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Enfield ILC Landscape and Ecological Area Management Plan

Enfield Intermodal Logistics Centre

NSW Ports | August 2020 | Version 3



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Revision History

DATE	DETAILS	BY	REVIEW/APPROVED
28/8/11	Issue of draft document to Sydney Ports – draft 0.1-0.3	AECOM	Sydney Ports
9/7/14	NSW Ports draft 0.4	A Wedgwood	T Brown
July 2014	Final v1.0	A Wedgwood	DPE
August 2016	NSW Ports final v2.0 – first operational review	A Wedgwood	T Brown
August 2020	NSW Ports final v3.0 – second operational review	A Wedgwood & I Ilias	DPIE

Glossary of Terms and Acronyms

TERM	DEFINITIONS
AHD	Australian Height Datum
ARI	Average Recurrence Interval
CEMP	Construction Environmental Management Plan
CLM Act	Contaminated Lands Management Act
CoA	Condition of Approval
CPW	Cumberland Plain Woodland
DPI	Department of Primary Industries
EA	Environmental Assessment
ECS	Empty Container Storage
FHCA	Frog Habitat Creation Area
FMP	Frog Management Plan
GGBF	Green and Golden Bell Frog
HIPS	Heritage Interpretation Plan and Strategy
IMT	Intermodal Terminal
LEAMP	Landscape and Ecological Area Management Plan
LIC	Light Industrial Commercial
LSW	Landscape Works Specification
OEH	Former Office of Environment and Heritage (now Environment, Energy and Science)
OEMP	Operational Environmental Management Plan
RAP	Remediation Action Plan
RFEF	River-Flat Eucalypt Forest
RL	Reduced Level
SEA	Southern Ecological Area
SoC	Statement of Commitment
WSUD	Water Sensitive Urban Design

1. Introduction

This Landscape and Ecological Area Management Plan (LEAMP) has been prepared for the Enfield Intermodal Logistics Centre (ILC). The LEAMP is a component of the overall urban, landscape and frog habitat design and documentation prepared for the ILC project. This LEAMP is to be read in conjunction with the Landscape Drawing Package and Plant Schedules in Appendix A.

Condition 6.3(d) of the Project Approval requires the preparation and implementation of an LEAMP as part of the overall Construction Environment Management Plan (CEMP) for the project. Version 1 of the LEAMP which addressed the Stage 9 – Southern Ecological Area Construction works (refer to NSW Ports Staging Report 2019) and the ongoing management of the landscaped areas across the site was approved by the former Planning Secretary of the Department of Planning and Environment in 2014.

The Overarching CEMP for the site contains relevant mitigation measures for ecological consideration during construction works, however the majority of main phase, southern ecological area and subsequent landscaping construction has been completed with on-going operational landscape maintenance requirements remaining, therefore it is now part of the Operational Environmental Management Plan (OEMP).

This LEAMP provides an update to the previous plan and details how the site will be managed and maintained on an ongoing basis during its operational phase (excluding the Intermodal Terminal Area (IMT)). Most areas of the site have already been landscaped as part of previous project construction stages and approved under the relevant CEMPs. This LEAMP consolidates the landscape details for the whole site.

The preparation of this LEAMP, including selection of landscaping species, species distribution, densities, landscape features and maintenance regimes for the ILC, has been based on:

- the relevant requirements of the Project Approval and the Environmental Assessment (*SKM, 2005*) (refer Table 1), as relevant to operations;
- security and safety considerations for this type of infrastructure development; and
- design water quality objectives for plants in the bioretention component of the stormwater detention basins.

1.1 Background to Enfield ILC

The ILC site occupies approximately 60 hectares of land, bounded by Sydney Trains' Enfield Marshalling Yards to the west and by Cosgrove Road to the east. The northern tip of the site is located south of the Hume Highway while the Punchbowl Road overpass demarcates the southern end of the site.

The project comprises the development of an ILC, associated road and rail infrastructure works, services and environmental enhancement works which will be used for the transfer and storage of container freight to and from Port Botany, packing and unpacking of containers within the warehouses and storage of empty containers for later re-use or for return to Port Botany.

The ILC site layout, as part of the approval of MP05_0147 MOD 14 is shown on Figure 1. This LEAMP excludes landscaping in the Intermodal Terminal (IMT) which is the responsibility of the intermodal terminal operator.

The areas to be landscaped which are covered by this LEAMP are illustrated in Figure 2.

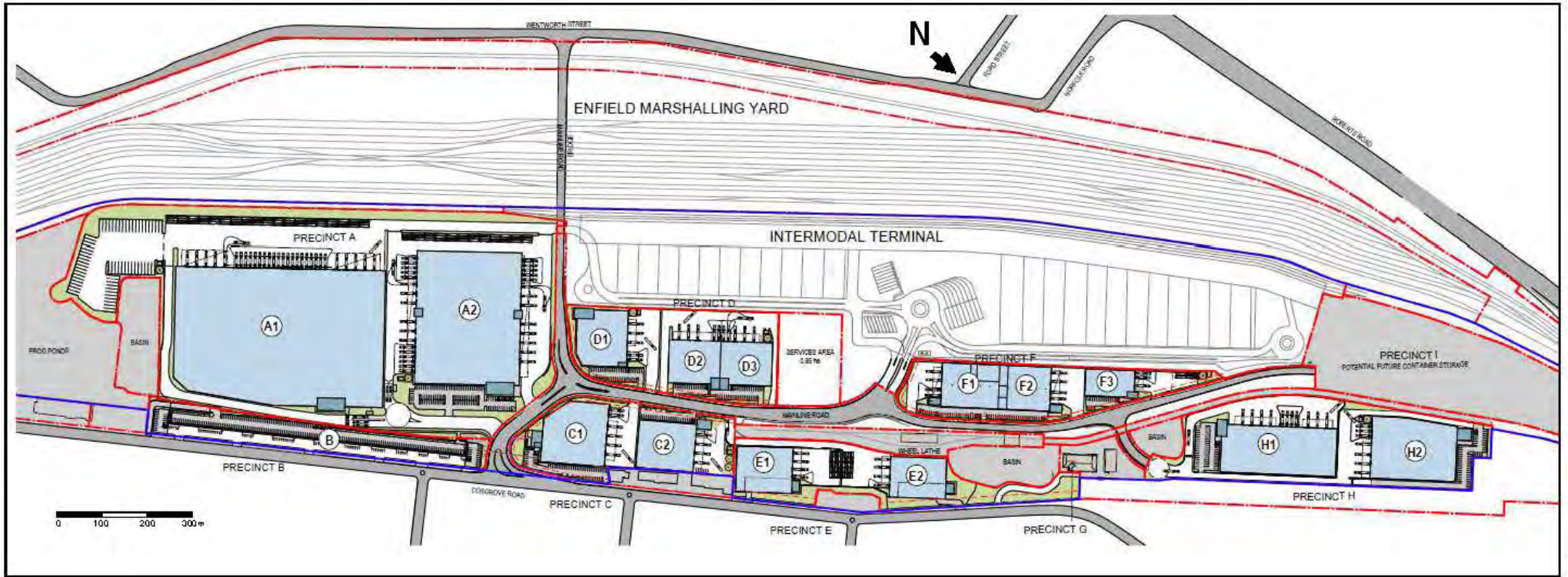


Figure 1: ILC Site Layout (approved as part of MP 05_0147 MOD 14)

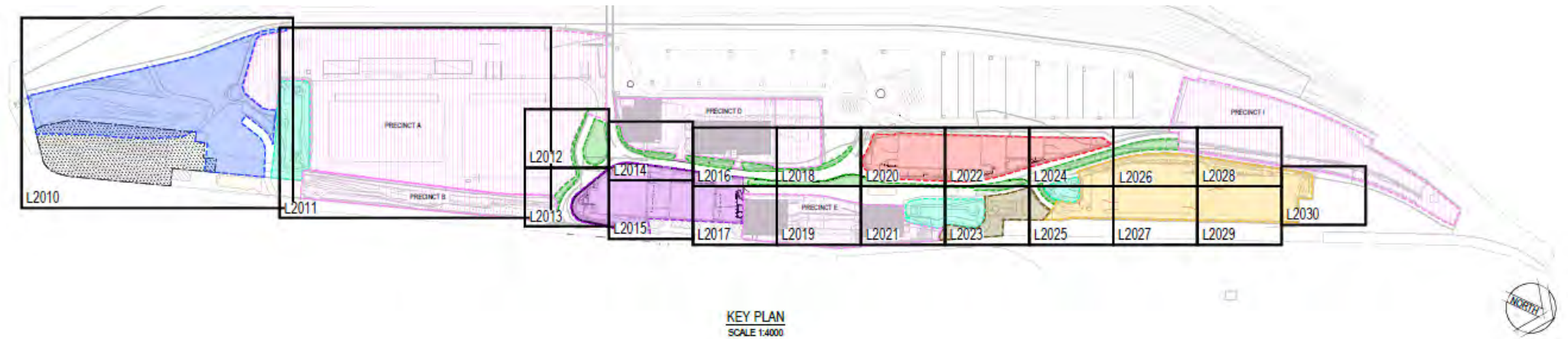


Figure 2: ILC Site Landscape Areas under this LEAMP

1.2 Approvals Framework

Background

Project approval (MP 05_0147) for the construction of the ILC at Enfield was granted by the former Minister for Planning in September 2007 to Sydney Ports Corporation who undertook the original design and early stage construction phases.

NSW Ports became the land manager of the site on 31 May 2013, as part of a 99 year lease from the NSW Government. NSW Ports has since completed the main construction phase which included the base infrastructure for the ILC, the construction of the frog ponds within the Southern Ecological Area (SEA) and the capping and revegetation of Mt Enfield.

Construction of the warehouses is being undertaken under a staged approach in accordance with the NSW Ports Staging Plan 2019. NSW Ports is responsible for the landscaping and ongoing management and maintenance of the warehouse tenancies.

Relevant Conditions of Approval (CoA)

CoA 6.3(d) requires the preparation and implementation of a LEAMP as part of an overall CEMP for the project. Other conditions relevant to landscaping requirements or the management of ecological areas on the site have also been addressed in the LEAMP. This Plan is designed to update Version 1 of the Plan which was approved in 2016 and outlines how the whole-of-site landscape requirements will be met, managed and maintained by NSW Ports as the site continues to develop.

The LEAMP also addresses the relevant operational requirements of the Statement of Commitments (SoCs) in the Environmental Assessment (EA) for the ILC outlined in the Enfield Landscape and Ecological Area Management Plan (SKM, 2005).

Table 1 summarises the relevant requirements and identifies the LEAMP reference where the requirement is addressed.

Table 1: Compliance Requirements

REFERENCE	REQUIREMENT	LEAMP REFERENCE
CoA 2.48	<p>The Proponent shall implement all the relevant actions for the site recommended in the <i>Management Plan for the Green and Golden Bell Frog Key Population at Greenacre</i> (DECC, May 2007) being:</p> <ul style="list-style-type: none"> a) creation of overwintering habitat as part of the two hectare improved foraging habitat at the southern end of the site; b) provision of linkages to the former RailCorp ponds; c) restrictions on the use of herbicides in known frog habitat and attainment of water quality standards for water discharged from the site. <p>These actions shall be incorporated within both the Construction Environmental Management Plan (refer to condition 6.2) and the Operation Environmental Management Plan (refer to condition 6.4) as relevant, including provisions for monitoring the outcomes of these actions and periodically reporting the outcomes to OEH at a frequency agreed with OEH.</p>	<p>Section 4.2, Appendices A and B</p> <p>Refer to NSW Ports OEMP / CEMP</p>
CoA 2.48A	<p>The Proponent shall implement the mitigation measures identified in Section 7.1 of the <i>ILC at Enfield Impact Assessment on Green and Golden Bell Frogs: Addition of Fill Material to Mt Enfield</i> (Biosphere Environmental Consultants Pty Ltd, 2011), supplementary letter of advice dated 10 January 2018 (Biosphere Consultants Pty Ltd, 2011) and the following:</p> <ul style="list-style-type: none"> a) the installation of an exclusion fence to help prevent frogs from entering the construction site; b) the installation of silt fences and silt trapping devices prior to any earthworks, and the use of dust suppression methods throughout construction, to prevent wind-blown dust from entering the frog habitat area; c) the establishment of run-off barriers between the construction areas and the frog habitat area, to prevent accidental spills and/or stormwater waste from entering the frog habitat area; d) the installation of visual screens to minimise light spill into the frog habitat area from night construction works; e) the demarcation of the frog habitat area as a “no go” area, using barrier bunting and signs that indicate the significance of the area and that the site is off limits to people, machinery and plant equipment; f) the installation of an exclusion fence to help prevent frogs from entering the operational areas; g) the installation of diversion bunds to ensure hazardous liquids can never enter the frog habitat area; <p>and</p>	<p>Section 4.2 and refer to NSW Ports CEMP</p>

	<p>h) the installation of visual screens to minimise light spill into the frog habitat area, from trucks and plant equipment operating throughout the night.</p> <p>These actions shall be incorporated within the CEMP (condition 6.2 of this approval) and the OEMP (condition 6.4 of this approval), as relevant.</p>	
CoA 6.3(d)	<p>As part of the CEMP for the project, the Proponent shall prepare and implement a LEAMP to detail how the site will be landscaped and maintained. The Plan shall be generally consistent with the Landscape Masterplan presented in the document referred to under Condition 1.1 b) of the approval, and shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> (i) Provision for the use of locally endemic native species for landscaping the site (ii) Consideration of landscaping locations and densities to maximise visual screening of the project from residential receptors and public open space (iii) Measures to maximise the retention of locally endemic native species existing on the site, and removal of weeds and non-indigenous vegetation (iv) Measures for the enhancement, revegetation and on-going management of the Ecological Area on the site, including measures to provide suitable habitat for <i>Litoria aurea</i>. 	Sections 3 and 4 Appendices A, B and C
6.3(f)	<p>A Mt Enfield Stabilisation Management Plan to detail how the batters of Mt Enfield and associated drainage will be managed during construction and until such time as it is stabilised with vegetation. The plan shall include but not be limited to:</p> <ul style="list-style-type: none"> (i) measures to prevent soil erosion and the discharge of sedimentation to lands or waters, including to the Green and Golden Bell Frog Habitat Creation Area and Coxs Creek; (ii) identification of where runoff from Mt Enfield is to be directed to, indicating ponding and flow paths to ensure runoff volume and increased flow velocity has been provided for, with the objective of not exceeding current rates; (iii) measures to mitigate potential dust impacts on sensitive receivers including the Green and Golden Bell Frog Habitat Creation Area and surrounding residences; and (iv) measures for the enhancement, revegetation and ongoing landscape management of the Mt Enfield site, undertaken in consultation with Strathfield Council and Canterbury Bankstown Council, and the local community. <p>The ongoing management of drainage structures and landscaping associated with Mt Enfield shall be incorporated into the OEMP required under condition 6.4 of this approval.</p> 	<p>Stage 3 CEMP Addendum (2012). Also refer to Section 1.2</p> <p>This LEAMP (is appended to the NSW Ports OEMP)</p>
Statement of Commitments (SoC)	<p>A Frog Habitat Area is proposed to be constructed as part of the Community and Ecological area at the southern part of the site. The area will be designed by qualified personnel and will comprise ponds, foraging and shelter habitat.</p>	Works completed in 2011
	<p>Frog movement corridors would also be identified to link the new habitat areas with existing frog habitat areas offsite.</p>	Works completed in 2011
	<p>During site works existing areas of potential frog habitat would be checked and any frogs found removed prior to works commencing. Frog exclusion fences will be provided during construction in areas where there is potential for frog activity.</p>	Incorporated into NSW Ports and tenant CEMPs
	<p>A Landscape Management Plan (LMP) will be prepared during detailed design of the project and implemented during and after the construction period. The plan would include:</p> <ul style="list-style-type: none"> • processes for the management of on-site weeds; • detail on the rehabilitation of the site with a program of weed removal and revegetation with native species. Noxious weeds at the ILC site would be identified and be removed in accordance to the criteria under the <i>Noxious Weeds Act 1993</i>, and the relevant NSW Department of Primary Industries weed control guidelines; • monitoring of vegetation to ensure it becomes established and to identify any further management requirements. • landscaping to be detailed and carried out in accordance with the concepts in the Landscape Masterplan. 	This LEAMP and previous Landscape Plans as outlined in Section 1.2
	<p>Landscaping and noise mounds would be installed in the early stages of construction to screen the site to a degree appropriate for the location and type of construction activities being carried out. Revegetation of these areas would be conducted as soon as practicable during the construction phases.</p>	Works completed in 2011, including revegetation
	<p>The Frog Habitat Area will be constructed according to the detailed design prepared and would be managed according to an appropriate Frog Management Plan.</p>	Works completed in 2011
	<p>Monitoring of the Frog Habitat Area will be undertaken to ensure it is functioning as designed.</p>	Section 4.2
	<p>Explore opportunities with local community groups for involvement of the community in managed access to the ecological and community area.</p>	Consultation on the SEA Concept Plans and with the CLC.

Approved Landscape Plans

The former Sydney Ports Corporation's CEMP Framework (2010), indicated that the LEAMP was not required for the Stage 1 Early Construction Works. Subsequent construction stage CEMPs included site specific landscape plans to address the requirements of CoA 6.3(d) as outlined in Table 2. All relevant approved landscape planting plans and ongoing maintenance and operational requirements from the plans outlined in the Table 2 have been incorporated into this LEAMP for the Enfield ILC site.

Leighton Contractors, under the main construction works phase (Stage 3) prepared and implemented the Mt Enfield Stabilisation Plan to address the requirements of CoA 6.3f (i)-(iii) during construction. This plan is not reproduced as part of this LEAMP.

The Mt Enfield Enhancement, Revegetation and On-going Landscape Management Plan (EROLMP) (Sydney Ports, December 2011), provided details for the landscaping, ongoing management and general enhancement of Mt Enfield and the surrounding area. The relevant provisions from this document have been incorporated into this LEAMP.

The landscaping and revegetation of Mt Enfield as outlined in the Stage 3 CEMP Addendum: Mt Enfield EROLMP was approved by the former DP&I in its letter dated 20 March 2012 and the measures implemented.

Table 2: Former approved landscape plans

STAGE	REPORT	CONTENT	DATE
Stage 2	Stage 2 CEMP Addendum	Modified Stage 2 CEMP (Sept 2010) and associated Flora & Fauna Management Plan to provide landscaping and maintenance requirements for the proposed landscaping at the frog ponds, ponds fringing area and the south east earth noise mound (refer to Figure 2).	July 2011
Stage 3 / Mod Application No. 5	On-site Management of Unsuitable Engineering Fill	Construction plans for Mt Enfield, including landscape drawings.	May 2011
Stage 3 / Mod Application No. 5	Stage 3 CEMP Addendum – Mt Enfield Enhancement, Revegetation, and On-Going Landscape Management Plan	Incorporates the Mod No. 5 Plan and the Mt Enfield Stabilisation Management Plan required under CoA 6.3(f). Includes construction and operational controls for management of the Southern Ecological Area.	February 2012
N/A	Frog Protection Plan (FPP)	Developed to address CoA 6.3(d) iv) to protect frogs and frog habitat during construction works including landscape recommendations	June 2009
N/A	Frog Management Plan (FMP)	Developed to address CoA 6.3(d) iv) for the on-going management of the frog habitat area including landscape recommendations.	March 2010

1.3 Scope of the LEAMP

The LEAMP provides an overall management plan for the landscaped and ecological areas within the site, including the ongoing maintenance and management of these areas during operation, excluding landscaping within the IMT.

The landscaping and ecological activities covered by this LEAMP have been categorised into management areas, as shown in Figure 3.

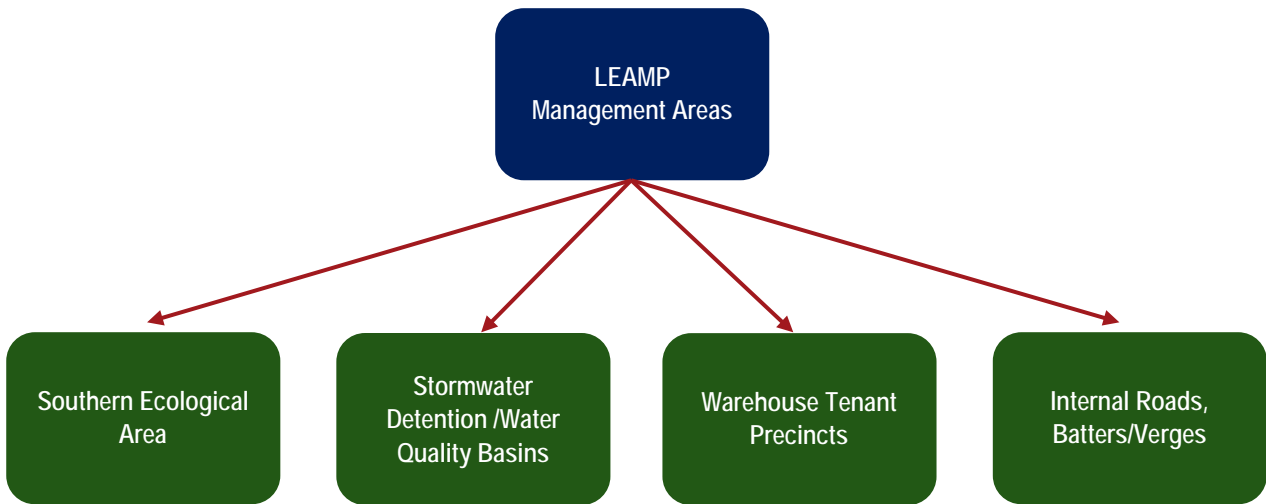


Figure 3: LEAMP Management Areas

Sections 4, 5, 6 and 7 define the specific objectives, and management actions relating to ongoing landscaping for each of the identified management areas. NSW Ports will manage the overall ILC site landscaping and ecological areas in an adaptive manner which will focus on the achievement of the listed objectives in these sections.

Major updates to the LEAMP (i.e. changes affecting compliance with the CoA) will be issued to the Planning Secretary for approval before adoption of the revised plan by NSW Ports. Minor updates (i.e. those which do not impact on compliance with the CoA) will be undertaken by NSW Ports as appropriate.

1.4 Roles and Responsibility

Table 3 outlines the roles and responsibilities relevant to the LEAMP during operational activities.

Table 3: Roles and Responsibilities

ROLE	RESPONSIBILITY
NSW Ports Asset Management Team	<ul style="list-style-type: none"> Oversight of maintenance regime and application of the LEAMP, including contractor management Inspections and monitoring as required Review of contractor reports and commissioning of corrective actions as required
NSW Ports HSE Team	<ul style="list-style-type: none"> Environmental management of the ILC site as Environmental Representative Review and approval of LEAMP documentation Inspections and monitoring as required Review of contractor reports
Landscape Contractor (FHCA)	<ul style="list-style-type: none"> Landscape establishment and ongoing maintenance for the frog habitat creation area Monthly reporting on FHCA
Landscape Contractor (General)	<ul style="list-style-type: none"> Landscape establishment and ongoing maintenance of the areas as identified under this LEAMP
Herpetologist Consultant	<ul style="list-style-type: none"> Advice to NSW Ports regarding monitoring of the GGBF population and frog habitat creation area
IMT Tenant Environmental Representative	<ul style="list-style-type: none"> Primary tenant contact in relation to environmental performance of tenant works and operations in the IMT area

2. Site Description

2.1 Pre-Construction Conditions

In its undeveloped state, the site is likely to have been vegetated with native species including areas of Cooks River/ Castlereagh Ironbark Forest and Cumberland Plain Woodland. Due to its industrial history the site has been largely cleared of any native vegetation. Some small patches of native vegetation exist on the lower slopes of Mt Enfield adjacent to the Tarpaulin Shed.

Prior to the commencement of construction, the site was dominated by invasive weed species (including Castor Oil Plant, Pampas Grass, Crofton Weed, Lantana, Fennel, Fleabane and Cobblers Pegs) with occasional scattered trees and shrubs. Mature street tree planting along the southern end of Cosgrove Road on the adjoining Council road reserve forms a well vegetated edge, although the avenue planting becomes less consistent, with some gaps to the northern section of Cosgrove Road.

2.2 Endangered Species

The only endangered species, population or community that has been identified as likely to be present on the ILC site is the Green and Golden Bell Frog (GGBF) *Litoria aurea* which is listed as an endangered species under Schedule 1 of the *NSW Threatened Species Conservation Act 1995*. These frogs have been recorded at several sites in the Enfield – Greenacre area. Frog surveys conducted on the ILC site as part of the investigations for the Environmental Assessment identified potential habitat areas for GGBF but failed to locate any GGBF.

In 1996, a GGBF pond was created in the former RailCorp's New Enfield Marshalling Yards, as shown on Figure 4, and frogs have been sighted at this pond. GGBF are also known to have been present in the nearby Juno Parade brickpit site (also shown on Figure 4). GGBF are known to be a highly dispersive species and have the capacity to travel across the site under suitable weather conditions.

An important component of the long term management of GGBF in the area is the maintenance of the interconnectivity between the surrounding populations in the Juno Parade Brickpit and the Enfield Marshalling Yards and any population that may establish on the ILC site.



Figure 4: Enfield-Greenacre GGBF Habitat Areas

2.3 Noxious Weeds

Weeds may be declared noxious if they pose a significant risk to human health, the environment, animals or the agricultural industry. Noxious weeds are plants that must be controlled under the *NSW Biosecurity Act 2015*. Under this Act (which had the effect of repealing the former *Noxious Weeds Act 1993*), all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Anyone who deals with any plant, who knows (or ought to know) of any biosecurity risk, such as NSW Ports, has a duty to ensure the risk is prevented, eliminated or minimise, so far that is reasonably practicable.

Weeds identified as a priority for the Greater Sydney region which includes the Strathfield LGA are outlined in Appendix C. Those weeds that have been identified as Weeds of National Significance under the *Australian Weeds Strategy 2017-2027 (Department of Agriculture and Natural Resources, 2017)* are also highlighted in the table. National Alert Weeds are non-native plant species that are in the early stages of establishment and have the potential to become a significant threat to biodiversity if they are not managed. Those weeds have also been identified in Appendix C.

The Bitou Bush Biosecurity Zone has been established for all land within the State except land within 10 km of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. Within the zone, this weed must be eradicated where practicable, or as much of the weed destroyed as practicable and any remaining weed suppressed. The local Council is required to be notified of any new infestations of this weed within the zone. A Control Order is in place for the whole of the State in relation to Boneseed, Chinese violet, Parkinsonia and Tropical Soda Apple and owners of land must notify the local authority of new infestations, immediately destroy the plants and ensure subsequent generations are also destroyed.

2.4 Soils

Results from geotechnical bore log investigations undertaken by Coffey Geotechnics (2009) show that ground conditions on site comprise of shale and/or clay or sandstone topped by a variety of fill materials. The site is generally void of topsoil, however patches of silt topsoil do exist.

Fill materials generally extend to depths of 0.5 - 1 metre, however in some locations fill extends to 3 metres. Fill types range in variety, depending on location, with materials including sand, silty sand, gravel (sandy and clayey) and clay.

Below the fill, ground conditions generally comprise clay and/or shale, and in limited areas, sandstone. Sandstone was found to be consistent in makeup, generally described as fine grained, pale grey, highly to moderately weathered and of medium strength. Shale material types, which were recorded as deep as 10 metres, varied from extremely weathered, very low strength, orange – brown, to medium strength, dark grey and orange – brown, moderately weathered. Clay types were generally found to have high plasticity, red, pale grey, red – brown, yellow and brown.

2.5 Contamination

Historic land uses on the site, combined with the importation of substantial amounts of fill and debris resulted in some residual contamination at the site prior to construction. The findings of site audits undertaken by Dames and Moore (1999) and Environ (2002) were summarised in the EA (*SKM, 2005*). A site audit concluded that the subject site was suitable for industrial use, subject to some soil remediation and validation during development.

Remediation works were undertaken at the site during 2009 in accordance with Remediation Action Plans (RAPs) prepared by the former Sydney Ports' remediation consultant (*Coffey Environments, 2009a and 2009b*). The RAPs were endorsed in Site Audit Statements prepared in 2009 by an accredited Site Auditor under the *Contaminated Land Management Act 1997* (CLM Act) in accordance with CoA 2.43.

Some contamination has been retained on site in cells and capped areas. The locations of remaining contamination are shown in NSW Ports' Operational Environmental Management Plan (OEMP). Site management plans (SMPs) and Long Term Environmental Management Plans (LTEMP) have been developed to manage the residual contamination risks by outlining procedures to be followed in the event of intrusive works that may breach soil marker and capping layers. Any works being undertaken will need to review the applicability of any SMP/LTEMP and include relevant mitigation measures.

2.6 Surface and Groundwater

Three main drainage lines are located beneath the site, including the Coxs Creek canal in the south of the site (shown on Figure 1), the DELEC Drain and the Central Drain north of Coxs Creek (underground stormwater channels under the site not relevant to landscaping).

During high flow events, stormwater runoff overflows on to the Coxs Creek floodplain. Within the ILC site, the Coxs Creek floodplain extends between Cosgrove Road and TfNSW's Marshalling Yards at the southern end of the site, on the northern side of Mt Enfield (refer Figure 2).

Groundwater investigations (*SKM 2005*) indicated that a general water table may be present at RL 12 - 13 metres AHD in the southern portion of the site, and at RL 15 - 18 metres AHD in the northern portion. This translates to groundwater depths of between 1 and 5.5m across the site which may fluctuate seasonally by 1-2m. The site bio-retention basins were designed to accommodate existing groundwater conditions.

2.7 Heritage

Recommendations for heritage interpretation on the site are contained in the Heritage Interpretation Plan and Strategy (HIPS) (*Conybeare Morrison, 2009*) and some components such as train wagon wheels and the DELEC turntable have also been included in the landscape design for the ILC. These items are of historical interest but are not listed heritage items. The HIPS also contains recommendations for the maintenance of the heritage items remaining on the site, which have been incorporated into the NSW Ports OEMP.

There are two Heritage items located adjacent to NSW Ports landscaped areas on site.

Tarpaulin Factory

Commitments made in the EA (*SKM 2005*) stated that NSW Ports would undertake further investigations and consultation regarding the future of the Tarpaulin Factory, with a final use to be determined at a later stage.

