



DESIGN CERTIFICATION

ATTENTION: Paul Cassimatis
COMPANY: Hansen Yuncken Pty Ltd
PROJECT: Lot 201, Horsley Logistics Park
PROJECT NO: SS20-4538
DA No: SSD-10436

Dear Paul,

The drawings provided meet Item B1 of the DA consent dated 31st March 2021.

Relevant Landscape Documents

Document	Issue
SI-LA-201-000	04
SI-LA-201-101	02
SI-LA-201-102	02
SI-LA-201-103	02
SI-LA-201-104	02
SI-LA-201-105	02
SI-LA-201-501	02
SI-LA-201-901	01

Please do not hesitate to contact the undersigned should you have any further queries.

Kind regards,
Site Image (NSW) Pty Ltd

Nick Metcalf
BLArch Dip Hort
Director



LANDSCAPING COMPLIANCE TABLE		
OUTSTANDING ACTION ITEM	COMMENTARY	REFERENCE IN PLAN
<p>Fairfield City Council The landscape details shown on the plan reference a landscape specification document, which has not been submitted with these plans and thus has been unable to be assessed as part of these comments. The proposed decomposed granite surfacing to be used would be a cement stabilized deco granite to ensure longevity into the future. The landscape plan needs to ensure compliance with the 4-metre-wide area of southern landscape buffer within Lot 201 as shown in Figure 6 of the SSD 10436 Consent</p>	<ul style="list-style-type: none"> - Landscape Specifications have now been provided. - Cement stabilized decomposed granite has been specified in the landscape specification. - The 4m wide buffer zone has been provided as per Figure 6. 	<p>SI-LA-201-LS01 SI-LA-204-LS01</p> <p>SI-LA-201-103 SI-LA-201-104</p>
<p>Fairfield City Council Regarding the landscape concept plan, Natural resources have the following comments regarding the species list*</p>	<ul style="list-style-type: none"> - All species mentioned in the comment have been replaced with non-weed species as per NSW WeedWise. 	<p>SI-LA-201-000 SI-LA-204-000</p>
<p>DPIE The Landscape Plan should include a response to all comments from Fairfield City Council dated 25 May 2021</p>	<ul style="list-style-type: none"> - An additional sheet in the landscape plans includes responses to all council comments 	<p>SI-LA-201-901 SI-LA-204-901</p>
<p>DPIE The Landscape Plan should include an assessment of the design against Section 4.2 Landscape Design of the 327-335 Burley Road, Horsley Park Development Control Plan (March 2016) as required by Condition B1(c), Schedule 2 of SSD-10436.</p>	<ul style="list-style-type: none"> - A descriptive design statement regarding the Burley Road, Horsley Park DCP has been included within the landscape plans 	<p>SI-LA-201-901 SI-LA-204-901</p>

* Refer to below Species List with commentary:

Fraxinus Oxycarpa Gleditsia Tricanthos	Weed tendency and can spread If not maintained this with develop massive thorns and become a health risk. Also has the potential to become a bad weed.
Lagerstroemia Indica X Fauriei	https://weeds.dpi.nsw.gov.au/Weeds/HoneyLocust
Syncarpia Glomulifera Rhapheolepis Anigozanthos 'Bush Bush Pearl Pink'	Not locally native and can spread https://weeds.dpi.nsw.gov.au/Weeds/IndianHawthorn Potentially won't survive due to heavy clay soils
Dianella Caerulea 'Breeze'	Dianella caerulea 'Breeze' Will cross pollinate with native species and destroy the genetic integrity of the native species
Lomandra Sp.	Will cross pollinate with native species and destroy the genetic integrity of the native species
Pennisetum Alopecuroides	Prefer to avoid Pennisetum species, see https://weeds.dpi.nsw.gov.au/Weeds/FountainGrass

Lot 201, Horsley Logistics Park Horsley Park, NSW 2175 Landscape Construction Certificate

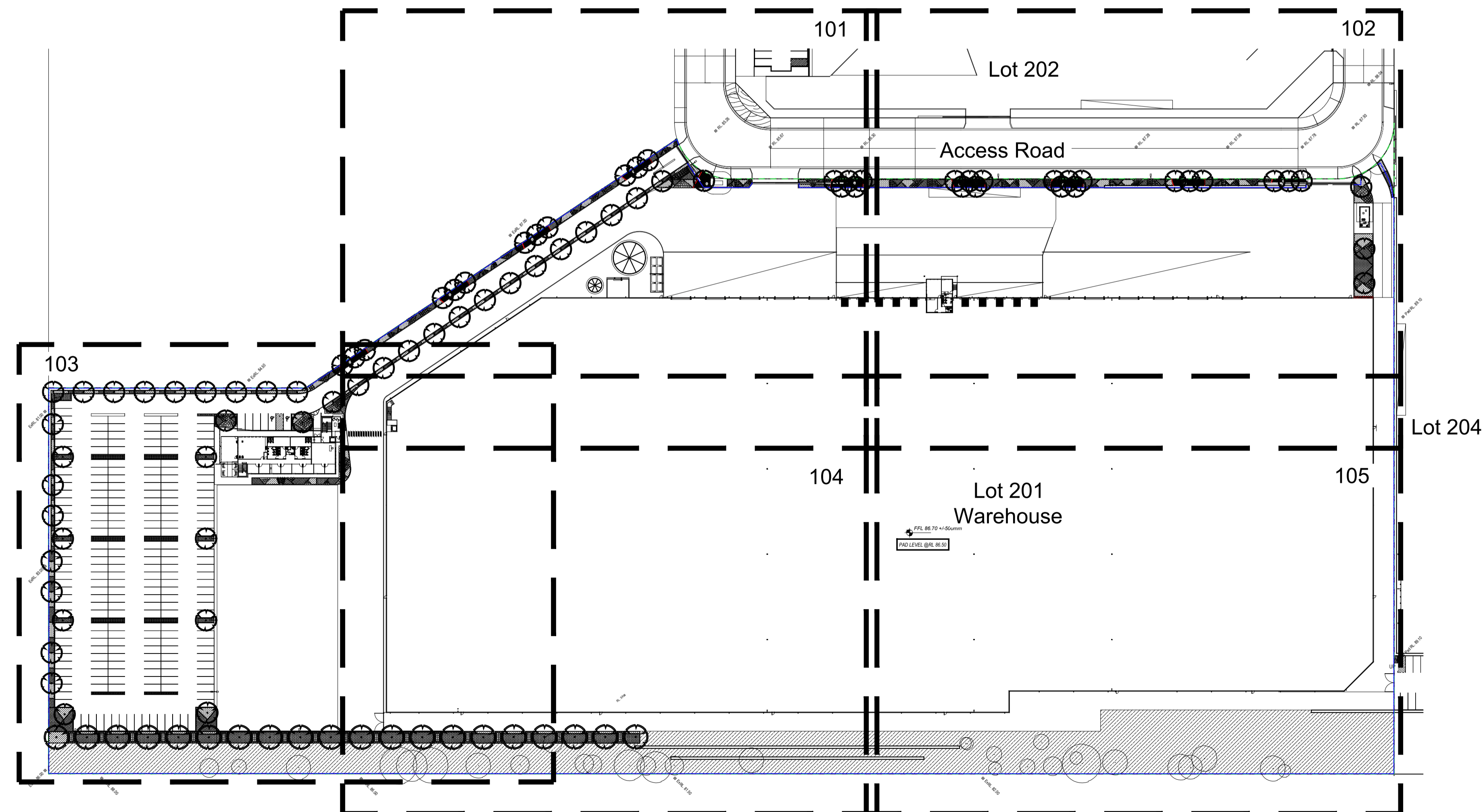
Drawing Schedule

Drawing Number	Drawing Title	Scale
SI-LA-201-000	Landscape Coversheet	N/A
SI-LA-201-101	Landscape Plan	1:250
SI-LA-201-102	Landscape Plan	1:250
SI-LA-201-103	Landscape Plan	1:250
SI-LA-201-104	Landscape Plan	1:250
SI-LA-201-105	Landscape Plan	1:250
SI-LA-201-501	Landscape Details	As Shown
SI-LA-201-901	Council Response	N/A

PLANT SCHEDULE

Symbol	Botanic Name	Common Name	Mature Size (Height x Width)	Pot size	Spacing	Quantity
TREES						
Bp	<i>Brachychiton populneus</i>	Kurrajong	20 x 6m	100L	As Shown	19
Em	<i>Eucalyptus moluccana</i>	Grey Box	25 x 10m	100L	As Shown	12
Et	<i>Eucalyptus tereticornis</i>	Forest Red Gum	30 x 8m	100L	As Shown	10
Cm	<i>Corymbia maculata</i>	Spotted Gum	30 x 8m	100L	As Shown	15
Lt	<i>Liriodendron tulipifera</i>	Tulip Tree	13 x 8m	100L	As Shown	3
PcC	<i>Pyrus calleryana 'Capital'</i>	Ornamental Pear	9 x 3m	100L	As Shown	2
Ms	<i>Melaleuca styphelioides</i>	Prickly Paperbark	10 x 6m	100L	As Shown	8
TIL	<i>Tristaniopsis laurina 'Luscious'</i>	Water Gum Tree	10 x 7m	100L	As Shown	13
WGA	<i>Waterhousea floribunda 'Green Avenue'</i>	Weeping Lilly Pilly	10 x 5m	100L	As Shown	15
SHRUBS						
AL	<i>Acacia 'Limelight'</i>	Limelight Acacia	1 x 1.2m	200mm	As Shown	26
AAM	<i>Acmena 'Allyn Magic'</i>	Lilly Pilly	0.5 x 1m	200mm	As Shown	119
Cg	<i>Correa glabra</i>	Rock Correa	1.5 x 1.5m	200mm	As Shown	109
CpC	<i>Correa pulchella 'Crimson Tide'</i>	Crimson Tide Correa	0.5 x 2m	200mm	As Shown	119
De	<i>Doryanthes excelsa</i>	Gymea Lilly	2 x 2m	200mm	As Shown	65
Ia	<i>Indigofera australis</i>	Australian Indigo	1.5 x 1.5m	200mm	As Shown	99
OdR	<i>Ozothamnus diosmifolius 'Radiance'</i>	Native Rice Flower	1.8 x 1m	200mm	As Shown	111
PGB	<i>Pittosporum 'Golf Ball'</i>	Golf Ball Pittosporum	0.5 x 0.5m	200mm	As Shown	49
WBG	<i>Westringia 'Blue Gem'</i>	Native Rosemary	1.5 x 1.3m	200mm	As Shown	328
GRASSES AND GROUNDCOVERS						
BmW	<i>Brachyscobe multifida 'White Delight'</i>	Rock Daisy	0.3 x 1m	140mm	5/m2	108
CrW	<i>Carpobrotus rossii 'White Hot'</i>	Native Pigface	0.2 x 3m	140mm	5/m2	439
DI	<i>Dianella longifolia</i>	Pale Flax-lily	1.2 x 0.7m	Tubestock	5/m2	1367
LPP	<i>Loropetalum 'Purple Pixie'</i>	Purple Loropetalum	0.5 x 1.2m	140mm	5/m2	251
Ju	<i>Juncus usitatus</i>	Common Rush	0.6 x 0.5m	Tubestock	5/m2	1057
LI	<i>Lomandra longifolia</i>	Mat Rush	0.75 x 1m	Tubestock	5/m2	1923
PI	<i>Poa labillardieri</i>	Tussock Grass	1 x 0.5m	Tubestock	5/m2	2473
Sm	<i>Senecio mandraliscae</i>	Blue Chalksticks	0.4 x 0.75m	140mm	5/m2	566
Ta	<i>Themeda australis</i>	Kangaroo Grass	1 x 0.3m	140mm	5/m2	613
BIO RETENTION PLANTING						
Cr	<i>Cymbopogon refractus</i>	Barbed wire grass	1 x 1.5m	Tubestock		206
Dm	<i>Dichelachne micrantha</i>	Short-hair plume grass	1 x 0.5m	Tubestock		206
Fn	<i>Ficinia nodosa</i>	Knobby Club Rush	0.6 x 0.6m	Tubestock	10/m2	206
Ju	<i>Juncus usitatus</i>	Common Rush	0.6 x 0.5m	Tubestock		206
Tt	<i>Themeda triandra</i>	Kangaroo Grass	1 x 0.3m	Tubestock		206

NOTE: Trees to be a minimum of 1m in height at time of planting



Site Plan | 1:1000

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Issue	Revision Description	Drawn	Check	Date
04	Council Response	JW	NM	10.06.2021
03	Plant Schedule Amendments	JW	NM	04.06.2021
02	Revised For Comments	JW	NM	27.05.21
01	For Comment	JW	NM	28.04.21

Client:
ESR

Project:
Lot 201, Horsley Park NSW 2175

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CONSTRUCTION CERTIFICATE

Drawing Name:
Landscape Coversheet

Scale:
Job Number: SS20-4538
Drawing Number: SI-LA-201-000
Issue: 04

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Issue	Revision Description	JW	NM	27.05.21
02	Revised For Comments	JW	NM	27.05.21
01	For Comment	JW	NM	28.04.21

LEGEND

- Property Boundary
- Proposed Trees
- Proposed Shrubs and Accents
- Proposed Grasses and Groundcovers
- Bioretention Planting Matrix
- Concrete Edge
- Decomposed Granite Paving
- Landscape Buffer Managed by Others
- Concrete Strip
- Fence Type 1: Metal Picket Fence
- Fence Type 2: Chain Wire Fence

Key Plan:

