

**Project Marvel
20 Kelso Crescent
Moorebank, NSW 2170**

Landscape Technical Specification (230301_SPC_LSP-01)
Geoscapes Project No: 230301

Prepared for:

maple^{tree}

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1.0 GENERAL REQUIREMENTS

1.1.1 Cross References

Technical requirements:

The Tender is to be based on the following drawings, and this specification. These are **NOT TO BE USED FOR CONSTRUCTION PURPOSES.**

SSD-00	LANDSCAPE COVER SHEET	N/A
SSD-01	LANDSCAPE PLAN	1:400 @ A1
SSD-02	LANDSCAPE DETAIL PLAN 1	1:200 @ A1
SSD-03	LANDSCAPE DETAIL PLAN 2	1:200 @ A1
SSD-04	LANDSCAPE DETAIL PLAN 3	1:200 @ A1
SSD-05	LANDSCAPE DETAIL PLAN 4	1:200 @ A1
SSD-06	TREE CANOPY COVER PLAN	1:400 @ A1
SSD-07	TREE RETENTION PLAN	1:400 @ A1
SSD-08	LEVEL 1 DETAIL PLAN	1:100 @ A1
SSD-09	LANDSCAPE SECTIONS AA & BB	1:75 @ A1
SSD-10	LANDSCAPE SECTIONS CC & DD	1:75 @ A1
SSD-11	SPECIFICATION & DETAILS	AS SHOWN @ A1
SSD-12	PLANTING SCHEDULE & IMAGERY	N/A

1.1.2 Scope of Works

The work shall cover provision of materials, plants, cartage, equipment & labour for landscape construction in accordance with landscape plans and details or as described in the documents.

Removal of all building and construction debris shall generally be performed by others, prior to commencement of this Contract. All bulk earthworks, services, civil works, SW drainage, etc. shall be responsibility of others.

1.1.3 Coordination with other trades

A number of separate contracts have been let in respect to related civil works. The Contractor shall liaise with and co-ordinate with these parties as required, to ensure access within the site to all parties is maintained or managed in a co-ordinated manner and so that all parties are forewarned in a timely manner of works which require their input or may impact them or the Contractor.

Client:	Mapletree	0478 224 778	Eng Khoon Tan
Architect:	Nettleton Tribe	0410 128 228	Chris Norris
Landscape Architects:	Geoscapes Pty Ltd	(02) 9411 1485	Ben Gluszkowski, Kiana Capule
Landscape Contractor	TBC		

1.1.4 Competence

Landscape works are to be carried to by a member of the Landscape Contractors Association. The Landscape Contractor or the approved foreman shall be on site during the whole of the period of the landscape contract period.

1.1.5 Siteworks Notes

Verify all dimensions and existing levels on site prior to commencement of work.

All work is to be undertaken in accordance with the details shown on the drawings, the specifications and the directions from the Superintendent. All survey and set-out is to be completed by a registered surveyor. Where new works abut existing ensure that a smooth even profile, free from abrupt changes is obtained.

Diagrammatic layouts: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable. Before commencing work, obtain measurements and other necessary information.

1.1.6 Protection of People and Property

Safety



Comply with all statutory & industrial requirements for provision of a safe working environment. Ensure that at all times access to all buildings adjacent the works is not disrupted. Provide safe passage of vehicles and/or pedestrians through or by the site.

Protection of adjacent properties

The Landscape Contractor shall take all steps necessary for the protection of adjacent properties. The Landscape Contractor shall immediately make good any damage to these properties arising from the implementation of the works under the contract.

Damage to existing works

The Landscape Contractor shall be responsible for all damage to fences, trees, paving, services or other property caused by his activities during the entirety of the contract. Prior to the commencement of works, the Landscape Contractor is to check all pavements, kerbs, footpaths, pits, walls etc on and adjoining the site and record their condition.

1.1.7 Materials, Labour and Constructional Plant

Use of existing services

Existing services may be used as temporary services for the performance of the contract subject to the agreement of Head Contractor. It should not be assumed that access to services is guaranteed. Arrangement for alternative sources should be allowed for, as a continuous supply cannot be guaranteed. Existing services should be located prior to undertaking of all works. It is the contractor's responsibility to establish the location of all services.

Project signage

Obtain approval before displaying of advertisements or provision of other signboards. Other signage is not to obstruct or interfere with the estate advertising signage. Any signage is to be the subject of approval by Principal and Council.

1.2 QUALITY

1.2.1 Inspection

Notice

Hold points: If notice of inspection is to be given in respect of parts of the works, do not conceal those parts without approval.

Witness points: If notice of inspection is required in respect of parts of the works, advise if and when those parts are to be concealed.

Minimum notice for inspections to be made: 2 working days.

1.2.2 Tests

Notice

General: Give sufficient notice so that designated tests may be witnessed.

Hold points: Do not carry out designated tests without approval.

Minimum notice for tests to be witnessed:

- 5 working days for site tests; and
- 10 working days for local pre-delivery tests.

Testing authorities

General: Except for site tests, have tests carried out by authorities accredited by NATA to test in the relevant field, or an organisation outside Australia recognised by NATA through a mutual recognition agreement. Cooperate as required with testing authorities. Site tests: Use instruments calibrated by authorities accredited by NATA.

Reports

General: Submit copies of test reports, including certificates for type tests, showing the observations and results of tests and compliance or non-compliance with requirements.

Number of copies of test certificates: 3

Endorsement

If tests are to be carried out on parts of the works, do not conceal those parts and do not commence further work on those parts until the tests have been satisfactorily completed and compliance verified.

1.3 EXECUTION

1.3.1 Materials and components

Consistency

For the whole quantity of each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.



Manufacturers' or suppliers' recommendations

General: Select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Instructions: Submit the recommendations and instructions, and advise of conflicts with other requirements.

Project modifications: Advise of activities that supplement, or are contrary to, Manufacturer's or Suppliers' written recommendations and instructions.

Product certification: If products must comply with product certification schemes, provide them in accordance with the certification requirements.

Consistency

For the whole quantity of each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.

2.0 ADVANCED TREE SUPPLY

2.1 GENERAL

Scope of Works

This section includes the supply, delivery and storage of all advanced trees, including labour and incidentals necessary to complete the work. The Contractor or the client will be responsible for the purchasing and procurement of all plant material, this will be at the client's discretion. The Contractor is responsible for the delivery and installation of all plant material.

All grown or purchased trees must conform to all the conditions and requirements given in this specification.

2.2 PLANT SCHEDULE

REFER to the plant schedules on SSD-12.

2.3 ORDERING AND SUPPLY

Stock Procurement

The client or the contractor will be responsible for the procurement of tree stock. This will be at the client's discretion and will be indicated to the contractor at the award of this project.

Substitutions

There will be no substitutions in quantities and sizes of plants nominated in the schedule. If a species is unavailable in the size specified, the Contractor is to notify the Superintendent and inform of likely substitutions that are available. No substitutions will be made without written permission from the Superintendent.

Holding of Plant Stock

The Contractor is to store and maintain trees in good condition within the on-site nursery until required on site. Prevent drying out or damage from any cause including frost, wind, sun, theft, vermin, animals and the like. Plant storage areas must be fenced where instructed by the Superintendent. Advanced trees must be planted immediately upon delivery to the site.

All plants are to be adequately 'hardened-off' prior to installation.

Site Conditions

Should the Contractor during the contract period observe or be aware of soil or drainage conditions considered detrimental to the growth of plant stock, he/she must advise the Superintendent. Similarly in accordance with accepted horticultural practice, planting will not be carried out during a period of extreme heat, cold nor in high winds, at the discretion of the Superintendent.

Guarantee

Submit the following data:

- Supplier's data: Including:
 - Recommendations for planting and maintenance of plants.
 - Product warranty: The supplier's written statement certifying that plants are true to the required species and type, are free from diseases, pests and weeds, and comply with contract requirements.

Identification

Identification will include the plant's full botanical name, being clearly printed on plastic tags. At least one plant of each species in a batch will be clearly labelled.



Delivery

Ensure that all plant material in transit between the point of supply and the site is covered and handled in a manner that will not be harmful to the plants.

Notice

Inspection: Give notice so inspection may be made at the following times.

- Delivery of plant to approve plant material

Hold Points: The Contractor will observe and notify the Superintendent's representative for inspections at the following hold points;

- Layout of plants in planting beds prior to planting
- 20% planting complete for each tree pit to ensure installation of plants and fertilisers are as specified.

2.4 PLANT MATERIALS

General

General: Conform to the *General requirements* worksection.

Provide plants with the following characteristics:

Plants and trees must be vigorous, well established, of good form, not soft or forced, hardened off, free from disease and pests with large healthy root systems, not root-bound. The root system must be well balanced in relation to the size of the plant. Plants should have been grown in their final containers for not less than twelve (12) weeks. Plant containers must be free from weeds and must be of appropriate size. Plants must not exhibit signs of having been stressed at any stage during their structural or root development due to inadequate watering, excessive shade / sunlight, physical damage or have restricted growth due to nursery rows.

Replacement

Replace damaged or failed plant / trees with plants / trees of the same type and size.

Plant containers

General: Supply plants in weed-free containers of the required size.

Open rooted stock: If plants are to be supplied as open rooted stock, ensure this is appropriate to the species, variety, size, and time of year for planting.

Potting-on:

Do not carry out potting-on of advanced tree stock prior to a minimum of three (3) months of delivery.

2.5 TESTING

Precompletion tests

Production tests

External inspection:

- Frequency: Inspect trees before shipment.
- Inspector: Supplier.
- Sampling: To the External inspection sampling table for each batch of trees. Select sample trees at evenly distributed intervals within each batch.

External inspection sampling table

Number of trees per batch	Number of trees to sample
0 – 20	4
21 – 50	8
51 – 100	15
101 – 500	15 for the first 100 + 5% of the balance of the order
501 – 2000	35 for the first 500 + 2% of the balance of the order
2001+	65 for the first 2000 + 1% of the balance of the order

Investigative inspection:

- Frequency: Inspect trees before shipment.



- Inspector: Qualified person authorised by contract administrator.
- Destructive inspection: Use for trees with rootballs /containers < 200mm.
- Allowance: Allow for sample trees in addition to quantity ordered.
- Partial inspection: Use for trees with rootballs / containers > 200mm.
- Sampling: To the Investigative inspection sampling table for each batch of trees. Select sample trees at evenly distributed intervals throughout each batch.

Investigative inspection sampling table

Number of trees per batch	Number of trees to sample
0 – 20	1
21 – 50	2
51 – 100	4
101 – 500	4 for the first 100 + 2% of balance of order
501 – 2000	12 for first 500 + 1% of balance of order
2001+	27 for the first 2000 + 0.5% of balance of order

Submissions

Test results

General: Complete and return the Tree Inspection Form (refer Section 2.10) for each batch inspected.

Rejection: Non-compliance may lead to rejection of the entire batch.