A development application (DA/2016/132) for the adaptive reuse of the Tarpaulin Factory for the purpose of a retail garden centre containing ancillary uses for a café, fruit and vegetable shop, pool shop and pet store, car parking/servicing areas and landscaping was lodged under Part 4 of the EP&A Act with Strathfield Council. The DA sought to excise approximately 2.16 ha of land from the approved 5 ha Community and Ecological Area located at the southern end of the site to enable the garden centre. The majority of the 2.16 ha comprises the Tarpaulin Factory building footprint. The DA and an accompanying Operational Plan of Management was approved by the Land and Environment Court on 29 November 2017. The Operational Plan of Management outlines measures required to be put in place to protect the habitat and declining population of the Green and Golden Bell Frog in this area.

Pillar Water Tank

Required to be relocated on site and undergo stabilisation works in accordance with CoA 2.35 and CoA 2.36. These works were completed in May 2013 with the Pillar Water Tank relocated to a location adjacent to the Tarpaulin Factory. The Pillar Water Tank sits within the footprint of the area under DA/2016/132.

3. General Site Landscaping Principles

All landscaped areas on the ILC site (with the exception of the IMT) are included in NSW Ports Asset Maintenance schedule and managed by landscape contractors.

Suitable local endemic species from the Cumberland Plain Woodland community, which is the original native vegetation community of much of western Sydney (Botanic Gardens Trust, 2010), formed the basis for landscaping the site. Existing trees and native species, including local endemic species, such as *Daviesia ulicifolia* and *Acacia parramattensis* on the slopes adjacent to the Tarpaulin Shed, have been retained in the southern part of the site.

Landscaping on site provides a level of screening for off-site viewers. Except for residential areas to the north-west and the south-east, the site is surrounded by industrial development. Existing views from the north-western and south-eastern residential areas are largely obscured by existing industrial/commercial development or street landscaping. The landscaping also provides some visual screening to internal areas of the site from adjacent public roads and industrial areas.

Ongoing landscaping works across the ILC includes:

- weeding of grass and planting areas;
- supply and spreading of fertiliser to grass and landscaped areas;
- pest and disease control of shrubs and trees;
- feral animal monitoring and control;
- maintenance of all grass areas including watering in prolonged dry periods;
- vegetation (including tree) removal, lopping or pruning where required for matters of security, Work Health & Safety and traffic safety requirements;
- replacement of dead or failed plants; and
- removal of rubbish and debris in planting areas.

Standards

All work shall be carried out with regard to standard horticultural and arboricultural practices and cannot be modified without the prior approval from NSW Ports.

Any landscape contractor used on site will be required to be a member of the Landscape Contractors Association of NSW or display suitable professional qualifications acceptable to NSW Ports and shall nominate a senior partner /personnel experienced in maintenance nursery practices and horticulture, who shall be responsible for carrying out instruction, and reporting any maintenance issues to NSW Ports.

Inspection and Reporting

NSW Ports landscape contractors are required to keep inspection records of all landscape and ecological management area actions as identified below. All maintenance inspection records will be provided to NSW Ports and will include where relevant, key issues identified, actions required to address issues and the date that actions were completed.

NSW Ports HSE Team will conduct quarterly inspections of the landscaped areas of the ILC and raise any issues or actions with NSW Ports Asset Maintenance Team to manage in accordance with landscape contracts.

The landscape contractor will provide a monthly report to NSW Ports on each maintenance area highlighting the work completed, compliance with this LEAMP and any outstanding issues/problems.

Weeding

All weed growth and re-occurring weed growth will be removed by hand, brush cutter or spray with herbicide unless otherwise specified throughout all planted and mulched areas. This work shall be executed at regular intervals so as to control and manage the spread weeds in planted and mulched areas.

Care should be taken to protect all trees and shrubs from overspray and to avoid spraying if rain is likely in a 12 hour period.

Note: No spraying of herbicides is permitted in or near the Frog Habitat Creation Area.

Staking and Tying

Stakes and ties will be used as required to support plants and to avoid trampling. Developing plants exposed to severe wind conditions will have an appropriately sized stake and tie positioned in such a way so as not to cause damage via movement or restriction.

In the case of trees and tall shrubs three hardwood stakes will be placed obliquely with the first stake placed on the opposite side to the prevailing winds. Single staking is to be discouraged with large plants. Stakes should be removed when a plant has reached a self-supporting stage.

Plant Replacements

All plants that are shown to have died shall be replaced with the same species and variety as the plant to be replaced with the closest commercially available size.

Generally plant material shall be uniformly high quality stock equal to best available for 'retail sale'. Plants shall be representative of optimum growth for the species as restricted by the container size.

The root system shall be balanced in relation to the size of the plant and shall be conducive to successful transpiration. Root conditions of plants may be determined by means of knocking out of plants from their containers and inspecting them.

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

Plants shall be healthy, well grown, hardened off specimens of good shape and free from pests and disease. Trees and shrubs shall have been grown in their final containers for not less than 12 weeks. Plants shall be well rooted without any indication of having been restricted (pot bound) or damaged at any time.

Rubbish Removal

Routine maintenance is an ongoing day-to-day task which involves all assets and activities required to keep the ILC at Enfield operating safely and is the responsibility of all maintenance staff. Any bottles, paper, cigarette butts, etc, shall be removed by hand from the site. Leaf litter shall be removed from all paved areas and removed from site.

Drainage

Overflow drains shall be cleared of mulch and other foreign material. This work shall be executed regularly so that all overflow drains are cleared when observed as part of inspections and maintenance schedule. In addition, inspections will be initiated following storm events so that any accumulated debris is cleared from drains.

A description of landscaping specifics within each management area of the ILC is provided in the following sections.

4. Southern Ecological Area

The Southern Ecological Area includes Mt Enfield (including a public access track), the GGBF Habitat Creation Area, Coxs Creek and associated floodplain. Figure 5 shows the location and extent of the management units within the Southern Ecological Area.

NSW Ports and its landscape contractors regularly inspect and maintain when required access gates to Mt Enfield and the Frog Habitat Creation Area, the public access path to Mt Enfield and the maintenance tracks and security fencing for the Southern Ecological Area.



Figure 5: Management units in the Southern Ecological Area

The Landscape Objectives for the Southern Ecological Area are:

- removal and management of weeds and non-indigenous species; without the use of herbicides in the FHCA in accordance with the Frog Management Plan to prevent harm to frogs
- ongoing maintenance and management of the integrity of the Mt Enfield landform including bush regeneration;
- ongoing monitoring and management of the Green and Golden Bell (FHCA), including habitat ponds and movement corridor, specifically to improve condition and habitat value of the area through effective bush regeneration techniques and water level control of the ponds;
- vegetation (including tree) removal, lopping or pruning where required for security, Work Health & Safety and traffic safety requirements;
- feral pest management as required;
- ongoing management of public pedestrian access to Mt Enfield for the appreciation of operations, ecological features and heritage items; and
- vehicle access for operational and maintenance purposes

4.1 Mt Enfield

Landscaping Components

Mt Enfield is located in the south of the ILC site within the Southern Ecological Area, as shown on Figure 5.

The highest point of Mt Enfield is currently 36.0 m AHD. The level of the footpath on the northern side of Punchbowl Road is approximately 26 m AHD. The area within the ILC site immediately north of Punchbowl Road has been filled to the same level as the footpath for a distance of approximately 10 - 12 m, before rising at a slope of 1V:5H to 35.25 m AHD and then flattening out to the highest point of 36 m AHD. The northern, eastern and western sides of Mt Enfield have a slope of approximately 1V:2H.

Where available, topsoil from the site was used in the reshaping of Mt Enfield. Hydro-mulching was undertaken as part of initial stabilisation works and an EcoBlanket layer was then applied to stabilise the soil and maintain the integrity of the slope. Additional soil requirements including maintenance of the topsoil and mulching for new plantings are addressed by the onsite landscape contractor.

In accordance with the requirements of CoA 6.3 (d), the reshaped Mt Enfield was landscaped with indigenous native species. The plant communities used to revegetate Mt Enfield comprised native species mostly from the locally occurring Cumberland Plains Woodland. Refer to the planting schedule in Appendix A for more details.

In addition, native *Eucalyptus tereticornis* (Forest Red Gums) have been planted along the Punchbowl Road site boundary to the south of Mt Enfield to provide additional vegetative screening for the Southern Ecological Area.

The revegetation will improve the long term ecological conditions of the area. Existing noxious weed infestation will be controlled and targeted through a sequential program of weed removal, mulching and planting which will minimise the exposure of Mt Enfield slopes to erosion potential. This will ensure the slopes remain vegetated enough to stabilise the soil and maintain the slope gradients.

Mt Enfield contains contaminated spoil material from the Enfield ILC site. A 100mm layer of clean fill has been placed over the contaminated material. A SMP was prepared for the Southern Precinct, including Mt Enfield, to minimise exposure to contamination on site. The SMP applies to any works that involve excavation or any landscaping maintenance that has the potential to disturb the clean fill layer. The SMP has been developed to cover landscaping works and maintenance, management of the FHCA and to allow public access along the track provided at Mt Enfield. NSW Ports' landscape contractors have been provided with a copy of the SMP and are required to comply with its provisions.

Controlled public access is provided to Mt Enfield. The entrance to the public access track is from Punchbowl Road via a self-closing gate and visitors are confined to a single access track that follows the ridgeline to the top of Mt Enfield to a number of viewing points. Fencing and vegetation barriers ensure visitors remain on the designated pathway to ensure their safety and to maintain the integrity of landscaping treatments in this area. Public access to the area is restricted to daylight hours only, with the gate locked after dark.

Mt Enfield Management Actions

Routine inspections of Mt Enfield will be undertaken by NSW Ports at quarterly intervals. These inspections will check the site for the following potential issues:

- Weeds and exotic species
- Dead or damaged plants
- Litter
- Erosion and integrity of areas
- Access pathway, signs and fencing

The Consultant Herpetologist has advised that herbicides may be used on the site of Mt Enfield provided that spray drift cannot reach the Frog Habitat Creation Area and that surface sprays cannot runoff into this area. Any proposed use of

herbicides in the Mt Enfield area will therefore require NSW Ports’ approval and will be undertaken in consultation with NSW Ports’ Consulting Herpetologist.

Additional requirements include restricting members of the public from entering the Frog Habitat Creation Area by ensuring that any public access to Mt Enfield restricts visitors to the nominated pathway and prevents unauthorised access to the adjacent frog ponds.

All batters on the Enfield ILC site were originally treated with an EcoBlanket treatment. Ongoing stabilisation of batter slopes will be done through re-planting where necessary.

Table 4 provides a summary of the management and maintenance measures associated with Mt Enfield.

Table 4: Summary of Management Measures for Mt Enfield

SUBSYSTEM	MAINTENANCE ACTIVITY	MAINTENANCE INTERVAL
General Landscaping	Routine inspection of vegetated area for: <ul style="list-style-type: none"> • Growth • Eroded areas • Vegetation presenting a safety or security risk • Dead plants/shrubs • Litter 	On going as required through landscaping contract
	Maintenance Activity: <ul style="list-style-type: none"> • Mowing and general cleaning of dead plants/litter • Weed removal (brush cutting or spraying) • Stabilisation of eroded areas • Replanting of bare areas 	Continual/ongoing Continual/ongoing As required As required

4.2 Green and Golden Bell Frog Habitat Creation Area

Landscaping Components and Management Actions

The GGBF Habitat Creation Area was designed in accordance with recommendations of NSW Ports’ consulting herpetologist, Dr Arthur White and as required by CoA 2.48, incorporates the requirements outlined in the Management Plan for the Green and Golden Bell Frog Key Population at Greenacre (OEH 2005). In accordance with the Project Approval, provisions must be made for monitoring the outcomes of the actions required under CoA 2.48, that is:

- creation of overwintering habitat as part of the improved foraging habitat at the southern end of the site;
- provision of linkages to the TfNSW ponds; and
- restrictions on the use of herbicides in known frog habitat and attainment of water quality standards for water discharged from the site.

Landscaping features and terrestrial and aquatic species suitable for GGBF habitat have been provided (in accordance with the Frog Management Plan prepared by NSW Ports’ consulting herpetologist in consultation with the OEH).

The elements that make up the two hectares of frog foraging habitat required under CoA 2.48 include a number of management units which fall within both the Frog Habitat Creation Area and the Coxs Creek Floodplain, as shown on Figure 6:

- three frog ponds
- a range of diurnal shelter sites comprising boulders and sleepers/logs
- over wintering habitat
- large frog foraging space
- frog movement corridor which connects to the Enfield Marshalling Yards

The frog ponds, foraging area and movement corridor are all located within the Cox’s Creek Floodplain area.

An adjacent area has been revegetated with species from the Cumberland Plains Woodland, plant community including south-east noise mound (depicted as management unit 8 in Figure 6).



Note:

- Precincts 4, 5, 6 & 8 contribute to the GGBF Habitat Creation Area
- Precincts 3, 4, 5 and sections of 8 are part of the Cox Creek Flood Plain

Figure 6: Southern Ecological Area Management Units

Herbicides, particularly glyphosate products, are not to be used around the ponds and the movement corridor. If herbicides are required to be used in the Frog Habitat Creation Area, approval will need to be given by NSW Ports. Any proposal for pesticide usage in the Frog Habitat Creation Area will be discussed with the Consulting Herpetologist. In general, spraying of herbicides would not be permitted but cutting and painting weeds may be acceptable under some circumstances. Herbicides may be used on other parts of the site provided that spray drift cannot reach the Frog Habitat Creation Area and that surface sprays cannot enter surface water run-off and enter the Frog Habitat Creation Area.

Signs have been erected around the Frog Habitat Creation Area indicating that herbicides, particularly glyphosate products, are not to be used around the ponds. Responsible land managers have also been briefed regarding this matter.

Frog Ponds

Three frog ponds (total surface areas of 400 m²) were constructed, the design of which is shown on Figure 7. One pond was designed as a water storage pond (Pond 1) to be used primarily for the supply of water to the other two ponds (Ponds 2 and 3). Ponds 2 and 3 are drainable and operate with fluctuating water levels. Unless the pond is being drained water should always be present in Ponds 1 and 2 and the depth should, if possible, fluctuate between 0.5 to 1.0 m. Ponds 2 and 3 must be topped up to a maximum of 1.0 m, if possible, from Pond 1 when the water levels drop below 0.5 m. During normal operations, the top water level in Ponds 1 and 2 will automatically be retained at a level of no greater than 1.0 m through the use of an overflow riser.

Plate 1 shows one of the frog ponds after a rain event.

Treated water from the southern stormwater bioretention/detention basin at the site (refer Plate 2), located about 70 m north-west, is the main source of water to the pond system beside rainfall. NSW Ports has installed a pump in the pit downslope of the bioretention basin and water is pumped to a number of storage tanks located upslope of the Frog Habitat Creation Area and then directed to Pond 1 via a gravity fed pipe.

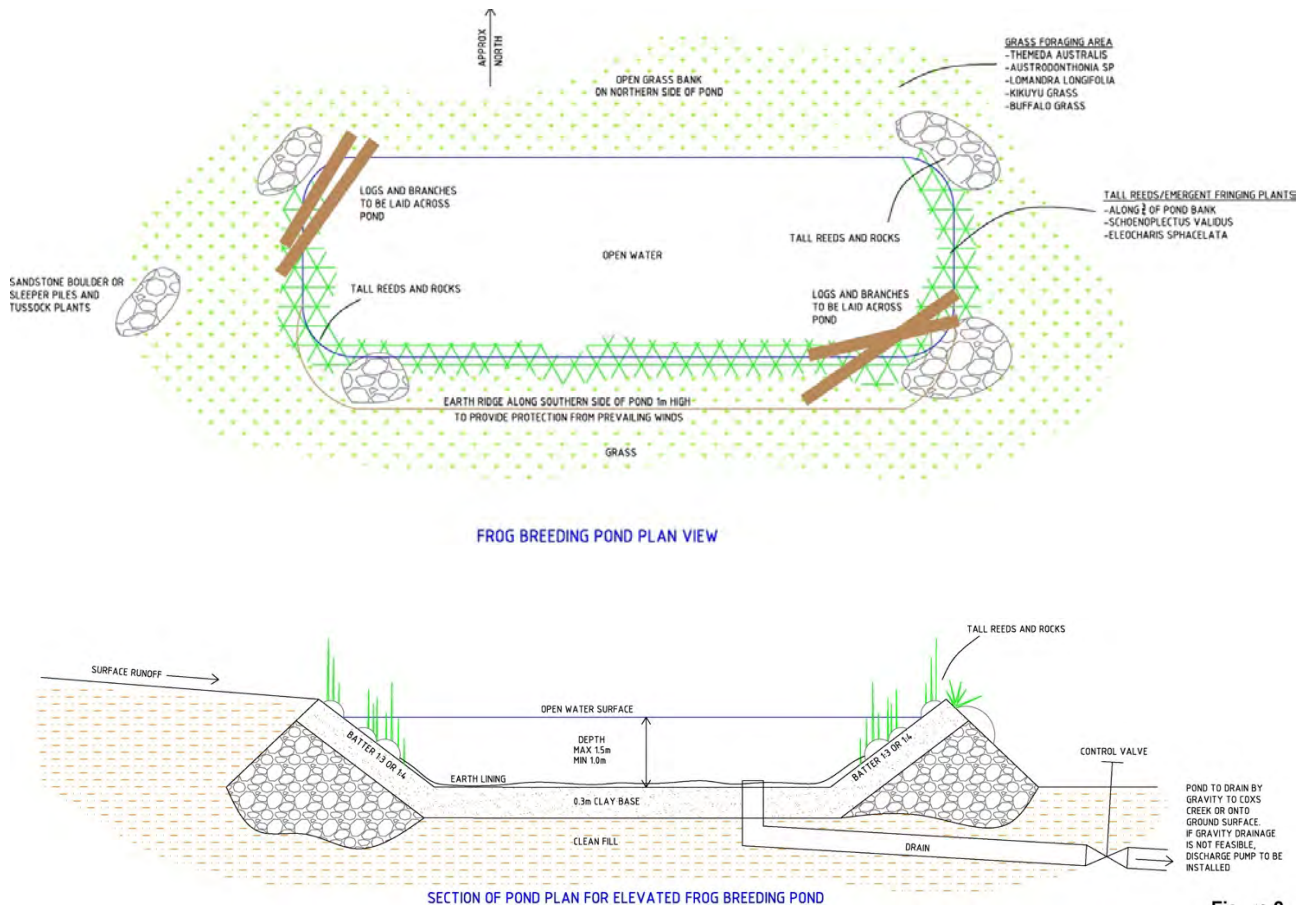


Figure 7: Frog Pond Design



Water is supplied from Pond 1 to Ponds 2 and 3 by gravity fed pipes. Fluctuation in water levels in Ponds 2 and 3 and the rate of flow received in these ponds is to be manually controlled by separate valves for each pond, enabling protection of the habitat in the ponds. If full, Pond 2 is designed to overflow via a rock spillway (refer Plate 3) onto the floodplain rather than overflowing into the Ponds 3, thus protecting the habitat in the frog ponds. All inlets to the ponds are provided with rock protection to prevent erosion of the pond embankment. Ponds 2 and 3 do not have a large catchment area draining directly to them and are therefore unlikely to overflow unless heavy rain occurs when they are already full.

Plate 3 – Rock spillway for Pond 2



During larger rain events the bio-retention/detention basin drains via a separate 850mm, high flow pipe to Coxs Creek and, in extreme events greater than 100 year ARI, overflows via a rock mattress spillway also into Coxs Creek.

Stormwater undergoes primary and secondary treatment prior to entering the frog pond system. Primary treatment is provided through gross pollutant traps and an inlet forebay sediment trap installed at the downstream end of the site stormwater collection system prior to discharge into the stormwater bio-retention/detention basin.

Secondary treatment is provided in the bioretention basin which is integrated within the stormwater detention basin. The bio-retention system achieves the Best Practice Stormwater Targets adopted by the Cooks River Sustainability Initiative and the targets set by the NSW DECC (2008) in the draft *Managing Urban Stormwater Guidelines*.

Pond Dewatering

Ponds 2 and 3 are drainable by a gravity outlet pipe, controlled by a capped drainage outlet, to permit periodic removal of water from the ponds. Studies show that frogs can be displaced from stable aquatic habitat areas but fare much better when ponds are fluctuating or ephemeral (Pyke and White, 1999).

Having drainable ponds, ensures that at least one of the ponds is functioning as a newly established pond most of the time. Each winter, or as considered necessary, NSW Ports will, in consultation with the herpetologist, drain one pond (usually Pond 3) and allow it to become dry, so that the surrounding emergent vegetation regresses and dies. The emptied pond would be refilled the following year and the natural succession of aquatic plants allowed to proceed. The decision to drain a pond, and any requirements for the draining of the pond, will be made by NSW Ports in consultation with the project's herpetologist. Any potential GGBF tadpoles present in the pond would be relocated prior to draining.

Pond drainage will also enable removal of unwanted pests from the ponds, in particular Plague Minnows *Gambusia holbrooki*. These small fish are present in the brickpit lake and are known to prey on the tadpoles and eggs of Green and Golden Bell Frogs (Pyke and White 2000). They can be transported by birds between aquatic sites, resulting in future pond infestation. If these fish are allowed to remain in a pond the chance of them being transported to another pond is high. Should *Gambusia* be found in one of the ponds, the pond would be drained during the next winter and the fish killed.

Pond water levels are monitored monthly by one of NSW Ports specialised Landscape Contractors and recorded in a monthly report.

Vegetation

The plantings in Ponds 2 and 3 have been designed for a fluctuation in water level generally between 0.5 to 1.0 m in depth. The inlets to the ponds are provided with rock protection to prevent erosion of the pond embankment and damage to pond plants.

As part of the establishment of the Frog Habitat Creation Area, emergent plants were planted in clumps in each of the ponds to provide shelter and basking sites for frogs during the day and to act as insect attractants (i.e. food for the frogs). The plants chosen for the ponds were all multiple-stemmed, including Sedge (*Schoenoplectus validus*) and Spike Rush (*Eleocharis sphacelate*). As these plants become too thick they are reduced on an as needs basis. When this occurs, the pond is drained and the plants are allowed to die back.

Fringing vegetation provides shelter habitat as well as foraging areas close to the breeding ponds. As adult GGBF feed mainly on large arthropods, often the most suitable foraging habitat is overgrown grassland. In many of the sites where GGBF occur, these grasses are exotic, such as Kikuyu and Buffalo Grass. These grasses appear to be particularly suitable as they grow quickly, are eaten by a variety of crickets, grasshoppers and other invertebrates, and create their own micro-habitats when allowed to become overgrown.

Vegetation species for the frog ponds are provided in the planting schedule in Appendix A. Alternate species may be considered where appropriate in consultation with the landscape contractors and the consulting herpetologist.

Shelter Habitat

Shelter for GGBF was provided in the form of:

- emergent plants around the ponds;
- sleepers and/or rock piles around the ponds, relocated from other areas of the ILC site;
- Mat Rush thickets and rock piles on the grassed area around the pond and at set points along the frog corridor.

At Enfield, the main predators of GGBF will be birds such as White-faced Herons, White Ibis, cormorants and egrets. These birds are likely to inhabit the ponds when vegetation levels are low (i.e. when a pond is being dried out or refilled).

Birds will prey on tadpoles in the ponds. Logs or long branches laid across the pond will provide some protection for tadpoles (and also basking sites for adult Bell frogs). If the vegetation is low and does not provide adequate protection for the tadpoles, flutter ribbons will be suspended above the ponds to deter the birds (similar to those used at the Marrickville Bell Frog Pond).

Frog Foraging Area

Specific terrestrial and aquatic plant species were recommended by NSW Ports' herpetologist to meet habitat requirements with regard to density of vegetation and foraging quality. In addition to the recommended native species, NSW Ports' herpetologist identified Kikuyu grass as being desirable within the Frog Habitat Creation Area, due to its quick growth and ability to provide optimal micro-habitats for the GGBF. Paths were provided in the area to separate Kikuyu grassland from native grassland plantings, allowing for manual removal of spreading Kikuyu.

Access to the Frog Habitat Creation Area is restricted by fencing, with the area open only for potential guided activities to community groups, schools and universities for educational purposes, and for maintenance and monitoring.

Frog Movement Corridor

GGBF are a very mobile frog species. They have been recorded undertaking long distance movements overnight and over sustained wet periods (Pyke & White 2001). This mobility allows frogs to periodically move between neighbouring sites.

GGBF need to be able to move safely between ponds and between foraging areas. At the ILC site, a number of foraging areas and shelters have been created around the ponds. The ability of frogs to move between nearby habitats at Juno Parade and the TfNSW Pond is important and facilitated by the Frog Movement Corridor constructed as part of the Frog Habitat Creation Area. This corridor, shown on Figure 6, consists of an approximately 10 m wide area of sown grass with a central swale. The corridor was planted with native tussock grasses and sleeper and/or rocks piles were relocated from

other areas of the ILC Site and located at 50 m intervals along the corridor to provide temporary refuge for dispersing frogs. Some tussocks plants, such as *Lomandra longifolia*, were also planted near these refuge sites. A swale, approximately 1 m in width collects water after rain and remains as a damp thoroughfare leading to the frog ponds in the Frog Habitat Creation Area. This area will be periodically mowed.

Coxs Creek Floodplain

Part of the Coxs Creek Floodplain is included in the two hectare of frog foraging area provided in the Frog Habitat Creation Area. The only landscaping that is undertaken in this management unit is maintenance including the removal of noxious weeds and management of grass to ensure that floodplain capacity is not diminished.

Cumberland Plain Woodland including South-east Noise Mound

In accordance with CoA 2.14 and the approved Stage 2 CEMP, an earth noise mound was constructed in the south-eastern part of the site. Landscaping of the mound was carried out using local endemic native species from the Cumberland Plain Woodland community. The species were selected to either match or complement the existing tree species on site and to provide a balanced scale and level of screening to the light industrial / commercial street corridor beyond.

Additional Frog Habitat Creation Area (FHCA) Management Actions

Predator Species

To protect shelter habitat from unwanted predators such as birds, scaring devices may be required to be installed, however, NSW Ports would liaise with the Consulting Herpetologist as to the measures and equipment required if monthly monitoring shows that birds are becoming more prolific around the ponds.

Foxes constitute the other main potential predator at Enfield, however, at this stage no measures are considered to be practicable in the control of foxes.

Sick or Dead Frogs

Any frogs that die in captivity or are found dead within the Frog Habitat Creation Area will be retained. The carcass would be picked up with gloved hands and the body preserved in a prepared specimen container filled with buffered formalin. The gloves would then be disposed. Dead frogs may need to be sent away for pathology testing.

The treatment of sick frogs would be carried out by NSW Ports' Consulting Herpetologist. Veterinary advice would be sought as needed.

Frogs that are caught and held in captivity because they appear to be sick would be kept isolated on site. A lockable work shed adjacent to the ponds is for this. Only one frog will be kept in each cage and the frogs will not be handled once they have been placed in the cage. Water bowls and other items placed in the cage would be sterilised in weak bleach when they are taken out. Similarly, when a frog cage becomes vacant by the release of a frog, the cage would be sterilised by washing in bleach and then left in direct sunlight for a few hours.

All water given to sick frogs would contain a 2% solution of Benzalconium and all handling procedures would conform to the NSW National Parks and Wildlife Service *Guidelines for Frog Handling and Frog Hygiene* (Appendix B).

If NSW Ports staff or contractors encounter sick or dead frogs within the Frog Habitat Creation Area, the HSE Team would be immediately notified. If the sick frog can be caught, it would be placed in the frog containers provided by the Consulting Herpetologist. The HSE Team would then notify the Consulting Herpetologist.

Frog Monitoring

Effective management of the GGBF population will be based on the result of ongoing frog monitoring. Frog monitoring within the Frog Habitat Creation Area, including the Frog Movement Corridor, will be carried out by the Consulting Herpetologist annually and include two nights for opportunistic surveys, carried out when breeding activity is likely to be highest and frog population estimates can be carried out. Frog monitoring will comprise:

- Calling surveys: an estimate of the number of male GGBF calling at each pond or location will be recorded. If no GGBF are calling, play back recordings are to be used to try to elicit calling.
- Headlamp searches: searches using headlamps.
- Tadpole Survey: sites containing freshwater will be netted using hand nets and all tadpoles caught will be identified and returned to the site of capture.

All GGBF seen or caught during monitoring surveys will be recorded, measured and sexed. Unchipped Bell Frogs will be micro-chipped. Frog location, activity and micro-chip tag number will also be recorded.

Tagging involves the implantation of the passive-induction transponder (PIT tag) microchip into captured frogs. These tags have been used very successfully in monitoring studies at Homebush Bay and in research studies on Broughton Island and Avoca Lagoon in NSW. Population sizes can be estimated from the recapture rates of tagged frogs.

Frogs will be released at the site of capture unless there is concern about the state of health of the frog. Retained frogs will be maintained in captivity until they are fit for release.

The extent of movement between the surrounding habitat areas will also be monitored so that future corridors can be considered, and the adequacy of existing frog corridors assessed.

During annual frog monitoring, some water testing will be undertaken by the Consulting Herpetologist to measure pH, salinity, dissolved oxygen, water temperature, turbidity and conductivity.

With the exception of the annual frog monitoring which is undertaken by the Consultant Herpetologist (usually around November/December), monthly monitoring of the Frog Pond Creation Area is undertaken by the Landscape Contractor in accordance with the tasks listed in Table 4. A report is prepared following each monthly inspection which outlines management measures and maintenance activities undertaken within the area and submitted to NSW Ports.

NSW Ports does not intend to fund or undertake any breeding or monitoring programs for the GGBF. As required by CoA 2.48, NSW Ports' funding commitment is limited to the creation of the habitat area, the land dedication associated with the frog ponds and surrounding habitat, and the monitoring and reporting program outlined in this document.

Frog Database

The results of monitoring and opportunistic sightings will be recorded in a database by the Consulting Herpetologist. The database will record the details of each frog, including date of capture, initial body size, location, sex and any other relevant notes.

This information will provide data on frog movements and population estimates and will enable an assessment to be made of habitat use. The results of monitoring surveys will be maintained in a monitoring file. Details to be recorded will include the number of frogs encountered, location found, sex and activity.

In accordance with CoA 2.48 of the Project Approval, the results of the monitoring of the actions listed above must be periodically reported to the DECCW (now Environment, Energy and Science within the Department of Planning, Industry and Environment). NSW Ports will consult with the Environment Team in DPIE in regards to these frog surveys.