Client:
ESR

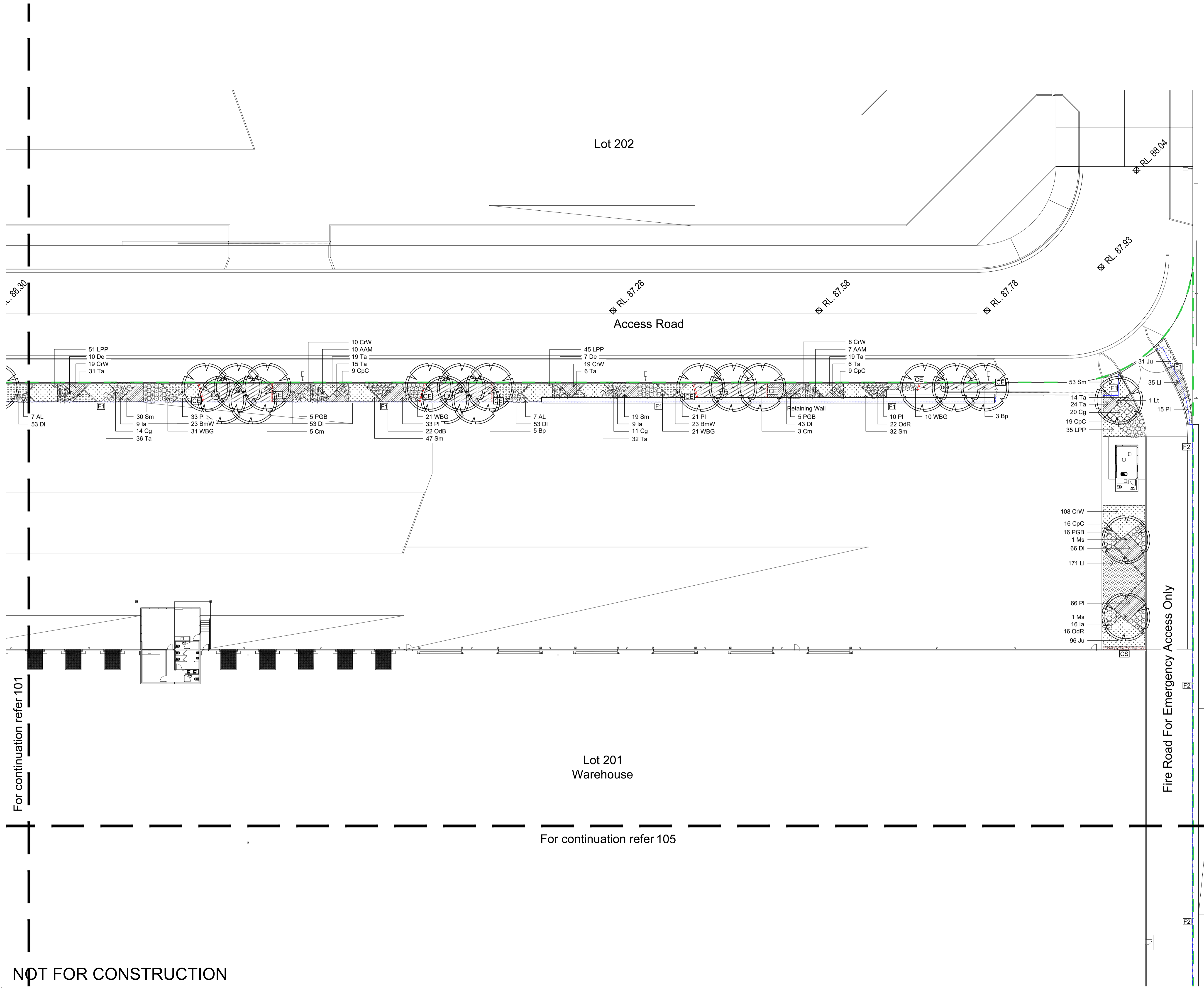
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Drawing Name:
Landscape Plan

Scale: 1:250 @ A1
Job Number: SS20-4538
Drawing Number: SI-LA-201-102
Issue: 02



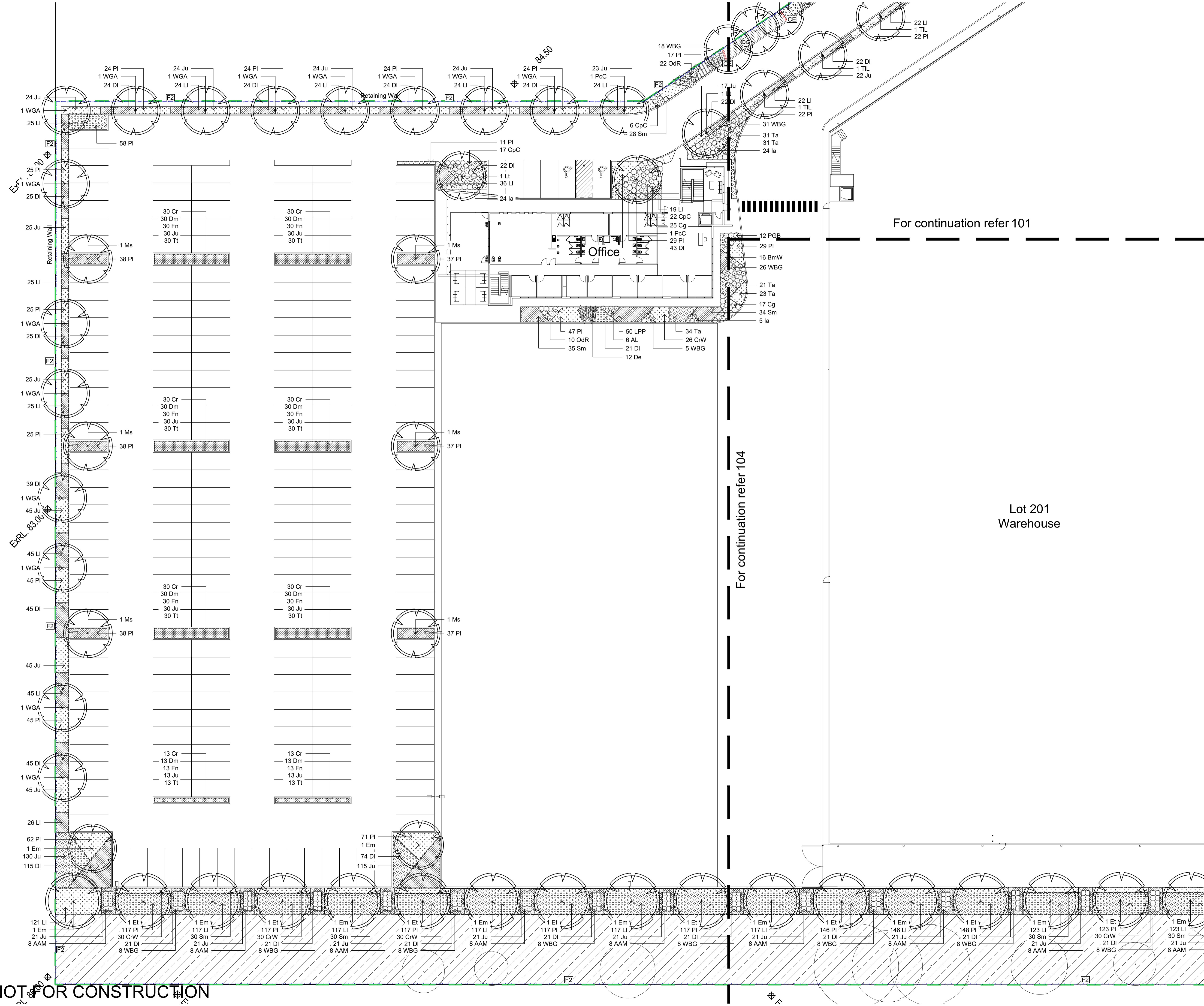
For continuation refer 101

Lot 201
Warehouse

For continuation refer 105

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For continuation refer 101

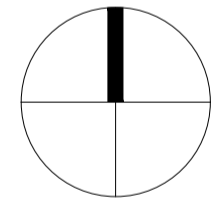
For continuation refer 104

Lot 201 Warehouse

02	Revised For Comments	JW	NM	27.05.21
01	For Comment	JW	NM	28.04.21
Issue	Revision Description	Drawn	Check	Date

- LEGEND**
- Property Boundary
 - Proposed Trees
 - Proposed Shrubs and Accents
 - Proposed Grasses and Groundcovers
 - Bioretention Planting Matrix
 - Concrete Edge
 - Decomposed Granite Paving
 - Landscape Buffer Managed by Others
 - Concrete Strip
 - Fence Type 1: Metal Picket Fence
 - Fence Type 2: Chain Wire Fence

Key Plan:



Client:
ESR

Project:
Lot 201, Horsley Park NSW 2175

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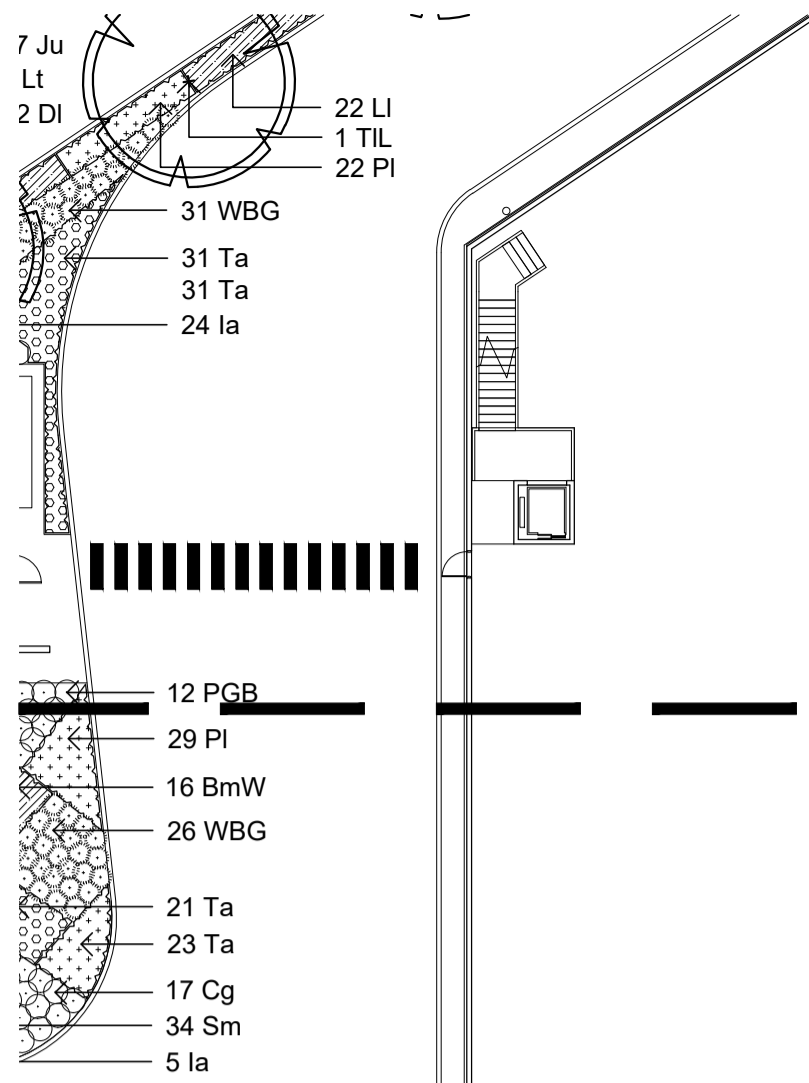


CONSTRUCTION CERTIFICATE

Drawing Name:
Landscape Plan

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Job Number: **SS20-4538**
Drawing Number: **SI-LA-201-103**
Issue: **02**

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For continuation refer 101

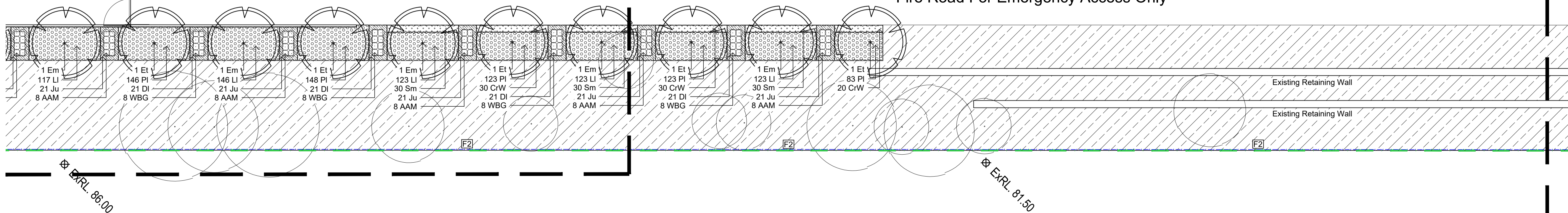
Lot 201
Warehouse

Lot 201
Warehouse

For continuation refer 103

For continuation refer 105

Fire Road For Emergency Access Only



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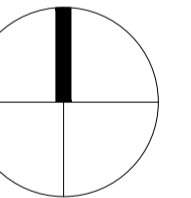
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Issue	Revision Description	Drawn	Check	Date
02	Revised For Comments	JW	NM	27.05.21
01	For Comment	JW	NM	28.04.21

LEGEND

	Property Boundary
	Proposed Trees
	Proposed Shrubs and Accents
	Proposed Grasses and Groundcovers
	Bioretention Planting Matrix
	Concrete Edge
	Decomposed Granite Paving
	Landscape Buffer Managed by Others
	Concrete Strip
	Fence Type 1: Metal Picket Fence
	Fence Type 2: Chain Wire Fence

Key Plan:



Client:

ESR

Project:

Lot 201, Horsley Park NSW 2175

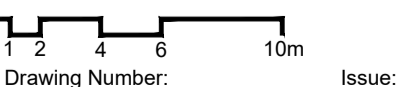
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Drawing Name:

Landscape Plan

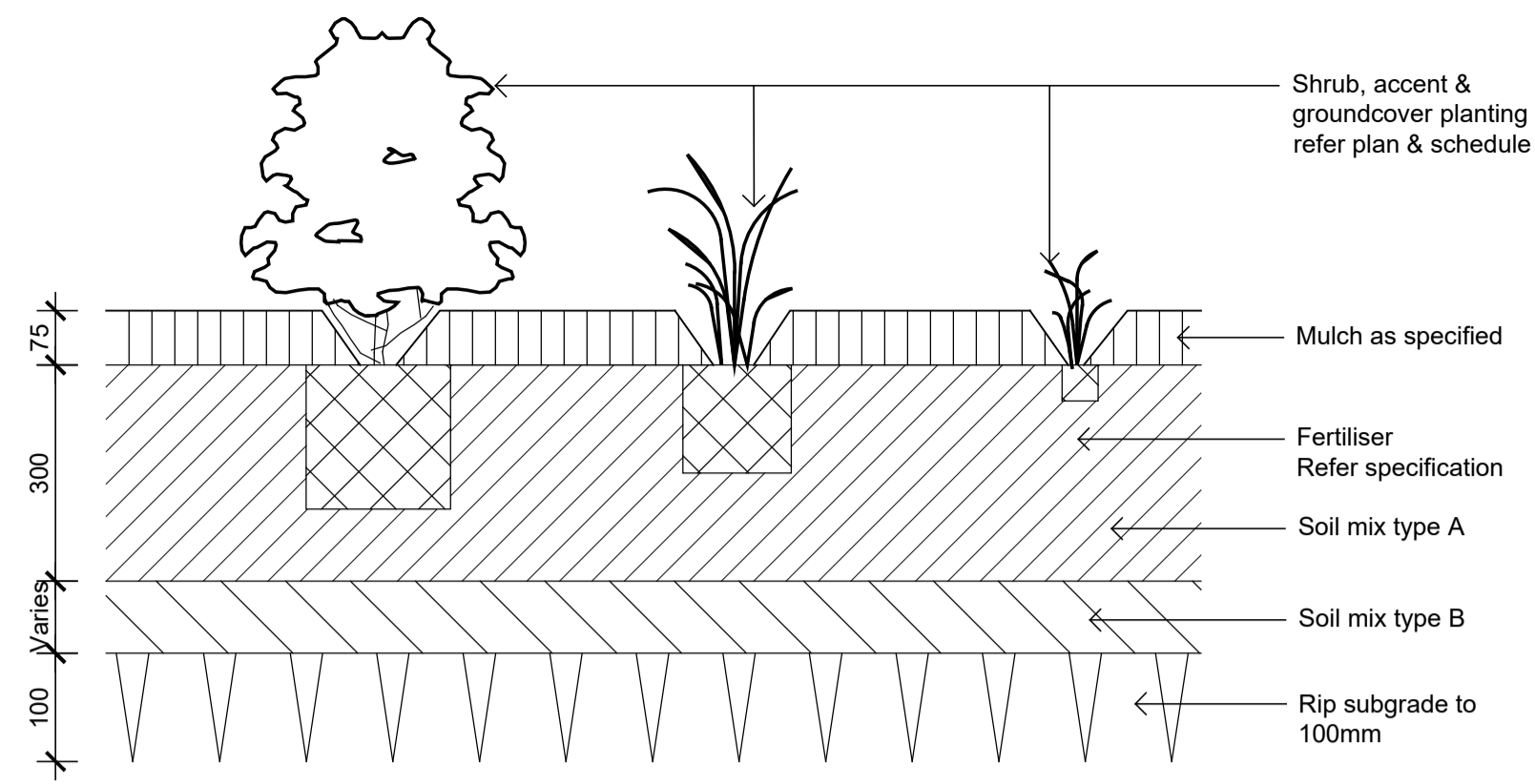
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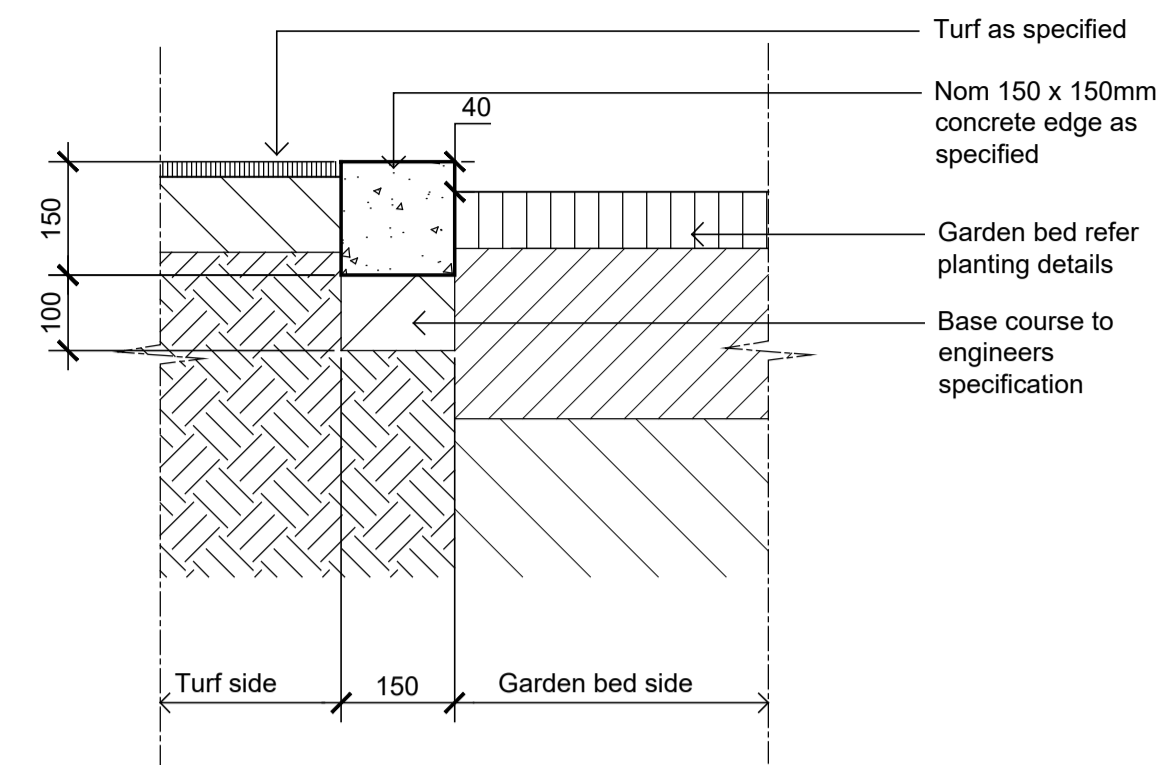
Job Number: Drawing Number: Issue:

SS20-4538 SI-LA-201-104 02

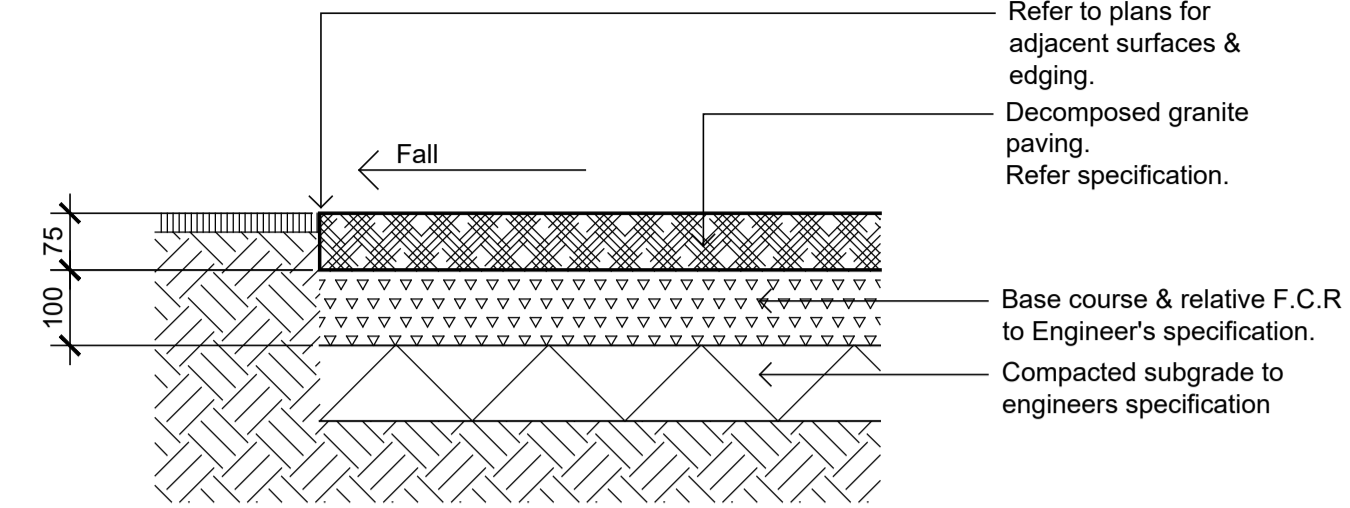
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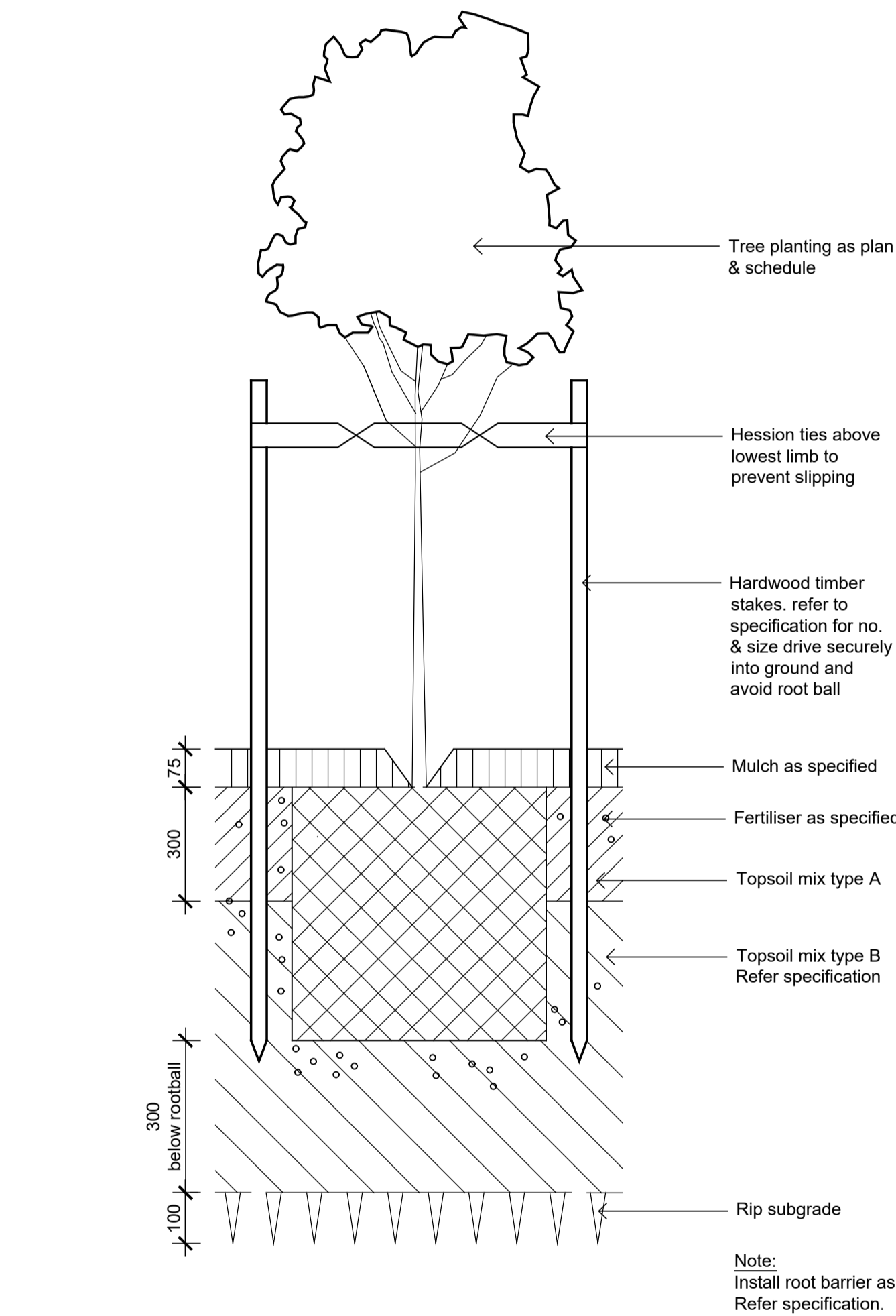
01 Shrub & Groundcover Planting on Grade
1:10



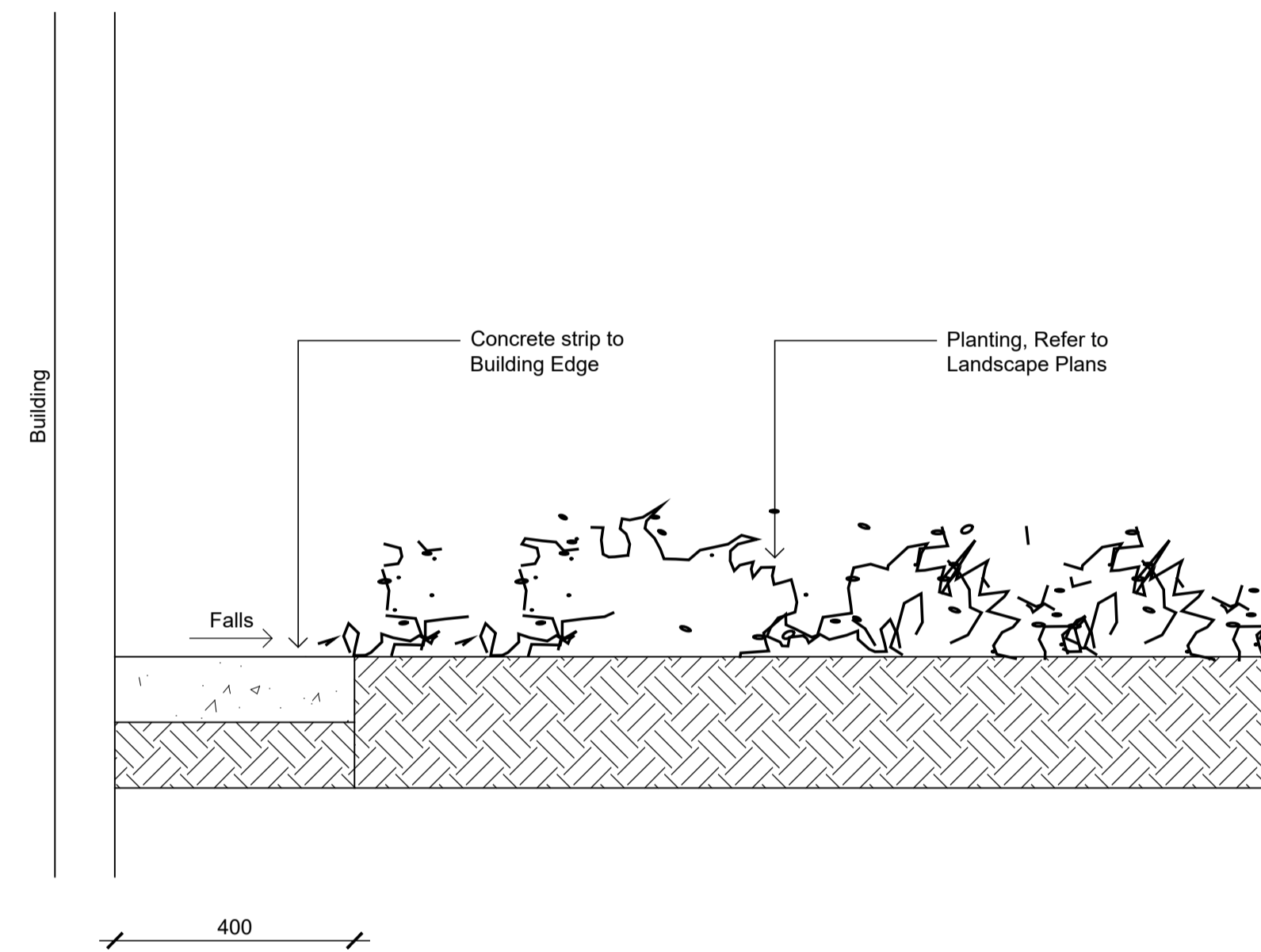
03 CE - Typical Concrete Edge
1:10



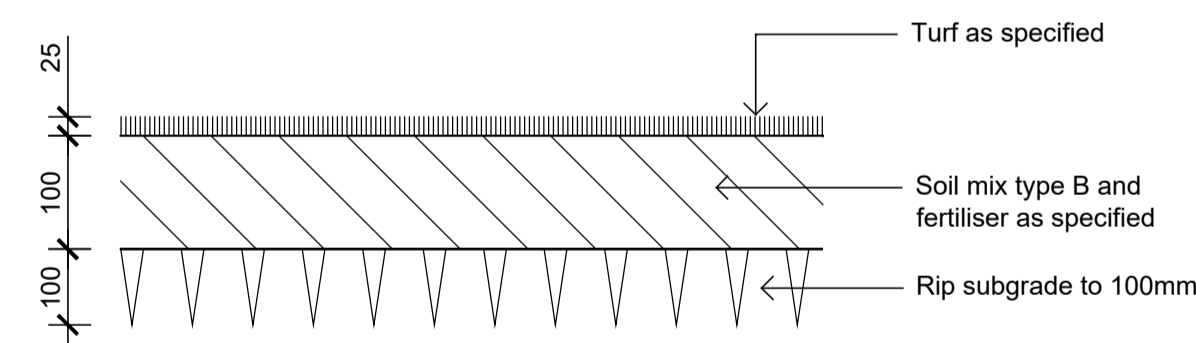
04 DG - Decomposed Granite Paving on Grade
1:10