Corrective action: Comply with corrective action procedures for each order as instructed.

Substitution: If non-complying trees are proposed, submit a proposal in writing.

Authentication: Supply a copy of the written approval of substitution with any non-complying trees.

Forward order contracts

Reports: Complete regular reports using the pro forma Tree Inspection Form. Include checks against specification requirements.

- Photographs: Provide current colour copies with date verification.
- Submissions: To the contract administrator.
- Inspection: Complete and return the attached pro-forma Tree Inspection Form before despatch of every batch, and at the following frequencies:
 - Inspections: At 3 monthly intervals.
 - Reports: At time of inspections.

2.6 SMALL TREE ASSESSMENT REQUIREMENTS

Conformance at inspection: To Balance (small trees) assessment requirements.

Balance (small trees) assessment requirements

- Tubes or plant cells: height above soil level must be between 1.5 and 2.5 times the height of the tube or plant cell.
- Trees in containers < 20L (other than tubes or plant cells) or ex-ground trees of Size Index < 35 (e.g. 1.4m high x 25mm calliper); height must fall within the range indicated for the container size in the **Small container-grown trees table**.
- Containers / rootballs (other than tubes or plant cells) must remain flat on the ground when the stem, held at 80% of height above ground, is deflected 30° from the vertical, side to side.

Exempt: Species that naturally produce hard inflexible wood in the early stages of their development.

Small container-grown trees table

Tubes or plant cells	Tree height between 1.5 and 2.5 x the height of the container	
Container size or minimum rootball diameter	Height range (m)	
	Thin-stemmed species	Thick-stemmed species
150mm (1.8L)	0.4 – 0.6	0.3 – 0.5
170mm (2.6L)	0.5 – 0.7	0.4 – 0.6



Tubes or plant cells	Tree height between 1.5 and 2.5 x the height of the container	
Container size or minimum rootball diameter	Height range (m)	
	Thin-stemmed species	Thick-stemmed species
200mm pot (4L)	0.7 – 0.9	0.6 – 0.8
200mm bag (5L)	0.8 – 1.0	0.7 – 0.9
250mm (8L)	1.0 – 1.2	0.8 – 1.0
300mm (15L)	1.2 – 1.5	1.0 – 1.2

2.7 LARGE TREE ASSESSMENT REQUIREMENTS

Conformance at inspection: To Balance (large trees) assessment requirements.

Balance (large trees) assessment requirements:

- For trees grown in containers > 20L, the Size Index must lie within the range for the nominal container size shown in the **Common container volumes table**.
- Ex-ground trees with a Size Index > 35 (e.g. 1.4m high x 25mm calliper) must have rootball diameters > the minimum rootball diameters shown in the **Ex-ground trees table**.

Common Container Volumes Table

Size Index	Nominal container volume (L)	Size Index	Nominal container volume (L)
26-33	20	371-480	450
32-41	25	412-518	500
45-58	35	453-587	550
57-74	45	495-640	600
77-99	60	533-716	700
83-107	75	632-818	800
111-143	100	711-921	900
154-200	150	791-1023	1000
194-251	200	842-1089	1100
227-314	250	918-1188	1200
273-353	300	1148-1485	1500
289-373	350	1530-1980	2000
330-427	400	1913-2475	2500

Ex-Ground Trees Table

Size Index	Minimum rootball diameter (mm)	Size Index	Minimum rootball diameter (mm)
36–55	350	341–383	850
56–72	400	384–429	900
73–106	450	430–530	1000
107–131	500	531–642	1100
132–156	550	643–732	1200
157–173	600	733–859	1300
174–228	650	860–1144	1500
229–249	700	1145–1507	1750



Size Index	Minimum rootball diameter (mm)	Size Index	Minimum rootball diameter (mm)
250–299	750	1508–1968	2000
300–340	800	1969–3075	2500

2.8 ABOVE GROUND TREE REQUIREMENTS

Labelling

General: Clearly label individual trees and batches.

- Label type: To withstand transit without erasure or misplacement.

Health and vigour

Health: Supply trees with foliage size, texture and colour at time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species.

Vigour: Supply trees with extension growth consistent with that exhibited in vigorous specimens of the species nominated.

Freedom from pests and disease

Pests and disease: Supply trees with foliage free from attack by pests or disease.

Native species with a history of attack by native pests: Restrict evidence of previous attack to < 15% of the foliage and ensure absence of actively feeding insects.

Supply

Supply only trees that:

- Are free from injury.
- Are self-supporting.
- Have the calliper at any given point on the stem greater than the calliper at any higher point on the stem.

Pruning

Specific form:

Clean stem height: < 40% of total tree height.

Pruning wounds: Restrict fresh (i.e. recent, non-calloused pruning wounds) to < 20% of total tree height.

Type: Ensure a clean-cut at the branch collar.

Diameter of wound: < 50% of the calliper immediately above the point of pruning.

Apical dominance

Species with an excurrent form: Supply trees with a defined central leader and the apical bud intact.

Crown symmetry

Crown distribution: Difference on opposite sides of the stem axis < 20%.

Stem structure

Species with excurrent form: Supply trees with a single stem roughly in the centre of the tree with any deviation from vertical < 15°.

Species with decurrent form: Supply trees where the central stem is not divided at any point lower than the clean stem height nominated, and that the stem junction at the point of division is sound.

All species: Ensure that branch diameter is less than or equal to one-half of the calliper immediately above the branch junction.

Included bark

General: Supply trees where the branch/stem bark ridges at junctions between stems and branches and between co-dominant stems are convex, except for species prone to include bark that are known to remain strong.

Trunk position

General: Supply trees with the distance from the centre of the trunk to the extremity of the rootball not varying by > 10%.

Compatibility of graft unions

General: Supply trees where the union between the scion and rootstock is sound for the entire perimeter of the graft, and the diameter of the scion immediately above the graft is equal to the diameter of the rootstock immediately below the graft ($\pm 20\%$).



Indication of north

Trees in containers > 100L or of Size Index > 140: Indicate the northerly aspect during growth in the nursery to withstand transit without erasure or misplacement.

2.9 BELOW GROUND TREE REQUIREMENTS**Root division**

Trees in containers < 45L or ex-ground trees with a Size Index < 70: Primary division of roots at < 100 mm intervals.

Trees in containers > 45L or ex-ground trees with a Size Index > 70: Primary division of roots within the outer 50% of the rootball at < 100 mm intervals.

Root direction

General: Ensure that roots, from the point of initiation, generally grow in an outwards (radial) or downwards direction, and that any deviation from the established direction < 45°.

Trees with a calliper at ground level < 40mm: Ensure that the diameter of any nonconforming roots at the extremity of the rootball < 25% of the calliper.

Trees with a calliper at ground level > 40mm: Ensure that the diameter of any nonconforming roots at the extremity of the rootball < 10 mm.

Rootball occupancy

Soil retention: On shaking or handling the unsupported rootball at least 90% of the soil volume to remain intact.

Rootball depth

Rootball depth assessment for containers/rootballs > 45L or larger:

- Depth: maximum depth specified and no rootball (regardless of size) > 550mm in depth.

Height of root crown

General: Ensure that root crown is at the surface of the rootball.

Non-suckering rootstock

Grafted cultivars/varieties: Supply trees grafted onto non-suckering rootstock.

2.10 TREE INSPECTION FORMS**General**

Date	Reference
Purchaser	
Supplier	Inspected by (supplier/purchaser/agent)
Species	Batch identification
Number of trees in batch	Container/rootball size
Height range	Calliper range
Special requirements	

Above ground

Labelling	Yes / No
Health and vigour	Yes / No
Freedom from pests/disease	Yes / No
Freedom from injury	Yes / No
Self-supporting	Yes / No
Stem taper	Yes / No
Pruning	Yes / No
Apical dominance	Yes / No
Crown symmetry	Yes / No
Stem structure	Yes / No
Included bark	Yes / No
Trunk position	Yes / No



Compatibility of graft unions	Yes / No
Indication of north	Yes / No

Below ground

Inspection method used	Yes / No	External only
	Yes / No	External plus investigative destructive q partial
Number of trees in sample	Yes / No	
Root division	Yes / No	
Root direction	Yes / No	
Diameter nonconforming roots at rootball extremity	Yes / No	
Rootball occupancy	Yes / No	
Rootball depth	Yes / No	
Height of root crown	Yes / No	
Non-suckering rootstock	Yes / No	

Balance

Balance	Yes / No
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Conformance with specification

Conforming	Yes / No
Comments	
Name and signature (inspector)	

3.0 SITE PREPARATION**3.1 SITE MANAGEMENT****3.1.1 Existing Services****Marking**

Before commencing earthworks, locate and mark existing underground services in the areas which will be affected by the groundworks operations including clearing, excavating and trenching. Notification to client representative of any conflicts with services.

Excavation

Do not excavate by machine within 1m of existing underground services.

3.1.2 Environmental Protection**Erosion control**

General: Plan and carry out the work so as to avoid erosion, contamination, and sedimentation of the site, surrounding areas, and drainage systems.

Dewatering

General: Keep groundworks free of water. Provide and maintain slopes, crowns and drains on excavations and embankments to ensure free drainage. Place construction, including fill, masonry, concrete and services, on ground from which free water has been removed.

Prevent water flow over freshly laid work. Note the requirement to maintain adequate soil moisture around trees to be retained.

3.1.3 Site Restoration**Requirement**

Where existing ground surfaces are not required to be varied as part of the Works, restore them to the condition existing at the commencement of the contract.

a) Site elements outside the construction area.

- repair at no cost to the Principal any damage caused by construction activity immediately after the damage occurs.



- b) Site elements inside the construction area.
 - repair at no cost to the Principal any damage caused by construction activity prior to the date of practical completion.
- c) Restore damage to grass by:
 - removing damaged grass and topsoil,
 - trimming subgrade to achieve required finished levels,
 - cultivation of subgrade to a depth of 150 mm,
 - supply, installation and establishment of new topsoil and grass as specified for GRASS in the LANDSCAPING section of the specification.

3.2 SITE CLEARING

3.2.1 Site Clearing

General

Site clearing for the paths, grassing and planting works has generally been executed by the civil contractor prior to the landscape contract.

Extent

General: Clear only the areas to be occupied by works.

Clearing operations

Removal: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble.

Grubbing: Grub out stumps and roots over 75mm diameter to a minimum depth of 500 mm below subgrade under embankments or paving, or 300mm below finished surface in unpaved areas.

Old works: Remove old works, including slabs, foundations, pavings, drains and manholes found on the surface.

Existing grass: Remove grass to a depth just sufficient to include the root zone.

Clearing of existing turf: Prior to removal/stripping of turf allowing to apply herbicide min two weeks prior to stripping operations to ensure grass is killed and to prevent regrowth.

3.2.2 Spoil

On site burial

Do not bury boulders, concrete fragments and the like on site.