The results of the monitoring will be provided to NSW Ports in the form of an annual report to be prepared by the Consulting Herpetologist. The annual report will contain information on:

- the arrival of GGBF into the Frog Habitat Creation Area;
- the relative frog numbers in the area over time;
- the number of migrating frogs from satellite populations entering the area;
- the number of frogs dispersing from the area;
- the success of the Frog Habitat Creation Area including any breeding at the ponds, and success of the over-wintering habitat and the frog movement corridor;
- recommendations regarding management strategies;
- the status of the actions assigned to NSW Ports under the Management Plan for the GGBF at Greenacre (DECC, 2007).

Summary of Management Measures

The checklist in Table 4 summarises the measures that are required to be managed on a long term basis within the Frog Habitat Creation Area. Responsibility, frequency and timeframe for the various measures are also outlined.

Table 5: Summary of Management Measures for Frog Habitat Creation Area

TASK	DESCRIPTION	RESPONSIBILITY	FREQUENCY
Inspection	Visually inspect the Frog Habitat Creation Area for the following: <ul style="list-style-type: none"> • Damage and erosion • Weeds • Plant die-off • Pond water levels • Dead or sick frogs • Presence of birds • Signage • Water pollution, algae accumulation 	Specialist Landscape Contractor in consultation with NSW Ports	Monthly
Weed removal and Plant Die-off	Hand pick weeds including bulrush from within the ponds (no herbicides) Remove any dead plants.	Specialist Landscape Contractor in consultation with NSW Ports	Monthly
Pond Water Levels	Monitor water level of ponds If water level less than 0.5 m, top up pond with water stored in on-site storage tanks	Specialist Landscape Contractor in consultation with NSW Ports	Monthly
Dead or sick frogs	Sick or dead frogs must be immediately reported to NSW Ports	Specialist Landscape Contractor in consultation with NSW Ports	Monthly
Presence of Birds	Install flutter ribbons (if required)	Specialist Landscape Contractor	As advised by Herpetologist and agreed by NSW Ports
Signage	Check integrity of signs within Frog Habitat Creation Area (i.e. no entry without permission, no herbicide use, etc)	Specialist Landscape Contractor	Monthly
Swale and grass cutting	Cut 1-2m meandering paths in the Kikuyu grass surrounding rock piles/sleepers using whipper snipper or brushcutter. Clear access paths, rock lined overflow paths and valve standpipes of any overgrowth. Cut swale in central movement corridor	Specialist Landscape Contractor in consultation with NSW Ports	Monthly
Empty pond (if required)	Identify pond to be drained and relocate any GGBF tadpoles if necessary Once pond is drained, if present, kill <i>Gambusia holbrooki</i> .	Specialist Landscape Contractor in consultation with the NSW Ports. Advice of Consultant Herpetologist to be sought prior to draining of the pond.	If required Every winter, a pond is to be drained and not refilled until August the following year.
Mechanical maintenance of ponds	Check valves for any rusting or damage and replace as required. Check on-site water storage tank to ensure water levels. Check on-site storage shed for signs of damage, corrosion, graffiti.	Specialist Landscape Contractor in consultation with the NSW Ports	Monthly
Annual Frog Monitoring	Frog and frog habitat monitoring Maintain frog database Reporting	Consultant Herpetologist	Annually

5. Stormwater Detention/Water Quality Basins

Three stormwater detention/ water quality treatment basins are provided within the ILC:

- Basin B - Northern Detention Basin;
- Basin F - Catchment F Stormwater Detention Basin and Water Quality Treatment;
- Basin D - Southern Stormwater Detention Basin and Water Quality Treatment.

The basins were developed and landscaped in accordance with the Regal Innovations Operation and Maintenance Manual (2014). Works included the installation of pits and pipe including slotted feeder pipes, construction of concrete dissipaters and spillways, gabion rock baskets, planting, soil works, jute mesh installation and hydroseeding.

The basins have been designed to receive stormwater and remove pollutants from stormwater runoff on the site. Basin B drains an area in the north and centre of the site, Basin F drains warehouse area F and Basin D drains the southern area of the site and supplies the required water for the frog ponds within the Frog Habitat Creation Area. The bioretention basin with Basin D was previously shown in Plate 2.

The design of each basin satisfies sizing and functional requirements as well as aesthetic integration into the broader landscape context. The basins have been planted with local endemic species that achieve Water Sensitive Urban Design (WSUD) bioremediation functions. Access for maintenance has also been included. Each basin can be subdivided into two components; the basin floor and the batters.

The Landscape Objectives for the Stormwater Detention/Water Quality Basins:

- ongoing management and maintenance of the vegetation in the basins for effective bioretention;
- ongoing management of basin infrastructure, including integrity of jute and irrigation infrastructure to FHCA;
- removal and management of weeds and non-indigenous species;
- vegetation removal, lopping or pruning where required for security, Work Health & Safety and traffic safety requirements; and/or pest/disease control;
- monitoring and management of sediment and litter build up; and
- monitoring and management of erosion and scour.

Management Actions

Table 6 outlines the proposed maintenance plan for the operational management actions for the basins. These maintenance activities include the relevant recommendations from the Operation and Maintenance Manual.

Table 6: Summary of Management Measures for the Stormwater Detention/Bioretention Basins

SUBSYSTEM	MAINTENANCE ACTIVITY	MAINTENANCE INTERVAL
General Landscaping	Routine inspection of vegetated area for: <ul style="list-style-type: none"> • Growth • Eroded areas • Vegetation presenting a safety or security risk • Dead plants/shrubs • Litter 	Continual/ongoing
	Maintenance Activity: <ul style="list-style-type: none"> • Mowing and general cleaning of dead plants/litter (outside known frog habitat) • Weed removal (hand removal, brush cutting or spraying with approved herbicides) • Stabilisation of eroded areas • Replanting of bare areas/failed vegetation with similar sized plants, provenance and species 	Continual/ongoing Continual/ongoing As required As required

Batter Treatment <ul style="list-style-type: none"> Basin batter 	Routine inspection of batter surface for: <ul style="list-style-type: none"> Unstable batter profile (slip, fall release rocks, not true to line, bulging, slumping, scoured or eroded) Presence of undesired vegetation (trees, noxious weeds, weeds in general) Absence of desired vegetation (missing ground cover to bind batter face) Deterioration of batter protection systems (batter scouring or jute damaged) Water seepage or slope failures 	Continual/ongoing
	Event inspection of batters condition after heavy rain event	After 20mm rain within 24hrs
	Maintenance activities: <ul style="list-style-type: none"> General cleaning of litter Weed removal (hand removal, brush cutting) Repair and replanting of slopes 	Continual/ongoing Continual/ongoing As required
Basins	Routine inspection of basin condition for: <ul style="list-style-type: none"> Concrete batters unstable and scoured Basin silted Drains silted, scoured or blocked 	Six monthly
	Event inspection of batters condition after heavy rain event	After 20mm rain within 24hrs
	Maintenance activities: <ul style="list-style-type: none"> Repair batters Cleaning of drains and basins 	As required As required
	Remove sediment build up from forebays of bio-retention basins.	Six monthly or after rain as required
	Infill any holes in the filter media. Check for erosion or scour and repair, provide energy dissipation (e.g. rocks and pebbles at inlet) if necessary.	Six monthly or after rain as required
	Inspect for the accumulation of an impermeable layer (such as oily or clay sediment) that may have formed on the surface of the filter media. Repair minor accumulations by raking away mulch on the surface and scarifying the surface of filter media between plants.	Six monthly or after rain as required
	Check for litter (including organic litter) in and around filter areas. Remove both organic and anthropogenic litter to ensure flow paths and infiltration through the filter media are not hindered.	Six monthly or after rain as required
	Assess plants for disease, pest infection, stunted growth or senescence.	As required for aesthetics
	Infill planting: between six and 10 plants per square metre should (depending on species) be adequate to maintain a density to the basin floor to ensure the plant's roots touch each other. Planting to be evenly spaced to help prevent scouring due to a concentration of flow.	As required
	Ensure that perforated pipes are not blocked to prevent filter media and plants from becoming waterlogged.	Six monthly or after rain
Ensure inflow areas and grates over pits are clear of litter and debris and in good and safe condition. Inspect for dislodged or damaged pit covers and ensure general structural integrity. Remove sediment from pits and entry sites etc. (likely to be an irregular occurrence in mature catchment).	Six monthly or after rain	

6. Internal Roads, Verges and Warehouse Precincts

NSW Ports is responsible for the management and ongoing maintenance associated with landscaping of internal roads, verges, batters and other the landscaped areas of the warehouse precincts using species and features appropriate for landscaping an industrial facility.

Internal batters have been landscaped with native grass mix. The seed mix provides a complete erosion control solution on application. Nature strips adjacent to internal roads have generally been landscaped as per the verges treatment. Some narrow land strips between the kerbs and footpaths have been turfed. Warehouse precincts have been landscaped in accordance with the Landscape Masterplan represented by the drawing package included in Appendix A.

The Landscape Objectives for the internal roads and verges and warehouse precincts are;

- to keep the landscaping between the precincts of high quality and overall consistent with the Landscape Masterplan approved and implemented for the warehouse precincts;
- implementation and ongoing management of landscape plantings adjacent to internal roads throughout the site;
- vegetation (including tree) removal, lopping or pruning where required for security, Work Health & Safety and traffic safety requirements;
- removal and management of weeds and non-indigenous species;
- sediment and litter removal associated with high flow and storm events; and
- ongoing monitoring, stabilisation and maintenance of batters and slopes to prevent erosion/ scour.

Management Actions

Table 7 outlines the operational management actions for the internal roads and batters.

Table 7: Summary of Management Measures for Internal Roads, Verges and Warehouse Precincts

SUBSYSTEM	MAINTENANCE ACTIVITY	MAINTENANCE INTERVAL
General Landscaping <ul style="list-style-type: none"> • Internal road verges • Warehouse precincts 	Routine inspection of vegetated area for: <ul style="list-style-type: none"> • Growth • Eroded areas • Vegetation presenting a safety or security risk • Dead plants/shrubs • Litter 	Continual/ongoing
	Maintenance Activity: <ul style="list-style-type: none"> • Mowing and cleaning (outside known frog habitat) • Weed spraying 	Continual/ongoing Continual/on going
Batter Treatment <ul style="list-style-type: none"> • Warehouse batter • Internal road batter 	Routine inspection of batter surface for: <ul style="list-style-type: none"> • Unstable batter profile (slip, fall release rocks, not true to line, bulging, slumping, scoured or eroded) • Presence of undesired vegetation (trees, noxious weeds, weeds in general) • Absence of desired vegetation (missing ground cover to bind batter face) • Deterioration of batter protection systems (shotcrete cracked or jute damaged) • Water seepage or slope failures 	Continual/ongoing
	Event inspection of batters condition after heavy rain event	After 20mm rain event within 24hrs or a few consecutive days with rain 10mm to 20mm
	Maintenance activities: <ul style="list-style-type: none"> • Mowing and cleaning • Weed spraying/removal • Repair and replanting of slopes 	Continual/on going Continual/on going As required

7. References

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- NSW Ports, Enfield ILC Staging Report v3, 2019
- NSW Scientific Committee 2002. Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion - endangered ecological community listing - final determination
<http://www.environment.nsw.gov.au/determinations/CooksRiverCastlereaghIronbarkForestSydneyEndComListing.htm>
- Regal Innovations (2014) Landscaping Basins B, D and F – Operation and Maintenance Manual
- Sinclair Knight Merz (SKM), Intermodal Logistics Centre at Enfield Environmental Assessment, October 2005
- Sydney Ports Green and Golden Bell Frog Management Plan, revision 4, March 2010

Appendix A: Landscape Design Drawing Package

DATE PLOTTED: 6 October 2020 4:44 PM BY: MELANIE ELLINGTON



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NSW PORTS
 ENFIELD INTERMODAL LOGISTICS CENTRE
 LANDSCAPE PLANS

LANDSCAPE COVER SHEET

XREFS: XR-82020222-01-EI-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
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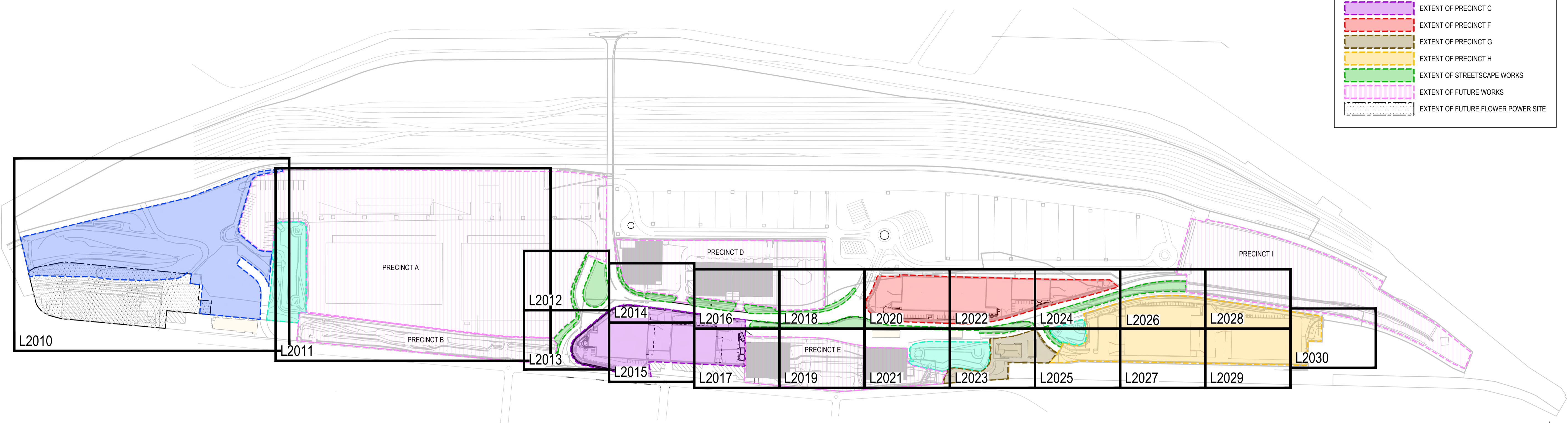
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Checked AG	Date 14.09.2020	
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Verified AG	Date 14.09.2020	DATUM AHD
Approved		Scale NTS
		Size A1
		Drawing Number 8202102201 L2000
		Revision C

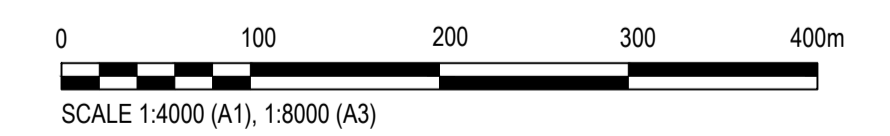
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- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- EXTENT OF FUTURE FLOWER POWER SITE



KEY PLAN
SCALE 1:4000

DRAWING LIST		
DRAWING No.	DESCRIPTION	REVISION
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8202102201 L2001	LANDSCAPE KEY PLAN AND DRAWING LIST	C
8202102201 L2002	LANDSCAPE PLANTING SCHEDULES	C
8202102201 L2010	LANDSCAPE PLANS SHEET 1 OF 21	C
8202102201 L2011	LANDSCAPE PLANS SHEET 2 OF 21	C
8202102201 L2012	LANDSCAPE PLANS SHEET 3 OF 21	C
8202102201 L2013	LANDSCAPE PLANS SHEET 4 OF 21	C
8202102201 L2014	LANDSCAPE PLANS SHEET 5 OF 21	C
8202102201 L2015	LANDSCAPE PLANS SHEET 6 OF 21	C
8202102201 L2016	LANDSCAPE PLANS SHEET 7 OF 21	C
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8202102201 L2029	LANDSCAPE PLANS SHEET 20 OF 21	C
8202102201 L2030	LANDSCAPE PLANS SHEET 21 OF 21	C



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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE KEY PLAN AND DRAWING LIST

Status			
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DATUM	AHD	Scale	1:4000
Size	A1	Revision	C
Drawing Number		8202102201 L2001	

FROG PONDS PLANT SCHEDULE

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Includes sub-sections for CUMBERLAND PLAIN WOODLAND (CPW) and Canopy and Midstratum Trees.

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Shrub Understorey.

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

NATIVE GRASS MIX (NGM)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

FROG MOVEMENT CORRIDOR (GFC)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

IMPROVED FORAGE TYPE A (IMF A)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

IMPROVED FORAGE TYPE B (IMF B)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

SHE OAK FOREST (SF-CL, SF-AT, SF-CG)

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Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

FROG PONDS (FRP)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

SWALE (SWL)

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Ground Layer.

MT ENFIELD PLANT SCHEDULE

Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: NATIVE SLOPE TREE & SHRUB MIX (NSTM) and Ground Layer.

NATIVE SLOPE MIX (NSM)

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DETENTION BASINS PLANT SCHEDULE

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Table with columns: ID, Botanical Name, Spacing (mm), Spacing (per m2), Size, % Mix. Sub-section: Shrub Understorey and Ground Layer.

PRECINCT C PLANT SCHEDULE

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Trees.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Shrubs & Perennials.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Grasses & Lilies.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Ferns, Cycads & Bromeliads.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Ground Covers.

PRECINCT F PLANT SCHEDULE

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Trees.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Shrubs & Perennials.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Grasses & Lilies.

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Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Climbers.

PRECINCT H PLANT SCHEDULE

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STREETSCAPE PLANT SCHEDULE

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Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Grasses.

Table with columns: ID, Botanical Name, Common Name, Size, Qty. Sub-section: Ground Covers.

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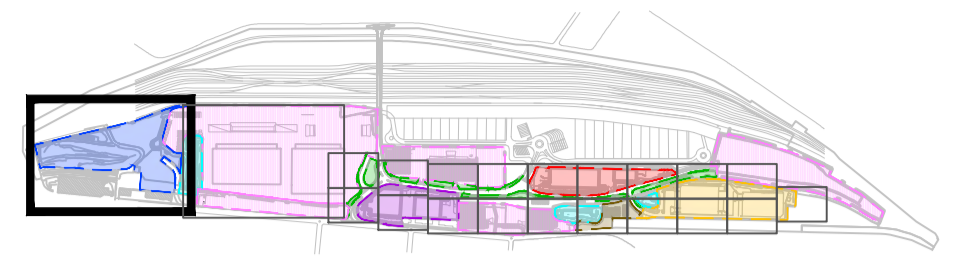
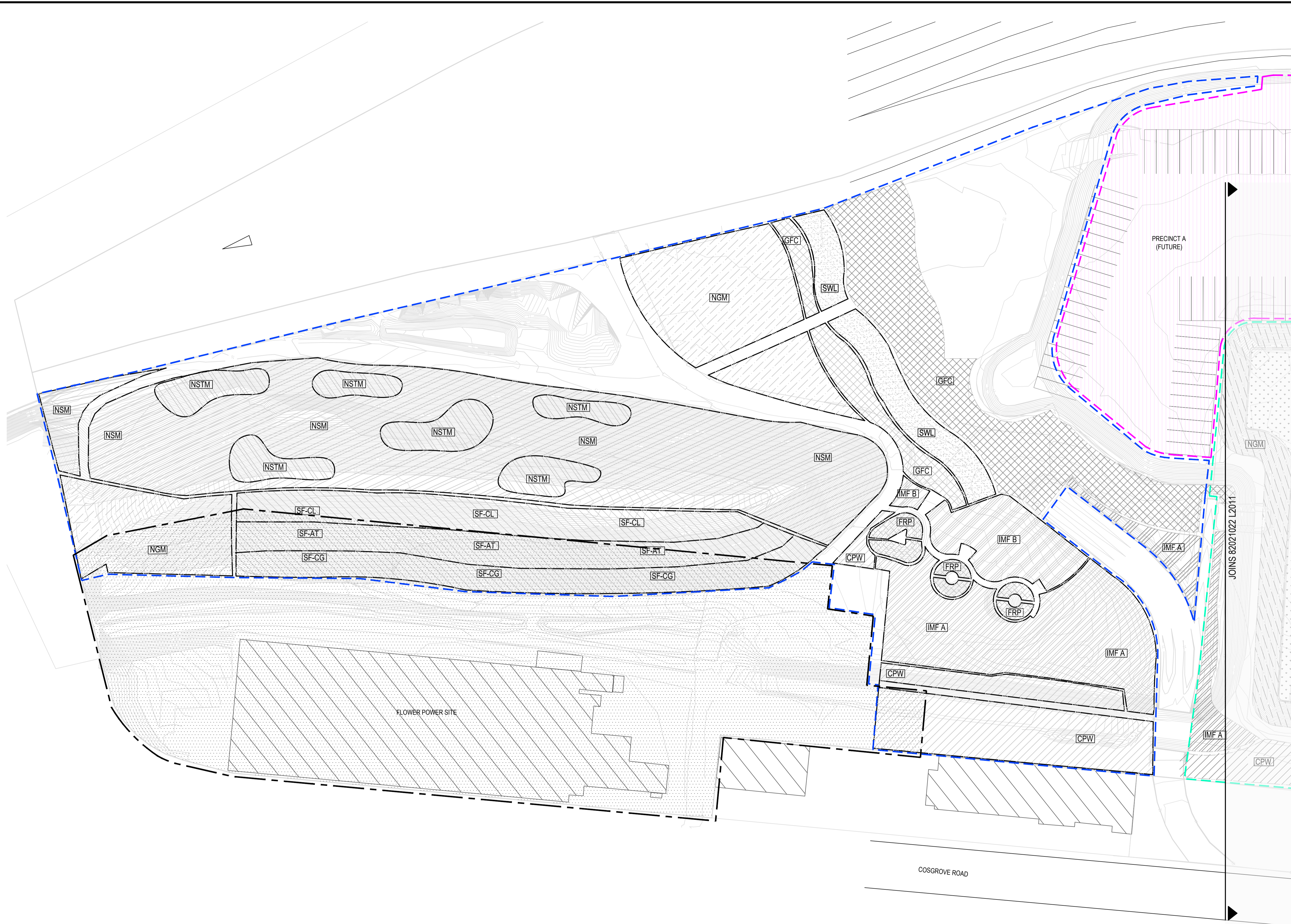
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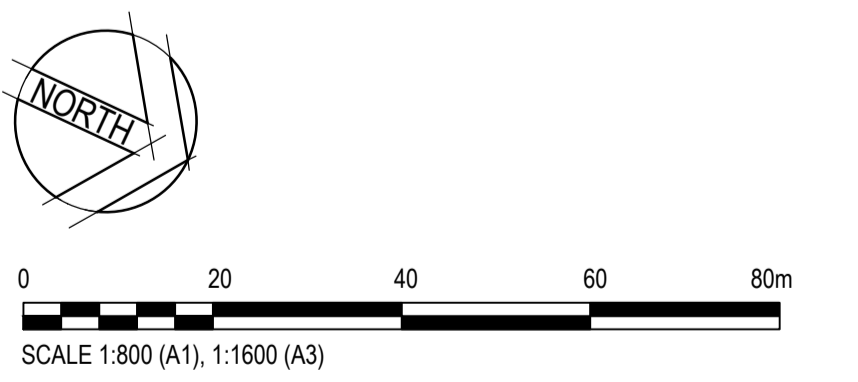
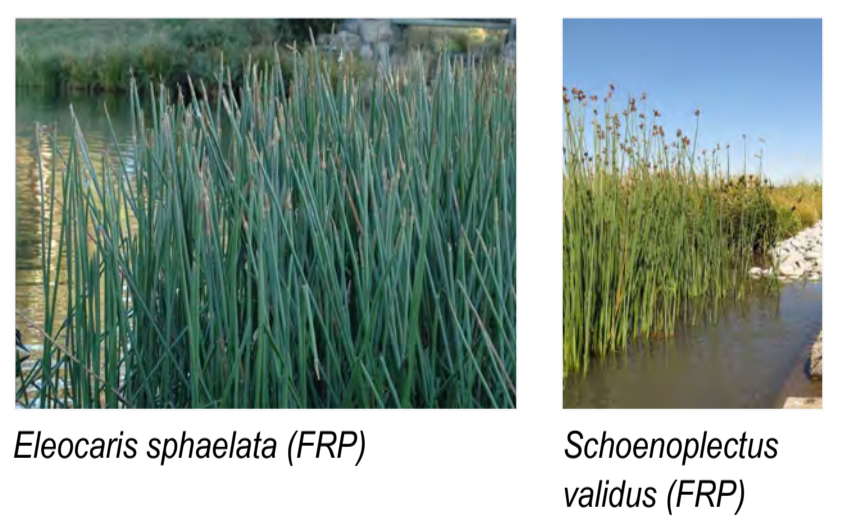
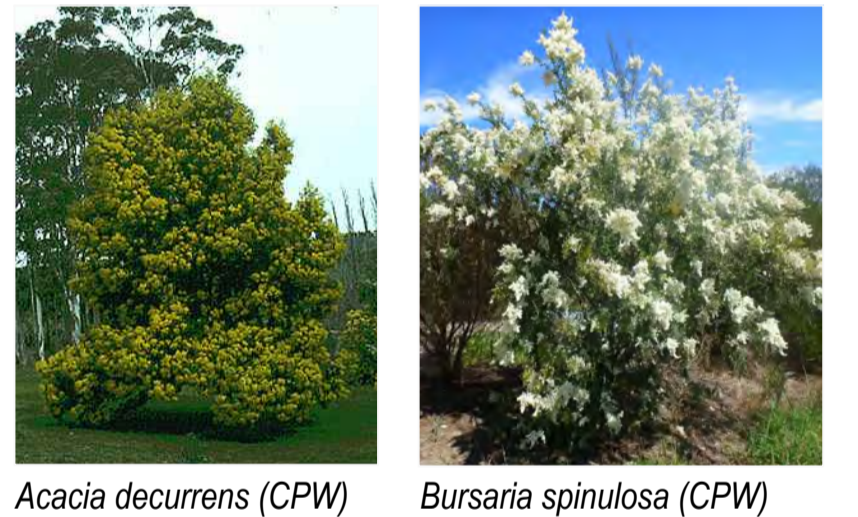


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- EXTENT OF DETENTION BASINS
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- NATIVE GRASS MIX
- GRASSLAND - FROG MOVEMENT CORRIDOR
- IMPROVED FORAGE TYPE 1
- IMPROVED FORAGE TYPE 2
- SHEOAK FOREST - CASUARINA LITTORALIS
- SHEOAK FOREST - ALLOCASUARINA TORULOSA
- SHEOAK FOREST - CASUARINA GLAUCA
- BIORETENTION BASIN
- FROG POND MACROPHYTES
- SWALE
- NATIVE SLOPE TREE & SHRUB MIX
- NATIVE SLOPE MIX
- EXTENT OF FUTURE FLOWER POWER SITE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



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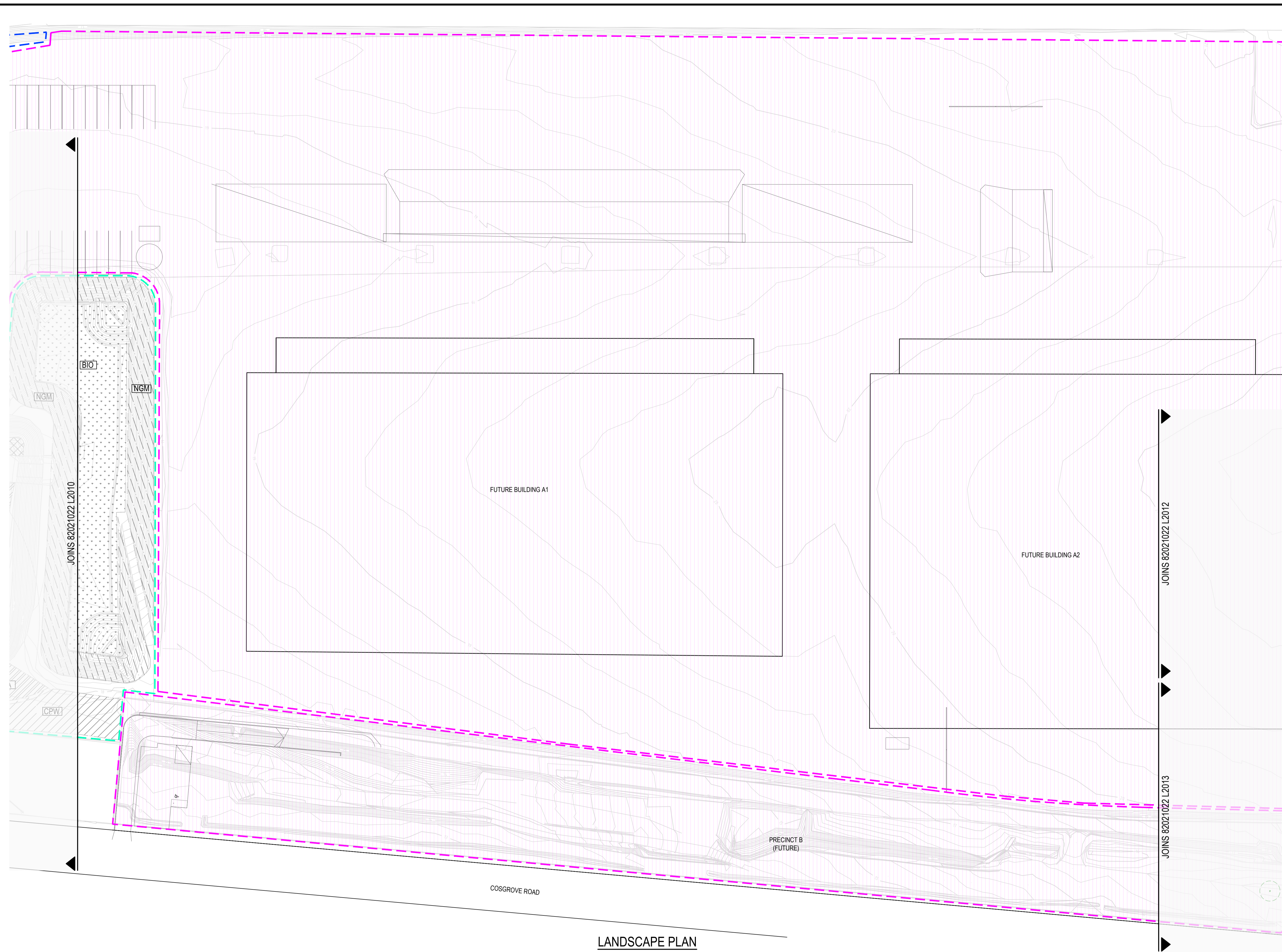
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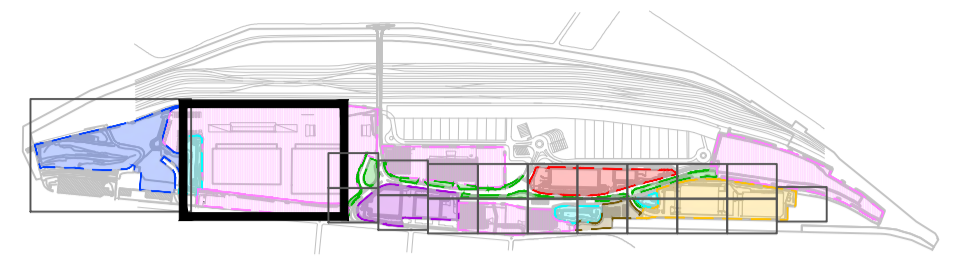
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Title	LANDSCAPE PLAN SHEET 1 OF 23