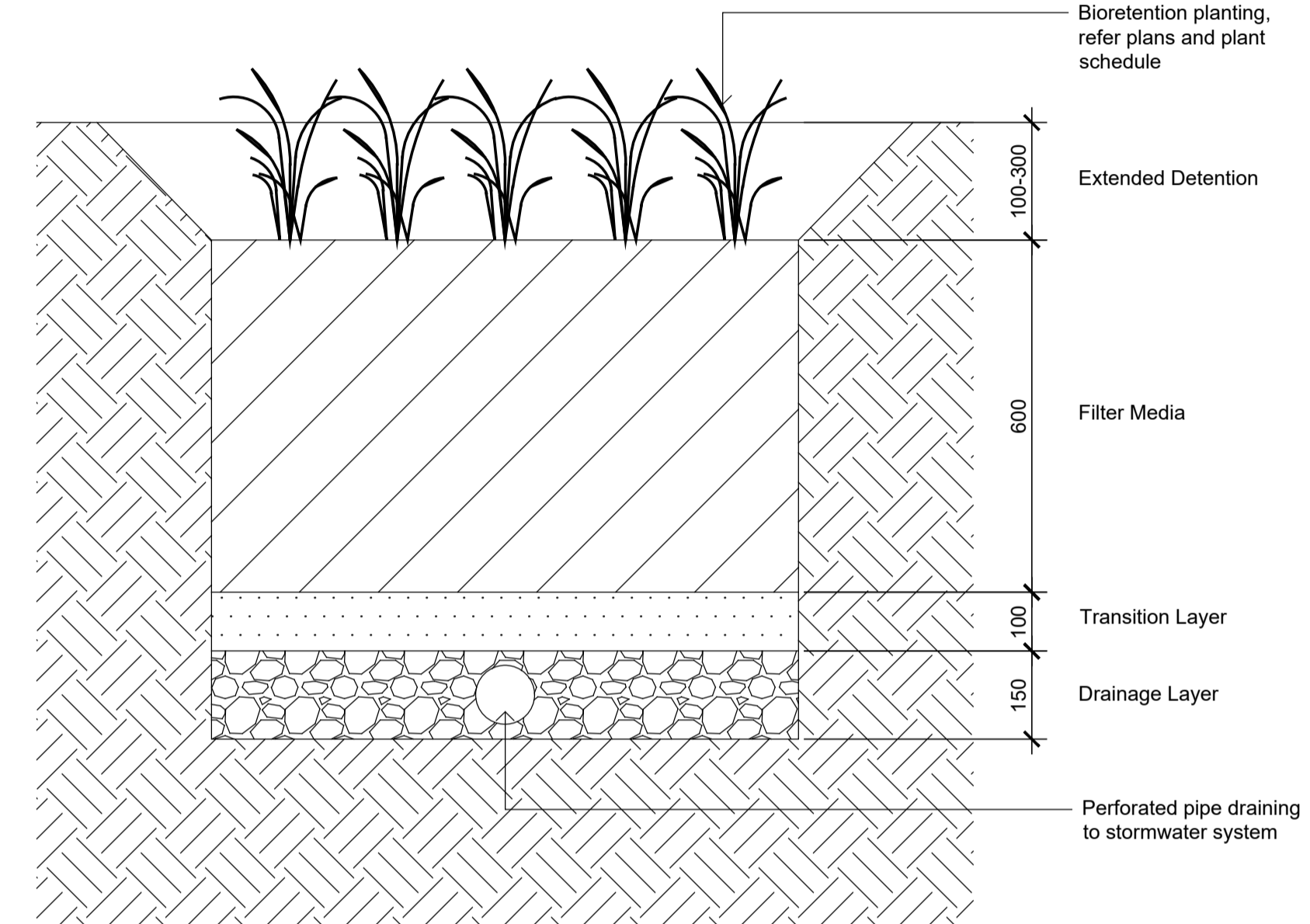
02 Detail 75-200L Tree Planting on Grade
1:10



05 CS - Detail Concrete Strip to Building Edge
1:10



06 Detail Turf on Even Grade
1:10



07 Typical Bioretention Planting
1:10

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The contractor shall check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Revision Description	Drawn	Check	Date
02	Revised For Comments	JW	NM	27.05.21
01	For Comment	JW	NM	28.04.21

Client:
ESR

Project:
Lot 201, Horsley Park NSW 2175

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CONSTRUCTION CERTIFICATE

Drawing Name:
Landscape Details

Scale: As Shown
Job Number: SS20-4538
Drawing Number: SI-LA-201-501
Issue: 02

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Council Response

E. Landscaping

The landscape details shown on the plan reference a landscape specification document, which has not been submitted with these plans and thus has been unable to be assessed as part of these comments. **Landscape Specifications have now been provided, refer SI-LA-201-LS01-01.**

The proposed decomposed granite surfacing to be used would be a cement stabilized deco granite to ensure longevity into the future. **Cement stabilized decomposed granite has been specified in the landscape specification, refer SI-LA-201-LS01-01.**

The landscape plan needs to ensure compliance with the 4 metre wide area of southern landscape buffer within Lot 201 as shown in Figure 6 of the SSD 10436 Consent. **The 4m wide buffer zone has been provided as per Figure 6, refer SI-LA-201-103 and SI-LA-201-104.**

G. Species Planting

Regarding the landscape concept plan, Natural resources have the following comments regarding the species list:

<i>Fraxinus oxycarpa</i>	Weed tendency and can spread
<i>Gleditsia tricanthos</i>	If not maintained this will develop massive thorns and become a health risk. Also has the potential to become a bad weed.
<i>Lagerstroemia indica x fauriei</i>	https://weeds.dpi.nsw.gov.au/Weeds/HoneyLocust
<i>Syncarpia glomulifera</i>	Not locally native and can spread
<i>Rhapheolepis indica</i>	https://weeds.dpi.nsw.gov.au/Weeds/IndianHawthorn
<i>Anigozanthos 'Bush Bush Pearl Pink'</i>	Potentially won't survive due to heavy clay soils
<i>Dianella caerulea 'Breeze'</i>	Will cross pollinate with native species and destroy the genetic integrity of the native species
<i>Lomandra Sp.</i>	Will cross pollinate with native species and destroy the genetic integrity of the native species
<i>Pennisetum alopecuroides</i>	Prefer to avoid <i>Pennisetum</i> species. see https://weeds.dpi.nsw.gov.au/Weeds/FountainGrass

See below for replacement schedule. All species mentioned in the above comment have been replaced with non-weed species as per NSW WeedWise.

Symbol	Botanic Name	Common Name	Size (m)
REPLACEMENTS 201			
FoR	<i>Fraxinus oxycarpa</i> 'Raywoodii'	Claret Ash	15 x 7m
Cm	<i>Corymbia maculata</i>	Spotted Gum	30 x 8m
GIS	<i>Gleditsia tricanthos</i> 'Sunburst'	Golden Honey Locust	9 x 5m
Lt	<i>Liriodendron tulipifera</i>	Tulip Tree	13 x 8m
LIS	<i>Lagerstroemia indica x fauriei</i> 'Sioux'	Hot Musk Pink Crepe My	5 x 4m
Ms	<i>Melaleuca styphelioides</i>	Prickly Paperbark	10 x 6m
Sg	<i>Syncarpia glomulifera</i>	Turpentine Tree	16 x 8m
Ms	<i>Melaleuca styphelioides</i>	Prickly Paperbark	10 x 6m
RIC	<i>Rhapheolepis indica</i> 'Cosmic Pink'	Indian Hawthorn	0.5m
Ia	<i>Indigofera australis</i>	Australian Indigo	1.5 x 1.5m
ABD	<i>Anigozanthos 'Bush Diamond'</i>	Kangaroo Paw	0.6m
ABP	<i>Anigozanthos 'Bush Pearl Pink'</i>	Kangaroo Paw	0.6m
Ta	<i>Themeda australis</i>	Kangaroo Grass	1 x 0.3m
DcB	<i>Dianella caerulea 'Breeze'</i>	Native Flax	0.5m
DI	<i>Dianella longifolia</i>	Pale Flax-lily	1.2 x 0.7m
LIT	<i>Lomandra longifolia 'Tanika'</i>	Mat-Rush	0.5m
Ju	<i>Juncus usitatus</i>	Common Rush	0.6 x 0.5m
Pa	<i>Pennisetum alopecuroides</i>	Swamp Fountain Grass	1m
LI	<i>Lomandra longifolia</i>	Mat Rush	0.75 x 1m

Design Statement

This Landscape Design has been prepared by Nick Metcalf BLArch, AILA 001695, Jane Dumbleton BLArch AILA 001916 and James Willmott BLArch. The landscape design has been prepared in accordance with Western Sydney Employment Area - Fairfield Development Control Plan 2016. Lot 1 DP 106143 327-335 Burley Road, Horsley Park.

The 14m southern landscape buffer as described in the DCP 4.2.2.4. A 4m strip of the south western corner of the site has trees, shrubs and massed grassed and groundcovers proposed, the balance of the landscape within this area has been documented by others.

Tree species *Eucalyptus moluccana*, *Eucalyptus tereticornis* documented within the landscape buffer area which not adjacent with the bund are over minimum 7m in height.

The sites landscaped frontages consist of regular groups of trees with an understory of massed shrubs grasses and groundcovers. Key planting areas are located at driveways and pedestrian access points.

Planting is proposed to flank circulation pathways which will help provide shade on hardstand areas. A covered outdoor area has been provided adjoining the office for staff amenity.

All proposed trees have been specified at a pot size of 100L or 1m height at the time of planting.

Car park planting has been provided within and surrounding the car parking areas. This planting will reduce the visual impact of the car parking through screening as well as provide shade and reduced heat and glare from the paved surfaces.

This planting is also to be provided with automatic irrigation as per the landscape specification, refer SI-LA-201-LS01.

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01	Council Response	JW	NM	10.06.2021
Issue	Revision Description	Drawn	Check	Date

Client:

ESR

Project:

Lot 201, Horsley Park NSW 2175

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Landscape Architects

CONSTRUCTION CERTIFICATE

Drawing Name:

Council Response

Scale:

Job Number:

Drawing Number:

Issue:

SS20-4538

SI-LA-201-901 01

NOT FOR CONSTRUCTION



Lot 201, Horsley Logistics Park Horsley Park, NSW 2175

LANDSCAPE SPECIFICATION

Prepared by	Site Image NSW Pty Ltd
Prepared for	ESR
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1.0 GENERAL NOTES

1.1 Contacts and Definitions

Project contacts are listed below. Terms used in this Landscape Specification shall have the meanings assigned to them in the referenced standards and as defined below.

CONSULTANT	ORGANISATION	TELEPHONE	EMAIL
Architect	HL Architects Pty Ltd	02 9166 9942	admin@hlarchitects.com.au
Landscape Architect	Site Image NSW Pty Ltd	02 8332 5600	mail@siteimage.com.au

DEFINITIONS	MEANING
Approved	Shall mean as approved in writing by the Project Manager
Equal to	Shall mean equivalent in performance, quality and price to that specified and shall be approved in writing by the Project Manager. Substitutions shall be submitted in writing to the Project Manager
TBA	To Be Approved
TBS	To be Specified or Selected
TBC	To Be Confirmed

1.2 Cross References

Where applicable, this Specification shall be read in conjunction with the General Conditions of Contract included in the general building works specification.

The various sections of this specification describe the works depicted on the landscape drawings.

The landscape Contractor shall have read the whole specification and understood that the complete works are described by all the documents. Where conflict occurs the Landscape Contractor shall seek clarification before progressing the works.

The contacts list in Section 1.1 above includes all the consultant disciplines involved in the project who have some degree of involvement in the outcome of the installed landscape works.

The Landscape Contractor shall have obtained information from all consultants in the way of written instructions and advice, specifications and drawings that impact on the landscape works.

The Landscape Contractor shall have coordinated their works with those trades associated with each discipline to ensure the timely installation of the landscape design in accordance with the Builder's construction program.

The landscape drawings include cross references on plans, sections and elevations to details on other landscape drawings.

Where no cross reference is evident and the available information is considered insufficient to proceed, the Landscape Contractor shall seek advice from the Landscape Architect in a timely manner to ensure that there is no delay to the contract caused by the absence of information.

1.3 Interpretation of Drawings

The Landscape Contractor shall check all relevant dimensions on site before proceeding with the work. Under no circumstances shall dimensions be scaled from the drawings.

No claim for extras arising from failure to obtain measurements and other information on site will be allowed.

The origin of levels is generally to the Australian Height Datum (AHD) or as otherwise shown on the drawings.

1.4 Workmanship and Materials

The whole of the landscape works shall be carried out by a competent Landscape Contractor who is experienced in horticultural practices, landscape construction and planting techniques.

The Landscape Contractor shall hold a current Building Contractors License and / or be a financial member of the Master Landscapers Association in the state in which the project is located.

All work shall be faithfully carried out in the most tradesperson-like manner in accordance with applicable trade and Australian Standards, and best horticultural industry practice.

All materials shall be new and of the best quality and shall be approved for use before installation.

1.5 Quality Assurance

The Landscape Contractor is to implement and maintain a quality assurance system aligned with Australian Standard AS/NZS ISO 9001:2008 Quality Management Systems – Requirements (including Amend.1). The Landscape Contractor's quality management system shall include as a minimum the following elements including:

- Quality manual;
- Technical procedures;
- Sample forms; and
- Check lists.

The Landscape Contractor shall have in place a system of maintaining records related to material being used on the project. Supply copies of information upon request. The information record system shall include the following information.

- Descriptions of the materials supplied;
- The source of landscape materials;
- MSDS for all materials that are likely to be requested due to the nature of the material.
- Methods of installation and placement of materials and products; and
- Certification of compliance of materials to relevant Australian Standards and other authority requirements.

1.6 Standards

Wherever reference is made to Australian and International Standards and Codes, and any amendments current at the date of commencement of the works shall apply to the relevant materials, products and installation methods they shall be deemed to be incorporated into this Specification.

The Landscape Contractor, if requested, shall furnish a certificate from the manufacturer/supplier that the materials or products delivered to the project meet the requirements of the relevant standards.

However, such certification shall not relieve the Landscape Contractor of the responsibility to comply with added requirements of this specification.

All materials, installations and workmanship shall comply with the Building Code of Australia and relevant authority requirements.

1.7 Site Conditions

The Landscape Contractor and his sub-contractors shall visit the site and compare the contract documents with the area of the works before tendering to ascertain for themselves the actual extent and nature of the work to be done and the nature of the ground into which the designed landscape is to be installed.

No claim related to this matter will be accepted if the Landscape Contractor or his sub-contractors failure to do so. It is the responsibility of the Landscape Contractor to check all aspects of the required work and report any discrepancy to the Project Manager for direction before proceeding with the works or any part of the works.

1.8 Access to Premises and Secure Storage

The Landscape Contractor is required to make arrangements with the Project Manager (or representative) for access to the site (including material handling) to carry out the installation of the landscape works.

Attendance at a safety induction meeting for all landscape contractor staff is mandatory.

Working hours shall comply with the local authority requirements and the conditions of development consent which are available from the site office.

Where possible, install materials directly in place. Do not store materials and tools on site if they cannot be locked in a secure location.

Do not store plants on site unless a secure maintained nursery space can be established whether one is required or not required by the contract.

The theft of materials and tools shall not be considered a valid monetary claim.

Any secure storage or nursery location on site shall be approved by the Project Manager.

Any costs associated with the establishment of a secure nursery or storage shall be borne by the Landscape Contractor.

1.9 Material Ordering Lead Times

The tenderers shall allow appropriate lead times for the ordering of materials.

Lead times vary from material to material due to their manufacturing process or the place where they are made.

Imported materials and products may have up to 3 months lead time for fabrication and/or transport before they reach site.

Other material such as Australian made precast concrete pavers may have 6 to 8 weeks lead time for manufacturing.

Tenderers shall identify lead times for specified materials and products that may be problematic and not fit into the project programme time frame. Alternative materials and products may have to be selected and orders placed for new selections at an early date and not delay the project or force a rushed decision and lessen the quality of the design outcome.