3.3 COMPLETION

3.3.1 Completion

Temporary works

Remove temporary erosion control measures when they are no longer required.

4.0 SOILS SPECIFICATIONS

4.0.1 Specification A1: Site soil investigation and characterisation

Specification A1 is for site analysis for substantially intact sites (the topsoil and the subsoil are present).

Site soil survey

A survey of the site's soil resource must be conducted, with the following as a minimum:

1. The uniformity or otherwise of the residual surface materials must be determined to 500 mm minimal depth.
2. The morphology (texture, structure and colour) of the main types of surface materials present and their horizon designations should be determined.
3. The depths of each soil horizon to rock or parent material should be measured if possible.
4. Any physical limitations posed by the materials (stoniness, clay, poor drainage) should be assessed.
5. Samples representative of the main types of surface horizon (topsoil) material present must be analysed for the following properties, as a



minimum:

- a. pH
 - b. salinity
 - c. cation exchange properties
 - d. plant available nutrient contents P, N, S, Fe, Mn, Zn, Cu, B
 - e. dispersibility and aggregate stability
 - f. organic matter
 - g. texture or particle size analysis
 - h. stone content.
6. Samples representative of the main types of subsurface horizons (subsoil) material present must be analysed for the following properties, as a minimum:
- a. pH
 - b. salinity
 - c. cation exchange properties
 - d. dispersibility and aggregate stability
 - e. texture or particle size analysis
 - f. stone content.
7. Where there is any suspicion of salinity, a deep subsoil sample (to around 800 mm depth) must be taken and also analysed for subsoil properties as above.
8. The consultant must provide a report identifying as a minimum:
- a. a description of the field condition of the surface materials soil (results of the field survey)
 - b. interpretation of test results
 - c. a statement of 'fitness for purpose' as topsoil, subsoil or subgrade
 - d. recommendations for reuse, amelioration or improvement of both topsoil and subsoil.
9. The report must include comments and recommendations on the following details:
- a. the depth of each soil horizon
 - b. the morphology (texture, structure and colour) of at least the A and B horizons
 - c. the presence of any inclusions (ironstone, manganese pellets, lime concretions)
 - d. the soil type or classification of the soil(s) present
 - e. any areas of disturbed, filled or altered conditions that render the soil unusable or raises special requirements
 - f. the depth of the topsoil and any variation in depth for stripping purposes
 - g. recommended topsoil stripping depths and stockpiling methods
 - h. any limitations imposed by the chemical and physical properties of the soils
 - i. the means by which the soils may be ameliorated or improved for various landscape purposes.

4.0.2 Specification A2: Site subgrade investigation and characterisation

Specification A2 is for site analysis is for substantially disturbed sites (the topsoil and subsoil are disturbed or not present).

Site soil survey

A survey of the site's soil resource must be conducted, with the following as a minimum:

1. The uniformity or otherwise of the residual surface materials must be determined to 500 mm minimum depth.
2. The morphology (texture, structure and colour) of the main types of surface materials present and their horizon designations should be determined, if applicable.
3. Any physical limitations posed by the materials (stoniness, clay, poor drainage) should be assessed.
4. Samples representative of the main types of surface materials present must be analysed for the following properties as a minimum:
 - a. pH
 - b. salinity
 - c. cation exchange properties
 - d. plant available nutrient contents P, N, S, Fe, Mn, Zn, Cu, B
 - e. dispersibility and aggregate stability
 - f. organic matter
 - g. texture or particle size analysis
 - h. stone content.
5. Samples representative of the main types of subsurface horizons (subsoil) material present must be analysed for the following properties, as a minimum:



- a. pH
 - b. salinity
 - c. cation exchange properties
 - d. dispersibility and aggregate stability
 - e. texture or particle size analysis
 - f. stone content.
6. Where there is any suspicion of salinity, a deep subsoil sample (to around 800mm depth) must be taken and also analysed for subsoil properties as above.
7. The consultant must provide a report identifying as a minimum:
- a. a description of the field condition of the surface materials soil (results of the field survey)
 - b. interpretation of test result
 - c. a statement of 'fitness for purpose' as topsoil, subsoil or subgrade
 - d. recommendations for reuse, amelioration, improvement or burial as subgrade.
8. The report must include comments and recommendations on the following details:
- a. the morphology (texture, structure and colour) of the main surface materials present
 - b. the presence of any inclusions (ironstone, manganese pellets, lime concretions)
 - c. all areas of disturbed, filled or altered conditions
 - d. any limitations imposed by the chemical and physical properties of the soil
 - e. the means by which the soils may be ameliorated or improved for use at topsoil or subsoil
 - f. what, if any, soil materials must be imported for the achievement of landscape aims.

4.0.3 Specification B1: Stripping and stockpiling

General background

Stripping and stockpiling of topsoil should occur immediately before bulk earthworks and be done in such a manner as to minimise erosion and sediment loss from site. Preparation is necessary to ensure that rubbish and foreign matter is minimised in the stripped soil. Stockpiles must be located in a convenient place away from any risk of running water and subject to suitable erosion control measures. They must be protected from contamination during the construction process and records kept of their location and type of soil, if any, they contain.

Stripping

Preparation:

- Clear all debris including demolition waste, timber, rubbish wire fences, rock, gravelled driveways, etc.
- Clear trees and shrub growth and slash if necessary.
- Clear pasture and weed growth. If heavy or otherwise a problem, spray with a broad spectrum herbicide at manufacturer's rate and allow 1-2 weeks to obtain kill before stripping.

Stripping:

- Avoid the inclusion of subsoil in topsoil stripping, adjust depth accordingly.
 - Strip topsoil to 150mm depth
- or
- Strip topsoil according to recommendations of VMP

Stockpiling

Stockpile construction and management:

- Locate stockpiles 5 m or more from concentrated water flows (including drainage lines, roadways) .
- Locations should have less than 10% slope.
- Locate greater than 8 m from any retained trees.
- Protect upslope using diversion drains.
- Protect downslope sediment loss using sediment control structures (silt fencing or other approved method).
- Stockpiles must be no higher than 2 m but may, be flat topped.
- Label stockpiles with origin and date.
- Protect stockpiles from waste and rubbish dumping and encroachment of works.
- If stockpiles are to be in place longer than 3 months, sow with a seasonally appropriate annual cover crop.

4.0.4 Specification B2: Site subgrade preparation



The following is a typical site subgrade specification that contains the elements required to ensure adequate preparation of the subgrade before topsoil placement. It can be used as a format for preparing a subgrade treatment specification for any project. Before laying topsoil, the following **subgrade treatment** must be applied to all finished subgrade areas:

1. Fair and trim to relative level to accommodate the required overall soil depths (see **Specification B4**).
2. Remove rocks > 100 mm diameter.
3. Remove rubbish such as construction generated waste, plastics, metals and glass.
4. Apply gypsum and lime according to the following schedule of gypsum and lime requirements to ameliorate the subgrade. Insert the application rate from the soil reports (**Specifications A1 and A2**).

Landscape treatment	Gypsum (g / m ²)	Agricultural lime (g / m ²)
General grassing, native mass planting (grasses, shrubs and trees)	<Insert rate >	<Insert rate >
High-quality amenity turf, housing lots, display beds	<Insert rate>	<Insert rate>

5. Chisel, disc plough or use an excavator with a tyne attachment to loosen the subgrade and mix the ameliorants to 200 mm depth to incorporate.
6. Harrow to break up clods but do not smooth (leave the surface 'keyed' to accept the topsoil).

Note: Use an excavator with a tyne or ripping blade for operations on the steeper batters or where access is difficult. Refer to soil reports for any other required actions (e.g. bucket screening to 50 mm).

4.0.5 Specification B3: Imported subsoil

This specification is to be used to manage the importation of subsoil, or its manufacture from on-site materials where present subgrades do not provide sufficient quality to qualify as a rooting medium to provide rooting depth sufficient for larger plantings.

Part A. 'Fit-for-purpose' performance description

Generally, a low organic matter material that is well balanced chemically, is not saline or sodic or excessively acidic or calcium deficient and not dispersive. It is designed to provide improved rooting depth for larger plantings and reduce the likelihood of waterlogging. It may be made up using site sub soil or fill materials or a blend of both. It is not generally considered to require the application of fertiliser to subsoil but must be low in P if used for P-sensitive plantings.

Alkaline soils	Phosphorus sensitive plants
NO - Soils are to be within the standard range of pH from Table 6.2	YES - Phosphorus-sensitive plants are included in the design. Phosphorus level must be in the low P range from Table 6.2

Note: If the above selections are not chosen, the landscape contractor/soil supplier must communicate with the landscape architect/specifier for determination.

Part B. Product specification (technical parameters)

Generally the soil must be free of 'unwanted material' and must meet all the requirements of Tables 6.1 and 6.2. Where variations from these requirements occur refer to Specifications G1 and G2.

See **Specification G1** for test methods.



Table 6.1. Physical properties

Property	Units	Acceptable range
Texture, preferred range	n /a	Sandy loam to sandy clay loam
Emerson aggregate class		> 4
Large particles (method ref. AS7755 5.4) in the largest dimension		
2-10 mm	%w/w	< 20
10-20 mm	%w/w	< 10
> 20	%w/w	< 10
> 50 mm	%w/w	< 2
Visible contaminants > 2 mm*	%w/w	0- 0.5

*of which plastics: 0 - 0.25 of which man-made sharps: 0 in 1. 0 kg of air-dried soil.

Table 6.2. Chemical properties

Property	Units	Acceptable range
Wettability	min	≥ 2
pH in water (1:5) Standard range	pH units	5.4- 6.8
pH in CaCl ₂ (1:5) Standard range	pH units	5.2- 6.5
pH in water (1:5) Alkaline range	pH units	6.8-8.0
pH in CaCl ₂ (1:5) Alkaline range	pH units	6.5- 7.5
Electrical conductivity (1:5)	dS/m	< 0.5
Chloride	mg/kg	< 200
Phosphorus - P-tolerant or standard plants acid soils method 18FI	mg/kg	< 50
Phosphorus - P-sensitive plants alkaline soils method 9B1 or 9C1	mg / kg	< 20
Exchangeable Sodium (Na)	% of ECEC	< 7%
Exchangeable Potassium (K)	% of ECEC	3- 10%
Exchangeable Calcium (Ca) method 18FI or 15AI in alkaline soils	% of ECEC	60-80
Exchangeable Magnesium (Mg)	% of ECEC	15- 25%
Ca:Mg ratio	Ratio	1.5- 8

Part C. Example components for the soil supplier

The following table outlines suggested components that may meet the physical requirements of this specification. This is **not** part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy or sandy loam soil	20 - 40 % v/v
On-site clay loam or clay subsoil	30 - 60% v/v

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and / or dolomite	2 kg/m ³
Gypsum	2 kg/m ³

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist recommendations.



See also **Specifications G1 and G2** for validation and certification requirements.