Status	FOR APPROVAL		
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DATUM	AHD	Scale	1:800
Size	A1	Revision	C
Drawing Number	8202102201 L2010		

DATE PLOTTED: 6 October 2020 5:00 PM BY: MELANIE ELLINGTON



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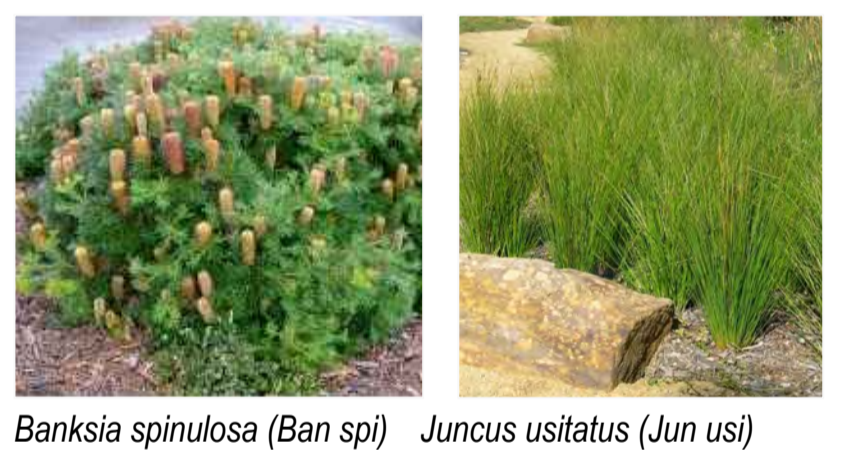


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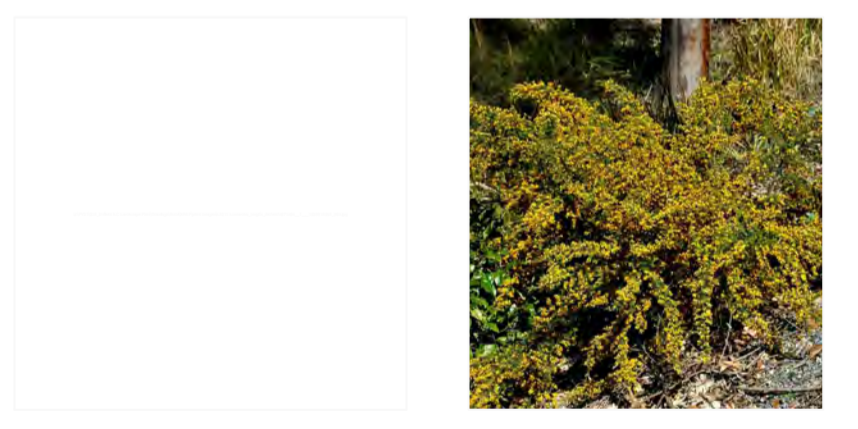
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- EXTENT OF FUTURE WORKS
- CPW CUMBERLAND PLAIN WOODLAND
- NGM NATIVE GRASS MIX
- GFC GRASSLAND - FROG MOVEMENT CORRIDOR
- IMF A IMPROVED FORAGE TYPE 1
- IMF B IMPROVED FORAGE TYPE 2
- SF-CL SHEOAK FOREST - CASUARINA LITTORALIS
- SF-AT SHEOAK FOREST - ALLOCASUARINA TORULOSA
- SF-CG SHEOAK FOREST - CASUARINA GLAUCA
- BIO BIORETENTION BASIN
- FRP FROG POND MACROPHYTES
- SWL SWALE
- NSTM NATIVE SLOPE TREE & SHRUB MIX
- NSM NATIVE SLOPE MIX
- [Symbol] EXTENT OF FUTURE FLOWER POWER SITE

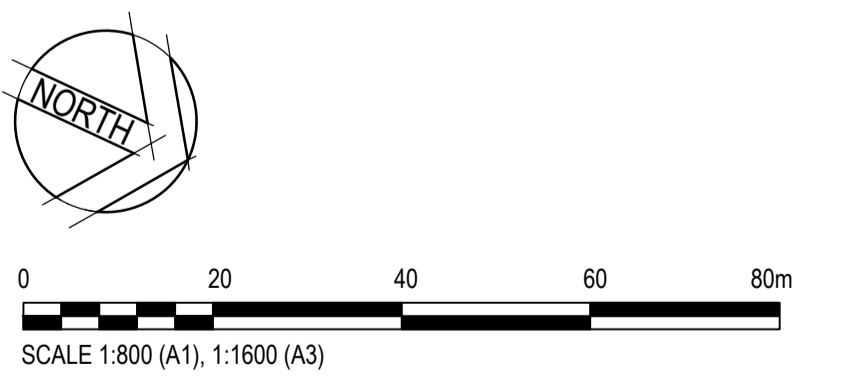
NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Banksia spinulosa (Ban spi) *Juncus usitatus (Jun usi)*



Lomandra longifolia (Lom lon) *Pullanea villosa (NGM)*



XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE H; X-STREETSCAPE
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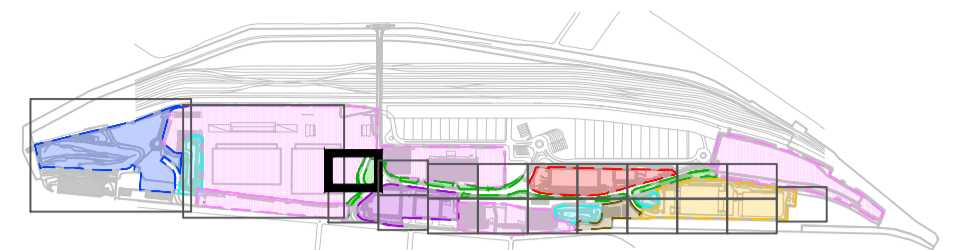
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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 2 OF 23

Status	FOR APPROVAL		
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Size	A1	Revision	C
Drawing Number	8202102201 L2011		



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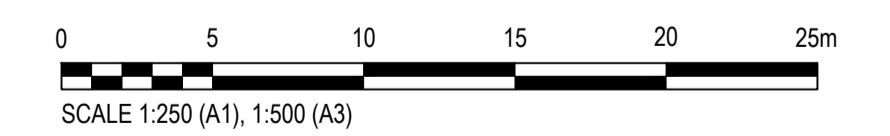
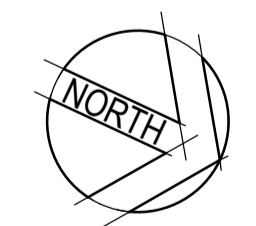
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- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT

PRECINCT A
(FUTURE)

JOINS 8202102201 L2013

LANDSCAPE PLAN
SCALE 1:250



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Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



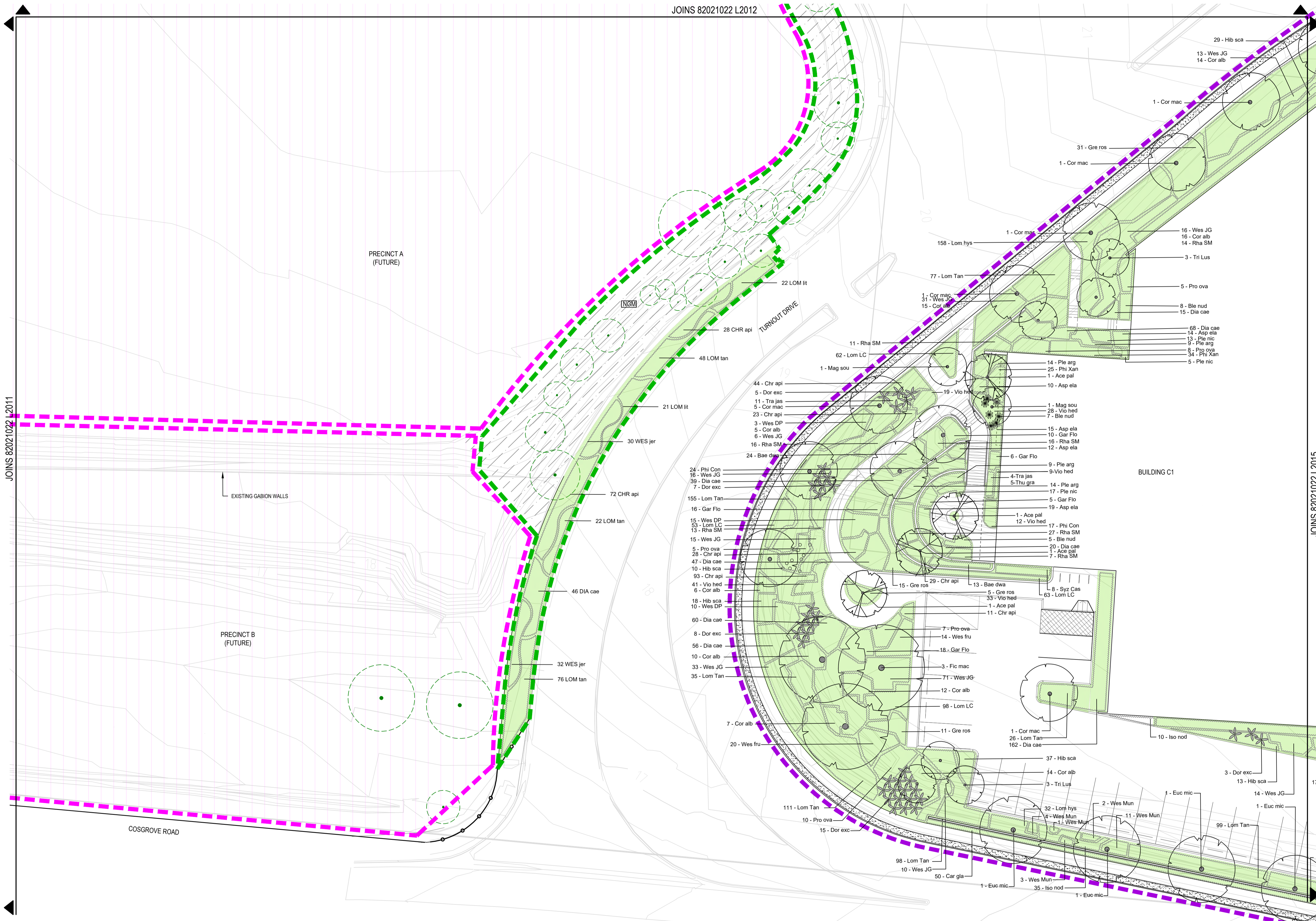
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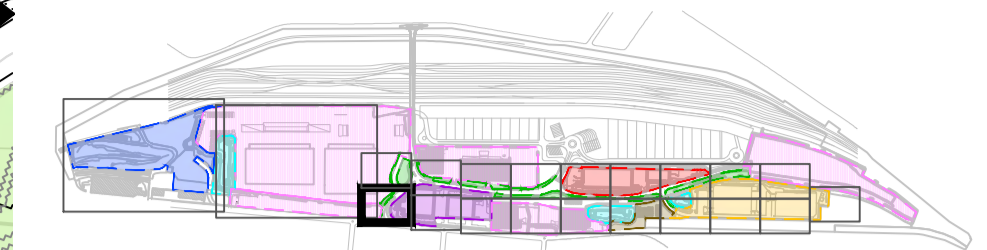
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Checked	AG	Date	14.09.2020
Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
Title	LANDSCAPE PLAN SHEET 3 OF 23

Status	FOR APPROVAL		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number	8202102201 L2012		



LANDSCAPE PLAN
SCALE 1:250

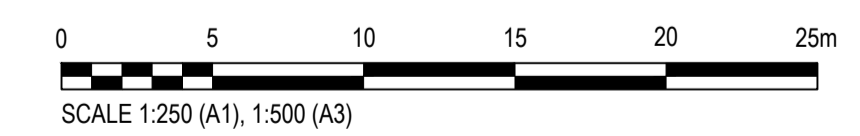
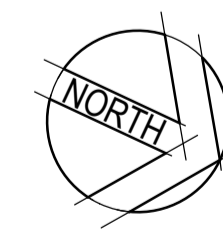


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
CAD File: U:\FY21\022_Enfield_ILC_Landscape_Plans\Drawings\Buid\82021022_Enfield_ILC_Landscape_Plans.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



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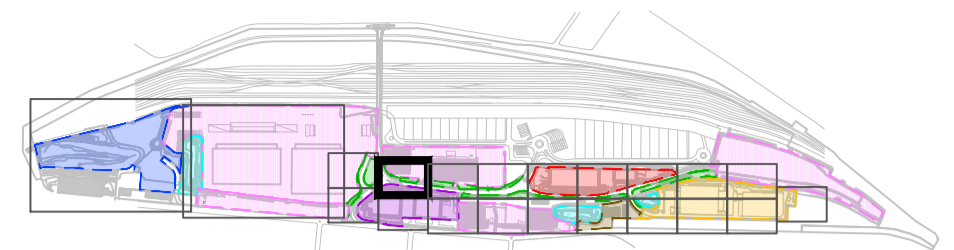
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Checked	AG	Date	14.09.2020
Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
	LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 4 OF 23

Status	FOR APPROVAL		
	NOT TO BE USED FOR CONSTRUCTION PURPOSES		
DATUM	AHD	Scale	1:250
		Size	A1
Drawing Number	8202102201 L2013		Revision
			C



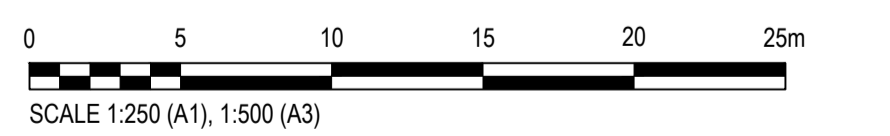
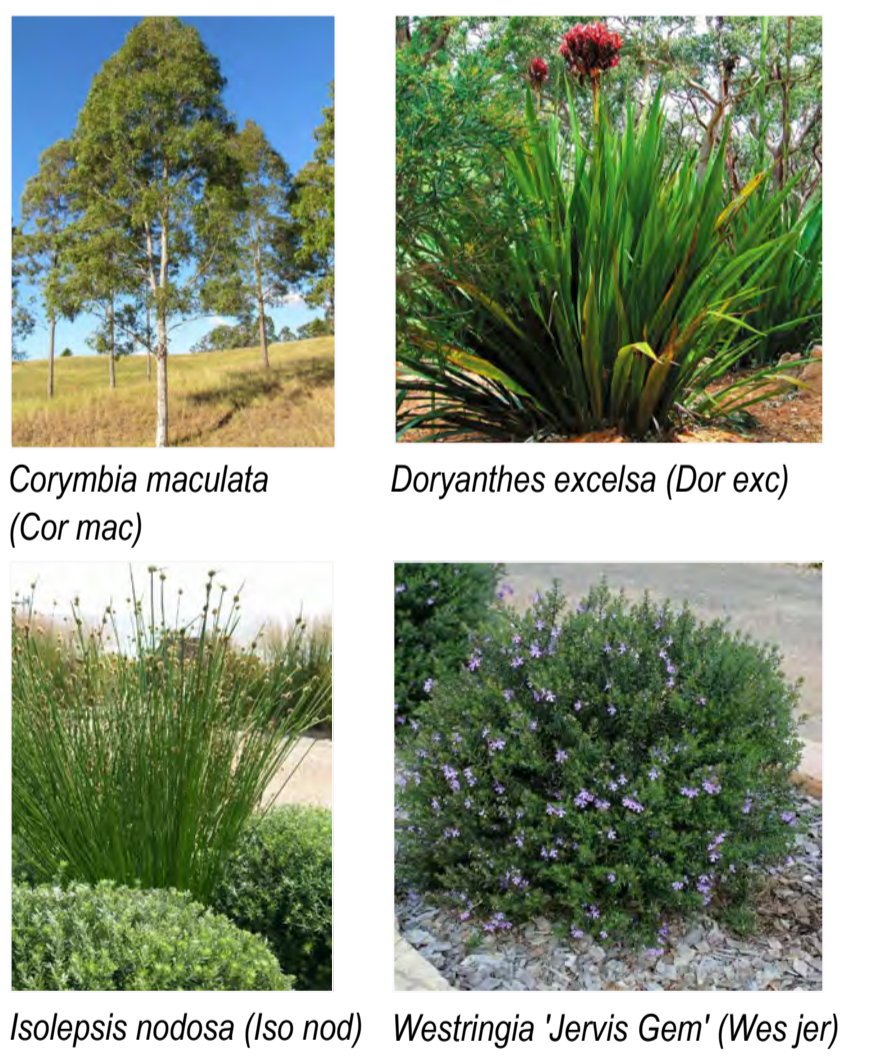
KEY PLAN
NTS



LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-EI-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
CAD File: U:\FY21\022_Enfield_ILC Landscape Plans\Drawings\Build\82021022_Enfield_ILC Landscape Plans.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
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B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



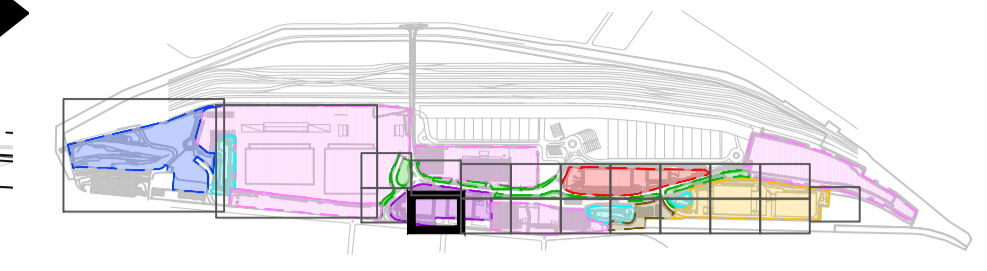
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Checked	AG	Date	14.09.2020
Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 5 OF 23

Status	FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION PURPOSES		
DATUM	AHD	Scale	1:250
Size		Revision	A1
Drawing Number	8202102201 L2014		Revision
			C

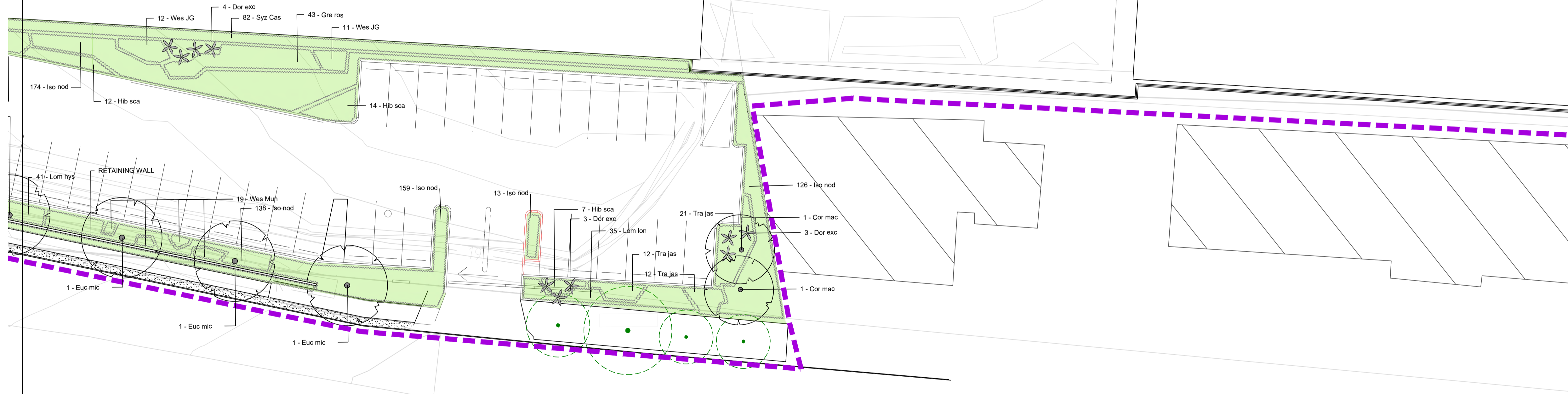


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- (NGM) NATIVE GRASS MIX
- (BIO) BIORETENTION BASIN
- (GARDEN BED) GARDEN BED
- (TURF) TURF
- (TREE) EXISTING TREE TO BE RETAINED
APPROXIMATE LOCATIONS
- (PLANT) TREE PLANTING
REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



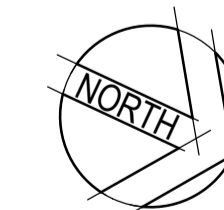
LANDSCAPE PLAN
SCALE 1:250



Eucalyptus microcorys (Euc mic) *Hibbertia scandens (Hib sca)*



Grevillea rosmarinifolia (Gre ros) *Syzygium australe 'Cascade' (Syz cas)*



Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



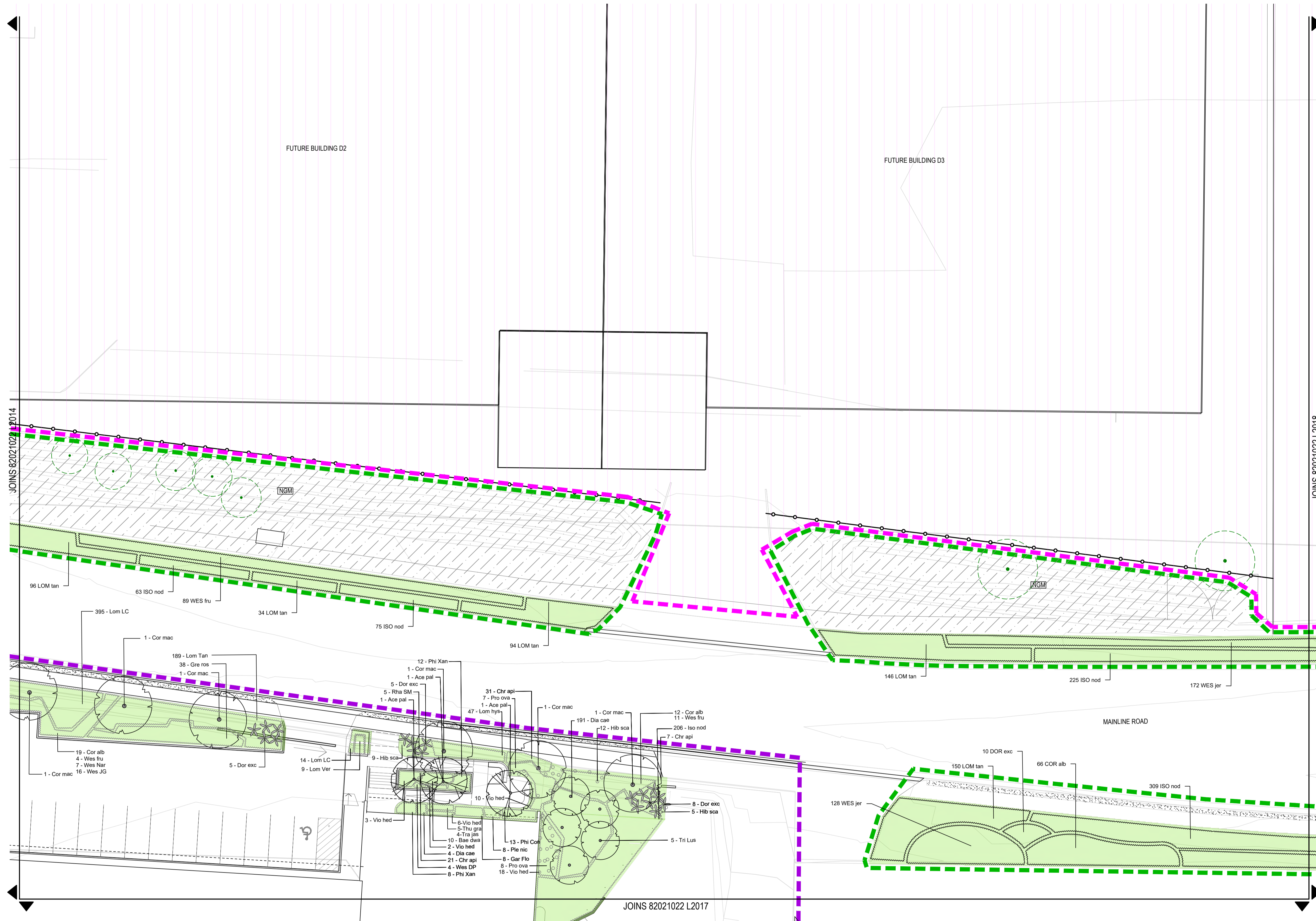
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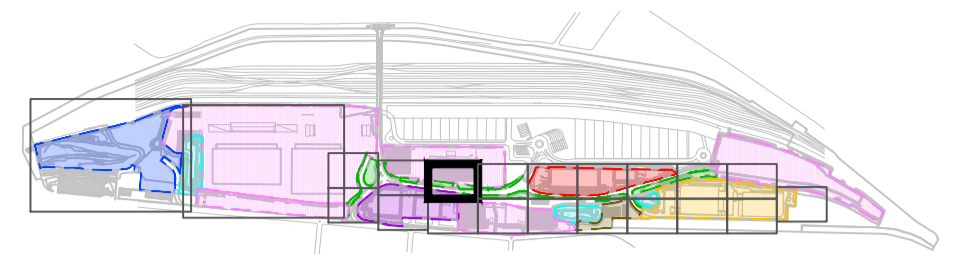
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Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 6 OF 23

Status			
FOR APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number		8202102201 L2015	



LANDSCAPE PLAN
SCALE 1:250

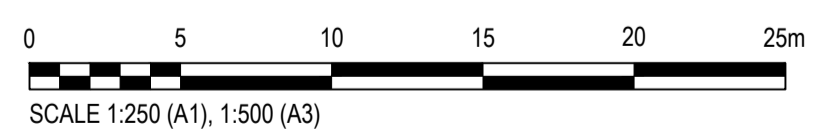
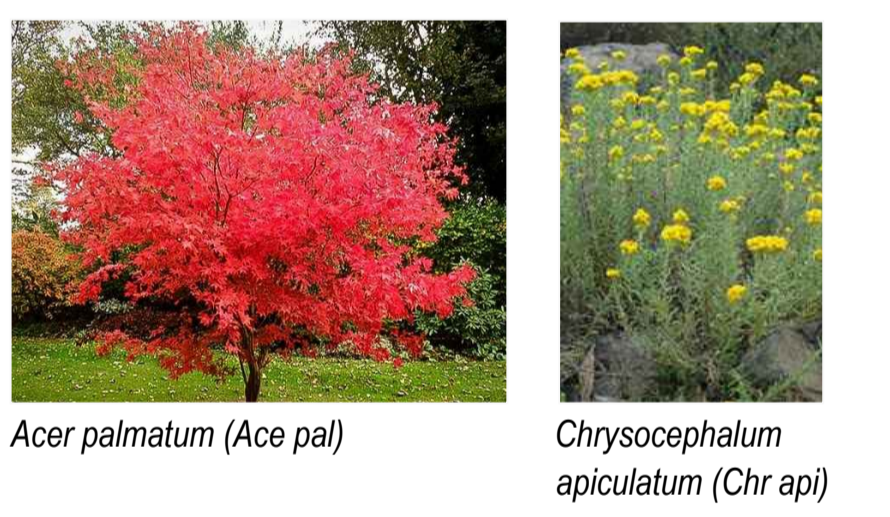