Also, refer to **4.3 Ordering Plants** where orders for plant stock are required within 14 days of award of contract.

1.10 Reinstatement

Any injury or damage to property, both public and private, including buildings, services, roads, footways, paving, ground levels, retaining walls, fencing, passing and /or parked vehicles, existing vegetation including shrubs and trees and other property, shall be reinstated or made good by the Landscape Contractor at their own cost.

Reinstatement shall match similar adjacent work and the whole of the works left in a condition equal to that at the commencement of works.

1.11 Cleaning site

All areas affected by the landscape works are to be kept clean at all times.

Site cleaning shall include but not be limited to collecting all empty plant containers, plant labels and other rubbish on a daily basis during installation.

Dispose of collected rubbish and waste material appropriately and recycle materials whenever possible.

Do not burn or bury any waste material or rubbish on site.

All empty containers and debris shall be removed from site prior to Practical Completion being certified.

2.0 SITE PREPARATION

2.1 Scope

The works included in this section include:

- Environmental protection;
- Tree removal or protection; and
- Site clearing.

2.2 Quality

Give sufficient notice so that inspection may be made of:

- Trees identified and marked to be removed or retained; and
- Tree protection zone enclosures for retained trees.

Submit samples of materials to be recycled, including:

- Vegetation to be cleared for mulching when approved; and
- Excavated material suitable for fill or processing for site soil if approved.

Submit the methods to be used and equipment required for the minor earthworks, including:

- Dewatering and groundwater control and disposal of surface water;
- Stockpiling of approved excavated material and any remediation required by the approval to reuse;
- Control of site erosion, contamination and sedimentation on site, surrounding areas and drainage systems serving the site; and
- Dust and noise control as required by authority approvals.

2.3 Environmental Protection

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

Temporary erosion control measures to include:

- Staging operations, such as clearing and stripping;
- Progressively restoring disturbed areas;
- Providing temporary drains and catch drains;
- Diverting and dispersing concentrated flows to points where the water can pass through the site without damage;
- Dispersing concentrated runoff with spreader banks or other structures;
- Constructing and maintaining silt traps to prevent discharge of scoured material to downstream areas;
- Installing temporary grassing;
- Installing temporary fencing;
- Inspecting, cleaning and repairing if required temporary erosion and sediment control works after each rain; and
- Removing temporary erosion control measures when they are no longer required.

Maintain dewatering measures on site. Keep groundwork 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.

Coordinate any environmental protection work carried out by the Landscape Contractor with the head contract protection works.

2.4 Trees to be Retained and Protected

Trees to be retained are as shown on the landscape drawings, and are to be protected prior to and during construction activities on the site. Identify and mark trees and shrubs to be retained using a suitable non-injurious, easily visible and removable means of identification.

Protect from damage the trees and shrubs to be retained, including those beyond the site area, both above and below the ground. If a tree becomes damaged during the works or it is proposed to perform work on a tree, give written notice immediately and obtain instructions.

Trees to be retained shall be protected in accordance with the latest edition of AS 4970. Generally, this includes, but is not limited to, the installation of tree protection fencing at the perimeter of the Tree Protection Zone. The fencing shall, as a minimum, consist of 1.8m high temporary chain wire panels supported by steel stakes, fastened together and supported to prevent movement, with a lockable opening for access. The fencing shall be maintained in good condition during the construction works period.

Display a warning sign in a prominent position at each entrance to the site, at 10 metre intervals along the tree protection fencing, and where the tree protection fence changes direction. Each sign shall advise Tree Protection Zone, No Access, and contact details. The signs shall be a minimum size of 600mm x 500mm using lettering in accordance with AS 1319 and AS 4970.

Remove fencing and signs on completion of all construction works only.

2.5 Work within the Tree Protection Zone TPZ

Keep the area of the Tree Protection Zone free from construction activities that may cause damage to the tree, including:

- Modification of soil levels;
- Excavation and trenching;
- Cultivation of the soil;
- Mechanical removal of vegetation;
- Soil disturbance;
- Movement of natural rock;
- Storage of materials, plant, or equipment;
- Erection of site sheds;
- Affixing signage or hoarding to the trees;
- Preparation of building materials;
- Disposal of waste materials and chemicals;
- Movement of pedestrian or vehicular traffic; and
- Temporary or permanent location of services, or the works required for their installation.

If encroachment is required into the tree protection zone, give notice and obtain instructions.

2.6 Existing Services

Dial Before You Dig. Before commencing any earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavation and trenching.

Do not excavate by machine within 1000mm of existing underground services.

2.7 Site Clearing

Where the site has not already been cleared by the Builder for other construction purposes clear only the following works:

- Areas to be occupied by works such as roads, buildings, structures, walls, paving, excavation, regrading and landscaping;
- Other areas designated to be cleared; and
- Extent of area necessary for the performance of the works.

Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable and organic debris, scrub, trees (except trees to be retained), stumps, boulders and rubble. Grub out stumps and roots over 75mm diameter to a minimum depth of 500mm below sub-grade under buildings, embankments or paving, or 300mm below finished surface in unpaved areas. Remove grass to a depth just sufficient to include the root zone. Remove old works, including slabs, foundations, paving, drains and manholes found on the surface.

Identify materials that may be approved for reuse on site. Refer to 2.9 Spoil and Material Approved for Reuse.

2.8 Weed Eradication

Eradicate weeds using environmentally acceptable methods, such as non-residual glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

2.9 Spoil and Materials Approved for Reuse

Remove surplus excavated material and surplus site clearance material from the site.

Seek approval from the Landscape Architect / Project Manager to reuse vegetative material found on site that could be processed as specified below as mulch.

Vegetation approved for reuse on site shall be chipped to a fine consistency no larger than 20–40mm with consistency equal to ANL Forest Blend or ANL Forest Fines or ANL Leaf Litter or ANL Eucy Mulch. Stockpile the chippings on site for re-use as mulch and secure stockpiles so that the material is not transported by wind or water or theft.

Do not bury boulders, concrete fragments and the like on site. Selected and approved excavated boulders may be reused on site as decorative elements where shown on plan.

3.0 HARDSCAPE ELEMENTS

3.1 Scope

The works included in this section shall include the supply of labour and materials to install and/or construct:

- Decomposed granite paving; and
- Edging.

3.2 Inspections

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

- Completed sub-grade, sub-base and base course preparation;
- Set-out of walls and fences;
- Completed trial set-out for all paving types;
- Completed pavements; and
- Set-out of edging.

3.3 Ordering Materials

Place orders for materials on a progressive basis coordinated with the works program in order that materials are delivered:

1. on a timely basis so that they are:
 - not ordered too soon that they stand on site for prolonged periods of time;
 - not ordered too late that their delivery delays the works; and
2. when onsite transport and lifting facilities are scheduled to be available.

Ensure that ordered materials are:

3. delivered, when specified, in sealed containers; and
4. true to specified brand, type, quantity, volume, size and quality.

3.4 Submit and Prepare Samples

Submit samples of the following materials and finishes, showing the full range of texture and colour of the material:

Sample	Details
Concrete blocks	One of each type where the material is a coloured block or has a special finish
Wall capping	One sample of each type, precast concrete, stone, other
Paving types	One sample of each type of hard paver, precast concrete, stone, other
Decomposed granite	One kilogram bag of each specified colour with stabiliser mixed in
Garden edging	One metre length of each type specified, steel, timber, other

Prepare minimum 1000 x 1000mm or 1000mm long sample or reviewable panels or assemblies of each of the specified materials and finishes, inclusive of joint, junction and trim details. Sample panels may become part of the works if considered satisfactory and contiguous with the specified and details works.

Material	Details
Concrete slab	Surface finish, edge and junction details
Masonry wall	Complete with capping where specified
Paving types	Joint pattern, edge and junction details
Decomposed granite	Edge restraint
Fences	Posts, rails, panels and junctions of each type specified
Balustrades	Posts, rails, panels and junctions of each type specified

Substitute Materials

Substitute materials must be submitted with written verification from the manufacturer/supplier that they comply with the requirements of this specification and achieve the expected design outcome. All substitute materials must be approved by the Landscape Architect prior to procurement and installation.

3.5 Planter Walls and Fences, Preparation and Set-out

Refer to section 2.0 Site Preparation for earth works related to planter wall and fence construction including the clearing of vegetation within 1 metre of the wall alignment. Grub out stumps and roots of removed trees and shrubs and trim the grass to ground level, but do not remove topsoil or disturb trees and shrubs designated for retention.

Verify that other trades have vacated the works area prior to set out so that set out markers are not disturbed.

Set-out the alignment and mark the position of planter walls, fences and fence posts as shown on the drawings.

Report any anomalies in the design set out that require review prior to commencing work to construct the walls.

3.6 Materials and Components

Supply labour and materials to complete the specified works. Materials and components shall incorporate the following details for all paving on ground, structure and on steps and furniture as appropriate.

Subgrade	Details
Parent Material	Remove topsoil containing grass roots, stones and the like
Action	Fill and compact as necessary to similar stiffness throughout
Moisture Level	Loosen to 200mm depth and adjust moisture content before compaction
Fill Material	Clean sand, gravel or quarried material free of organic, manufactured or deleterious material
Density	98% minimum dry density in accord with AS1289.5.2.1
Depth Tolerance	-5mm
Level Tolerance	-25mm

Base-course	Details
Material	Well graded crushed rock or gravel, free of organic, manufactured or deleterious material
Particle size	Uniformly graded particle size 25mm maximum
Clay content	6% by mass maximum
Density	98% minimum dry density in accord with AS1289.5.2.1
Depth tolerance	-5mm
Level tolerance	-0,+25mm except at existing structures where -0, +10mm shall be achieved

Bedding Sand	Details
Material	Coarse, well-graded, washed sand, free of organic, manufactured and deleterious material, soluble salts and other contaminants liable to cause efflorescence or reduce slip resistance
Grading	4.75mm maximum particle size and not more than 30% passing 0.3mm sieve

Stabilised Bedding	Details
Sand material	Coarse, well-graded, washed sand, free of organic, manufactured and deleterious material, soluble salts and other contaminants liable to cause efflorescence or reduce slip resistance
Grading	4.75mm maximum particle size and not more than 30% passing 0.3mm sieve
Cement	Type GP to AS3972

Insitu Concrete	Details
Standards	AS 1379 and AS 3600 Avoid: <ul style="list-style-type: none"> • adding excessive volumes of water to the mix. • using high salt content sands
Admixtures	Include an admixture to concrete which inhibits the movement of water containing calcium hydroxide to the surface of the pavement.
References	Details to be read in conjunction with engineer's specification and details
Thickness	To engineer's detail, but generally: 100mm for light traffic, and 150mm for medium traffic
Reinforcing	To engineer's detail, but generally: <ul style="list-style-type: none"> • F62 mesh with 30mm minimum cover for pedestrian areas • F82 mesh placed centrally for vehicular areas
Aggregate	Standard: 10mm graded basalt Washed: 70% 10mm basalt, 30% 10mm Cowra Quartz
Joints	To engineer's detail, but generally: <ul style="list-style-type: none"> • expansion joints at maximum 6m centres • junctions with fixed structures and other paving finishes • control joints at maximum 2m centres
Margins	50mm wide steel tooled for exposed pavement slabs.
Washed finish	Steel trowelled smooth surface, washed after final set with clean water and brushed to remove the surface film of mortar until the aggregate is uniformly exposed without undercutting of the matrix. Avoid using excessive volumes of water.
Oxide finish	Oxides shall be integrated into the concrete mix at the mixing plant by weight in accordance with manufacturer's recommendations. Oxide is to be mixed thoroughly and uniformly to prevent discolouration and patching. Finish the concrete with wood float or broom as scheduled
Broom finish	Wood float and broom using a moistened nylon broom 500mm wide moved across the concrete to give an even textured parallel pattern slip-resistant surface
Wood float or cove finish	Wood float moved across the concrete in a circular or figure '8' motion, always in the same direction to produce a textured slip-resistant surface pattern
Finished surface tolerance	Uniform in appearance, with a texture depth of 2 – 2.5mm free from depressions in which water can lie

Asphaltic Concrete	Details
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Standard	AS 2734
Mixes	AC10: 10mm nominal maximum aggregate size, AC3: 3mm nominal aggregate size
Bitumen binder class	170, except 320 for areas with high ambient temperature
Compaction	While above 140°C
Site density	95% of the 50 blow Marshall density of the laboratory compacted mix (minimum)
Level tolerance	±10mm

Precast concrete	Details
Standard	AS/NZS 4455
Admixtures	Pavers shall contain an admixture to inhibit the movement of water containing calcium hydroxide to the surface of the pavers.
Dimensional category	DPA1 and DPB1
Thickness	40mm minimum
Abrasion index	1.2 minimum
Salt resistance	Exposure
Unconfined CS	Unconfined compression strength: 12 MPa
Breaking load	2 kN
Surface deviation	10mm under a 3m straight edge laid in any direction on the finished surface 2mm across junctions between adjacent pavement surfaces

Jointing sand	Details
Sand material	Proprietary, clean, fine, washed and screened bedding sand products which include modified polymer additives to strength joints and reduce weed growth.

Drainage and sealing	Details
Under all pavers on slab	Ensure that drainage under paving beds incorporates a puddle flange outlet cast into the slab.
Paver joints	Allow to only fill paver joints to 20-25mm below the top surface of paving.
Sealing	Allow to pre-seal all pavers unless advised otherwise. Pre-seal pavers all round before laying. Reseal cut and drilled paver surfaces before laying. Typically, these pavers include natural stone, precast concrete and clay unit paving where specified.

Paver pedestals	Details
Reference	Pedestal Supported Paving section of this specification

3.7 Sub-grade Preparation

Determine the depth required to achieve the design levels of finished surfaces. Trim and remove topsoil containing grass and plant roots, rocks and stones.

Where levels have been reduced below required depths fill and compact as necessary as specified above in 3.9 Paving Materials and Components.

Ensure soft spots are removed so that the sub-grade strength and stiffness is similar throughout, including service trenches. Where there is an inconsistency in the sub-grade moisture content, loosen the sub-grade to a depth of 200mm and adjust the moisture content before compaction. Do not sterilise the sub-grade.

3.8 Base-course Installation

Spread the base-course material over the sub-grade to correct loose thickness of 100mm by approved mechanical means. Do not transport new material over uncompacted material unless prior approval is given. Compact the base-course material by approved mechanical means. Bring the base-course materials to the optimum moisture content prior to and during placement.

Do not add water during compaction except for light sprinkling if necessary to replace evaporation loss.

Bring the compacted base-course to the required levels within a tolerance from the level indicated on plans. Any required contours of the pavement will be achieved by shaping the base-course. During compaction all soft or yielding, and other unsuitable material shall be removed and replaced with approved material. Grade the base course to provide 1-2% cross fall to all paved surfaces to drain toward garden beds and away from buildings.

3.9 Separation of Different Paving

Where movement between different paving types can be anticipated or is indicated on plan or evident in the work that precedes landscape paving, supply and install separation strips as necessary to control cracking and trip hazards in the finished surface or where the design includes a feature strip for aesthetic reasons.

Refer to engineers details to determine where movement joints are required or refer to hardscape plans for locations.

3.10 Paving Separation Strip Installation

Paving separation strips may consist of metal, timber or other compressible or expanding material depending on the detail. Refer to the Material Schedule for selection.