4.0.6 Specification B4: Soil Schedules

Profile Horizon Structure

The following landscape types must have the following profile horizon structure:

Landscape type	Profile horizon structure
Turf	A and C
Shrubs/mass planting	A B and C
Trees	A B and C

A – Topsoil, B – Subsoil and C – Subgrade. Refer to landscape drawings and relevant soil specification E1, E2, or C1

Schedule of Soil Horizon Depths

Landscape type	Total Soil Depth	Minimum recommended Topsoil depth (A horizon)	Typical minimum subsoil depth or depth of ameliorated subgrade (B horizon)
Turf	200mm	150mm	0-150mm
Shrubs/mass planting	450mm	300mm	0-150mm
Trees over 45L or trees with shrubs	800mm	300mm	0-500mm

4.0.7 Specification D2: Garden bed planting soil

Part A. 'Fit-for-purpose' performance description

A sandy loam to clay loam topsoil mix designed for general purpose, on-grade landscape garden bed planting of grasses, woody and herbaceous annuals and perennials that have a high nutrient requirement for sustained optimum growth, and are not subject to compaction by pedestrian or other traffic.

The heavier textured soils in this specification may require the use of engineered solutions (drainage techniques) where excessive wetness is anticipated. Note that the organic soil variant should not be chosen for low P plantings and should not be used below 300 mm. Planting methods may vary and include direct seeding, tube and potted specimens up to 45 L.

This planting specification may use site-won topsoil characterised according to **Specification A1**.

Choose from the following alternatives based on the soil approach and design approach method

Alkaline soils	Phosphorus sensitive plants
NO - Soils are to be within the standard range of pH from Table 6.2	YES - Phosphorus-sensitive plants are included in the design. Phosphorus level must be in the low P range from Table 6.2

Part B. Product specification (technical parameters)

Generally the soil must be free of 'unwanted material' and must meet all the requirements of Tables 6.11 and 6.12. Where variations from these requirements occur refer to Specifications **G1 and G2**.

See **Specification G1** for test methods.

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is **not** part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	70- 90% by volume	e.g.8 parts washed sand / 2 parts sandy loam / 1 part AS 4454 soil variant compost
Composted soil conditioner conforming with AS 4454	10-30% by volume 30- 60% by volume for organic loam soil variant compost	



Table 6.11. Physical properties

Property	Units	Target range
Texture, preferred range	n/a	Sandy loam to clay loam
Organic matter	% dwb	3-6
Organic matter (organic soil variant)	% dwb	15- 25
Permeability (@ 16 drops by McIntyre Jakobsen)	mm/h	> 30
Wettability	mm /h	> 5
Dispersibility in water		1 or 2 (AS 4419) category
Large particles (naturally occurring)		
2- 20 mm	0/ow/w	< 20
> 20 mm	0/ow/w	< 10
Visible contaminants > 2 mm (glass, plastic and metal)	0/ow/w	< 0.5

Table 6.12. Chemical properties

Property	Units	Target range
pH in water (1:5) Standard range	pH units	5.4- 6.8
pH in CaCl ₂ (1:5) Standard range	pH units	5.2- 6.5
pH in water (1:5) Alkaline range	pH units	6.8- 8.0
pH in CaCl ₂ (1:5) Alkaline range	pH units	6.5-7.5
Electrical conductivity (1:5)	dS/m	<0.65
Phosphorus - P-tolerant/standard plants . Acid soils method 18FI	mg/kg	50-150
Phosphorus - P-tolerant/ standard plants. Alkaline soils method 9B1 or 9CI	mg/kg	30-60
Phosphorus for P-sensitive plants, acid soils method 18FI	mg/kg	< 30
Phosphorus for P-sensitive plants, alkaline soils method 9B1 or 9CI	mg/kg	< 20
Exchangeable sodium (Na)	% of ECEC	< 7%
Exchangeable potassium (K)	% of ECEC	5-10%
Exchangeable calcium (Ca) method 18FI or 15AI in alkaline soils	% of ECEC	60-80
Exchangeable magnesium (Mg)	% of CEC	15 - 25
Exchangeable aluminium (Al)	% of CEC	< 2
Exchangeable Ca: M g ratio	Ratio	3- 9
Available iron (Fe)	mg/kg	100-400
Available manganese (Mn)	mg/kg	25-100
Available zinc (Zn)	mg/kg	5-30
Available copper (Cu)	mg/kg	1-15
Available boron (B)	mg/kg	0.5-5
Available N (N as nitrate)	mg/kg	> 30

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and/or dolomite	2 kg/m ³ at mixing
Balanced compound NPK turf starter fertiliser	1.0 kg/100 m ² after placement
Minor trace elements	300 g/m ³ mixing

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist 's recommendations. See also **Specifications G1 and G2** for the testing and certification requirements.



4.0.8 Specification D4: Advanced tree and vault subsoils

Part A. 'Fit-for-purpose' performance description

A sandy, well-drained medium with low organic matter for backfilling below 300 mm from the surface in larger potted specimens over 45 L or 400 mm depth of root ball, semi-advanced, advanced and super-advanced tree planting. The specification may use a small proportion of site won topsoil or subsoil, provided the organic matter upper limit is not exceeded. Above 300 mm, preferably use **Specification D2**.

Choose from the following alternatives based on the soil approach and design approach method

Alkaline soils	Phosphorus sensitive plants
NO - Soils are to be within the standard range of pH from Table 6.2	YES - Phosphorus-sensitive plants are included in the design. Phosphorus level must be in the low P range from Table 6.2

Part B. Product specification (technical parameters)

Generally the soil must be free of 'unwanted material' and must meet all the requirements of Tables 6.11 and 6.12. Where variations from these requirements occur refer to **Specifications G1 and G2**. See **Specification G1** for test methods.

Table 6.15. Physical properties

Property	Units	Target range
Texture, preferred range	n/a	Loamy sand to Sandy loam
Organic matter	% dwb	< 5
Permeability (@16 drops by McIntyre Jakobsen)	mm/h	> 50
Wettability	mm/h	> 5
Dispersibility in water	Category	1 or 2 (AS 4419) category
Large particles (naturally occurring)		
2-20mm	% w/w	<20
>20mm	% w/w	<10
Visible contaminants >2mm (glass, plastic and metal)	% w/w	<0.5

Table 6.16. Chemical properties

Property	Units	Target range
pH in water (1:5) Standard range	pH units	5.4- 6.8
pH in CaCl ₂ (1:5) Standard range	pH units	5.2- 6.5
pH in water (1:5) Alkaline range	pH units	6.8 - 8.0
pH in CaCl ₂ (1:5) Alkaline range	pH units	6.5- 7.5
Electrical conductivity (1:5)	dS/m	< 0.5
Phosphorus - P-tolerant/standard plants . Acid soils method 18FI	mg/kg	30 - 80
Phosphorus - P-tolerant / standard plants. Alkaline method 9B1 or 9CI	mg/kg	10- 30
Phosphorus for P-sensitive plants, acid soils method 18FI	mg/kg	< 30
Phosphorus for P-sensitive plants, alkaline soils method 981 or 9CI	mg/kg	< 20
Exchangeable sodium (Na)	% of ECEC	3,0
Exchangeable potassium (K)	% of ECEC	
Exchangeable calcium (Ca) method 18FI or 15A1 in alkaline soils	% of ECEC	60- 80
Exchangeable magnesium (Mg)	% of CEC	15 - 25



Exchangeable aluminium (Al)	% of CEC	< 5
Exchangeable · Ca: M g ratio	Ratio	3- 9
Available iron (Fe)	mg/kg	100- 400
Available manganese (Mn)	mg/kg	25- 100
Available zinc (Zn)	mg/kg	5- 30
Available copper (Cu)	mg/kg	1- 15
Available boron (B)	mg/kg	0.5- 5
Available N (N as nitrate)	mg/kg	> 20

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is **not** part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	60- 80% by volume
On-site clay loam or clay topsoil or subsoil	20-30% by volume
Composted soil conditioner conforming with AS 4454	<10 % by volume

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and / or dolomite	2 kg/m ³
Gypsum	2 kg/m ³

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist recommendations. See also **Specifications G1 and G2** for validation and certification requirements.

4.0.9 Specification E1: On slab soil media 'A' horizon

Part A. 'Fit-for-purpose' performance description

The specification describes the formulation of an open granular well-drained growing media with a saturated density of less than 2400 kg/m³ (2.4 kg/L) for use in on-slab applications, including green roofs with an expectation of longevity. It is a topsoil formulation to be used in the surface 300 mm of all on-slab installations including planter boxes, containers and garden beds.

In order to maintain structure and porosity over extended periods, and to avoid slumping and volume loss over time, the formulation must employ low density mineral components such as ash, perlite, scoria, pumice and diatomaceous earth, or artificial components such as urea formaldehyde and styrofoam. Physically, the media has the properties of a potting media and is assessed using the methodology of AS 3743. Where a subsoil is also specified, use the 'B' horizon profile **Specification E2** as well as **Specification E1**.

Choose from the following alternatives based on the soil approach and design approach method

Alkaline soils	Phosphorus sensitive plants
NO - Soils are to be within the standard range of pH from Table 6.2	YES - Phosphorus-sensitive plants are included in the design. Phosphorus level must be in the low P range from Table 6.2

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the requirements of AS 3743 Potting mixes and the specified requirements of AS 4419. However, compliance with AS 3743 does not demonstrate compliance with this specification. Where the requirements of this specification and AS 3743 conflict, properties specified here must take precedence.

Use AS 3743 unless otherwise stated. See **Specification G1** for other test methods.

Table 6.17. Physical Properties



Property	Units	Target Range
Texture, preferred range	n/a	Gravelly loamy sand to organic sandy loam
Air-filled porosity	%	≥ 10
Water-holding capacity	%	≥ 40
Permeability (@16 drops by McIntyre Jakobsen)	mm/h	> 100
Organic Matter	% w/w	< 15
Wettability	Min	≤ 5
Dispersibility in water	Category	1 or 2 (AS 4419) category
Large particles in the largest dimension		
< 2mm	% w/w	30-70
2-10mm	% w/w	10-20
10-20mm	% w/w	5-10
20-50mm	% w/w	< 5
>50mm	% w/w	0

Table 6.18. Chemical Properties

C2 Property	Units	Target Range
pH in water (1:5) standard range	pH units	5.4-6.8
Electrical conductivity (1:1.5)	dS/m	< 2.2
Chloride	mg/L	≤ 200
Ammonium-N (NH ₄)	mg/L	≤ 100
Ammonium-N + nitrate-N (NH ₄ +NO ₃)	mg/L	≥ 50
Nitrogen draw-down index	-	≥ 0.7
Toxicity index	mm	≥ 70
Phosphorus – P standard range	mg/L	8-40
Low phosphorus – P (P-sensitive plants)	mg/L	< 3
Potassium (K)	mg/L	50-250
Sulphate (SO ₄)	mg/L	≥ 40
Calcium (Ca)	mg/L	≥ 80
Magnesium (Mg)	mg/L	≥ 15
Ca:Mg ratio	Ratio	1.5-10
K:Mg ratio	Ratio	1-7
Sodium (Na)	mg/L	≥ 130
Iron (Fe)	mg/L	≥ 35
Copper (Cu)	mg/L	0.4-15
Zinc (Zn)	mg/L	0.3-10
Manganese (Mn)	mg/L	1-15
Boron (B)	mg/L	0.02-0.65

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is **not** part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	20-40% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30-60% by volume
Composted soil conditioner conforming with AS 4454	20-30% by volume

Base level requirements for fertilisers (to be verified by laboratory testing and per agronomist's report)

Lime and/or dolomite	2 kg/m ³ at mixing
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Balanced compound NPK turf starter fertiliser	3.0 kg/100m ² after placement
Minor and trace elements	300 g/m ³ at mixing

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist's recommendations. The suggested fertilisers are expected to last 3-6 months of sustained growth. A suitable fertiliser (e.g. controlled slow release) and organic matter maintenance program may be required after this period, depending on the design intent.