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- (NGM) NATIVE GRASS MIX
- (BIO) BIORETENTION BASIN
- (GARDEN BED) GARDEN BED
- (TURF) TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
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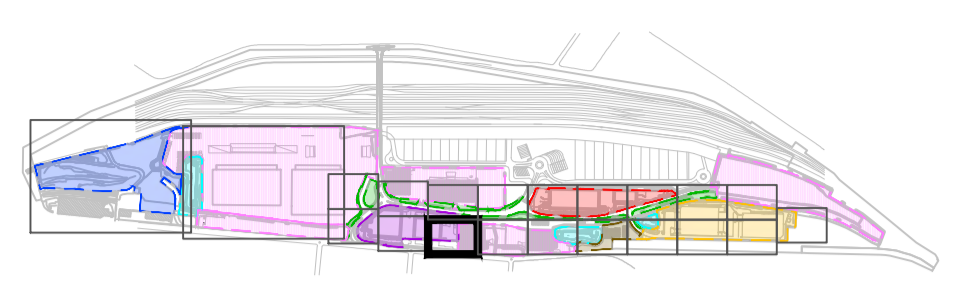
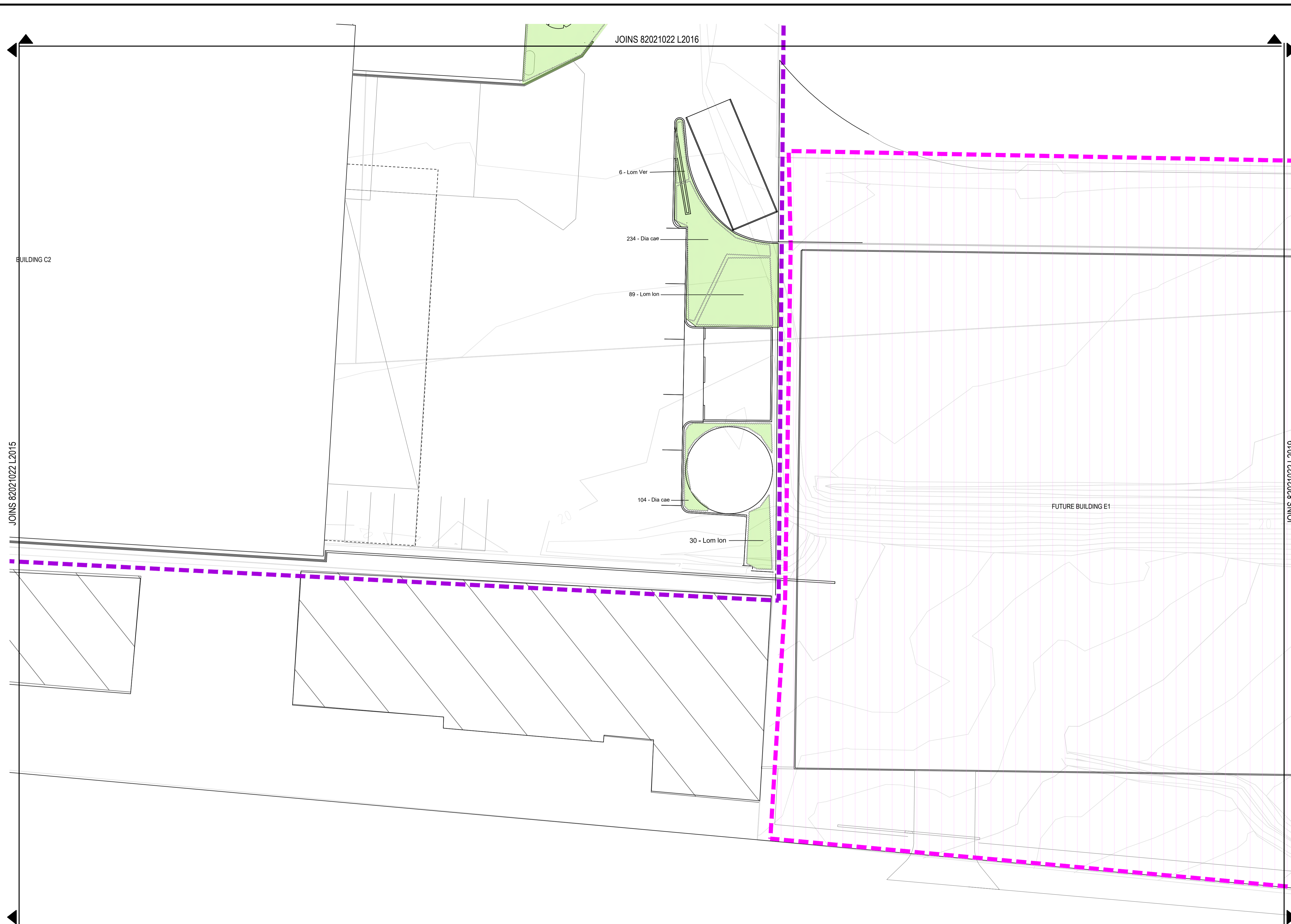
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Checked	AG	Date	14.09.2020
Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 7 OF 23

Status	FOR APPROVAL		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size			A1
Drawing Number	8202102201 L2016		Revision
			C

DATE PLOTTED: 6 October 2020 4:55 PM BY: MELANIE ELLINGTON

XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
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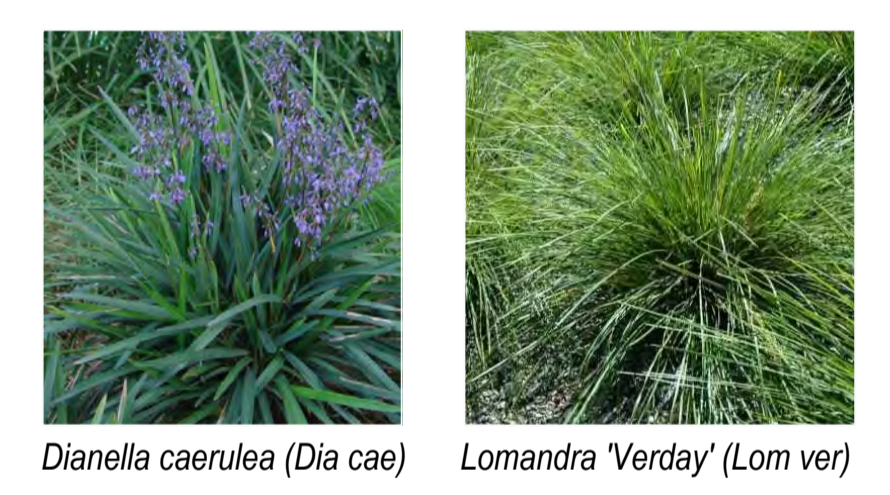


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Dianella caerulea (Dia cae) *Lomandra 'Verday' (Lom lon)*

0 5 10 15 20 25m
SCALE 1:250 (A1), 1:500 (A3)

LANDSCAPE PLAN
SCALE 1:250

Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



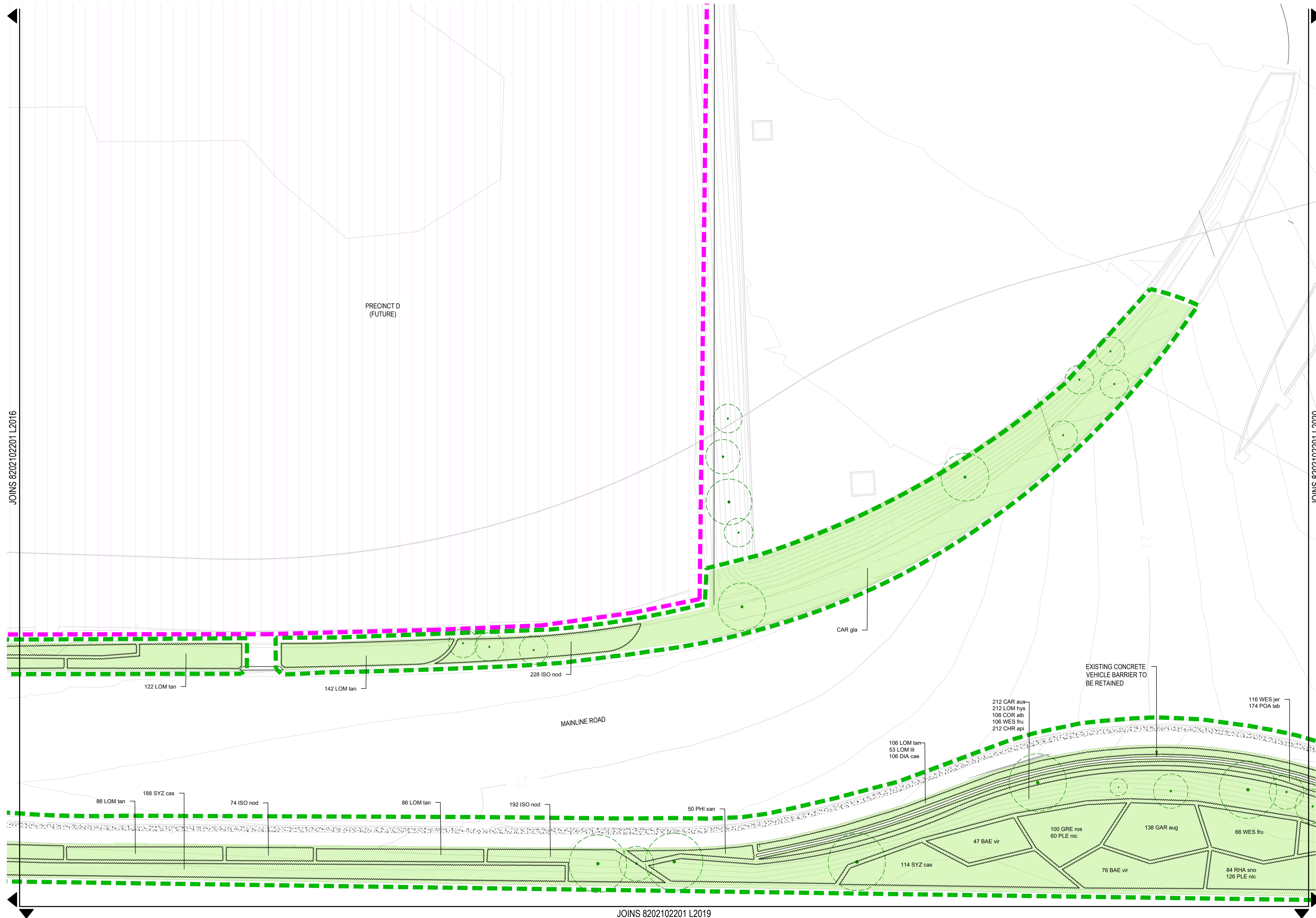
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Approved	AG	Date	14.09.2020

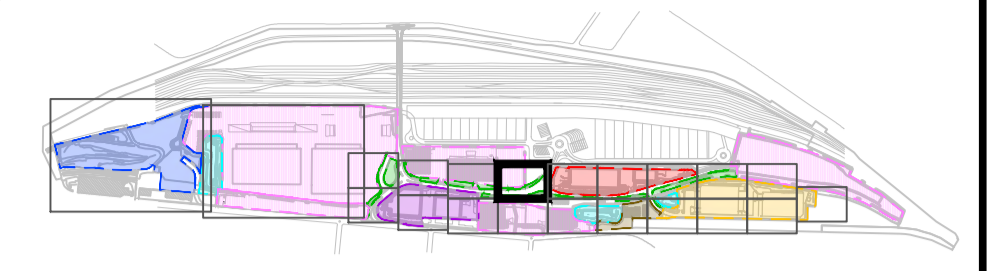
Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
Title	LANDSCAPE PLAN SHEET 8 OF 23

Status			
FOR APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number	8202102201 L2017		



JOINS 8202102201 L2019

LANDSCAPE PLAN
SCALE 1:250

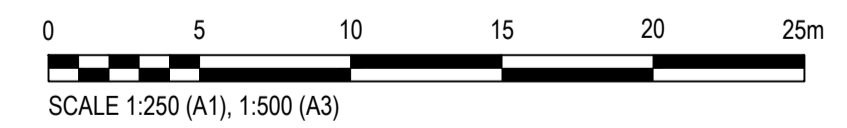


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- (NGM) NATIVE GRASS MIX
- (BIO) BIORETENTION BASIN
- (GARDEN BED) GARDEN BED
- (TURF) TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



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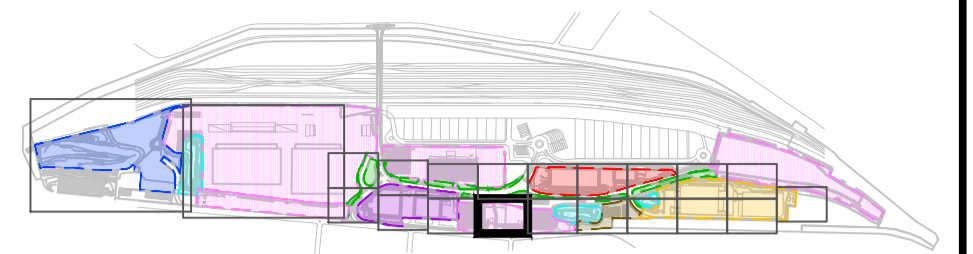
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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
Title	LANDSCAPE PLAN SHEET 9 OF 23

Status	FOR APPROVAL		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size			A1
Drawing Number	8202102201 L2018		Revision
			C

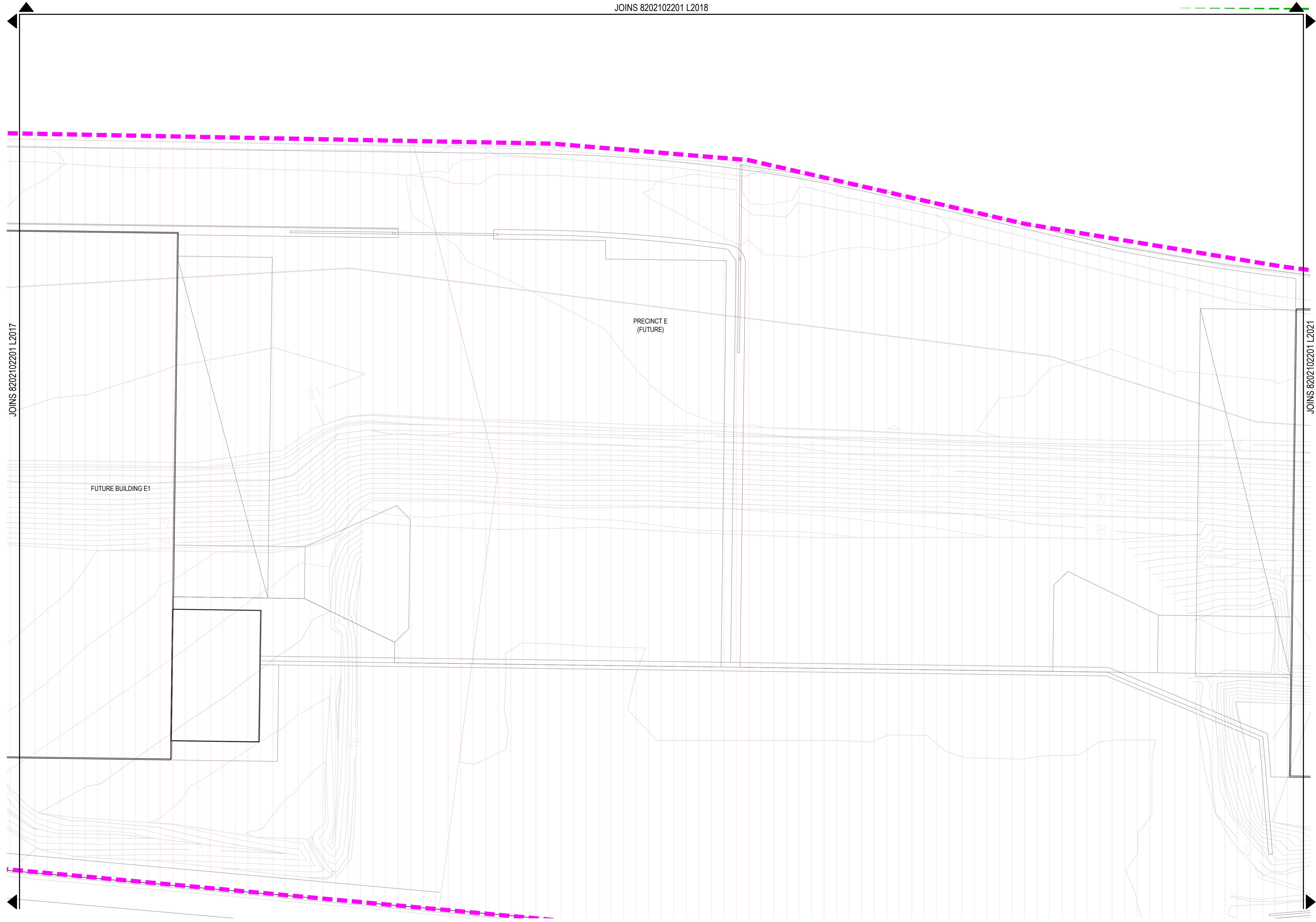
DATE PLOTTED: 6 October 2020 4:53 PM BY: MELANIE ELLINGTON

JOINS 8202102201 L2018



KEY PLAN
NTS

JOINS 8202102201 L2017



LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT

LANDSCAPE PLAN
SCALE 1:250

SCALE 1:250 (A1), 1:500 (A3)

XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
CAD File: U:\FY21\022_Enfield_ILC_Landscape_Plans\Drawings\Build\82021022_Enfield_ILC_Landscape_Plans.dwg

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B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



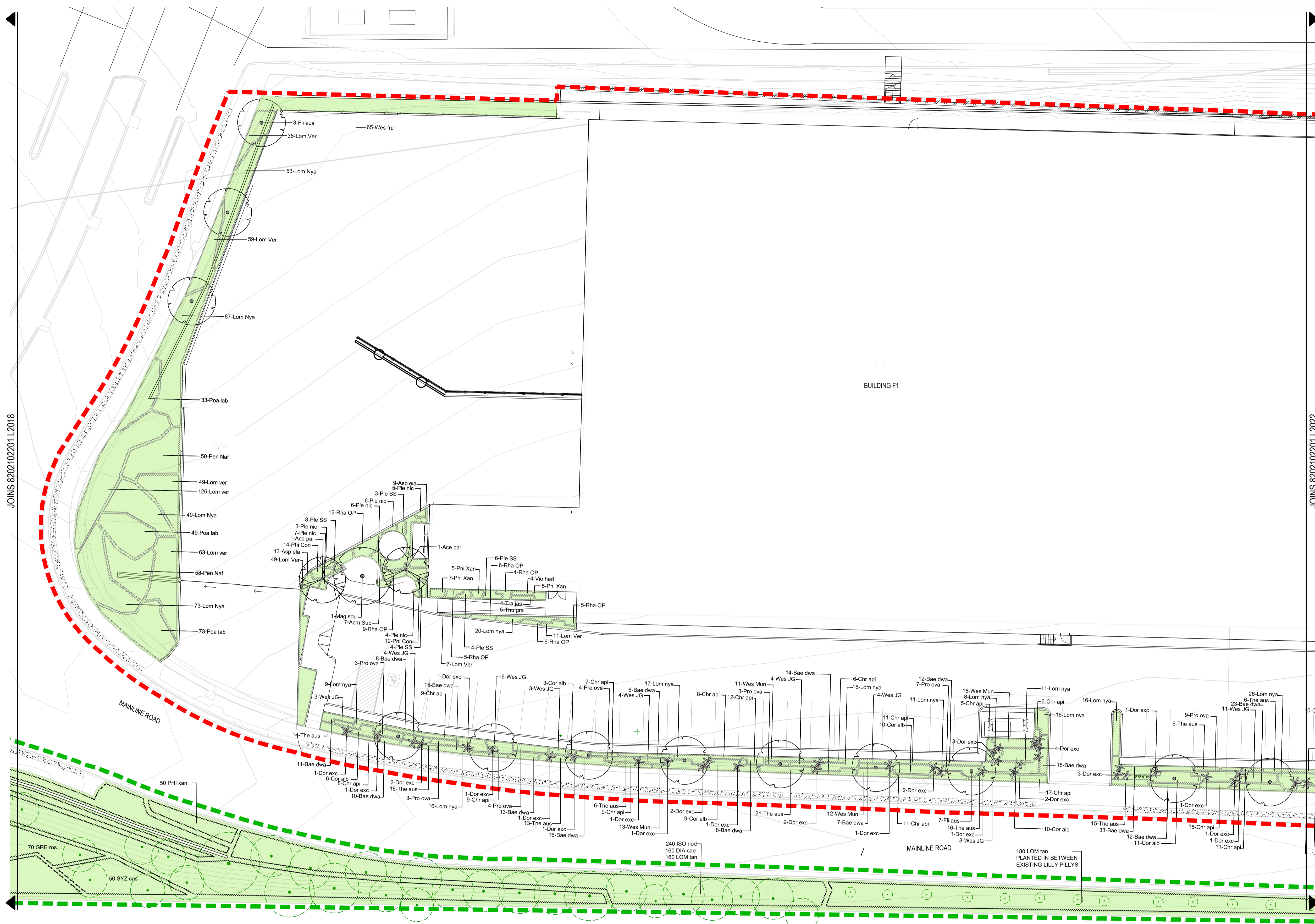
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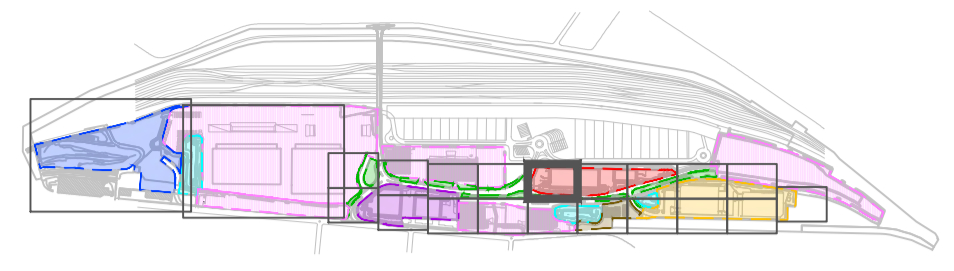
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Checked	AG	Date	14.09.2020
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Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 10 OF 23

Status	FOR APPROVAL		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Drawing Number	8202102201 L2019	Size	A1
Revision			C



JOINS 8202102201 L2021
LANDSCAPE PLAN
SCALE 1:250

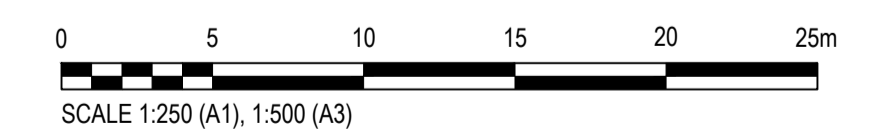
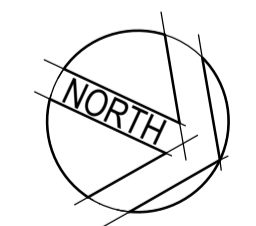
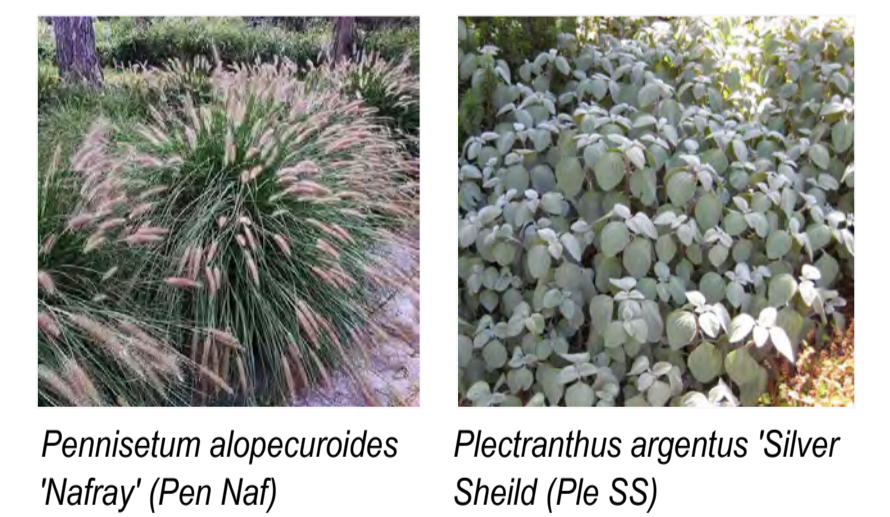
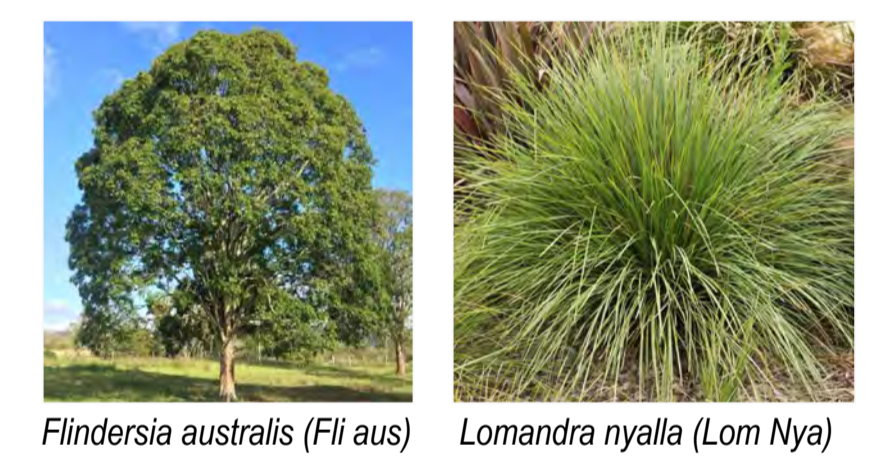


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- (NGM) NATIVE GRASS MIX
- (BIO) BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2022 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
 CAD File: U:\FY21\022 - Enfield ILC Landscape Plans\Drawings\Build\82021022_Enfield_ILC_Landscape Plans.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
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Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 11 OF 23

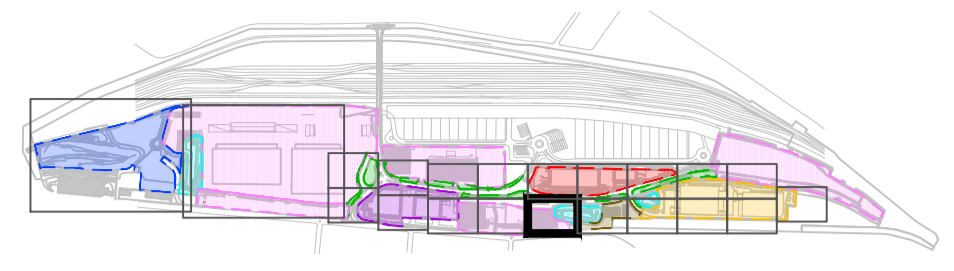
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NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
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Drawing Number	8202102201 L2020		Revision
			C

DATE PLOTTED: 6 October 2020 4:51 PM BY: MELANIE ELLINGTON

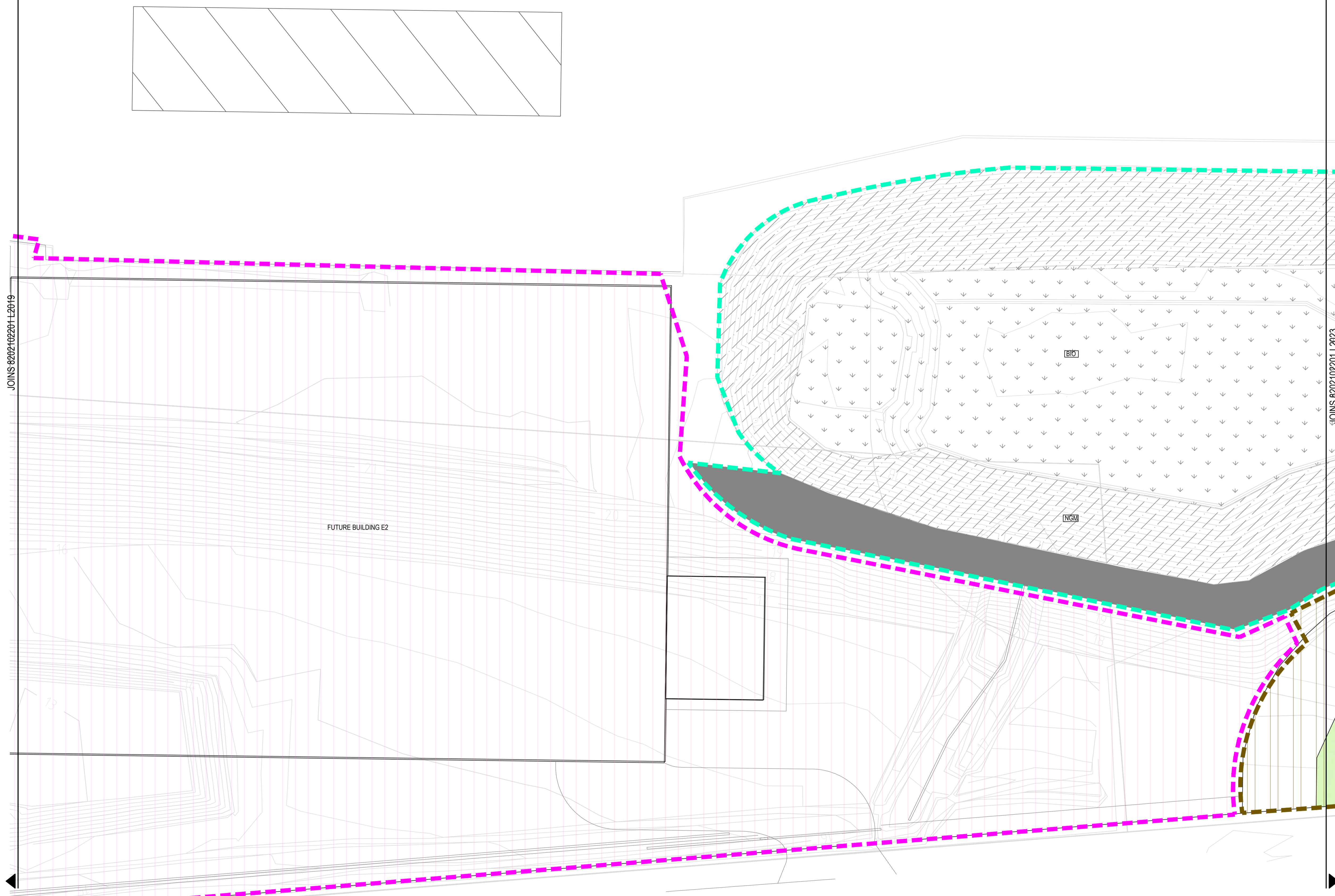
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JOINS 8202102201 L2019

JOINS 8202102201 L2023



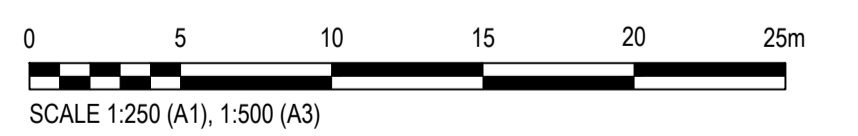
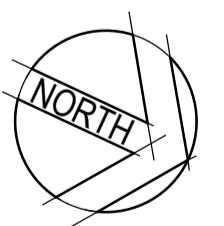
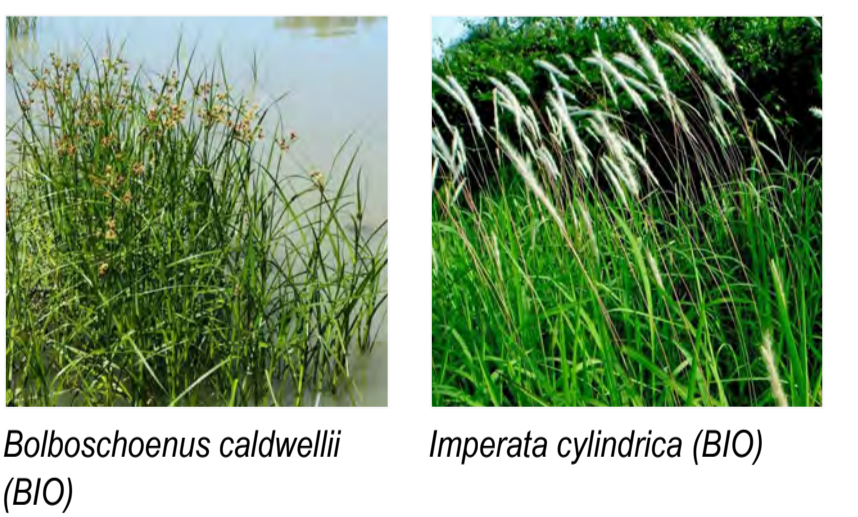
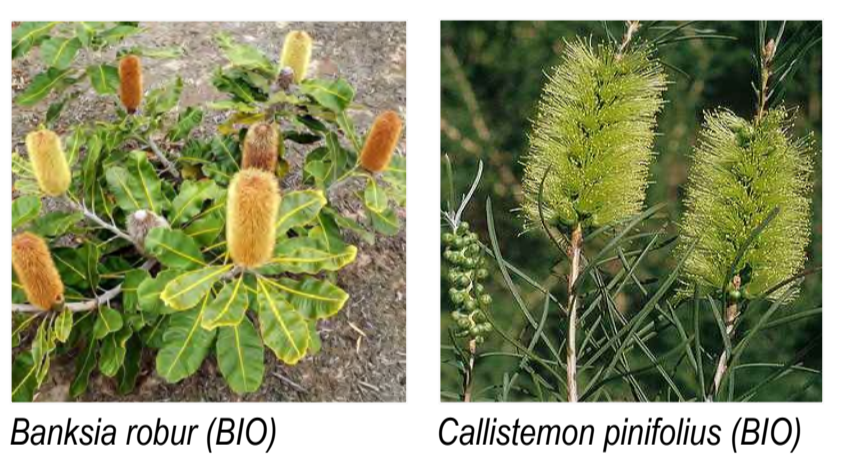
KEY PLAN
NTS



LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX (NGM)
- BIORETENTION BASIN (BIO)
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
CAD File: U:\FY21\022_Enfield_ILC_Landscape Plans\Drawings\Build\82021022_Enfield_ILC_Landscape Plans.dwg

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B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



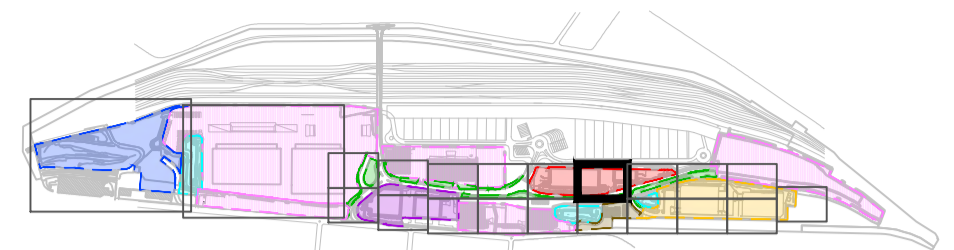
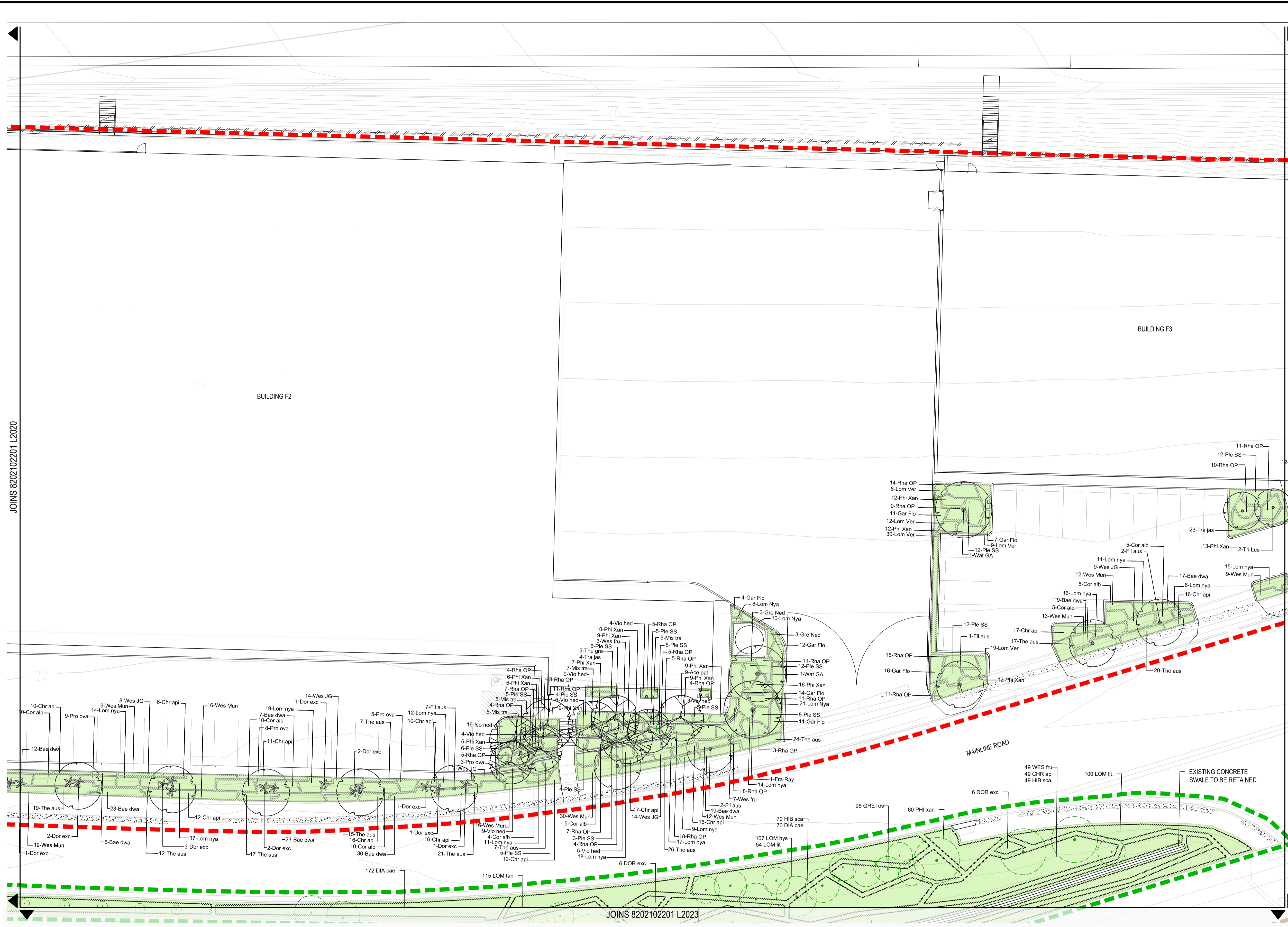
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Checked	AG	Date	14.09.2020
Designed	ME	Date	07.09.2020
Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 12 OF 23

Status			
FOR APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number		8202102201 L2021	



KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

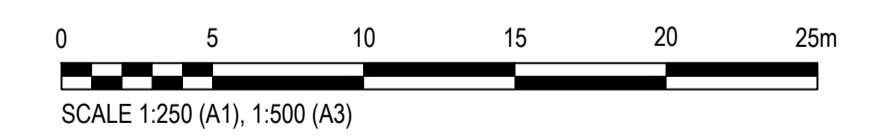
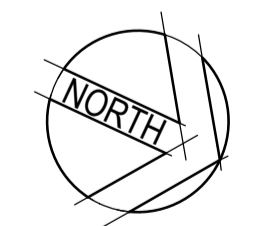
NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Miscanthus transmorrisonensis (Mis tra)
Thunbergia grandiflora (Thu gra)



Waterhouisia floribunda 'Green Avenue' (Wat GA)
Fraxinus oxycarpa 'Raywoodii' (Fra Ray)



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-EI-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
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Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
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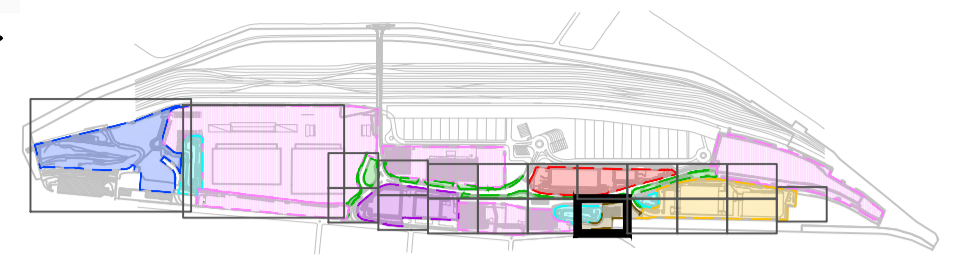
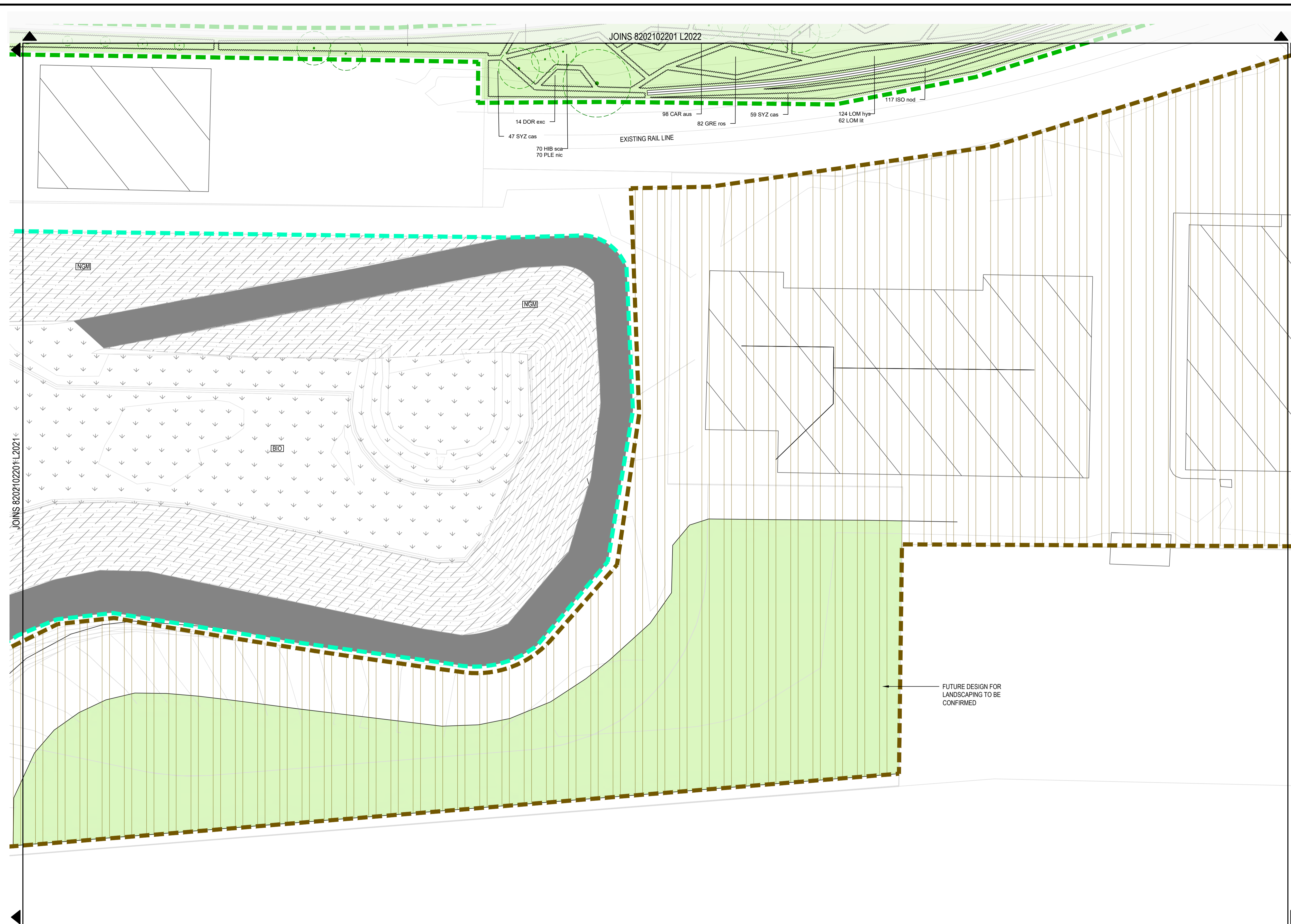
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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
Title	LANDSCAPE PLAN SHEET 13 OF 23

Status	FOR APPROVAL		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size			A1
Drawing Number	8202102201 L2022		Revision
			C

DATE PLOTTED: 6 October 2020 4:50 PM BY: MELANIE ELLINGTON



KEY PLAN
NTS

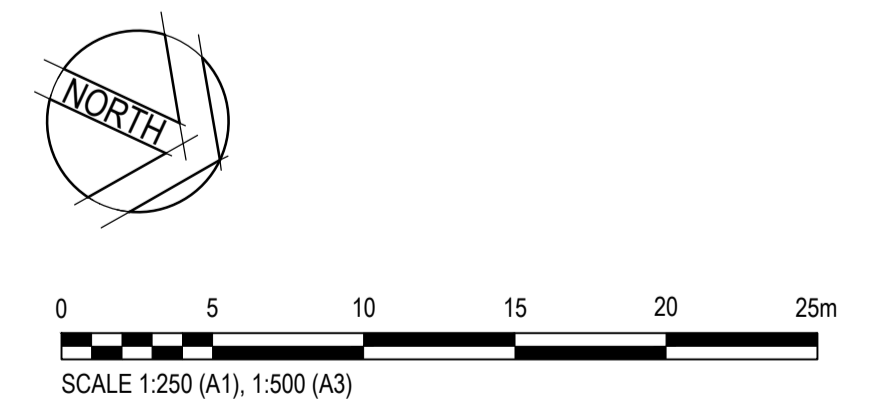
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- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETScape WORKS
- EXTENT OF FUTURE WORKS
- [NGM] NATIVE GRASS MIX
- [BIO] BIORETENTION BASIN
- [GARDEN BED] GARDEN BED
- [TURF] TURF
- (Dotted Circle) EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- (Plant Symbols) TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Leptospermum juniperinum (BIO)
Carex appressa (BIO)
Gahnia sieberiana (BIO)
Pteridium esculentum (BIO)



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-EI-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
CAD File: U:\FY21\022 - Enfield ILC Landscape Plans\Drawings\Buid\82021022_Enfield_ILC Landscape Plans.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
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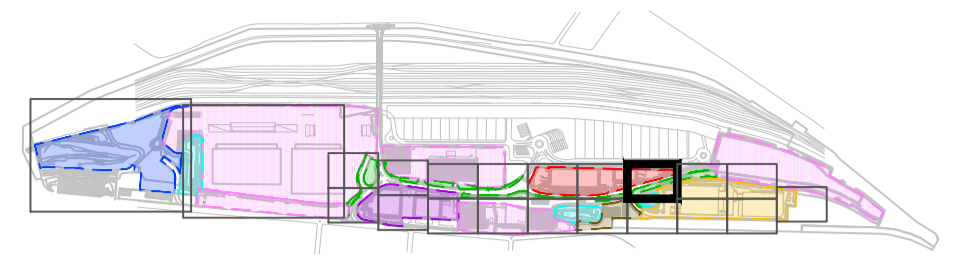
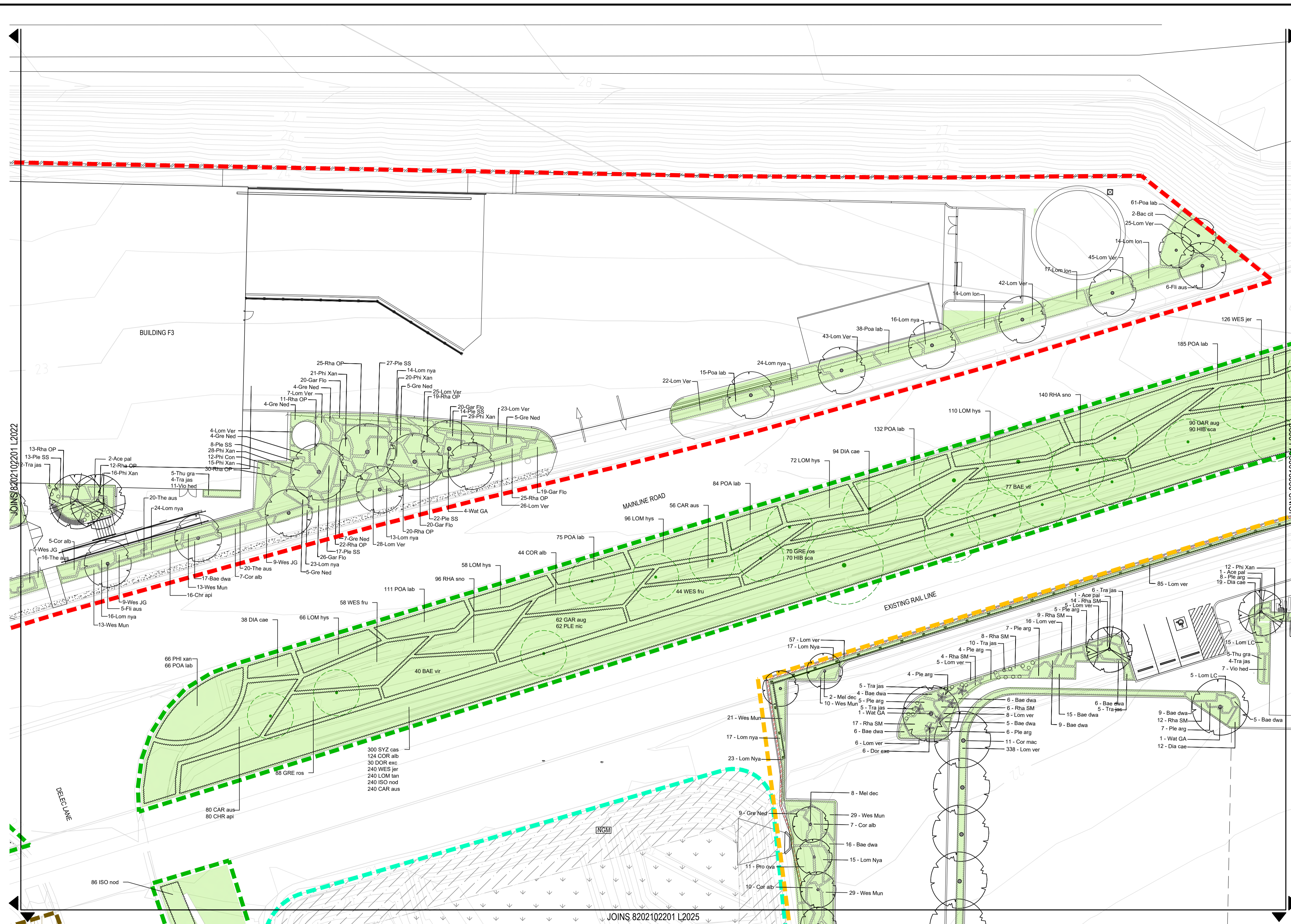
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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 14 OF 23

Status			
FOR APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number		8202102201 L2023	

DATE PLOTTED: 6 October 2020 4:49 PM BY: MELANIE ELLINGTON



KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED
- APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

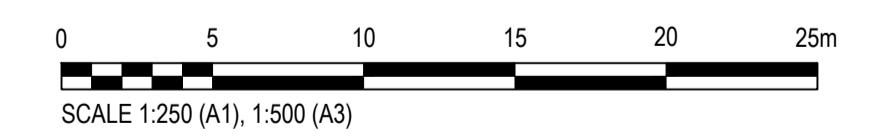
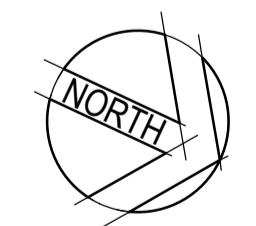
NOTE: REFER TO SHEET 8202102201 L2025 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



Backhousia citriodora (Bac cit)
Grevillea 'Ned Kelly' (Gre Ned)



Melaleuca decora (Mel dec)
Plectranthus argentatus (Ple arg)



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-8202022-01-EI-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
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C	06.10.2020	RE-ISSUED FOR APPROVAL	ME	AG	AG
B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



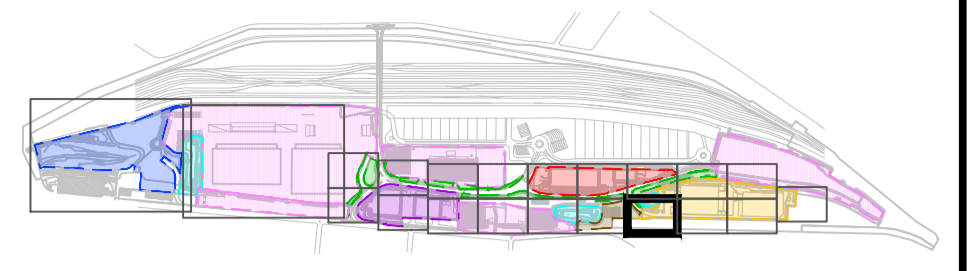
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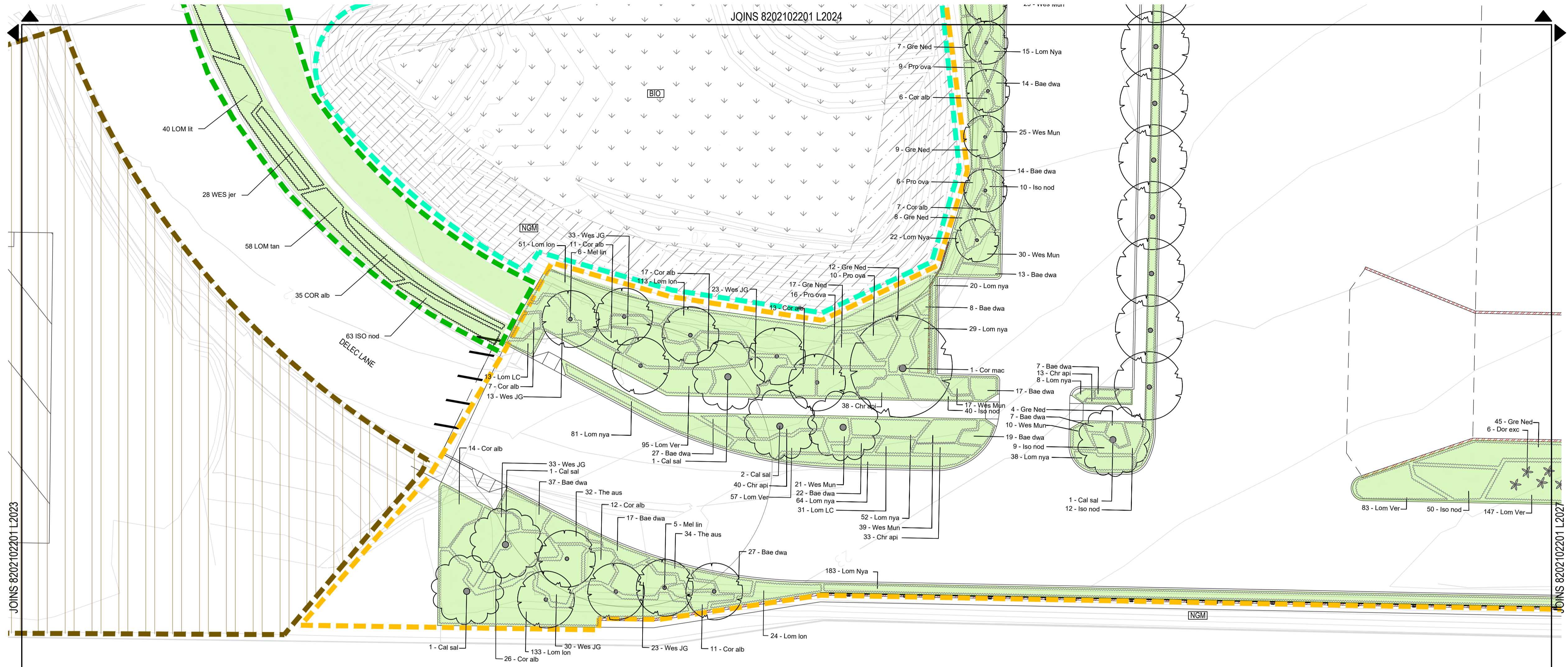
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Checked	AG	Date	14.09.2020
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Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
	LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 15 OF 23

Status		FOR APPROVAL	
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DATUM	AHD	Scale	1:250
		Size	A1
Drawing Number	8202102201 L2024		Revision
			C



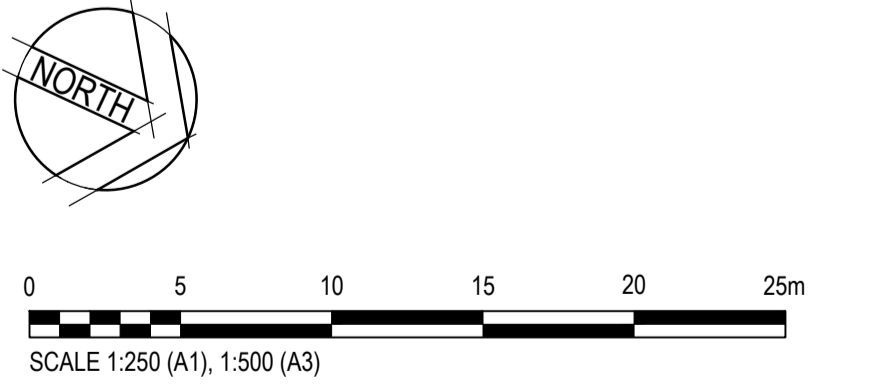
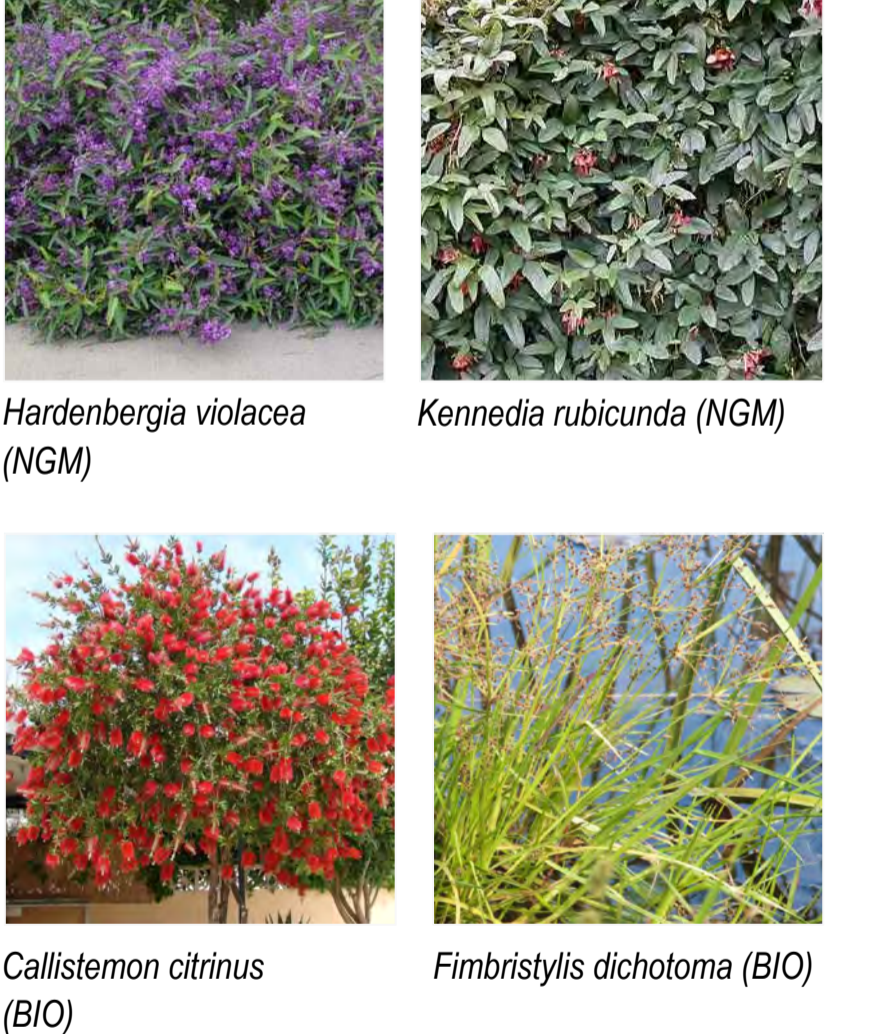
KEY PLAN
NTS



LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX (NGM)
- BIORETENTION BASIN (BIO)
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETSCAPE
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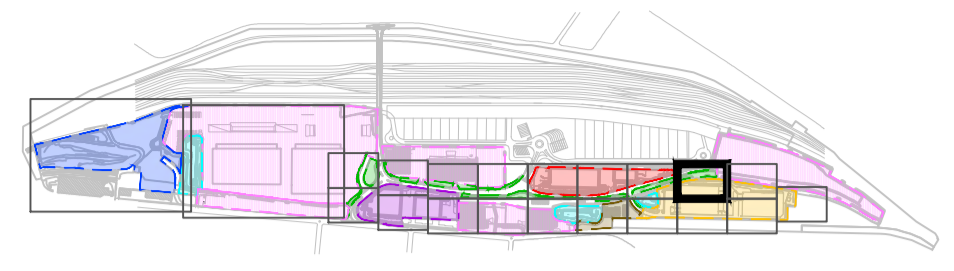
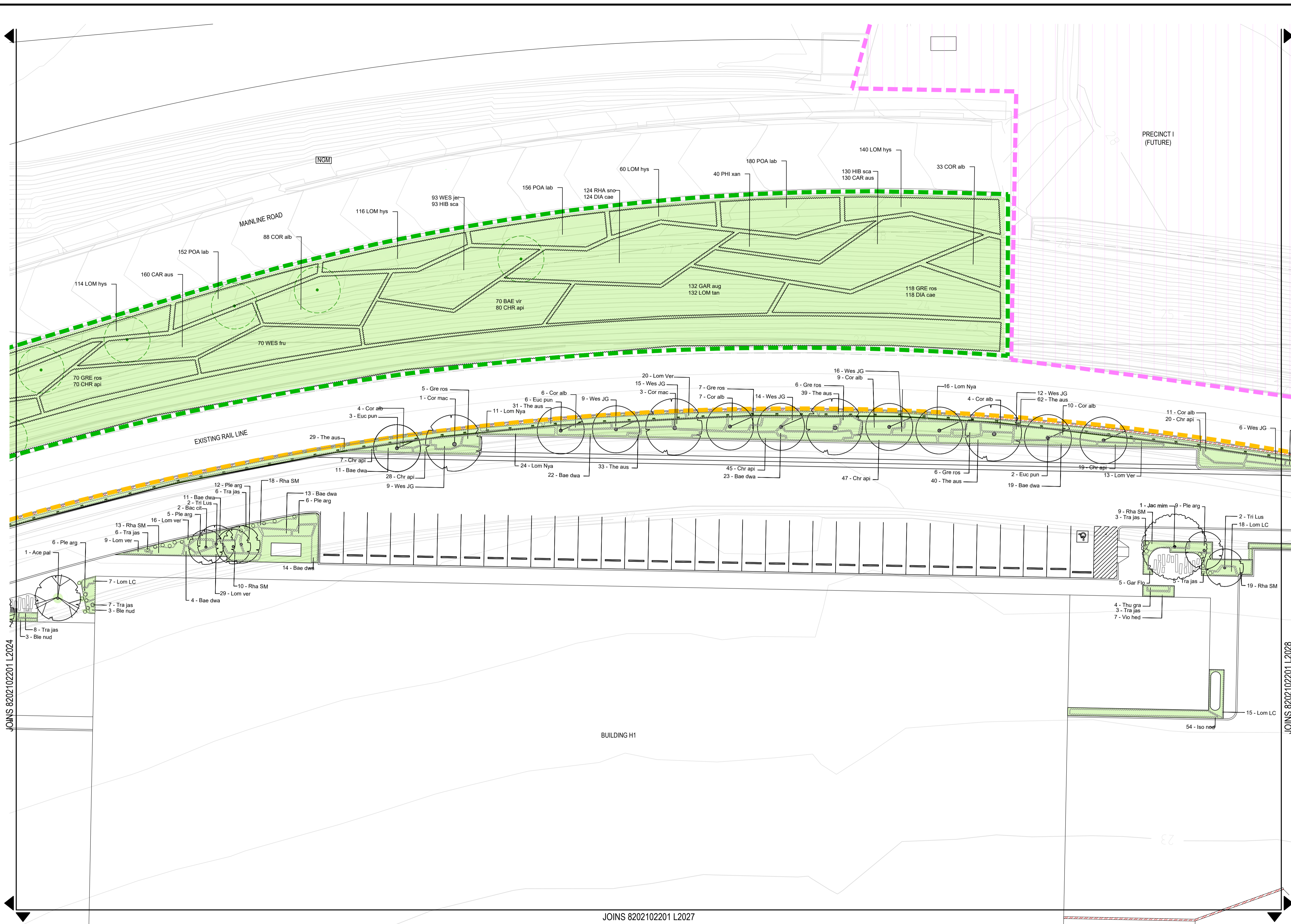
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Verified	AG	Date	14.09.2020
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Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE LANDSCAPE PLANS
Title	LANDSCAPE PLAN SHEET 16 OF 23

Status	FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION PURPOSES		
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Size	A1	Revision	C
Drawing Number	8202102201 L2025		

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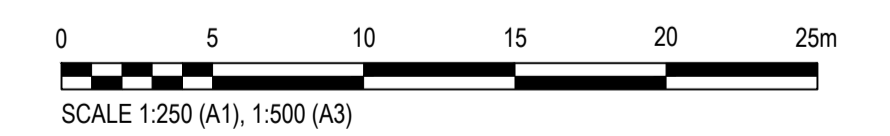
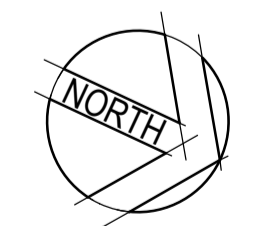
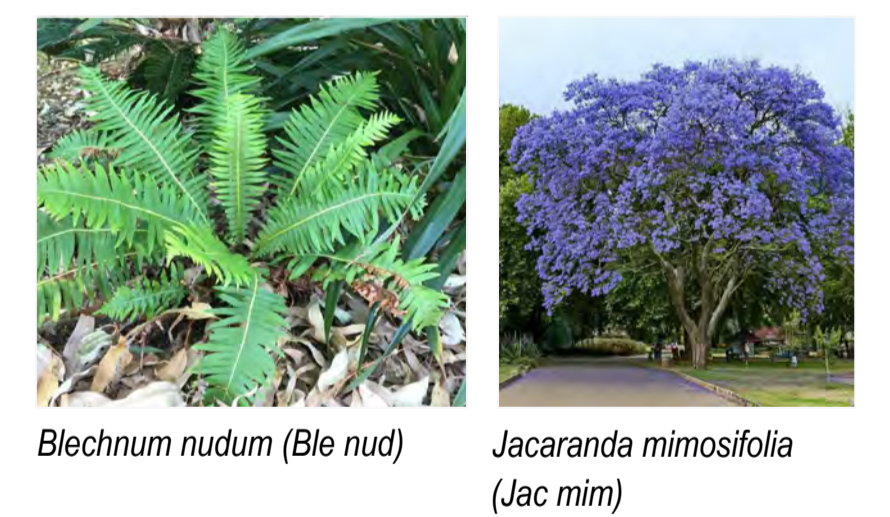


KEY PLAN
NTS

LEGEND

- EXTENT OF FROG PONDS PRECINCT
- EXTENT OF DETENTION BASINS
- EXTENT OF PRECINCT C
- EXTENT OF PRECINCT F
- EXTENT OF PRECINCT G
- EXTENT OF PRECINCT H
- EXTENT OF STREETSCAPE WORKS
- EXTENT OF FUTURE WORKS
- NATIVE GRASS MIX
- BIORETENTION BASIN
- GARDEN BED
- TURF
- EXISTING TREE TO BE RETAINED APPROXIMATE LOCATIONS
- TREE PLANTING REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2027 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



JOINS 8202102201 L2027

LANDSCAPE PLAN
SCALE 1:250

XREFS: XR-82020222-01-E1-CONTOURS; XR-82021022-01-D1-BASE; X-LANDSCAPE; X-FROG POND; X-STAGE C; X-STAGE F; X-STAGE H; X-STREETScape
CAD File: U:\FY21\1022_Enfield_ILC Landscape Plans\Drawings\Build\82021022_Enfield_ILC Landscape Plans.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
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B	28.09.2020	ISSUED FOR APPROVAL	ME	AG	AG
A	16.09.2020	ISSUED FOR APPROVAL	ME	AG	AG



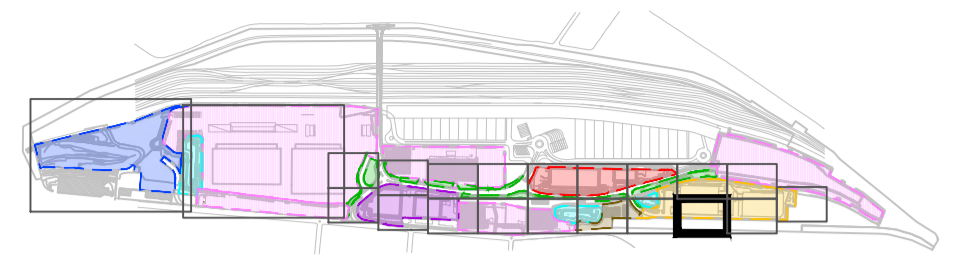
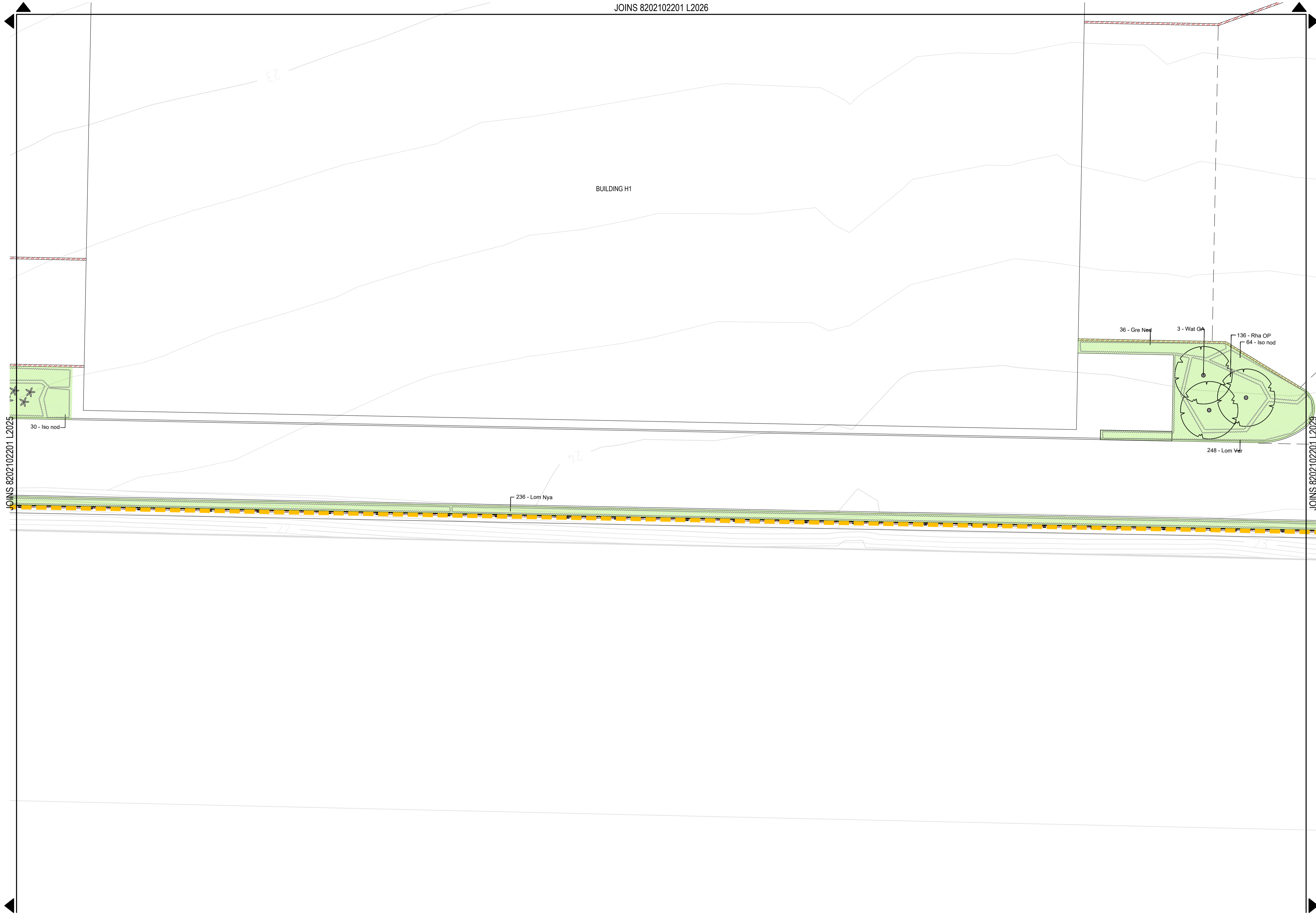
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Verified	AG	Date	14.09.2020
Approved	AG	Date	14.09.2020

Client	NSW PORTS
Project	ENFIELD INTERMODAL LOGISTICS CENTRE
Title	LANDSCAPE PLAN SHEET 17 OF 23

Status			
FOR APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	AHD	Scale	1:250
Size	A1	Revision	C
Drawing Number		8202102201 L2026	

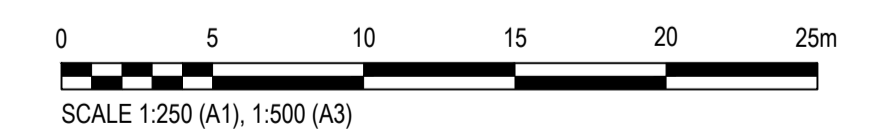
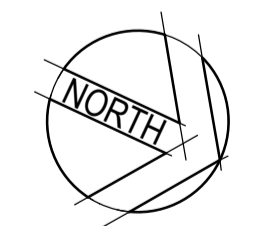
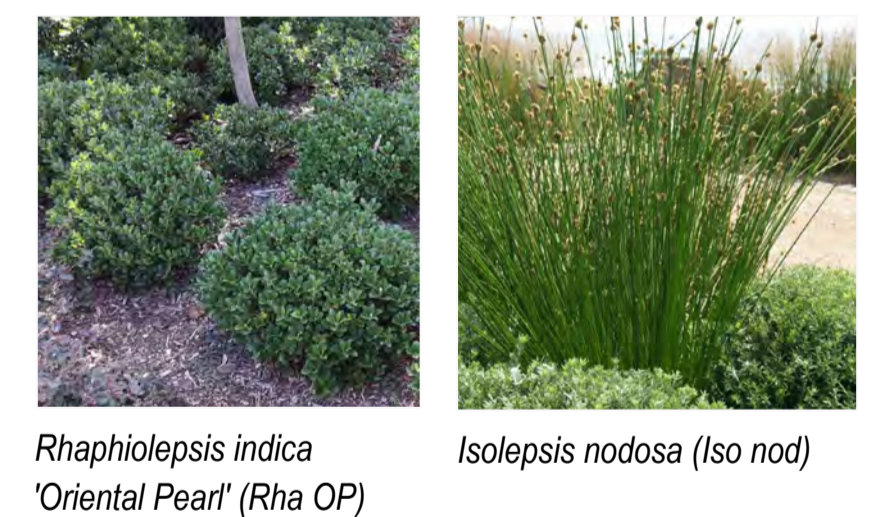
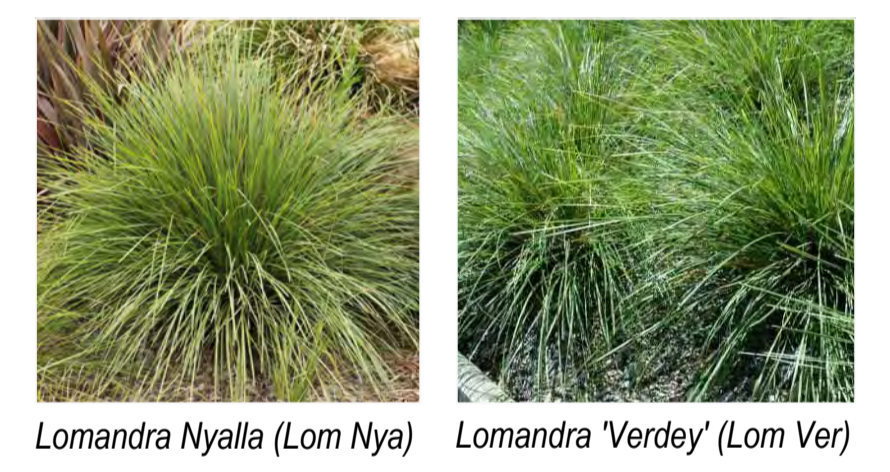


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- EXISTING TREE TO BE RETAINED
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- TREE PLANTING
REFER TO PLANT SCHEDULE

NOTE: REFER TO SHEET 8202102201 L2002 FOR CORRESPONDING PLANT SCHEDULES FOR EACH PRECINCT



LANDSCAPE PLAN
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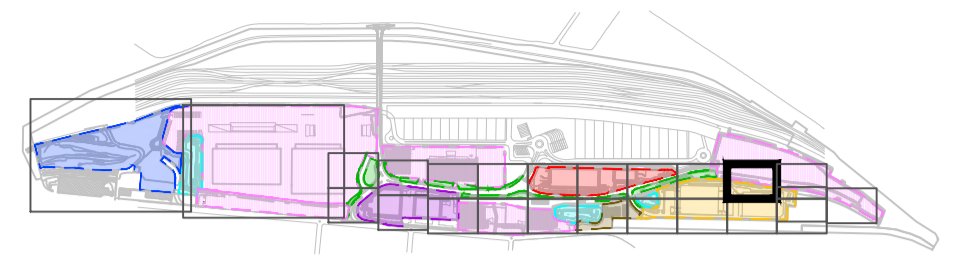
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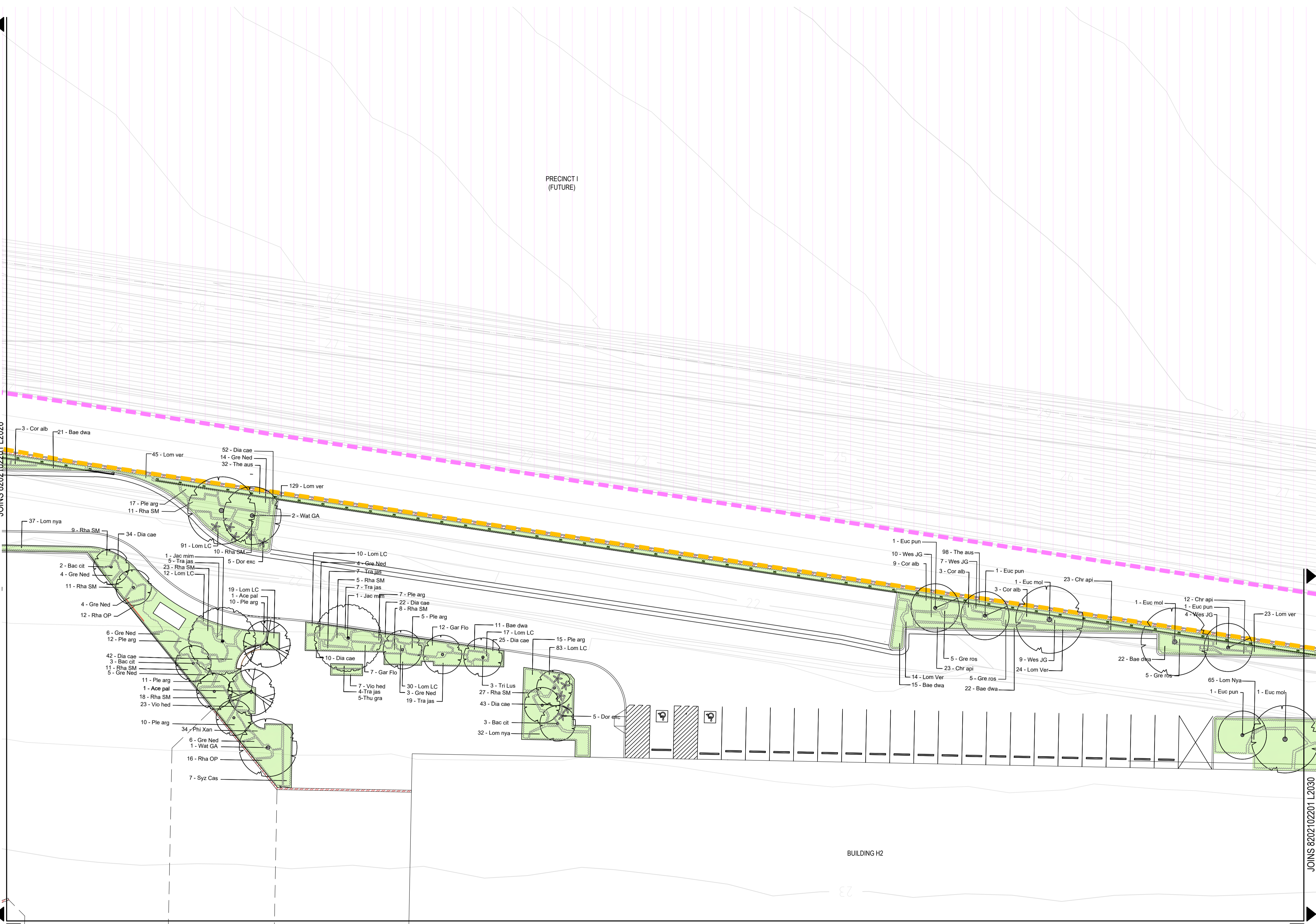
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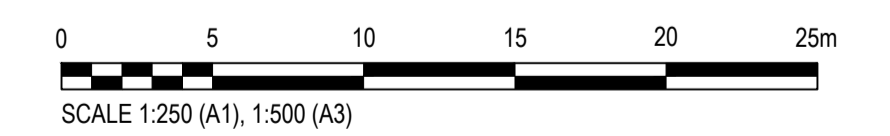
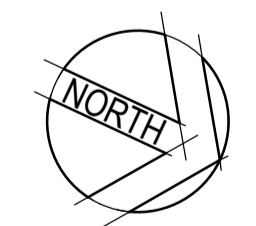
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Correa alba (Cor alb) Doryanthes excelsa (Dor exc)



Syzygium 'Cascade' (Syz Cas) Backhousia citriodora (Bac cit)



LANDSCAPE PLAN
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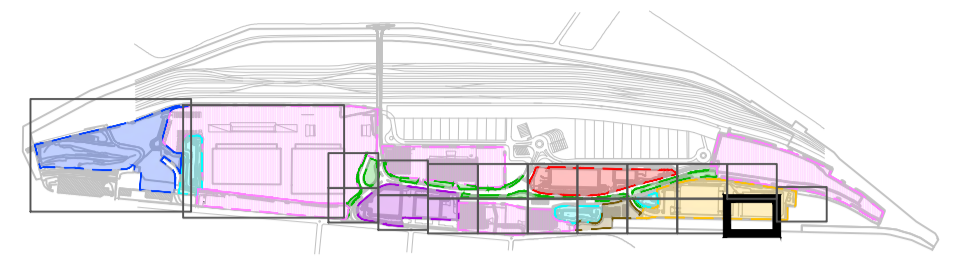
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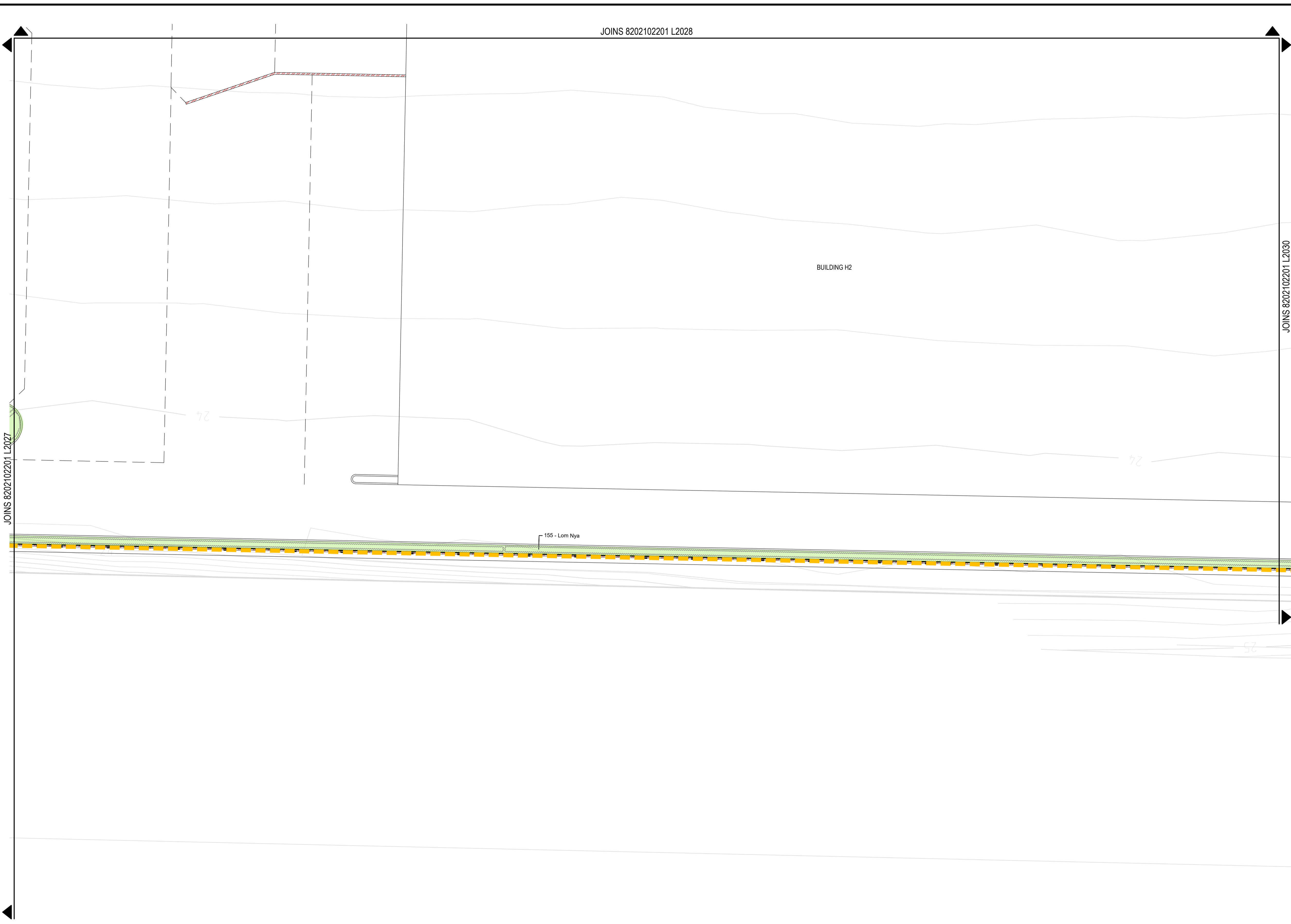
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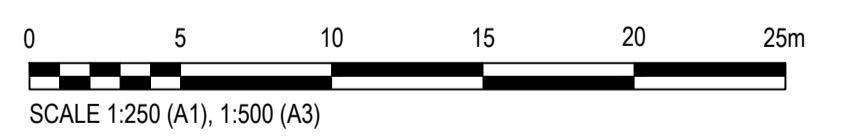
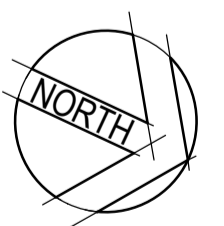
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Lomandra Nyalla (Lom nya)



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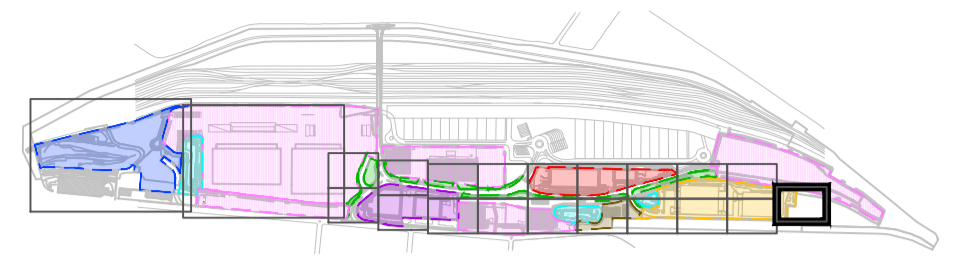
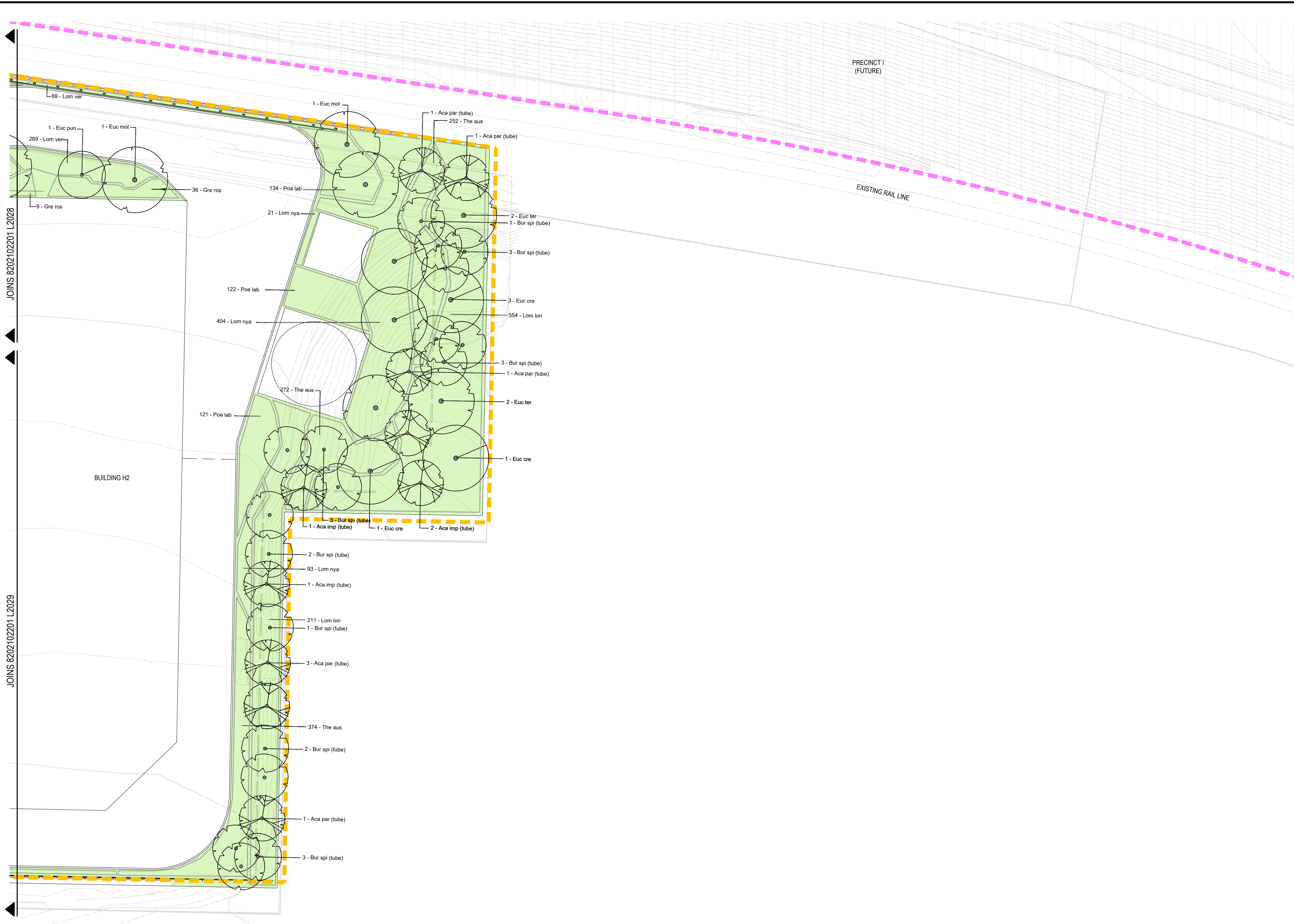
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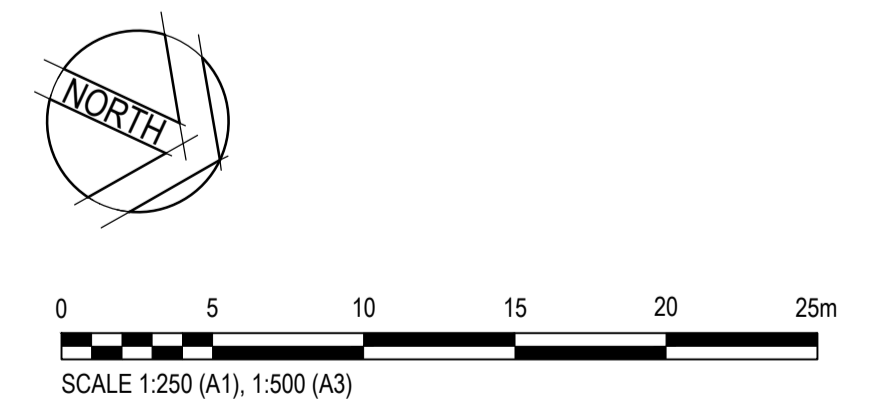
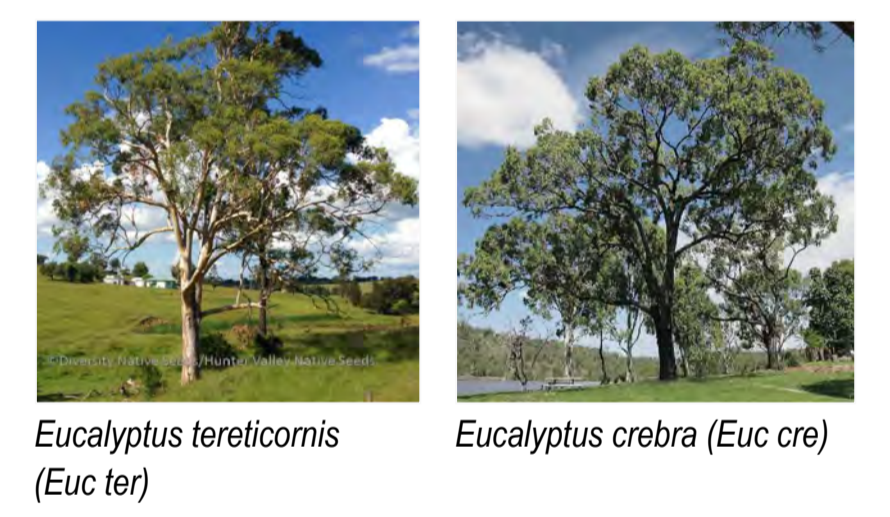


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Appendix B: Hygiene Protocol for the Control of Disease in Frogs

(NPWS, August 2001)

Threatened Species Management Information Circular No. 6



hygiene protocol for the
control of disease in

frogs

April 2008

Department of **Environment & Climate Change** NSW



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This document can be sourced from the DECC website:
www.environment.nsw.gov.au/resources/nature/hypfrog.pdf

This document should be cited as:
Department of Environment and Climate Change (NSW) 2008.
Hygiene protocol for the control of disease in frogs.
Information Circular Number 6. DECC (NSW), Sydney South.

