will be issued by the Superintendent when all Landscape Works are complete in accordance with the Contract Documents (and any variations issued during the construction period).

The Practical Completion of Landscape Works will include but not be limited to the planting of tube stock plants, replacement of planting lost or damaged during the construction period, construction of other Sub Contractor works defined as Landscape Works.

Following issue of the Certificate of Practical Completion the “Establishment Period” will commence.

6.5.2 Establishment Period and Handover

All shrubs and Trees will be maintained in good health for a period of six weeks, this being the “Establishment Period”.

Recurrent Works throughout the Establishment Period continue to carry out routine landscape works of a maintenance nature, to care for all plantings. This is to include but not be limited to watering, weeding, fertilising, pest and disease control, staking and tying, replanting, cultivating, pruning top dressing, managing access, dealing with the vandalism of plants. The Contractor will also report any major incidents of plant loss or vandalism as soon as possible to the Superintendent.

Following the completion of the Establishment Period a Handover Inspection will be conducted by the Client /Superintendent, covering all Landscape Works to identify any landscape remedial works required, when these are completed satisfactorily the Handover will occur and the Contractor will be deemed to have Completed all Contracted Works and the Final Progress Payments will be made as per the Contract Agreement.

6.6 Plant Species Guide, Groundcovers, herbs and small shrubs

The following coastal plant species may be suitable to the area. This is a guide only.

Final selection of plant species shall be approved by the superintendent.

Muntries (*Kunzea pomifera*)

Ground-hugging shrub with branches extending over several metres. Thick bright green leaves, showy white fluffy flowers in spring and early summer..

Cushion Bush (*Leucopyhta brownii*)

Compact, rounded shrub to 1m. Silver-grey foliage, pale yellow ball-shaped flowers in summer. Great structural form, provides colour and texture contrast. Responds well to regular pruning. Full-sun.

Native Pelargonium (*Pelargonium australe*)

Herb to knee high. Large green velvety leaves, pale pink flowers with purple stripe occur spring to summer. Pretty plant, great in cottage or bushland garden. Prune after flowering. Full-sun to semi-shade.

Native Pigface (*Carpobrotus rossii*)

Thick, fleshy groundcover. Green leaves triangular in cross-section, large bright pink flowers occur in spring. Attractive ground-cover, soil stabilizer. Suitable as trailing plant for pots or down walls. Ripe fruits are edible.

Round-leaf Pigface (*Disphyma crassifolium*)

Succulent groundcover plant. Green leaves round in cross section, bright pink flowers in spring. Attractive ground-cover, soil stabilizer. Trail over rock walls. Tolerates saline soils. Full-sun to shade.

Ruby Saltbush (*enchylaena tomentosa*)

Low shrub to 1m. Leaves small, blue-green, fleshy. Yellow to red fleshy fruits produced through-out the year. Attracts native wildlife. Full-sun to semi-shade. Ripe fruits are edible.

Grasses and sedges**Wallaby Grass** (*Austrodanthonia* sp)

Clumping grass to knee high, fluffy white seed heads in summer. Plant in clumps, good in bush garden setting. Attracts wildlife including butterflies.

Knobby Club-rush (*Isolepis nodosa*)

Attractive evergreen clumping plant to 1m high. Leaves dark-green, cylindrical and up-right. Flower heads brown ball-shaped, occur all year. Versatile plant. Use as accent, group plantings, pot-plants, around ponds. Tolerates salt spray and wet zones. Attracts butterflies. Full-sun to semi-shade.

Coast Spear-grass (*Austrostipa* spp)

Tussock grass species of varying heights, with flowering stems to 1m. Use coastal species *A. flavescens* (tall) and *A. elegantissima* (small and compact). Plant in clumps, suitable for mass plantings. Showy when in flower. Fill in spaces or border plantings. Attracts butterflies.

Sword Sedge (*Lepidosperma gladiatum*)

Sedge to 1m high with wide, flat leaves (like a gladiator's sword!) Brown flower heads present winter to summer. Plant in large or small clumps. Good accent plant, use in borders, foliage contrast. Suitable pot-plant. If unavailable, substitute with Knobby Club-rush or Short-stem Flax-lily.

Coast Tussock-grass (*Poa poiformis*)

Tussock grass growing to knee high. Thin blue-green leaves, blown-yellow flower heads. Tight foliage. Great in small or large group plantings, also rockeries, borders and pots. Full-sun.

7 ENVIRONMENTAL MONITORING DURING CONSTRUCTION

Daily inspection of the seaward face of the construction area is required to identify any sediment plumes in the water.

All construction works should be conducted at low tide (or when the tide is at a level outside of the works area) to ensure minimal environmental impact. If a section of compacted fill is not completed and the incoming tide results in works halting, a silt curtain shall be provided to protect the fill.

Photographs of the seaward face of the construction area are required prior to construction. Weekly photographs are required during construction as well as during heavy weather and when plumes are evident.

Ensure all records are clearly dated, and time of day noted. All photographs should be taken from a high vantage point.

For Magryn & Associates Pty. Ltd.

A handwritten signature in black ink, appearing to be 'W. Souter', written in a cursive style.

W. Souter
B Eng. (Hons.) MIEAus