See also **Specifications Gland G2** for the testing and certification requirements.

4.0.10 Specification E2: On slab soil media 'B' horizon

Part A. 'Fit-for-purpose' performance description

The specification describes the formulation of an open granular well-drained growing media with an all-up saturated density of less than 2400 kg/m³ (2.4 kg/L) for use in on-slab applications with an expectation of longevity to be used as a subsoil below 300 mm of all on-slab installations, including planter boxes, containers and garden beds. For the upper/ above 300 mm 'A' horizon use **Specification E1**. In order to maintain structure and porosity over extended periods, and to avoid slumping and volume loss over time, the formulation must employ low-density mineral components such as ash, perlite, scoria, pumice and diatomaceous earth, or artificial components such as urea formaldehyde and Styrofoam.

Physically the media has the properties of a potting media and is assessed using the methodology of AS 3743.

Choose from the following alternatives based on the soil approach and design approach method

Alkaline soils	Phosphorus sensitive plants
NO - Soils are to be within the standard range of pH from Table 6.20	YES - Phosphorus-sensitive plants are included in the design. Phosphorus level must be in the low P range from Table 6.20

Part B. Product specification (technical parameters)

Generally, the soil must be free of 'unwanted material' and must meet all the requirements of AS 3743 and the specified requirements of AS 4419. However, compliance with AS 3743 does not demonstrate compliance with this specification. Where the requirements of this specification and AS 3743 conflict, properties specified here must take precedence.

Use AS 3743 unless otherwise stated. See **Specification G1** for other test methods.

Table 6.19. Physical properties

Property	Units	Target Range
Texture, preferred range	n/a	Gravelly loamy sand to organic sandy loam
Air-filled porosity	%	≥ 10
Water-holding capacity	%	≥ 40
Permeability (@16 drops by McIntyre Jakobsen)	mm/h	> 100
Organic Matter	% w/w	< 5
Wettability	Min	≤ 5
Dispersibility in water	Category	1 or 2 (AS 4419) category
Large particles in the largest dimension		
< 2mm	% w/w	30-70
2-10mm	% w/w	10-20
10-20mm	% w/w	5-10
20-50mm	% w/w	< 5
>50mm	% w/w	0

Table 6.20. Chemical properties



C2 Property	Units	Target Range
pH in water (1:5) standard range	pH units	5.4-6.8
Electrical conductivity (1:1.5)	dS/m	< 2.2
Chloride	mg/L	≤ 200
Ammonium-N (NH ₄)	mg/L	≤ 100
Ammonium-N + nitrate-N (NH ₄ +NO ₃)	mg/L	≥ 50
Nitrogen draw-down index	-	≥ 0.7
Toxicity index	mm	≥ 70
Phosphorus – P standard range	mg/L	8-40
Low phosphorus – P (P-sensitive plants)	mg/L	< 3
Potassium (K)	mg/L	50-250
Sulphate (SO ₄)	mg/L	≥ 40
Calcium (Ca)	mg/L	≥ 80
Magnesium (Mg)	mg/L	≥ 15
Ca:Mg ratio	Ratio	1.5-10
K:Mg ratio	Ratio	1-7
Sodium (Na)	mg/L	≥ 130
Iron (Fe)	mg/L	≥ 35
Copper (Cu)	mg/L	0.4-15
Zinc (Zn)	mg/L	0.3-10
Manganese (Mn)	mg/L	1-15
Boron (B)	mg/L	0.02-0.65

Part C. Example components for the soil supplier

The following table outlines suggested components that may likely meet the physical requirements of this specification. This is **not** part of the product specification. It is an example for the edification of the soil supplier of what might meet the product specification.

Example components (likely to meet the physical requirements of this specification)

Sandy loam soil or site won topsoil	10-30% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30-50% by volume
Composted 10mm pine bark	20-40% by volume
Composted soil conditioner conforming with AS 4454	<20 % by volume

Base level requirements for fertilisers (to be verified)

by laboratory testing and per agronomist's report)

Lime and/or dolomite	2 kg/m ³ at mixing
Balanced compound NPK turf starter fertiliser	3.0 kg/100m ² after placement
Minor and trace elements	300 g/m ³ at mixing

For the purposes of tendering, the contractor must allow for the inclusion of the above soil amendments, but the specific amendments required must be verified by laboratory testing and agronomist's recommendations.

The suggested fertilisers are expected to last 3-6 months of sustained growth. A suitable fertiliser (e.g. controlled slow release) and organic matter maintenance program may be required after this period, depending on the design intent.

See also **Specifications G1 and G3** for the testing and certification requirements.

4.0.11 Specification G1: Quality assurance and control

Part A. General description

The contractor must use analytical testing to verify compliance with the product specification. This is done in two parts: initial compliance certification and quality control, as described below.



Initial compliance certification

Before any soil installation, the contractor or soil manufacturer will submit samples of trial blends likely to meet the performance specifications to a testing laboratory. See Part C of each specification for suggested formulations to start this process. The trial blend must be based on available test information on components and, if necessary, employ an agronomist for advice .

Submit trial samples to the testing laboratory, allowing sufficient time for testing and re-formulation in the case of failure to satisfy the performance criteria. Once compliant, a test certificate clearly stating compliance with the applicable criteria must be presented to the site supervisor or quality officer.

Note that alternative test methodologies may be accepted and certified as compliant by an independent expert agronomist or soil scientist.

Non-compliance will automatically generate **Hold point 1**. No soil will be installed until initial compliance certification has been demonstrated.

Manufacturer's product representation: For imported soils from manufacturers, a 'product representation' document produced by the supplier may be accepted as a compliance certificate if:

- it is an off the shelf product line, not a custom mix
- a representative test certificate is available and is acceptably recent (within 6 months) ..
- the testing covers all those criteria in the performance specification
- the manufacturer's quality assurance system is externally certified.

Record keeping

Growing media initial compliance certification records must be kept in an easily retrievable manner that provides for traceability of purchase and location on site. Each compliance certification for all the product specifications used on site must be identified by date, quantity to be supplied and a copy of the formulation used to reach compliance.

Quality control: compliance during construction

The contractor must submit samples of blended soils or imported soil mixes at regular intervals during construction for the purposes of demonstrating continued compliance as part of quality control.

Test submissions

Submit representative samples of -5 kg of each product specification, packed and labelled to indicate the source and the specification to be met. The samples must be taken in a representative manner. The contractor must refer to the testing frequencies indicated in Table 6.30. Variations to the frequencies in this table are permitted on the submission to the superintendent of an alternative testing program that clearly achieves the desired outcome of quality control.

Materials supplied from operations that have a third-party-endorsed quality assurance program may be acceptable pending submission of the relevant documentation.

Table 6.30. Outline of the required testing frequency to achieve compliance testing. Samples must be tested to the performance criteria indicated in the product specification

Specification	Activity	Minimum QC test frequency
B2	Subgrade and subsoil preparation	1 per 500m ³ or 1 per 2000m ² for <i>in-situ</i> soils following amelioration
B3	Imported subsoils	1 per 500m ³
C1,C2,C3	Turf and lawn soils	1 per 1000m ³
D1, D2, D3, D3, F4	Mass planting and garden soil specifications, wetland soils	1 per 500m ³
E1, E2, E3, F1, F2	Artificial containerised growing media, structural support soils, raingardens and stormwater filtration soils	1 per 100m ³

Note:

Where the delivery is less than the stated QC testing frequency, the initial compliance certification certificate must be deemed to demonstrate compliance.



Testing

All testing as required by the product specifications must be arranged by the contractor and carried out by the Principal's nominated soil testing laboratory. All test results records will be made available to the superintendent or quality officer.

Hold point 1

The test certificate will be accompanied by a statement of compliance from a competent person (e.g. qualified agronomist, horticulturist or soil scientist). Compliance certificates will be in the form of a report clearly stating the material is compliant, with an attachment showing the test result relied upon. In the case of minor non-compliance or substantial compliance a clear statement must be obtained from a qualified independent agronomist waiving the compliance and certifying the sample is compliant with or without conditions.

Non-compliance

In the case of substantive non-compliance, **Hold points 2 and 3** will occur (see **Specification G2**) - one to correct soil already installed and another to ensure new deliveries are compliant. In the case of minor non-compliance or substantial compliance, a clear statement must be obtained from a qualified independent agronomist waiving the compliance and certifying the sample is fit for purpose. Non-compliance with the target range criteria does not necessarily render a soil not fit for purpose but making this judgement requires an expert person to take responsibility for such deviation. Also, a conditional compliance certificate may be issued requiring that a certain fertiliser or further organic matter or some other amendment be added, with the aim of achieving compliance. Where the drainage layer is coarser than around 5 mm, a transition layer may be needed between it and the filtration soil media to prevent soil migrating into the drainage gravel layer. Generally, this will be an intermediate very coarse sand or fine gravel. Do not use geotextile fabrics over the drainage layer to prevent soil migration.

Hold point 2

The contractor will need to make corrective procedures to bring any soil that has been placed within substantial compliance in accordance with any agronomist's advice.

Hold point 3

In the event that quality control samples show substantial non-compliance from the approved performance requirements, the supplier must demonstrate compliance of any future loads. This may require re-formulation or alteration to existing formulations and may require the advice of a qualified person to meet correct analysis, and make adjustments to mixing ratios, additives and procedures to achieve compliance.

Record keeping

Growing media construction and QC compliance records must be kept in an easily retrievable manner that provides for traceability of purchase and location on site. Each batch of soil must be identified by date of manufacture, quantity and a corresponding test result, and must link into when the material was delivered and where the material was placed.

4.0.12 Specification G2: Hold points

There are three applicable hold points:

- **Hold point 1:** Initial compliance certification before installation
- **Hold point 2:** Corrective procedures and their certification in the case of on-compliant produce being in stalled
- **Hold point 3:** Re-certification in the case of on-going non-compliance.