Install any separation strips for the full length of junctions between different pavement finishes or materials, with the top edge to be set flush with the proposed finished pavement levels.

Fix strips in place so that they cannot be dislodged during the work of subsequent trades.

Unless otherwise stated, separation strips shall be installed by the trade installing the finished paving material.

3.11 Decomposed Granite Paving

Decomposed granite shall be of uniform colour and low plasticity. Particle size shall be graded up to 10mm maximum with between 30-40% less than 5mm.

Lay paving compacted to a thickness of not less than 75mm. Mix gravel thoroughly in the proportion of 10 parts gravel to 1 part lime. The mix shall be damp but not wet when placed. Compact with vibrating roller generally and in accessible areas by other approved mechanical means. Produce an even surface and finish flush with the adjoining surfaces and edges. Ensure that the granite does not come in contact with trunk/stem of plantings.

Supply and install decomposed granite paving as follows:

Decomposed Granite DG	Details
Location	To paths and other open areas as shown on plans
Manufacturer / Product	Australian Native Landscapes, Deco Granite
Material / Finish	Cement stabilised decomposed granite, compacted, consistent, regular granular surface
Colour	Brown
Thickness	75
Base-course	100 depth fine crushed rock or as detailed by the engineer
Edge detail	Timber, steel, paver as detailed flush with top of granite and adjoining surface

3.12 Graffiti Protection Coatings

There are three types of graffiti protection that may be required depending on the surface type to be protected. These coatings are:

1. Sacrificial;
2. Semi sacrificial; and
3. Permanent.

Some coatings are factory applied while others are applied on site. The selection of the most appropriate coating system will depend on the location, finish and expected longevity of the coating.

Supply and install anti-graffiti coatings to all walls, fences, timber decking, balustrades, handrails, and furniture in accordance with manufacturer's recommendations. Manufacturers' of suitable products include but are not limited to:

- Dulux;
- Easy-on;
- Murobond; and
- Taubmans.

Furniture suppliers/makers may specify protective products made by other anti-graffiti coating manufacturers and these will be acceptable. Where other products are preferred by the contractor, these may be approved after submitting product information to the Project Manager, for approval and acceptance to proceed.

3.13 Paving Sealer

Supply and apply a water based penetrating sealer on all pavers and, where noted on the drawings, other stone and masonry surfaces where the potential for staining is apparent. The sealer shall be selected as the most appropriate for the type of stone to be laid and its location related to the types of staining that are likely to occur. Where pre-sealed pavers are cut, re-seal the cut edges prior to laying. Apply the selected sealer in accordance with manufacturer's recommendations.

Pavers shall be pre-sealed all round in the factory prior to delivery to site. Where pavers are cut on site reseal cut edges with the same sealer used to pre-seal the pavers.

Product and method statement: The Contractor shall submit a preferred product and method of application for review prior to delivery of the stone material to site.

Cleaning: Thoroughly clean the surfaces to be sealed prior to application of the sealer.

Preferred sealer: Equal to Aqua Mix or similar water based penetrating sealers.

Aqua Mix Australia

30/16 Bernera Road, Prestons, NSW, 2170, Australia

1300 AQUA MIX (1300278264)

02 9620 5189

Sample: The Contractor shall supply a sample paver with the preferred sealer applied for review prior to commencing the general application of the sealer to ensure that the sealer and the method of application is satisfactory.

3.14 General Painting

Where shown on the drawings or required for base material protection from weathering and abrasion supply all materials and labour to paint timber, metal and other paintable materials to prolong their predicted life and intended appearance.

Paint Surface	Paint System
Timber rough sawn	Cabots Timber colour opaque colour water based paint or equal
Timber DAR	Cabots Timber colour opaque colour water based paint or equal
Steel	White Knight, Rust Guard, 1 coat Metal Primer, 2 coats Epoxy Enamel or equal
Galvanised steel	White Knight, Rust Guard, 1 coat Metal Primer, 2 coats Epoxy Enamel or equal
Colours	TBS
Products	Equal to DULUX, Cabots, White Knight, Taubmans

3.15 Edging

Edging shall be used as a separation between gardens (including tree planting) and lawns.

Supply and install edging as follows:

Concrete Edge CE	Details
Location	As shown on the drawings
Installation	Laid insitu by supplier
Type	150mm x 150mm 'Square' profile 'Kwik Kerb'
Colour	Charcoal
Base Course	150mm compacted roadbase

3.16 Completion of Hardscape Trade Work

Upon the completion of any hardscape trade work described by this specification leave the completed areas clear of off-cuts, waste material, rubbish, litter and the like, and clean on completion, ready for the next trade to commence work.

4.0 SOFTSCAPE ELEMENTS

4.1 Scope

The works included in this section shall include the supply of labour and materials to install, prepare and/or implement:

- Site preparation;
- Soil works;
- Soil preparation for planting;
- Plant installation;
- Mulch; and
- Turf.

4.2 Inspections

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

- Set-out;
- Sub-grades cultivated or prepared for placing topsoil;
- Topsoil spread before planting or turfing;
- Plant holes excavated and prepared for planting;
- Plant material set-out before planting;
- Planting, staking and tying completed; and
- Turf completed.

4.3 Ordering Plants

Place orders for all plants with approved nurseries and provide evidence of order within fourteen (14) days of being awarded the contract. All plant material shall be obtained from approved suppliers. Approved suppliers include those registered with Nursery & Garden Industry NSW & ACT.

A warranty shall be provided by the plant supplier declaring that plants:

1. are the correct size for their containers;
2. have not recently been potted-on;
3. are true to the specified species;
4. are free from diseases, pests, weeds and the like; and
5. have the provenance specified where applicable.

4.4 Submit Samples

Submit representative samples of each of the following materials, packed to prevent contamination and labelled to indicate source and content.

Samples	Details
Soil	Mix types, chemical composition, supplier
Mulch	Types, supplier
Plants	One of each type in the plant schedule, suppliers, plant provenance where applicable
Other	Root barrier, stakes and ties and other products as specified where a sample may reasonably and easily be procured

4.5 Site Soil Testing

General

The contractor shall allow in their tender to undertake soil testing as described below. This specification only relates the need for soil testing of site soil that is either to be used as:

1. a secondary growing medium, expected to influence plant root systems in the short term as the “B” horizon by being at shallow depth below an imported “A” horizon; or
2. a primary growing medium, designed to become the “A” horizon soil growing media after amelioration.

All site soils approved for reuse on site shall be tested before amelioration.

If the drawings indicate the site soil is a secondary growing medium only, by having an imported A Horizon soil overlaid, allow to test the subject site soil being used as the B Horizon with Test Type 1.

If the drawings indicate that site soil is to be used as the primary growing medium throughout, by its use as the A Horizon, then allow for Test Type 2 on the site soil being used as the A Horizon.

If site soil is to be used in one location as the secondary growing medium and elsewhere as the primary growing medium then allow for both Soil Tests 1 and 2 as above.

If the project landscape design is wholly upon structure whether it's a built structure or natural impervious structure then no site soil testing is required. In these situations, soils shall be imported. There is no requirement to test imported soil as it should comply with the soil details scheduled and described by this specification.

Aim

The aim shall be to achieve successful, healthy, vigorous plant growth, over an indeterminate extended period of time, of all plants listed in the Plant Schedule.

Test Type 1 - Site Soil Testing at Site

Test Type 1 shall be exercised using a clay dispersal in water test and a simple soil pH test kit.

Where plants are to be installed in natural site soil or in imported soil but that the project design implies that plant root systems will, in the short term, populate the site soil beneath, undertake a simple soil test, for each visibly different soil type on site, to determine:

- approximately how much clay is present and therefore the drainage characteristics of that soil; and
- the pH of the soil to determine its acidity and therefore what needs to be done to reach the preferred pH of the proposed plants.

If the site soil is heavy clay then add calcium sulphate (gypsum) to improve aeration and reduce compaction. If the soil being tested is loamy or sandy do not add gypsum.

If there are extremes of pH range < 5.4 or > 6.8, the contractor shall undertake corrections needed to achieve a standard mid-level pH range to meet the optimum growing conditions of the plants in the plant schedule.

Implement any corrections during the initial ripping of the site soil below gardens and lawns.

If the soil is too acid, raise the pH by the addition of calcium carbonate (agricultural lime) or if the soil is too alkaline lower the pH by the addition of organic matter or sulphate of iron or sulphate of ammonium.

The target pH range is > 5.4 to < 6.8 but the desired pH range may extend up to 7.5 or 8.0 where turf or wet gardens are to be installed.

Test Type 2 - Site Soil Laboratory Testing

Test Type 2 is a full comprehensive laboratory scientific site soil testing process as described in AS 4419 Appendix A.

Obtain at least two (2) soil samples or the number indicated as sample locations shown on the drawings.

Provide results and recommendations to adjust the physical and chemical properties of the site soil to achieve an appropriate planting medium for the selected plants.

Employ the services of a certified testing laboratory to provide complete physical and chemical composition test results and recommendations for amelioration to achieve the aim.

If laboratory soil testing is required, the following is the recommended provider:

Soil Testing Laboratory	
Company	Sydney Environment and Soil Laboratory (SESL)
Address	16 Chilvers Road, Thornleigh NSW 2120
Contact	T. 1300 30 40 80 E. online@sesl.com.au

If site soil testing has been carried out, thoroughly mix in materials required to be incorporated into the tested soil as recommended in the soil testing results and to manufacturer's recommendations.

If no site soil testing has been specified and heavy clay is encountered at tangible depths, add horticultural gypsum to the reduced levels before final cultivation in accordance with the manufacturer's recommendations.

4.6 Subsoil Drainage

Provide and install subsoil drainage equal to Vinidex 65mm \varnothing (min) Draincoil with filter sock at the base of slopes, on the high side of paths, at the base behind retaining walls and where water is likely to accumulate at depth in the soil. Connect

all subsoil drainage to the nearest downstream stormwater pit to ensure that subsoil water is managed and channelled to a stormwater drainage system. On sites with cross fall of less than 1:50 install subsoil drains to remove excess water from the subsoil in areas where water is likely to accumulate and may not penetrate lower strata naturally. Rip the sub-base surface 150mm deep before placing any soil. Install drainage pipes in subsoil trenches backfilled with 10mm blue metal (basalt) equal to ANL Blue Metal.

Coordinate the connection of subsoil drains to stormwater pits with the Civil or Hydraulic contractor.

4.7 Soil Profile as Horizons

For the purpose of this specification the following soil profile convention shall apply. Various areas may consist of differing combinations of horizons depending on the site conditions and required design outcomes. The following table describes the general arrangement of soil profiles as horizons.

Soil Horizons Table	
Horizon	Description
O	Organic or inorganic mulch layer or soil insulation (highest layer)
A	Top soil or upper depth of soil below horizon O for gardens and below turf areas
B	Subsoil or the prepared site subsoil or the soil below horizon A
C	Sub-base being weathered rock, clay, undisturbed existing base site soil or built structure below horizon B
R	Base material, regolith or parent material or rock below horizon C

Excavate the site soil to create the subsoil level to achieve finished design topsoil levels of horizons O and A.

4.8 Mulch – Horizon O

Garden mulch shall be free of deleterious and extraneous matter such as soil, weeds, sticks, rubbish, litter, stones, plastic and the vegetative reproductive parts, including seed, of undesirable plants.

In addition, organic mulch shall conform to AS4454.

All mulch material shall be equal to products supplied by Australian Native Landscapes (ANL) or other approved suppliers or approved processed site material.

Mulch from any other source may be rejected.

Mulch Selection Schedule		
Mulch Type	Description	
O4	Horticultural pine bark	15mm approx. graded pine bark recycled from plantation timber production.

Before placing mulch ensure that soil depths are correct and that the soil surface is even and ready to receive mulch as a consistent layer.

After all plants have been installed, place mulch in all garden beds to a depth of 75mm.

Mulch shall be clear of all plant stems, and raked to an even surface flush with the surrounding finishes and evenly graded between design surface levels.

The specified depth shall be achieved after the mulch has settled. If mulch is mechanically blown onto gardens, as opposed to being placed, it shall precede planting to avoid plant damage.

4.9 Topsoils – Horizon A

Garden topsoil shall conform to AS4454 and be free of deleterious and extraneous matter such as weeds, sticks, rubbish, litter, stones, plastic and the vegetative reproductive parts of undesirable plants.

Where indigenous / endemic plants are included in the plant schedule a soil low in phosphorus shall be used where these plants are located.

In the process of spreading topsoil for turf and mulched areas allow for natural compaction by setting the top of horizon A soil flush with adjoining surfaces such that over the initial establishment period the turf and mulch may settle under their own weight.

All imported soil material shall be equal to products supplied by Australian Native Landscapes (ANL) or other approved or other approved suppliers or approved processed site material.

Soil from any other source will be rejected. Horizon A soil shall consist of soil as scheduled below.

Table A - Horizon A - Topsoil Product Schedule

Soil Type	Description
A6 Garden Soil	A blend of soil, coarse sand, graded ash, coco peat and composted organics

Horizon A6 – Garden Soil

The garden soil is intended for mass planting of grasses, woody and herbaceous perennials in gardens other than on structure. Garden soil shall be used where it will not be subject to compaction under foot traffic shall consist of sandy loam to clay loam topsoil mix. Drainage is an essential requirement of this heavier soil mix. Subsoil drains shall be installed into the lower levels of the soil profile to collect excess subsoil water. This soil is intended to be direct tube and pot specimen planted up to 45 litre and should have the characteristics listed in Table A6 below..

Table A6		Physical components
Sandy loam soil or site won topsoil	70–100% by volume	Example 8 parts washed sand 2 parts sandy loam 1 part AS4454 compost
Composted soil conditioner (conforming to AS4454)	0-30% by volume	
Fertilisers		
Lime and/or dolomite	2 kg/m3 at mixing	Example + Lime and/or dolomite + NPK + Trace elements
Balanced compound NPK turf starter fertiliser	0.5 kg/100m2 after placement	
Minor and trace elements	300 g/m3 at mixing	

4.10 Subsoils – Horizon B

Shape the subsoil to fall to subsoil drains where possible. Do not excavate within the drip line of trees to be retained and near existing services. If necessary cultivate these sensitive areas by hand.

Cultivate the created subsoil surfaces to a further depth of 100mm minimum to encourage infiltration of water.

Remove stones exceeding 25mm, clods of earth that resist breaking, weeds, rubbish or other deleterious material brought to the surface during cultivation.

Supply and install 90mm Ø socked subsoil drains to all garden areas to drain excessive ground water volumes. Connect subsoil drains to the nearest downstream stormwater collection pit or piped stormwater system.

Subsoils or the “B” horizon generally shall conform to the following details.

Horizon B1 – Subsoil

The ‘B1’ horizon subsoil shall be an open granular well-drained growing media with a saturated density of less than 2400 kg/m³ (2.4 kg/L). This soil shall be used below Horizon A or the top 300mm of any deeper planter boxes, containers and garden beds.

Soil for the ‘B’ horizon shall have the properties of a potting media. The physical and fertiliser requirements of this soil type are tabulated in Table B1 below.