Hold point 1

	Completion of E1, E2, C1, B1 initial compliance certification
Process held :	Placement of E1, E2, C1, B1 soil
Acceptance criteria:	Demonstrated compliance with the E1, E2, C1, B1 Soil Specification
Release of hold point:	Submission of laboratory test certificates to superintendent together with supplier's, contractor's or independent agronomist's report certifying compliance including acceptance of any non-compliance with or without conditions

Hold point 2



	Compliance failure of E1, E2, C1, B1 during ongoing compliance certification
Process held :	Further placement of E1, E2, C1, B1 soil
Acceptance criteria:	Corrective procedures specification from a qualified horticulturist, agronomist or soil scientist for soil corrective amendments likely to result in compliance with E1, E2, C1, B1
Release of hold point:	Submission of laboratory test certificates to superintendent together with an independent agronomist's report certifying the corrective procedure has resulted in compliance including acceptance of any non-compliance with or without conditions

Hold point 3

	Compliance failure of E1, E2, C1, B1 during ongoing compliance certification
Process held :	Further deliveries of E1, E2, C1, B1 soil
Acceptance criteria:	Corrective procedures specification from a qualified horticulturist, agronomist or soil scientist for corrective amendments to the formulation likely to result in the correction of non-compliance with E1, E2, C1, B1
Release of hold point:	Submission of laboratory test certificates to superintendent together with an independent agronomist's report certifying the corrective procedure has resulted in compliance including acceptance of any non-compliance with or without conditions.

4.0.13 Specification G3: Compliance certification

Prior to the lifting of a hold point, a declaration of compliance (certificate of compliance) shall be issued by a competent approval authority. This may be issued by the testing laboratory analyst, an independent agronomist or soil scientist or any other appointed agent of the principal contractor. In any case the identity of the competent authority shall be clearly stated. A declaration of compliance may be issued under one of three circumstances:

1. The tested material complies with all target criteria.
2. The tested material shows minor or insignificant non-compliances with the target criteria.
3. The tested material shows non-compliances that may be corrected, in the judgement of the competent approval authority, that will bring the test material within compliance or minor non-compliance. The competent approval authority will state the corrective steps or additives that may be required.

Such declarations shall be signed and dated by the competent approval authority and submitted to the project manager and landscape architect prior to the lifting of the hold point. An example of a declaration of compliance follows:

Declaration of compliance

Certificate no.:

To: *<insert addressee's name>*Of: *<insert company name>*

Phone:

Fax:

Email:

Project name:

Project location:

Product name:

Supplier:

Supplier's batch

Compliance standard :

Date sampled:

Laboratory ID

Batch no. and sample no.:

I, *<insert name>*, of *<insert company name>*, having been appointed by *<insert principal's name>*, hereby certify that:

or

1. I am a qualified soil scientist, agronomist or analyst.

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2. I am a person experienced and competent in the interpretation of soil test results for the establishment and cultivation of plants in amenity horticulture and have been appointed by the Principal or their agents.
3. This sample has been submitted by *<insert name of person submitting sample>* and has been analysed in accordance with specification *<insert reference to specification>*.
4. The extent of sampling and the results of all tests carried out on the subject soil mix conducted for the subject project are described in my report *<insert report no.>* dated *<insert date>* and are attached to this declaration for reference.
5. In my professional opinion, the *soil* mix described in the attached report complies with the nominated soil specification having given due consideration to the intended use and purpose, under the following circumstance:
- The *soil* complies with all target criteria with no further amendment.
 - The soil shows minor or insignificant deviation from some of the target criteria that do not affect its fitness for purpose and do not require corrective action.
 - The soil shows significant deviation from one or more of the target criteria but may be considered compliant if the corrective action as stated below is taken.

Corrective actions required

This certificate is issued on the understanding that the following corrective actions will be undertaken by a competent person. These corrective actions are intended to adjust *<insert purpose of the corrective action>*.

The corrective actions required are:

<Insert list of corrective actions>

This professional opinion is furnished to *<insert addressee's name>* as a representative of *<insert company name>* for their purposes alone on the express condition this it will not be relied upon by any other person and does not remove the necessity for the normal inspection of site conditions, workmanship and product liability at the time of construction.

Signed:

Date of report:

5.0 GENERAL LANDSCAPING

5.1 GENERAL

5.1.1 Standards

Soils

General: To AS 4419.

5.1.2 Ordering

Requirement

Within 14 days of the date of acceptance of tender, furnish proof of ordering the required materials, and advise immediately if any supply difficulties are encountered. No extension of time will be granted of any material or product is not available because of late ordering.

5.2 QUALITY

5.2.1 Inspection

Witness points

Give sufficient notice so that inspection may be made at the following stages:

- Delivery of plant material to site, for approval of species condition.
- Setting out completed.
- Subgrades cultivated or prepared for placing topsoil.
- Tree planting holes excavated and prepared for planting.
- Planting, staking and tying completed.
- Turfing completed.
- Completion of planting establishment work.

5.2.2 Tests

- Soil testing with recommend improvement strategies for site topsoil to be recycled in Works under contract.



5.2.3 Samples

General

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Bulk materials

Submit a 5 kg sample of each type specified. Submit bulk material samples, with required test results, at least 5 working days before bulk deliveries or commencement of work.

Plant materials

Quantity: Submit three plant sample for each species or variety (excluding trees), in the condition in which it is proposed to supply that plant to the site.

Samples schedule

Item	Quantity
Topsoil Mix	5 kg
Organic mulch	1kg

5.2.4 Submissions

Suppliers

Submit statements from suppliers of plants and other materials, giving the following, where applicable:

- Particulars of the supplier’s experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of the material to the site.

Materials

Supplier’s data: Submit supplier’s data including

- certificate identifying seed species, purity, age and germination viability; and
- material source of supply.

Compost: Submit a certificate of proof of compost pH value.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.

Maintenance program: Submit a proposed planting maintenance program.

Planting machine: If a planting machine is to be used as an alternative to hand planting, submit proposal.

Spraying: Submit proposal.

Plants - open rooted stock: If open rooted stock is to be used, submit proposal.

5.3 SUBSOIL IN NATURAL GROUND (SOIL MUST CONFORM TO SECTION 4.0 SOIL SPECIFICATIONS)

5.3.1 Subgrade levels

- a) The areas to be landscaped shall be profiled by the Civil Contractor. The landscape contractor shall check existing levels prior to commencement of the landscape works. Any remedial work required to the existing surfaces shall be carried out by the landscape contractor.
- b) The landscape contractor shall grade the subgrades and bases to receive the specified depths of soil preparation to the falls and levels indicated on the civil bulk earthworks plan. Allowing for bulking and consolidation of materials ensure that subgrade levels are as follows to achieve the specified minimum soil and mulch depths. Topsoil depth 300mm, mulch depth 75mm.
- c) Ensure all subsoil profiles have positive drainage.

5.3.2 Cultivation

Minimum depth: 150 mm.

Cultivation: Thoroughly mix in materials required to be incorporated into the subsoil. Cultivate manually within 400 mm of paths, kerbs or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.



Where diesel oil, cement or other harmful material has been split on the subgrade or topsoil, the affected areas shall be excavated and the contaminated soil removed from site. Trim surfaces to specified shape and level after cultivation so that the minimum specified depth of topsoil and finish remains on completion of preparation.

Services and roots: Do not disturb services or tree roots; if necessary cultivate these areas by hand.

Additives

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil.

Gypsum: Incorporate at the rate of 0.25 kg/m².

5.4 TOPSOIL (SOIL MUST CONFORM TO SECTION 4.0 SOIL SPECIFICATIONS)

5.4.1 Definitions

Site topsoil: Soil excavated from the site which

- contains organic matter;
- supports plant life;
- is free from unwanted matter such as
 - o stones over 25 mm diameter;
 - o clay lumps;
 - o weeds and tree roots;
 - o sticks and rubbish; and
 - o material toxic to plants; and
- is approved for reuse on site as topsoil.

Topsoil mixture: Site topsoil and imported topsoil combined together with compost or other additives, thoroughly mixed before placing.

Top dressing: Coarse or medium soil to AS 4419 (int), suitable for application to turf or grass areas.

Soil textures: Use topsoils described by the following terms (or their equivalents), which comply generally with the texture classifications and typical uses of AS 4419 (int):

- Medium (Sandy Loam).

5.4.2 Source

ALL TOPSOIL TO BE IMPORTED

Landscape contractor shall prepare approved topsoil option, as directed by the Superintendent, in writing prior to installation.

Approved topsoil shall be used in all tree planting, turf and massed garden bed area applications, as shown on landscape drawings. Refer to CULTIVATION clause for specified topsoil depths.

Additives

If using additives to raise topsoil to the required standard, ensure compliance with the relevant test criteria.

The Reused site topsoil and imported topsoil mix shall be used in all tree planting pits, as shown on landscape drawings.

Imported topsoil shall be fertile, of coarse (light) to medium texture and shall not set hard or become difficult to work as a consequence of drying out and shall be capable of handling when moist. Soil reaction should be slightly acid to neutral with a pH not less than 5.5 and not more than 7.5. Salinity shall not exceed 600ppm.

All topsoil to be used shall be clean, best quality material, free from materials toxic to human health or plants and be free of roots greater than 12mm diameter, clay lumps and stones greater than 10mm and other material foreign to the normal composition of soil.

Topsoil mixture shall have a maximum weight of 1800kN per m³. Topsoil shall generally comply with the texture classifications and typical uses of AS 223. Topsoil shall not be worked whilst wet.

Note: Any soil or other humus material obtained from site or sources external to the site shall be subject to certification by an Independent Testing Authority and also approved by the Superintendent, in writing prior to the delivery to the site.

5.4.3 Topsoil Specification

General

All site topsoil to be used in topsoil mix shall be clean, best quality material, free from organic matter, as per specification requirements (REFER TO SECTION 4.0)

Ensure all additional humus mix, fertilisers and soil conditioners required are thoroughly and evenly mixed throughout topsoil, to the satisfaction of the Superintendent, prior to application. **ENSURE NO ORGANIC MATTER IS PRESENT BELOW 300MM DEPTH IN ANY SOIL PROFILE. USE SITE OR IMPORTED SUBSOIL BELOW THESE DEPTHS**



Note: Landscape contractor shall provide a ½ Kg sample from each batch of Topsoil mix to be tested by Sydney Environmental and Soil Laboratory Ph: 9980 6554. Landscape contractor to provide certificate of proof and results of soil testing for organic and structural characteristics to determine suitability and any amelioration requirements. Soil test results shall be subject to certification and approval by Superintendent, in writing prior to application

Any Humus mix to be used in topsoil mix shall be 30% composted ANL ‘Greenlife’ material or similar approved. **ENSURE NO ORGANIC MATTER IS PRESENT BELOW 300MM DEPTH IN ANY SOIL PROFILE**

Supplier: Australian Native Landscapes Pty Ltd.

Landscape contractor shall submit written certificate of Humus mix composition to Superintendent, to be approved in writing prior to application.

Note: Any soil, sand or other humus material obtained from site or sources external to the site shall be subject to certification by an Independent Testing Authority and also approved by Superintendent, in writing prior to the delivery to the site.

Topsoil Depths Schedule:

Soil Type	Depth	Location
Topsoil Mix	To top 300mm	All garden beds in Natural Ground
A and B Horizon (E1&E2)	A – Top 300mm B – Below 300mm	All trough planters

TOPSOIL IMPORTED MIX

- ANL ‘Greenlife Garden Mix’ is required to fulfil the chemical criteria for premium grade non-specialist mixes according to AS 3743.

Topsoil mix is required to fulfil the chemical criteria for premium grade non-specialist mixes according to AS 3743

5.4.4 Placing Topsoil

General: Spread the topsoil on the prepared subsoil and grade evenly, making the necessary allowances to permit the following:

- Required finished levels and contours may be achieved after light compaction.

Contamination: Where diesel oil, cement or other phytotoxic material has been spilt on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil to restore design levels.

Spreading: On steep batters, if using a chain drag, ensure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

Consolidation

Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

Surplus topsoil

General: Dispose off site.

5.5 COMPOST AND FERTILISERS

Organic Compost

General: Provide well rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth. **ENSURE NO ORGANIC MATTER IS PRESENT BELOW 300MM DEPTH IN ANY SOIL PROFILE**

Standard: To AS 4454.

Fertiliser

Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor,.



Deliver fertiliser to site in sealed bags clearly labelled with type and manufacturer weight, fertiliser type, N:P:K ratio, recommended uses and application rates. All fertilisers shall be applied in strict accordance with manufacturer’s instructions.

Fertiliser types shall be as follows:

INDIVIDUAL TREE PLANTING

Pellets shall be in the form intended to uniformly release plant food elements for a period of approximately nine months equal to Shirleys KOKEI pellets, analysis 6.3:1.8:2.9 or similar approved. KOKEI pellets shall be placed at the time of planting to the base of the plant, 50mm minimum from the root ball at a rate of two pellets per 300mm of top growth to a maximum of 8 pellets per tree.

5.6 MULCHING

Mulch

General: Provide mulch which is free of deleterious and extraneous matter such as soil, weeds and sticks.

Standard: To AS 4454.

Organic mulches: Free of stones.

Mulching schedule

Location	Mulch type	Depth
All mass planted areas on groundfloor except basin outlet	Aged Forest Blend by Australian Native Landscapes or equivalent approved	75mm
Level 1 Planter Boxes	Pebble Sino Black Natural 50-70mm	75mm

Placing mulch

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds, and not closer to the stem than 50 mm in the case of gravel mulches.

- Level 1: Spread pebbles evenly to entire planter trough area and as nominated on the plan at a 75mm depth. Finish 75mm below top of trough planter level. Grade the finished surface evenly between design surface levels.
- Place mulch/pebbles clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of tree stems in plantation beds, and not closer to the stem.

5.7 PLANT MATERIALS

5.7.1 Scope

The Contractor or the Client shall be responsible for the procurement and purchase of the Tree Stock. This will be at the discretion of the client. Delivery and installation will be the contractor’s responsibility.

All grown or purchased plant stock must conform to all the conditions and requirements given in *NATSPEC Guide: Specifying Trees* and in this specification. Trees must be sourced in accordance with the tests and measurements contained within AS2303 – Tree Stock for Landscape Use.

5.7.2 Submission

The Contractor is required to ensure the plant material is of acceptable form, in relation to pot size or root ball diameter, current height, calliper, etc.

5.7.3 Substitutions

There shall be no substitutions in quantities and sizes of plants nominated in the schedule. If a species is unavailable in the size specified, the Contractor is to notify the Superintendent and inform of likely substitutions that are available. No substitutions shall be made without written permission from the Superintendent.

5.7.4 Holding of Plant Stock

The Contractor is to store and maintain plant material within the on-site nursery until required on site. The Contractor shall pot on plant material at the required growing intervals into larger sized containers, ensuring the plant material satisfies *NATSPEC Guide: Specifying Trees*. The growing medium for potting shall be equal to the existing potting mix.

All plants are to be adequately ‘hardened-off’ prior to installation.



5.7.5 Plant Material

The plant material shall be uniformly high quality stock grown to suit anticipated site conditions and shall exhibit optimum quality through out the plants development and at the time of Contract Completion.

All plants supplied shall be well grown established specimens true to form and species, they are to conform to *NATSPEC Guide: Specifying Trees* and the following specifications;

- Large healthy root systems, with no evidence of root curl, restriction or damage.
- Vigorous, well established, free from disease and pests, of good form consistent with the species or variety.
- Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site.
- Trees shall have a single leading shoot.
- Plants shall have been grown in their final containers for not less than twelve (12) weeks to allow for substantial new root growth to have been produced therein and the size of the plant shall be in reasonable proportion to the size of that container.
- Plant containers shall be free from weeds, of appropriate size.
- Plants shall not exhibit signs of having been stressed at any stage during their development due to inadequate watering, excessive shade / sunlight, physical damage or have restricted growth due to nursery rows.

Any root-bound stock shall be rejected. The roots must fill the bag or pot so as to hold soil in place once removed.

Sample plants rendered unsuitable for use as a result of inspection shall be replaced at no additional cost.

5.7.6 Plant Material Sizes

All trees shall conform to the size and height details specified in *NATSPEC Guide: Specifying Trees*.

5.7.7 Identification

Identification shall include the plant's full botanical name, being clearly printed on plastic tags. At least one plant of each species in a batch shall be clearly labelled.

5.7.8 Delivery

Ensure that all plant material in transit between the point of supply and the site is covered and handled in a manner that will not be harmful to the plants.

5.8 PLANTING

5.8.1 Planting Preparation

Watering

Before planting begins, thoroughly water trees. Keep the areas moist during planting. Water the trees immediately after planting and thereafter as required to maintain growth rates free of stress.

Handling

All trees shall be handled at all times in such a manner as to prevent any damage in transit.

Plants Set Out

As soon as possible after delivery, the trees shall be set out in the positions for planting as indicated on the landscape layout plan, ready for inspection. The Construction manager will inspect the tree pits, set out with their full complement of plants, and will make changes of placement as necessary. Following this inspection, the landscape contractor is to immediately install trees. Where all planting cannot be achieved in one day, this work will be staged.

Street Tree Planting

All species to be planted into an individual prepared hole. Each hole shall be dug with a shovel, backhoe or similar tool. Individual holes shall be excavated to a maximum depth of 800mm or to such a size to allow root system to sit flat on the excavated hole and 400mm to each side of the root system. Cultivate the subsoil to 150mm below planting hole as detailed in Section 5.3.

5.8.2 Planting

Tree Planting

Advanced trees are to be planted in accordance with relevant advanced tree planting details. Stakes to be carefully aligned in a straight line. Refer to planting detail on Landscape Plans.

Excavate a plant hole as shown in plans. Cultivate the base of planting hole to 200mm and add gypsum. Integrate the Topsoil Mix and loosen compacted sides of hole. This type of topsoil mix shall be the bulk of the material required for the tree pit. If the existing soil is poor then ameliorate as necessary. (Soil analysis must be conducted to ascertain soil ameliorates).

Place plant in the cultivated hole and install Rootrain Urban tree irrigation ring as per manufactures instructions. Ensure the topsoil level of the plant root ball is level with the finished surface of the soil surrounding the hole.



Backfill with 50/50 even mix of site soil and Imported Topsoil Mix. Site topsoil should be included in this soil mix. Lightly tamp and water to eliminate air pockets.

If it appears necessary to vary tree locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

Backfilling

Soil shall be progressively firmed during backfilling to avoid air pockets. Backfilling shall be with Planting Soil Mix as specified to the specified depths. Ensure that topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.

Planting conditions

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

Watering

Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

Placing

Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil.

Fertilising

Pellets: Place fertiliser pellets as per 3.5 around the trees at the time of planting.

5.9 SPRAYING

Notice

Immediately give notice of evidence of insect attack or disease amongst plant material.

Spraying

Where required, spray with insecticide, fungicide or both.

5.10 TREE STAKES AND TIES

Stakes

Use hardwood, straight, free from knots or twists, pointed at one end. Drive stakes into the ground a minimum one third of their length as shown on details, avoiding damage to the root system.

Stake sizes:

- For 100L trees: Three 38 x 38 x 1800mm stakes per tree.

Ties

General: Provide ties fixed securely to the stakes, one tie at half the height of the main stem, others as necessary to stabilise the plant. Ties shall be of flexible nature and approved material such as 50mm wide hessian webbing, or other flexible and resilient materials as approved. Fix ties in a figure of eight pattern 300mm above ground level and stapled to stake.

Tie types:

- For 100L trees > 2.5m high: 50mm hessian webbing, installed around stake and stem in a figure of eight pattern and stapled to the stake

5.11 COMPLETION

Product warranty

Submit the supplier's written statement certifying that plants are true to the required species and type, and are free from diseases, pests and weeds.

Maintenance manual

Submit recommendations for maintenance of trees and turf.

Cleaning

Stakes and ties: Remove those no longer required at the end of the planting establishment period.



6.0 HARD LANDSCAPING

THE FOLLOWING WORKS WILL FALL UNDER EITHER THE HEAD CONTRACTORS OR LANDSCAPE CONTRACTORS SCOPE, LANDSCAPE TO DETERMINE WITH HEAD CONTRACTOR:

Ground Floor

6.0.1 River Gravel

Size: 30-40mm

Supplier: ANL

Contact: (03) 9782 2855

Location: Adjacent to fire stair east of carpark.

Install gravel over weed mat as per the location on the landscape plans.

Level 1

6.0.2 Paving Slip Rating

ALL PAVING SURFACES ARE TO CONFORM TO AS 4586, P5 SLIP RATING. TEST REPORTS TO BE PASSED TO SUPERINTENDANT BEFORE INSTALLATION

6.0.3 Mineral Tiles (P2)

Type: Porcelain Tile Paver

Colour: INK

Size: 600 L x 600 W x 20mm D

Supplier : Outdure

Installation to be on Outdure Quickbuild system as per manufacturers specification.

6.0.4 Mineral Tiles (P1)

Type: Porcelain Tile Paver

Colour: Oasis

Size: 600 L x 600 W x 20mm D

Supplier : Outdure

Installation to be on Outdure Quickbuild system as per manufacturers specification.

6.0.5 Decking

Product: Casadeck

Size: 138mm x 23mm x 2800mm

Colour: Walnut Mixdure

Supplier: Outdure

Contact: 1800 722 465

Email: customerservice@outdure.com

Installation to be on Outdure Quickbuild system as per manufacturers specification.