Table B1 - Subsoil	Physical components
Sandy loam soil or site won topsoil (if specified)	10–30% by volume
Horticultural ash, perlite, or similar lightweight low density mineral matter or mixtures of these	30 – 50% by volume
Composted 10 mm pine bark	20 – 40% by volume
Composted soil conditioner (conforming to AS4454)	< 20% by volume
Fertilisers	
Lime and/or dolomite	2 kg/m ² 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

Spread the soil over the prepared sub-base and grade evenly to achieve design levels. Compact lightly and uniformly in 150mm layers. Avoid differential subsidence and excess compaction and produce a finished soil surface which is:

- Smooth and free from stones or lumps of soil;
- Graded evenly to drain freely, without ponding, to catchment points; and
- Ready for spreading horizon A.

4.11 Sub-Base – Horizon C

The Sub-Base may consist of weathered rock, clay, undisturbed existing base site soil or built structure which may be ripped.

Trim any undisturbed sub-base, weathered rock or clay as necessary to achieve the depth of soil specified and detailed. Do not disturb built structure. Where horizon C is impervious, other than built structure, rip the surface to 150 mm deep before placing the designed soil profile. If the sub-base, other than built structure, cannot be ripped then refer to **Garden and Turf Drainage** in following clauses. At all times ensure that top surface of trimmed Horizon C is self-draining before overlaying any upper soil horizon.

4.12 Base Material – Horizon R

The Base Material may consist of regolith, parent material or rock which offers solid resistance to excavation.

For the purpose of tendering assume that solid rock will not be encountered on site within the landscape work-zone depth. Provide tender rates for solid rock excavation and proposal for reuse or transport of the material should it be encountered.

4.13 Garden and Turf Drainage on Built Structure and Impervious Natural Ground

For the purposes of this clause “Structure” shall refer equally to built structure and natural ground such as solid rock or other impervious strata.

On built structure supply and install drainage in the form of drainage cell draining water to outlets in the slab floor of the gardens.

On natural structure or impervious ground an alternate drainage system that replaces drainage cell with an aggregate layer and subsoil drain may be approved. Seek approval to change.

If specified that the Landscape Contractor is responsible for water proofing garden walls, inspect the installed waterproof membrane to verify that the specified waterproofing is complete without breaks or inadequacies prior to commencing the installation of planter drainage. Make any repairs prior to proceeding. Protect the membrane from mechanical damage.

Where the membrane is installed by others seek written approval from the Project Manager stating that the waterproofing is complete and that the landscape installation may proceed. Notify the Project Manager of any breaks or inadequacies observed so that any necessary repairs can be made prior to continuing with the landscape work.

Supply and install a polypropylene cellular drainage cell equal to 'Atlantis' drainage cell complete with a continuous geotextile filter fabric liner to all planting areas on structure, in accordance with manufacturer's instructions and details. Drainage cell and filter fabric shall extend across the base of planters on structure and up planter side walls to the underside of the mulch layer.

Geotextile filter fabric is to be installed over all drainage cell material. Allow to tape the fabric over the top of the planter walls to ensure soil mix does not escape into drainage outlets/holes. Trim excess fabric later. Install a minimum 50mm depth of double washed coarse river sand over all horizontal geotextile lining prior to installation of soil mix.

In gardens install a 90mm Ø slotted PVC pipe with geotextile sleeve and matching screw cap in a vertical configuration to provide visual access and flushing capability directly over drainage outlets at the base of soil in planters. Ensure that the pipe runs directly from a level below the mulch down to the drainage cell at the outlet point, with the geo-fabric turned up and secured around the base of the pipe prior to filling the planter with the specified soil profiles and sand layer.

Fit a PVC flange collar to the bottom end of the slotted pipe in a position above the drainage cell to stop the pipe dropping into the waste outlet. Do not block water from entering the outlet in the structure. Back filling the soil over the flange prevents the pipe assembly from being pulled out of the soil.

4.14 Additional Fertiliser

Apart from the fertiliser specified for soil mixes, provide proprietary fertilisers delivered to the site in sealed containers or bags marked to show the name of the manufacturer, weight, fertiliser type, N:P:K ratio, recommended uses and application rates. Additional fertiliser shall be in the form of a slow release granulated or pelletised fertiliser appropriate to the provenance of the plants being native or exotic and related to trees, shrubs and turf. Apply at the rates and periods specified by the manufacturer. Allow for at least 2 applications during the 12 month establishment maintenance period.

4.15 Embankment Stabilisation

As shown on the drawings and where necessary to prevent soil erosion or soil movement, stabilise embankments with erosion control fabric and planting or turf as described in the following table. Refer to drawings for the extent of this work.

Embankment Stabilisation

Gradient	Method of stabilisation
Steeper than 1:2 (50%) 26.6°	To engineer's design and detail
Equal to 1:2 (50%) but steeper than or equal to 1:3 (33%) 18.5°	Jute mesh
Shallower than 1:3 (33%) but steeper than or equal to 1:5 (20%) 11.3°	Jute mesh or turf
Shallower than 1:5 (20%) 11.3°	Turf
Areas of high volume stormwater flow of any gradient	Jute mesh and large rocks according to detail

Stabilise embankments using biodegradable fibre reinforced heavy duty polymer mesh equal to Jutemaster Thick as supplied by Geofabrics. Install the mesh in accordance with manufacturer's specification from top to bottom of slopes and include:

- 300 mm wide x 300 mm deep anchor trenches at top and bottom.
- Backfill trenches with soil after placing and pinning mesh and compact the soil on completion.
- Mesh overlaps shall be minimum 100 mm wide with the free edge running downstream with the anticipated overland flow (not against the flow).
- Install U-shaped galvanised steel pins at 1000 mm centres generally and 300 mm centres at overlaps.
- Plant through cuts in the mesh after the embankment stabilisation mesh has been installed or pre-seed the slope before installing mesh.

Where gradients permit turf to be used to stabilise embankments refer to the Turf clause in this specification.

4.16 Plants

Supply plants which have the following characteristics in accordance with the landscape drawings and schedules:

Plant characteristics	
Root systems	Large healthy root systems, with no evidence of root curl, restriction or damage
Plant health	Vigorous, well established, free from disease and pests, of good form consistent with the species or variety specified
Acclimatisation	Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site, and in shade and full sun conditions
Container	Grown in their final containers for not less than twelve weeks and free from weeds
Leaders	Trees, unless required to be multi-stemmed, shall have a single leading shoot
Plant size	Plants shall be an appropriate size in relation to their container size

All plant specimens are to be true to name and variety listed in the plant schedules on the landscape drawings. Make no substitutions of species type or container size unless approved by the Landscape Architect and Project Manager.

Plants shall not exhibit signs of having been stressed at any stage during their development and delivery due to inadequate watering, excessive shade/sunlight, physical damage or have restricted growth due to nursery conditions.

4.17 Tree Procurement

Procure large specimen trees from specialised supply nurseries having a reputation for best quality control based upon *AS 2303:2015 Tree Stock for Landscape Use*. Seek a verified copy of the supplier's tree inspection forms for the plant stock being supplied and submit them to the project manager prior to delivery. Inspect the trees upon delivery and determine that they have the characteristics that the inspection form indicates they should have. Ensure that the trees being delivered have identity tags that match the inspection form information submitted when the trees arrive on site. Check that the reference information matches the tags and sign the forms accordingly to verify conformity. If any specimen does not match the inspection form information, do not verify conformity. In this event recommend to the project manager that the specimen or specimens are to be rejected and replaced with stock that is conforming.

4.18 Lifting Trees

Larger specimen trees shall be crane lifted when required in order that they are placed correctly and in the shortest possible time from truck to soil. Lift trees by their root ball taking the full load of the tree weight. Only strap the trunk to stabilise the plant when lifting. **DO NOT LIFT THE FULL WEIGHT OF TREES BY THEIR TRUCK.**

4.19 Plant Delivery and Labelling

Plants are to be delivered to site in a covered vehicle to prevent wind damage. Plants are to be placed in the vehicle in a manner that prevents them from moving and sustaining any damage.

Plants damaged on delivery shall be rejected and replaced at the Landscape Contractor's cost. Deliver plant material to the site on a day to day basis and plant immediately after delivery. Do not store plants on site for a period that may invite theft or expose the plants to adverse weather while they are in containers.

Label at least one plant of each species or variety in a batch with a durable, legible tag. Maintain the tags for the plant establishment period.

4.20 Installation of Plants

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.

Do not vary the plant locations from those shown on the drawings unless otherwise directed. If it appears necessary to vary the locations and spacing to avoid service lines, or to cover the area uniformly, or for other reasons, apply for directions. Allow for sufficient notice for approval by the Landscape Architect and Project Manager of the location of mature and feature trees and plants.

For tree plantings, excavate a hole to twice the diameter of the root ball and at least 200mm deeper than the root ball. Break up the base of the hole to a further depth of 100mm, and loosen compacted sides of the hole to prevent confinement of root growth.

If, after excavation of the planting holes the soil is found to be hydrophobic, apply a wetting agent pre-mixed with water in accordance with the manufacturer's recommendations. Apply the wetting agent to the bottom of each planting hole.

Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress. No plant material shall show signs of water stress at any time.

When 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. All plants are to be positioned in the centre of their planting hole.

In planting beds and individual plantings, apply fertiliser pellets, as recommended in the soil testing results and in accordance with the manufacturer's recommendations around the plants at the time of planting. Provide proprietary fertilisers, delivered to the site in sealed containers displaying manufacturer or vendor's name, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Backfill the planting holes with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure the topsoil is not placed over the top of the rootball, so that the plant stem remains the same height above the ground as it was in the container.

4.21 Root Barriers

Supply and install root control barriers to all new tree plantings, where their proximity poses a threat to the stability of in-ground services, road kerbs, road paving and footpaths and other hard landscape elements such as walls, fences, steps, and garden edging.

As a minimum root barriers should be installed where trees are located within 2 metres of the element, and are to extend along the element for 2 metres either side of the tree trunk or as far as the diameter of the foliage canopy crosses the protected element, whichever is the greater.

As required install either, 600mm, 900mm or 1200mm width sheets to adequately protect the potentially affected element. The root barrier width shall always be wider than the depth of the planted tree rootball.

Root barriers shall be equal to Root Wall, as supplied by Geofabrics Australasia under the brand name Treemax.

Stakes and Ties

Stakes shall be durable hardwood, straight, free from knots or twists, pointed at one end, in the following quantities and sizes for each of the various plant pot sizes:

Staking Schedule			
Plant Size	No. of stakes	No. of ties	Stake size
Plants > 25 lt	1	1	25 x 25 x 1500mm
Semi-advanced plants > 75 lt	2	2	38 x 38 x 1800mm
Advanced plants > 100 lt	3	3	50 x 50 x 1800mm

Drive stakes into the ground a minimum one third of their length, making sure they are plumb, equal in height and avoids damage to the plants root system.

Provide ties fixed securely to the stakes, one tie at half the height of the main stem, others as necessary to stabilise the plant, allowing a small degree of movement but not affording any damage to the stem.

Ties shall be 50 mm wide hessian webbing or strap stapled at the stake with a loop twisted before looping around the stem. Each tie stabilises the stem to one stack.

Only use stakes when the plants need support and when it is obvious that they are or could be exposed to extremes of wind speed and where habit correction needs to be exercised. Remove stakes when plants have established stability in their root system and strength in their stem to withstand the exposure.

4.22 Turf

Unless otherwise specified or directed turf shall be the species listed below and equal to turf supplied by Windsor Turf, Gate 6 Cornwallis Road, Windsor NSW 2756 T. 02 4577 2550 or other approved specialist grower of cultivated turf.

Turf Supply				
Botanic name	Common name	Climate	Shade tolerance	Water demand
<i>Stenotaphrum secundatum</i>	Sir Walter Soft-leaf Buffalo	Warm	High	Low

Deliver turf to site in 25mm minimum thick cut rolls within 24 hours of being cut. Lay the turf within 24 hours of delivery. Prevent it from drying out between cutting and laying. Turf shall be of even thickness, free from weeds and other foreign matter.

Lay the turf in stretcher pattern with the joints staggered and close butted, parallel with the long sides of level areas, and with contours on slopes. After tamping the turf shall be flush with adjacent finished surfaces of ground, paving edges, timber edges and the like.

Lightly tamp to an even surface immediately after laying. Do not use a roller or plate compactor.

Water the turf immediately after placement and as necessary to keep the topsoil moist to a depth of 100 mm. Protect new turf areas against damage by pedestrians and vehicular traffic until grass is established by installing temporary fencing. Temporary fencing shall consist of star pickets and safety barrier mesh or similar device to help keep the turf in a healthy condition.

Fertilise within two weeks after laying with approved lawn fertiliser to manufacturer's recommendations. Apply additional fertiliser as required to maintain healthy grass cover.

When established, top dress the turf to a maximum depth of 10mm with coarse washed river sand to remove any depressions or irregular areas. Rub the dressing well into the joints and correct any unevenness in the turf surfaces. Mow the turf to maintain a grass blade height of between 30-50mm.

4.23 Summary of Required Actions, Submissions and Documentation

Provide the following:	
1	Provide sufficient notice to inspect as scheduled
2	Evidence of plant order within 14 days of contract award
3	Plant supplier's warranty for true to species stock
4	Submit the listed material samples
5	If required, obtain and test soil samples
6	When required, submit soil test results
7	Provide tender rates for solid rock excavation

5.0 IRRIGATION

5.1 Scope

The works included in this section shall include all the necessary components to:

- Design, supply, install, balance and commission multiple permanent irrigation systems;
- Prepare and submit irrigation design documents and plans for relevant authority and project approval that fully describe the system to be installed;
- Conform to Water Board and other relevant authorities' approvals, rules and regulations; and
- Supply and install all necessary pipes, fittings, equipment, tanks and pumps to provide a separate automatic system for irrigating all garden and turf areas in the public domain, private open space and private space in the proposed development.

The final irrigation design and installed system shall take into account:

- The requirements to comply with water use restrictions dictated by authorities,
- Water saving and conservation components,
- Using a drip system rather than the use of sprinklers,
- Using on-site irrigation storage tanks for irrigation reticulation and/or connection to potable water supply throughout the site,
- Controlling water flow to deliver only the necessary volume to sustain plant vigour, and
- Reducing water delivery rates, volumes and frequencies as plants mature and find their own water sources in the soil and lower strata.

Areas to be irrigated shall include all landscape areas, including individual tree plantings, mass garden beds, planting on slab, and lawn areas.

5.2 Quality

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

- Work ready for specified testing,
- Underground or enclosed work ready to be covered up or concealed, and
- Final testing of the completed system.

5.3 Detailed Drawings

Prepare and submit detailed drawings and a full performance schedule for the required irrigation systems, including, but not limited to:

- Control panel;
- Irrigation pipes and fittings;
- Layout and irrigation controllers;
- Valve locations; and
- All other components of the design

Drawings shall be prepared by a qualified person expert in irrigation design. Submit the drawings electronically in DWG and PDF format to the Project Manager and Landscape Architect for review, coordination and approval prior to the supply and installation of the works.

Prepare and furnish to the Project Manager before the date of practical completion, 'work as executed' drawings of the installed irrigation system, in DWG and PDF format, showing the locations of:

- Control panel;
- All pipes and fittings;
- Actual depths of underground pipework;
- Position of control valves; and
- All other installed components.

Provide written instructions for the operation and maintenance of the automatic irrigation system to be included in the overall project maintenance manual prepared by others.