6.0.6 Trough Planter (TR1)

Product: Civic 2200 Wide Tall

Size: 2200mm (L) x 1000mm (W) x 800mm (H)

Colour: White

Supplier: Quatro Design

Contact: 02 6672 1190

Email: sales@quatrodesign.com.au



Contractor to supply and install pots to locations nominated on landscape plans. Pots to be elevated with pot feet for clear drainage. Trough planter to have drainage holes. Soil mix to be as typical podium planter detail with drainage cell, geo fabric, river sand, subsoil and topsoil. Irrigation to be supplied to all pots.

6.0.7 Square Pot (PT1)

Product: Civic 2000 Square Tall
Size: 2000mm (L) x 2000mm (W) x 1000mm (H)
Colour: White
Supplier: Quatro Design
Contact: 02 6672 1190
Email: sales@quatrodesign.com.au

Contractor to supply and install pots to locations nominated on landscape plans. U Bowls to have drainage holes. Soil mix to be as typical podium planter detail with drainage cell, geo fabric, river sand, subsoil and topsoil. Irrigation to be supplied to all pots.

6.0.8 Small Square Pot (PT2)

Product: 900 Cube
Size: 900mm (L) x 900mm (W) x 900mm (H)
Colour: White
Supplier: Quatro Design
Contact: 02 6672 1190
Email: sales@quatrodesign.com.au

Contractor to supply and install pots to locations nominated on landscape plans. U Bowls to have drainage holes. Soil mix to be as typical podium planter detail with drainage cell, geo fabric, river sand, subsoil and topsoil. Irrigation to be supplied to all pots.

6.0.9 Barbecue (BBQ)

Product: CC2 Electric Barbecue Cooktop
Size: 600mm (W) x 600mm (D) x 226mm (H)
Colour: Stainless Steel
Supplier: Christie
Contact: 1300 135 227
Email: sales@dachristie.com

6.0.10 Sink (S)

Product: Barbecue Sink Kit
Size: 490mm (W) x 490mm (D) x 186mm (H)
Colour: Stainless Steel
Supplier: Christie
Contact: 1300 135 227
Email: sales@dachristie.com

6.0.11 Pergola

Rafter Finish: Aluminium Curly Birch
Frame Colour: Monument

Contractor to arrange shop drawings of Pergola for landscape architect's review. All fixing into podium slab to be waterproofed and certified by waterproofing consultant.

7.0 Drainage

7.0.1 General

NOTE: THE LANDSCAPE CONTRACTOR MUST ENSURE THAT ALL GARDEN BEDS HAVE POSITIVE DRAINAGE AND A SUFFICIENT NUMBER OF SUB SOIL AGG LINES IF REQUIRED TO REMOVE EXCESS WATER FROM THE SUBSOIL.

TYPICAL INSTALLATION FOR SUBSOIL AGG LINE

- Black or white corrugated pipe with lateral slots is commonly used.



- When laying the pipe, ensure the pipe and the bottom of the trench are on a slope in the direction of the existing water flow, moving with gravity. It is best if the gradient is 1 centimetre to half a metre (1 in 50), although a gradient of 1 centimetre to 1 metre (1 in 100) will still work.
- The trench for the pipe must be twice the width of the pipe and 25 millimetres deeper than the level of the pipe. Gravel should be laid 25mm in the trench while keeping the gradient.
- Keep the pipe straight when laying it along the gravel. Using 10mm gravel will avoid the need for a geofabric sock.
- Fill the trench with the gravel almost to the top, and then fill the remaining 100mm with topsoil until the trench becomes level with the ground.
- Things to consider when installing agg pipes:

Separate systems

To avoid waterlogged soil, separate pipe systems must be used. Connecting ag pipes to roof downpipes or stormwater pipes is a mistake, as water can easily flood through the ag pipe and flow back into the trench, ultimately weakening the building.

For this reason, it is also important never to run ag pipes under the building itself, due to the slots in the pipe, and pipes should be at least 1 metre away from the foundations.

While solid pipes can be installed under a house, it is best to take water away from the area altogether. Collecting stormwater as it falls in a concrete surface-level spoon drain may be an option in some circumstances.

Ag pipes should not be connected to the stormwater system, however, the lower end of the ag pipe can be discharged into the stormwater if the stormwater is downhill from the building. The end of the ag pipe should finish at the soil's surface so it can be flushed for easy maintenance. Make sure there is a cap on the end to prevent debris from entering the pipe.

Silt pits

Silt is another factor to be considered. National industry construction codes may require silt traps to be constructed and regularly cleared. The base of the pit must be below the inlet and outlet pipes so that any silt in the drain will be trapped in the pit. Silt must be removed manually from the pit to prevent blockage.

Keeping water away from your building by purchasing the correct materials for installing an ag pipe is a practical way of maintaining the structural integrity and value of your property.

8.0 Irrigation

8.0.1 Landscape

The Contractor shall be responsible for coordination and engagement of a specialist irrigation designer and installation contractor to design, supply and install an automatic irrigation system as indicated on irrigation diagram. Pop-up sprinklers may not be usable if water restrictions come into place. The contractor shall supply the most suitable system.

The irrigation plan will be prepared and certified by an irrigation designer. The designer shall confirm pressure and pumping requirements with the Hydraulic Engineer. The Contractor shall coordinate water supply via the on site holding tank. Make provision for pressure reduction in the design and installation.

This section sets out the requirements for the design and supply of all materials, equipment and labour necessary for the complete and proper implementation of the irrigation works. The Irrigation Contractor will be responsible for all works required. Items not specifically described in this section, but which would normally be required to produce a fully functioning irrigation system, is considered part of the works.

It is the Landscape Contractor's responsibility to bring to the foreman's attention any concerns, potential obstacles or possible improvements before implementation commences.

The irrigation rates and / or centres of irrigation outlets are to take the nominated plant species into consideration. It is the responsibility of the contractor to ensure that the irrigation can accommodate the climatic conditions. The contractor should contact supply nurseries for recommendations on water rates and regimes for individual plant species.

8.0.2 Works by others

Works by other trades associated with the irrigation system:

Water supply: The take off and head works including gate valves, filter, meter RPZ, pipe work to the planter and backflow prevention will be installed by a licensed plumber to Hydraulic Engineer's detail. **The primary water supply is to be advised by the Hydraulic Engineer & Head Contractor and may not be solely from the onsite 'harvested water' tanks.** The Contractor shall make all provision for connection to the tank/water source, coordinate and supply pumps and the like to service the irrigation system and allow for all pipe work, joints, valves and filtration appropriate to a drip system and recycled / harvested water.



Conduits: 100mm diameter PVC conduits will be installed under hard surfaces dedicated for irrigation works. The landscape contractor / irrigation contractor shall confirm the location and installation of conduits under pedestrian and road pavements to ensure all landscape areas can be serviced.

Electrical Works: The position of the irrigation controller(s) are to be coordinated with the head contractor and electrical trades. The position should also be discussed with the client.

8.0.3 Standards

Unless recommended otherwise by the Manufacturer, all work will be carried out using equipment and installation process as outlined in the relevant Australian Standards and industry codes. The product shall be REECE range (or equivalent) including controller(s), inline drip emitter tube, solenoid, valves, pressure valves, air and low drainage valves.

8.0.4 Design information criteria

The intent is to provide a basis on which a professional standard, fully operational and industry compliant irrigation system can be provided to the Client. The equipment and installation processes described are intended to produce an irrigation system which complies with all applicable industry and local authority and Australian standards.

Submission of the design to the Site construction manager prior to commencement of works is the responsibility of the Contractor. The Contractor will inspect the site prior to lodgement their design and review the landscape plans to understand the landscape intent, planting and site specific factors that need to be taken into consideration to ensure a suitable design outcome and operational efficiency.

8.0.5 Coordination

Co-ordinate the irrigation works with all other works on site to ensure a high standard of works. Liaise with the other Contractors on site and the site construction manager to ensure all infrastructure works meet the requirement of the design.

8.0.6 Approved contractors

All work will be performed by Irrigation installers with a minimum of 5 years' experience in this type of work and will be performed by Certified Irrigation installer.

8.0.7 Performance specification

The irrigation system will need to provide designated landscaped areas with enough water for vigorous healthy plant growth. **As a general rule landscaped areas will need 20-25mm**, species dependant, of water per week. The landscape Contractor will need to monitor natural rainfall using a rain switch in order to set irrigation flow rates accordingly on a monthly basis.

Rain switch: The irrigation system shall have rain switches suitably located to manage the system during rain periods.

Pump(s): To be provided by the Hydraulic Engineer/Contractor at the water storage tank. Coordinate supply, connection, filtering, controls, pipe work and the like for the connection and distribution of water for the irrigation system.

Valve boxes: It is assumed that solenoid valves will be centrally located as positioned directly in planter areas. If valves are located within planters, valve boxes shall be installed with lockable lids and shall be clearly identified by number correlating to the design drawings for field reference.

Controller: Housed in a lockable box capable of being wall mounted. The controller must have the capacity for multi day cycle programming with 14 day calendar schedule and pump controller provision. The controller is to be direct wired.

Pipe work: Copper pipe work is to be installed where required to satisfy all code requirements. Class 12 HDPE and fixtures shall be used for supply pipe work and Netafim – Techline low volume drip line with internal drip emitters or equal used to planter positions.

8.0.8 Drawings

The Irrigation Contractor accepts full responsibility for the system operation as per the submitted design which is to be pre-approved of by the Head Contractor prior to fabrication. The plans will be prepared and certified by a qualified irrigation designer. The plans will indicate all pipe work, drip runs, controls, valves, inline filters and all necessary equipment for the automatic operation of the system. Supply cycle schedule for review.

'As Constructed' drawings of the installed irrigation system, to scale, shall be submitted to the Site construction manager prior to Practical Completion.

8.0.9 Warranty

The irrigation Contractor will warrant both materials and installation against fault, and repair or replace without delay and at no cost to the head contractor. The duration of the warranty is to be 12 months after completion of Defects / Maintenance period. Details of any extended Warranty Periods offered by the manufacturers are to be provided to the site construction manager at the time of tender evaluation.



9.3 PLANT REPLACEMENT AND VANDALISM

Continue to replace failed, damaged or stolen plants. All plant materials which die during the Maintenance Period due to inadequate or incorrect maintenance by the Contractor, are to be replaced at the Contractors own expense. Plants lost due to vandalism or theft during the Maintenance Period, beyond the control of the Contractor, are to be replaced at the Client's expense. The Contractor shall be responsible for theft, vandalism and wilful damage up to the date of Practical Completion. Contractor to notify superintendent of vandalised elements or stolen plants, in writing on a fortnightly basis.

9.4 MAINTENANCE PROGRAM & REPORTING

Maintenance Program

A written maintenance program is to be provided within 14 days of letting of the Contracts, including provision for all of the above requirements. A cost breakdown of this work should be provided with the tender.

Log book

Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection on request.