5.4 System Design

A water delivery rate of 25mm/m²/week of planter or garden soil and lawn area is suggested for areas that have similar rainfall expectancy as that experienced in Sydney (approximately 1200mm/annum ± 200mm). The design shall provide the necessary flow rate for the actual site location which may be more or less than the Sydney district. Also, the design shall detail any on-site water storage proposed as detailed in **5.5 Materials and Components - Water supply** in this specification.

The designed system shall be:

- Centrally controlled by an electronic, multi-zone, timed control system panel located:
 - a locked waterproof cabinet internally in a secure space; or
 - in a locked waterproof cabinet externally in a convenient but discrete location.
- Appropriate to the type of plant material to be installed and the water flow rate required for the site environment.
- Automatic with the ability to operate multiple zones over variable time frames on a seasonal basis.
- Fitted with fixed drip or controlled spray emitters activated by soil moisture sensors.
- Fully adjustable so that it may be tuned to account for changes in climate, plant growth and natural water uptake by plants over time.
- Fully serviceable to ensure that the irrigation system does not fall into disuse because of a lack of maintenance or the inability to easily replace components.
- Provide each individual plant with the required amount of water to sustain healthy, vigorous growth.
- Designed to be component theft, vandalism free.
- Free from over-spray which may wet paths and building facades.

5.5 Materials and Components

The system shall incorporate the following components:

- **Valve boxes**

All water supply points and timers shall be housed in lockable in-ground valve boxes for easy access. The valve boxes shall be manufactured from high density thermos-plastic polypropylene. The valve lid is to incorporate a locking mechanism.

- **Automatic control valves**

All valves shall be 24V solenoid actuated hydraulic valves providing flow control to a maximum operating pressure of approximately 1MPa. All metal parts shall be stainless steel and able to be serviced without removal from the pipeline. Provide a gate valve of the same size immediately upstream of each automatic control valve. House both valves in a valve box as previously specified at finished ground level allowing for mulch to be overlaid.

- **Quick coupling valves**

Provide DN 20 double lugged bronze quick coupling valves with neoprene seats mounted on DN 20 copper risers offset at least 150mm from the supply pipe. Provide valve boxes and covers set flush with the finished surface.

- **Pressure regulating valves**

Provide pressure regulating valves at take-off points, which are adjustable between 100-700 kPa. Provide an 800µm in-line filter sized to suit the flow immediately upstream from the pressure regulating valve. Include gate valves upstream from the filter and downstream from the pressure regulating valve. Mount the assembly in an accessible position in a valve box, access pit or adjacent building.

- **Backflow Prevention**

Supply and install a reduced pressure zone device RPZ valve to every irrigation to main or potable water supply connection point in accordance with local water supply authority regulations. Ensure that the valves are readily accessible but concealed from general view or access to limit vandalism.

- **Soil moisture sensors**

Provide fixed ceramic moisture sensors as required by the design and connect them via wiring to the irrigation controller via moisture control units.

- **Control wiring**

Connect the automatic control valves and soil moisture sensors to the controller with double insulated cables laid in conduits alongside piping. Install wiring without joints except at valves, sensors and branches of common wiring with waterproof connectors and expansion loops at changes of direction and at wire junctions.

- **Irrigation controllers**

The irrigation control panel shall be automatic being manually set to cycle through a predetermined watering regime. It shall provide individual or simultaneous multi-zone operation with manual on/off override without loss of programme. The panel shall be connected to a 240V, 10A power supply installed by others to provide 24V output capable of operating at least 2 control valves simultaneously. Include a 24 hour battery programme backup and power surge protection device. Mount the controller in a waterproof lockable cabinet as previously specified.

- **Water supply**

Water for the system shall be provided either from:

- Main town water reticulation; and/or
- On-site stored water tanks; and/or
- Recycled water supply if available.

If from recycled water source ensure that the irrigation design has accommodated the available pressure and required connection valve components determined by the water supply authority.

Water supply from town water sources maybe be supplemented by on-site storage to maintain a continuous water supply in times when main pressure is not available, for example, when mandatory water restrictions are in force.

Conversely, if the on-site storage is large enough to be the main source of irrigation water it may be topped up from town water supply if the local water authority approves of such a connection.

As a guide only, the volume of on-site water storage to maintain a garden and lawn of 1000m² for one week without top up supply equals 25,000 lt or a tank 3730Ø x 2550 total height, based upon 25mm/m²/week. Tank size may vary depending on available predictable top up supplies. The irrigation design shall provide all water storage calculations in order that a full assessment of the impact of a water tank on the landscape may be determined.

5.6 Installation

Work shall be done by or under the direct supervision of appropriately licensed personnel who are expert in the methods of irrigation installation.

The final installation of the system shall include the following features:

- All components except the visible top of pop-up sprinklers shall be installed in a manner that is concealed below ground or below mulch;
- All tubing below mulch shall be pinned into place with galvanised steel spikes to prevent the tubing bending up through the mulch layer;
- All valve boxes shall be supported in the ground on brickwork;
- Valve box lids shall be set level with garden mulch levels and in concealed locations;
- All control fittings such as valves and the like shall be fully accessible within concealed valve boxes in the landscaping;
- All mainline and lateral pipework shall be concealed from view;
- Where water supply pipes traverse the underside of concrete paths use Class B copper piping;
- Where the irrigation tubing traverses the underside of concrete paths it shall be within uPVC conduit;
- No tube junctions shall be placed in conduits or under slabs where access is not possible;

- All joints shall be fitted tightly, sealed and made leak proof, with no internal projections, burrs or obstructions;
- Each separate system shall be controlled by one control panel located as previously specified;
- Back flow and master valve assemblies shall be sized as follows:
 - Flow rate 10-17 l/m use 25mm backflow and master valve assembly,
 - Flow rate 71-150 l/m use 40mm backflow and master valve assembly, or
 - Flow rate 151-240 l/m use 50mm backflow and master valve assembly.
- Space dripline tubing at maximum 450mm centres and maximum 200mm from garden edges; and
- Pipework shall be in accordance with AS 1477 and AS 2032.
- Flush the system with clean water at a velocity sufficient to remove foreign matter until only clean water is discharged at tube ends. Then terminate each tube flushing end/junction to complete the tube installation. Leave the system pipes and tubing free of foreign matter on completion. If need be, open the system again to re-flush if blockages are apparent and re-seal tube ends.

5.7 Commissioning

The entire system shall be tuned and tested to deliver an adequate amount of water to all plants and turf. Test the system in the presence of the Landscape Architect and/or irrigation designer to facilitate the issue of a Certificate of Practical Completion.

Maintain the system for the duration of the establishment maintenance period as detailed elsewhere in the specification. Replace any faulty, broken or stolen components. Leave the system operating as if it was newly installed upon acceptance of the completed work.

6.0 PLANT ESTABLISHMENT AND MAINTENANCE

6.1 Generally

The Landscape Contractor shall rectify defects during installation and that become apparent in the works under normal use for the duration of the contract Defects Liability Period.

The Landscape Contractor shall maintain the contract areas by the implementation of industry accepted horticultural practices for 52 weeks. The landscape maintenance works shall include, but not be limited to, the following:

- Replacing failed plants;
- Pruning;
- Insect and pest control;
- Fertilising;
- Maintaining mulch;
- Mowing;
- Watering;
- Weeding;
- Rubbish removal; and
- Cleaning of the surrounding areas.

6.2 Logbook

Keep a Maintenance Logbook recording when and what maintenance work has been done and what materials, including chemical materials, have been used.

The records shall show when and where identified chemicals were used and why.

Submit the initial logbook for inspection prior to Practical Completion and again at the end of the Defects Liability Period as a prerequisite for granting Practical and Final Completion Certificates.

Record all major events and activities in the logbook.

Make the logbook available for inspection on request.

6.3 Plants

Trees, shrubs and groundcovers shall at all times display healthy vigorous growth. Spent flower heads or stalks shall be removed immediately following flowering.

Replace failed plants: A "failed" plant may not mean complete death of soft tissue but failure due to poor growth, appearance, or unacceptable time for plant to re-establish new growth following damage or vandalism.

Replacement plants shall be in a similar size and quality and identical species or variety to the plant that has failed.

Replacement of plants shall be at the cost of the Landscape Contractor unless advised otherwise. If the cause of the failure is due to a controllable situation then correct the situation prior to replacing plants.

Failure of a plant shall be at the sole discretion of the Landscape Architect.

6.4 Pruning

Whatever pruning work is requested by the Landscape Architect shall be performed, including any pruning of damaged growth or miscellaneous pruning considered as beneficial to the condition of the plants.

All pruning works shall be undertaken in a manner equal to acceptable horticultural practice.

6.5 Spraying

Avoid spraying:

- if ever possible;
- in wet weather;
- if wet weather is imminent;
- if target plants are still wet after rain;
- in windy weather; and
- if adjacent desirable species are too close to the target plants to be avoided.

Immediately report to the Project Manager any evidence of intensive weed infestation, insect attack or disease amongst plant material. Submit all proposals to apply chemicals and obtain approval before starting this work.

When approved, spray with herbicide, insecticide, fungicide as appropriate in accordance with the manufacturers' recommendations. Record in the logbook all relevant details of spraying activities including:

- Product brand / manufacturer's name,
- Chemical / product name,
- Chemical contents,
- Application quantity and rate,
- Date of application and location,
- Results of application, and
- Use approval authority.

6.6 Fertilising

Fertilise gardens with a proprietary slow release fertiliser applied in accordance with the manufacturer's directions and recommendations. Record in the logbook all relevant details of fertilising including:

- Product brand / manufacturer's name,
- Fertiliser / product name,
- Application quantity and rate, and
- Date of application and location.

6.7 Stakes and Ties

Adjust and replace as required to ensure plants remain correctly staked. Remove those not required at the end of the planting establishment period (Defects Liability Period).

6.8 Mulched Surfaces

Maintain the surface in a clean, tidy and weed free condition and reinstate the mulch as necessary to ensure correct depth as before specified.

6.9 Mowing and Top Dressing

Mow the turf to maintain a grass height of between 30-50mm. Do not remove more than one third of the grass height at any one time. Remove grass clippings from the site after each mowing.

Top dress to a maximum of 10mm as necessary to fill depressions and hollows in the surface.

6.10 Irrigation and Watering

Maintain the irrigation system to sure that each individual plant receives the required amount of water to maintain healthy and vigorous growth, adjust and rectify as required.

Provide additional watering, if necessary.

6.11 Erosion Control Measures

Where necessary, maintain the erosion control devices in a tidy and weed free condition and reinstate as necessary to ensure control measures are effective where deemed necessary.

6.12 Weeding and Rubbish Removal

During the plant establishment period remove by hand, rubbish and weed growth that may occur or re-occur throughout all planted, mulched and paved areas.

The contractor shall target weeds that are capable of producing a major infestation of unwanted plants by seed distribution.

Whenever possible, time weed removal to precede flowering and seed set.

6.13 Urgent Works

Notwithstanding anything to the contrary in the Contract, the Project Manager may instruct the Landscape Contractor to perform urgent maintenance works that place the completed contract works at risk.

If the Landscape Contractor fails to carry out the work within seven (7) days of such notice, the Project Manager (or representative) reserves the right without further notice to employ others to carry out such urgent and specified work and charge the cost to the Landscape Contractor.

Such work shall include but not limited to the inspection and clearing of drains in the pavement and gardens.

6.14 Completion

A final inspection shall be made by the Project Manager, Landscape Contractor and Landscape Architect before the completion of the Plant Establishment Maintenance Period (Defects Liability Period).

Any items requiring rectification shall be repaired before completion of the relevant works and finally approved prior to certification.

7.0 Appendices

7.1 Referenced Standards

Standard	Name
AS 1289.5.2.1	Method of testing soils for engineering purposes – Soil compaction and density tests
AS 1319	Safety signs the occupational environment
AS 1379	Specification and supply of concrete
AS 1428.1 (All)	Design for access and mobility
AS 1428.3	Requirements for children and adolescents with physical disabilities
AS NZS 1428.4.1	Means to assist the orientation of people with vision impairment – Tactile ground surface indicators
AS 1428.5	Communications for people who are deaf or hearing impaired
AS 1477	PVC pipes and fittings for pressure applications
AS 1604	Specification for preservative treatment – Sawn and round timber
AS 1720	Timber structures – Design methods
AS 2032	Installation of PVC pipe systems
AS 2082	Timber – Hardwood – Visually stress-graded for structural purposes
AS 2303	Tree stock for landscape use
AS 2734	Asphalt (hot mix) paving – Guide to good practice
AS 2890.1 (All)	Off-street car parking
AS 2890.2	Commercial vehicles off-street parking
AS 2890.3	Bicycle parking
AS 2890.5	On-street parking
AS 2890.6	Off-street parking for people with disabilities
AS 3600	Concrete structures
AS 3610	Formwork for concrete
AS 3660	Protection of buildings from subterranean termites
AS 3850.1	Tilt-up concrete and precast concrete elements for use in buildings
AS 3972	General purpose and blended cements
AS 4373	Pruning of amenity trees
AS 4419	Soils for landscape and garden use
AS 4419	Appendix 1 Soils for landscape and garden use - sampling
AS 4454	Composts, soil conditioners and mulches
AS 4970	Protection of trees on development sites

7.2 Maintenance Schedule

Table 7.2	ACTIVITY	FREQUENCY						ACTION
		D	W	2W	3W	M	3 or 6M	
1	Logbook	+		+		+		Daily, Weekly, Monthly Complete a logbook entry every day at site and at least every two weeks. All actions listed below require a logbook entry. Upon request, make the logbook available for inspection. Submit copies of new entries in the logbook to the Contract Administrator on a monthly basis. Please note that more frequent, short, occasional inspection should result in less maintenance work when problems are observed earlier than they might otherwise have been seen.
2	Plant replacement			+		+		Inspect and replace failed plants within 2 weeks of observation of failure. Match species, size (original) and location of new with old.
3	Mulch			+		+		Inspect and replace mulch deficiencies within 2 weeks of observation. Prior to placing new mulch aerate the soil by fork turning to a depth of at least 100mm, roughly level the soil and then place mulch. Do not disturb major plant roots while aerating soil.
4	Erosion control			+				Inspect every two weeks and repair ground, soil and mulch immediately. Maintain erosion control device as necessary.
5	Stakes and ties			+				Inspect every two weeks, adjust and/or replace as necessary but remove as plants mature and are able to support themselves.
6	Weed and rubbish removal			+				Inspect and remove immediately upon observation. Leave no waste on site. Dispose of waste material at a designated waste disposal site.
7	Pruning			+				Inspect every 2 weeks and prune as necessary to remove dead wood, improve plant shape and promote healthy vigorous new growth.
8	Spraying			+				Inspect every 2 weeks and action as necessary. Do not spray if other non-chemical methods will satisfy the need to remove insects. Spray for disease control only when absolutely necessary.
9	Urgent works		+					Complete within 1 week (7 days) of notification. Inspect and clear drains.
10	Planting and fertilising			+			3m+	Inspect every 2 weeks and remove spent flowers and dead stalks as they become apparent. Fertilise gardens every 3 months or other frequency in accordance with fertiliser manufacturer's directions.
11	Watering	+		+				Water when and where necessary every day at site and at least every 2 weeks generally. Do not allow soil and plants to dehydrate. Allow for prolonged rain, windy and dry periods. Water in the early morning or late afternoon to avoid excessive evaporation during the heat of the day.
12	Mowing, top-dressing and edging			+		+	6m+	Summer fortnightly. Winter monthly. Top-dress 6 monthly.