ISBN 0 7313 6372 8
DECC 2008/199

Acknowledgments

NSW National Parks and Wildlife Service Declining Frog Working
Group who recommended the preparation and provided input into the
development of this strategy.

Ross Wellington and Ron Haering (both DECC) the authors of this
document.

Thanks to Jack Baker, Lee Berger, Mark Endersby, Jeff Hardy, Frances
Hulst, Alex Hyatt, Keith McDougall, Diana Mendez, Deborah
Pergolotti, Graham Pyke, Marjo Rauhala, Julie Ravallion, Karrie Rose,
Lothar Voigt and Arthur White for their advice and/or technical review.

This hygiene protocol is an adaptation of the Declining Amphibian
Population Task Force (DAPTF) Fieldwork Code of Practice and
the recommendations of Speare et al. (1999) and has drawn on
recommendations from earlier guidelines prepared by Environment
ACT.

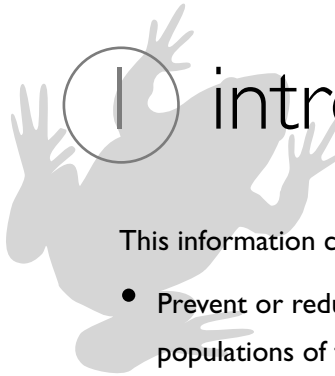
Foundation for National Parks and Wildlife funded the printing of this
protocol.



hygiene protocol for the control of disease in

frogs

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I introduction

This information circular outlines measures to:

- Prevent or reduce disease causing pathogens being transferred within and between wild populations of frogs.
- Ensure captive frogs are not infected prior to release.
- Deal safely with unintentionally transported frogs.
- Assist with the proper identification and management of sick and dead frogs in the wild.

1.1 Who should read this document?

This protocol is intended for use by all researchers, wildlife consultants, fauna surveyors and students undertaking frog field-work. In addition, the protocol should be read by Department of Environment and Climate Change (DECC) personnel, frog keepers, wildlife rescue and carer organisations, herpetological/frog interest groups/societies, fauna park/zoo operators/workers and other individuals who regularly deal with or are likely to encounter frogs.

This protocol outlines the expectations of the DECC regarding precautionary procedures to be employed when working with frog populations. The intention is to promote implementation of hygiene procedures by all individuals working with frogs. New licences and licence renewals will be conditional upon incorporation of the protocol. The DECC recognises that some variation from the protocol may be appropriate for particular research and frog handling activities. Such variation proposals should accompany any licence application or renewal to the DECC.

1.2 Background

1.2.1 Amphibian Chytrid Fungus

The apparent decline of frogs, including extinctions of species and local populations, has attracted increased international and national concern. Many

potential causes for frog declines have been proposed (eg see Pechmann et al., 1991; Ferrero and Bergin, 1993; Pechmann and Wilbur, 1994; Pounds and Crump, 1994; Pounds et al., 1997). However, the patterns of decline at many locations suggest that epidemic disease maybe the cause (Richards et al., 1993; Laurance et al., 1996; Alford and Richards, 1997). Recent research has implicated a water-borne fungal pathogen *Batrachochytrium dendrobatidis* as the likely specific causative agent in many of these declines both in Australia and elsewhere (Berger et al., 1998; 1999). This agent is commonly known as the amphibian or frog chytrid fungus and is responsible for the disease Chytridiomycosis (Berger et al., 1999).

B. dendrobatidis is a form of fungus belonging to the phylum Chytridiomycota. Most species within this phylum occur as free-living saprophytic fungi in water and soil and have been found in almost every type of environment including deserts, arctic tundra and rainforest and are considered important primary biodegraders (Powell 1993). *B. dendrobatidis* is a unique parasitic form of Chytridiomycete fungi, in that it invades the skin of amphibians, including tadpoles, often causing sporadic deaths with up to 100% mortality in some populations. Chytridiomycosis has been detected in over 40 species of native amphibian in Australia (Mahony and Workman 2000). However, it is not currently known whether the fungus is endemic or exotic to Australia.

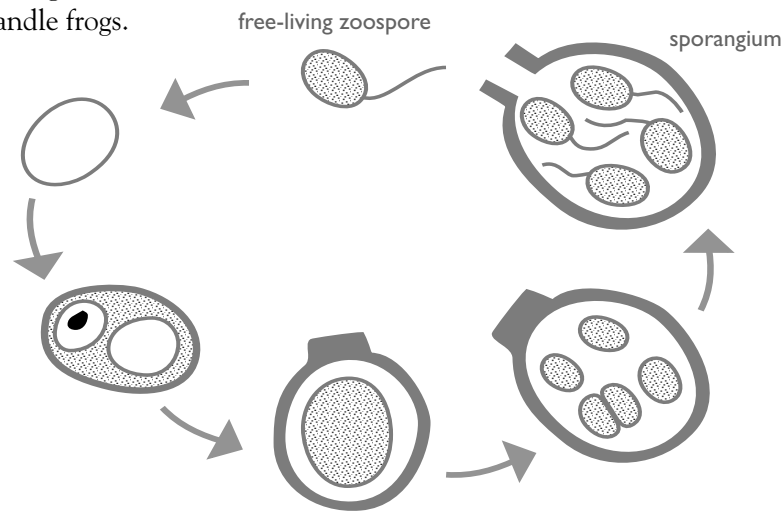
The infective stage of *B. dendrobatidis* is the zoospore and transmission requires water (Berger et al., 1999). Zoospores released from an infected amphibian can potentially infect other amphibians in the same water. More research is needed on the dynamics of infection in the wild. *B. dendrobatidis* is known to be susceptible to seasonal temperature changes, dehydration, salinity, water pH, light, nutrition and dissolved oxygen (Berger et al., 1999).

1.3 Objectives

The objectives of the hygiene protocol are to:

- Recommend best-practice procedures for DECC personnel, researchers, consultants and other frog enthusiasts or individuals who handle frogs.

- Suggest workable strategies for those regularly working in the field with frogs or conducting fieldwork activities in wetlands and other aquatic environments where there is the potential for spreading pathogens such as the frog chytrid fungus.
- Provide background information and guidance to people who provide advice or supervise frog related activities.
- Provide standard licence conditions for workers engaged in frog related activities.
- Inform Animal Care and Ethics Committees (ACEC) for their consideration when granting research approvals.



Life cycle of frog chytrid fungus from infective free-living zoospore stage to sporangium (adapted from L. Berger).

A large, light grey silhouette of a frog is positioned on the left side of the page. The number '2' is enclosed in a circle and placed over the frog's head area.

2 site hygiene management

A checklist of risk management procedures and recommended standard hygiene kit is provided in Appendix I. Please note Footnote I on page 4.

Individuals studying frogs often travel and collect samples of frogs from multiple sites. Some frog populations can be particularly sensitive to the introduction of infectious pathogens such as the frog chytrid fungus. Also, the arrangement of populations in the landscape may make frogs particularly vulnerable to transmission of infectious pathogens. Therefore, it is important that frog workers recognise the boundaries between sites and undertake measures which reduce the likelihood of spreading infection.

Where critically endangered species or populations of particular risk are known to occur, this protocol should be applied over very short distances ie a single site may need to be subdivided and treated as separate sites.

When planning to survey multiple sites, always start at a site where frog chytrid fungus is not known to be present before entering other infected areas.

2.1 Defining a site

Defining the boundary of a site maybe problematic. In some places, the boundary between sites will be obvious but in others, less so. Undertaking work at a number of sites or conducting routine monitoring at a series of sites within walking distance creates obvious difficulties with boundary definitions. It is likely that defining the boundary between sites will differ among localities. It may be that a natural or constructed feature forms a logical indicator of a site boundary eg a road/ track, a large body of water such as a river or the sea, a marked habitat change or a catchment boundary.

As a guiding principle, each individual waterbody should be considered a separate site.

When working along a river or stream or around a wetland or a series of interconnecting ponds it is reasonable, in most instances, to treat such examples as a single site for the purposes of this protocol. Such a case would occur in areas where frogs are known to have free interchange between ponds.

Where a stream consists of a series of distinctive tributaries or sub-catchments or where there is an obvious break or division then they should be treated as separate sites, particularly if there is no known interchange of frogs between sites.

2.2 On-site hygiene

When travelling from site to site it is recommended that the following hygiene precautions be undertaken to minimise the transfer of disease from footwear, equipment and/or vehicles.

Footwear

Footwear must be thoroughly cleaned and disinfected at the commencement of fieldwork and between each sampling site.

This can be achieved by initially scraping boots clear of mud and standing the soles in a disinfecting solution. The remainder of the boot should be rinsed or sprayed with a disinfecting solution that contains *benzalkonium chloride* as the active ingredient. Disinfecting solutions should be prevented from entering any water bodies.

Rubber boots such as 'gum boots' or 'Wellingtons' are recommended because of the ease with which they can be cleaned and disinfected.

Several changes of footwear bagged between sites might be a practical alternative to cleaning.

Equipment

Equipment such as nets, balances, callipers, bags, scalpels, headlamps, torches, wetsuits and waders etc that are used at one site must be cleaned and disinfected before re-use at another site.

Disposable items should be used where possible. Non-disposable equipment should be used only once during a particular field exercise and disinfected later or disinfected at the site between uses using procedures outlined in 2.4 below.

Vehicles

Where necessary, vehicle tyres should be sprayed/flushed with a disinfecting solution in high-risk areas.

Transmission of disease from vehicles is unlikely to be a problem. However, if a vehicle is used to traverse a known frog site, which could result in mud and water being transferred to other bodies of water or frog sites, then wheels and tyres should undergo cleaning and disinfection. This should be carried out at a safe distance from water bodies, so that the disinfecting solution can infiltrate soil rather than run-off into a nearby water body.

Spraying with 'toilet duck' (active ingredient *benzalkonium chloride*) is recommended to disinfect car wheels and tyres.

Cleaning of footwear before getting back into the car will prevent the transfer of pathogens from/to vehicle floor and control pedals.

2.3 Handling of frogs in the field

The spread of pathogenic organisms, such as the frog chytrid fungus, may occur as a result of handling frogs.

Frogs should only be handled when necessary.

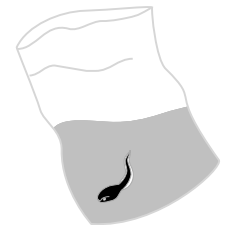
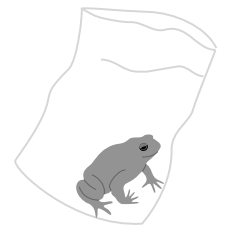
Where handling of frogs is necessary the risk of pathogen transfer should be minimised as follows:

- Hands should be either cleaned and disinfected between samples or a new pair of disposable gloves used for each sample¹. This may be achieved by commencing with a work area that has a dish containing a disinfecting solution and paper towels.
- A 'one bag – one frog' approach to frog handling should be used especially where several people are working together with one person processing frogs and others doing the collecting. Bags should not be reused.
- A 'one bag – one sample' approach to tadpole sampling should be used. Bags should not be reused.

Researchers who use toe clipping or Passive Integrated Transponder (PIT) tagging are likely to increase the risk of transmitting disease between frogs due to the possibility of directly introducing pathogens into the frogs' system. This can be minimised by using:

- Disposable sterile instruments
- Instruments disinfected previously and used once
- Instruments disinfected in between each frog

Disinfecting solutions containing *benzalkonium chloride* are readily available from local supermarkets. Some brands include Toilet Duck, Sanpic, New Clenz and Pine Clean.



¹ As a principle, this protocol assumes that not all frogs in an infected pond will be contaminated by the frog chytrid fungus. The infective load of a body of water may not be high enough to cause cross contamination of individual frogs in the same pond. Therefore care should be taken to use separate gloves and bags and clean hands for each sample, to avoid transmission of high infective loads between individuals.

Open wounds from toe clipping and PIT tagging should be sealed with a cyanoacrylate compound such as *Vetbond*® to reduce the likelihood of entry of pathogens. The DECC ACEC further recommends the application of topical anaesthetic *Xylocaine*® cream and *Betadine*® disinfectant (1% solution) before and after any surgical procedure. This should then be followed by the wound sealant.

All used disinfecting solutions, gloves and other disposable items should be stored in a sharps or other waste container and disposed or sterilised appropriately at the completion of fieldwork. Disinfecting solutions must not come into contact with frogs or be permitted to contaminate any water bodies

2.4 Disinfection Methods

Disinfecting agents for hands and equipment must be effective against bacteria and both the vegetative and spore stages of fungi. The following agents are recommended:

- Chloramine and Chlorhexidine based products such as *Halamid*®, *Halasept*® or *Hexifoam*® are effective against both bacteria and fungi. These products are suitable for use on hands, footwear, instruments and other equipment. The manufacturers instructions should be followed when preparing these solutions.
- Bleach and alcohol (ethanol or methanol), diluted to appropriate concentrations can be effective against bacteria and fungi. However, these substances may be less practical because of their corrosive and hazardous nature.

When using methanol either:

- immerse in 70% methanol for 30 minutes or
- dip in 100% methanol then flame for 10 seconds or boil in water for 10 minutes

Fresh bleach (5% concentration) may be also effective against other frog pathogens such as Rana Virus.

Some equipment not easily disinfected in these ways can be effectively cleaned using medical standard 70% isopropyl alcohol wipes – *Isowipes*®.



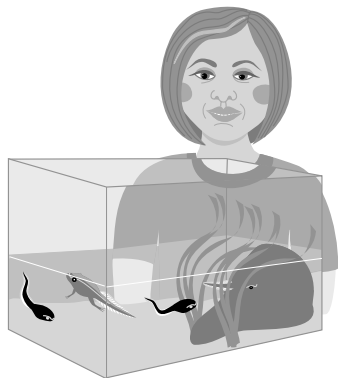
3 captive frog hygiene management

3.1 Housing frogs and tadpoles

Frogs and tadpoles should only be removed from a site when absolutely necessary.

When it is necessary for frogs or tadpoles to be collected and held for a period of time, the following measures should be undertaken:

- Animals obtained at different sites should be kept isolated from each other and from other captive animals.
- Aquaria set up to hold frogs should not share water, equipment or any filtration system. Splashes of water from adjacent enclosures or drops of water on nets may transfer pathogens between enclosures.
- Prior to housing frogs or tadpoles, ensure that tanks, aquaria and any associated equipment are disinfected.
- Tanks and equipment should be cleaned, disinfected and dried immediately after frogs/tadpoles are removed.



Careful maintenance of your enclosures will ensure a safe and hygienic environment for captive frogs and tadpoles.

When contemplating a release of captive bred tadpoles for conservation purposes a Translocation Proposal should be submitted to the DECC and pathological screening for disease should be undertaken (see also DECC Translocation Policy). Tadpoles can be tested by randomly removing 10 individuals at 6 weeks and again at 2 weeks before anticipated release. Testing could be undertaken by the pathology section at Taronga Zoo, Newcastle University, CSIRO Australian Animal Health Laboratories at Geelong and James Cook University at Townsville. Such an arrangement would need to be negotiated by contacting one of these institutions well before the anticipated release date. (see Appendix 2 for contact details)

DECC have licenced NSW Schools to allow students and/or teachers to remove tadpoles for classroom life cycle studies. They are authorised to remove individuals from only one location, each school also requires endorsement from Department of Education and Training Animal Care and Ethics Committee and comply with this protocol.

Tadpoles collected for these purposes are to be obtained from the local area of the school and are not to be obtained from DECC Reserves. As soon as tadpoles have transformed, froglets must be returned to the exact point of capture. Tadpoles from different locations are not to be mixed.

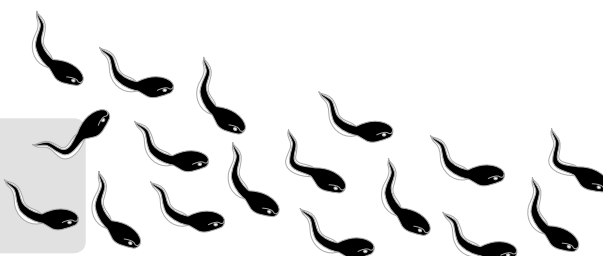
Antifungal cleansing treatments to clear tadpoles of the frog chytrid fungus are currently being trialed. In the future, such a treatment may be an added procedure required prior to froglet releases.

Detailed information on safely maintaining frogs in captivity is provided in Voigt (2001).

3.2 Tadpole treatment

In most instances:

Release to the wild of tadpoles held or bred in captivity should be avoided.



3.3 Frog treatment

The rigour with which frogs must be treated to ensure pathogens are not introduced to native populations means that any proposal for the removal of adult frogs (particularly threatened species) from wild populations should be given careful consideration.

When it is essential for frogs to be removed from the wild, the following should apply.

Individuals to be released should be quarantined for a period of 2 months and monitored for any signs of illness or disease.

Frogs must not be released if any evidence of illness or infection is detected. If illness is suspected, further advice must be sought from a designated frog recipient (Appendix 2) as soon as possible to determine the nature of the problem. Chytridiomycosis can be diagnosed in live frogs by microscopical examination of preserved toe clips or from shedding skin samples. Research is still in progress on the development of a simple technique for the detection of Chytridiomycosis and a treatment for infected frogs.

Current methods which may be used include:

- A technique for the treatment of potentially infected frogs is to place the frogs individually in a 1mg/L benzalkonium chloride solution for 1 hour on days 1, 3, 5, 9, 11 and 13 of the treatment period. Frogs are then isolated/quarantined for two months. This and other possible treatments are documented in Berger and Speare (1998)
- *Betadine*© and *Bactone*© treatments have also been used on adult frogs with some success (M. Mahony, Newcastle University pers. comm.)
- *Itraconazole*© is an expensive drug

which has been used successfully (Lee Berger CSIRO Australian Animal Health Laboratory pers. comm.). Information on this method is available on the Website <http://www.jcu.edu.au/school/PHTM/frogs/adms/attach6.pdf>.

Frogs undergoing treatment should be housed individually and kept separate from non-infected individuals.

3.4 Displaced frogs

Displaced frogs are those native frog species and introduced Cane Toads (*Bufo marinus*) which have been unintentionally transported around the country with fresh produce, transported produce and landscaping supplies. Procedures to be undertaken when encountering introduced/displaced native frog species (as well as Cane Toads) are as follows.

3.4.1 Banana box frogs

'Banana Box' frog is the term used to describe several native frog species (usually *Litoria gracilentata*, *L. infrafrenata*, *L. bicolor* and *L. caerulea*) commonly transported in fruit and vegetable shipments and landscaping supplies. In the past, well meaning individuals have attempted to return these frogs to their place of origin but this is usually impossible to do accurately. There is risk of spread of disease if these frogs are transferred from place to place.

It is strongly recommended that:

Displaced Banana Box frogs should be treated as if they are infected and should not be freighted anywhere for release to the wild unless specifically approved by DECC.

When encountering a displaced frog:

- Contact a licensed wildlife carer organisation to collect the animal. The frog should then undergo a quarantine period of 2 months along with an approved disinfection treatment.
- Post-quarantine, the frog (if one of the species identified above) may be transferred to a licensed frog keeper. All other species require the permission from DECC Wildlife Licensing and Management Unit (WLMU) prior to transfer. Licensed carer groups are to record and receipt frogs obtained and disposed of in this way.
- Licensed Frog Keepers are to list these frogs in their annual licence returns to DECC.

Frogs held by licensed frog keepers are not to be released to the wild except with specific DECC approval.

Displaced frogs may be made available to recognised institutions for research projects, display purposes or perhaps offered to the Australian Museum as scientific specimens once approval has been provided by the DECC WLMU.



Frogs are often unintentionally transported with fresh produce and landscaping supplies. They are collectively known as 'banana box' or displaced frogs.

3.4.2 Cane toads

Cane toads are known carriers of the Frog chytrid fungus and should not be knowingly transported or released to the wild.

If a cane toad is discovered outside of its normal range, it should be humanely euthanased in accordance with the recommended NSW Animal Welfare Advisory Council procedure (see Appendix 3). Care should be taken to avoid euthanasia of native species due to mistaken identity.

3.4.3 Local frog species

Frogs encountered on roads, around dwellings and gardens or in swimming pools should not be considered as displaced frogs.

Frogs encountered in these situations should be assisted off roads, away from dwellings, or out of swimming pools preferably to the nearest area of vegetation or suitable habitat.

Incidences of frogs spawning or tadpoles appearing in swimming pools should be referred to a wildlife carer/rescue organisation for assistance (see Appendix 4).

Contact the Frogwatch Helpline if you are unsure whether a frog is a local species or displaced.

An NPWS information brochure titled 'Cane Toads in NSW' provides further information on cane toads and assistance with identification of some of the commonly misidentified native species. This information is also available on the DECC website.

4 sick or dead frogs

Unless an obvious cause of illness or death is evident (eg predation or road mortality): Sick or dead frogs encountered in the wild should be collected and disposed of in accordance with the procedures described in section 4.2 below.

4.1 Symptoms of sick and dying frogs

Sick and dying frogs exhibit a range of symptoms characteristic of chytrid infection. Symptoms may be expressed in the external appearance or behaviour of the animal. A summary of these symptoms are described below. More detailed information can be found in Berger et al., (1999) or at the James Cook University Amphibian Disease website at: <http://www/jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm>.



Appearance (one or more symptoms)

- darker or blotchy upper (dorsal) surface
- reddish/pink-tinged lower (ventral) surface and/or legs and/or webbing or toes
- swollen hind limbs
- very thin or emaciated
- skin lesions (sores, lumps)
- infected eyes
- obvious asymmetric appearance

Behaviour (one or more symptoms)

- lethargic limb movements, especially hind limbs
- abnormal behaviour (eg a nocturnal, burrowing or arboreal frog sitting in the open during the day and making no vigorous attempt to escape when approached)
- little or no movement when touched

Great barred frog (*Mixophyes fasciolatus*) with severe Chytrid infection — note lethargic attitude and sloughing skin. Photo: L. Berger

Diagnostic behaviour tests

Sick frogs will fail one or more of the following tests:

test	healthy	sick
Gently touch with finger	Frog will blink	Frog will not blink above the eye
Turn frog on its back	Frog will flip back over	Frog will remain on its back
Hold frog gently by its mouth	Frog will use its forelimbs to try to remove grip	No response from frog

4.2 What to do with sick or dead frogs

A procedure for the preparation and transport of a sick or dead frog is given below². Adherence to this procedure will ensure the animal is maintained in a suitable condition for pathological examination and assist the DECC and researchers to determine the extent of the disease and the number of species affected.

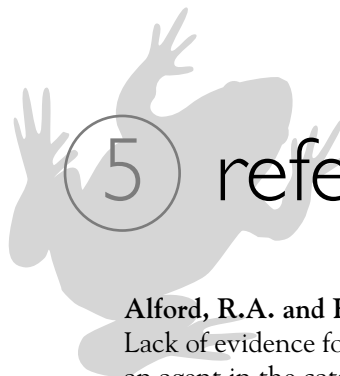
- Disposable gloves should be worn when handling sick or dead frogs. Avoid handling food and touching your mouth or eyes as this could transfer pathogens and toxic skin secretions from some frog species.
- New gloves and a clean plastic bag should be used for each frog specimen to prevent cross-contamination. When gloves are unavailable, use an implement to transfer the frog to a container rather than using bare hands.
- If the frog is dead, keep the specimen cool and preserve as soon as possible (as frogs decompose quickly after death making examination difficult). Specimens can be fixed/preserved in 70% ethanol or 10% buffered formalin.

Cut open the belly and place the frog in about 10 times its own volume of preservative. Alternatively, specimens can be frozen (although this makes tissues unsuitable for some tests). If numerous frogs are collected, some should be preserved and some should be frozen. Portions of a dead frog can be sent for analysis eg a preserved foot, leg or a portion of abdominal skin.

- The container should be labelled showing at least the species, date and location. A standardised collection form is provided in Appendix 5.
- If the frog is alive but unlikely to survive transportation (death appears imminent), euthanase the frog (see Appendix 3) and place the specimen in a freezer. Once frozen, the specimen is ready for shipment to the address provided below.
- If the frog is alive and likely to survive transportation, place the frog into either a moistened cloth bag with some damp leaf litter or into a plastic bag with damp leaf litter and partially inflated before sealing. Remember to keep all frogs separated during transportation.
- Preserved samples can be sent in jars or wrapped in wet cloth, sealed in bags and placed inside a padded box.
- Send frozen samples in an esky with dry ice (available from BOC/CIG Gas outlets).
- Place live or frozen specimens into a small styrafoam esky (available from K-Mart/Big W for approximately \$2.50).
- Seal esky with packaging tape and address to one of the laboratories listed in Appendix 4.
- Send the package by courier.

Further information on sick and dying frogs is available on the Amphibian Disease Home Page at <http://www.jcu.edu.au/dept/PHTM/frogs/ampidis.htm> — in particular refer to 'What to do with dead or ill frogs'.

²The measures described below are standard procedures and may vary slightly depending on the distance and time required to reach the intended recipient. Contact the intended recipient of the sick or dead frog prior to sending to confirm the appropriate procedure.



5 references

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appendix I

hygiene protocol checklist and field kit

The following checklist and field kit are designed to assist with minimising the risk of transferring pathogens between frogs.

Have you considered the following questions before handling frogs in the field:

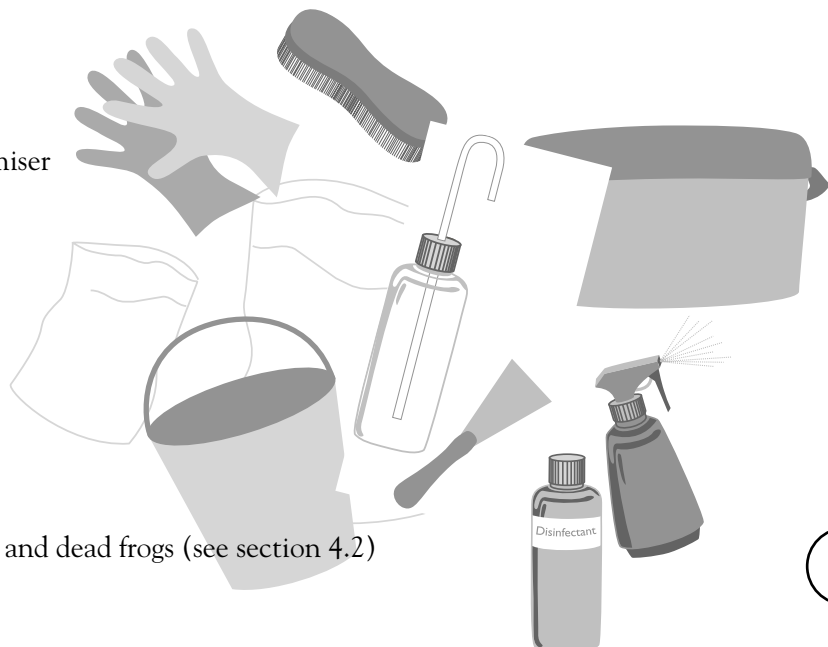
- Has your proposed field trip been sufficiently well planned to consider hygiene issues?
- Have you taken into account boundaries between sites (particularly where endangered species or populations at risk are known to occur)?
- Have footwear disinfection procedures been considered and a strategy adopted?
- Have you planned the equipment you will be using and developed a disinfection strategy?
- Are you are planning to visit sites where vehicle disinfection will be needed (consider both vehicle wheels/tyres and control pedals) and if so, do you have a plan to deal with vehicle disinfection?
- Have handling procedures been planned to minimise the risk of frog to frog pathogen transmission?
- Do you have a planned disinfection procedure to deal with equipment, apparel and direct contact with frogs?

If you answered NO to any of these questions please re-read the relevant section of the DECC Hygiene Protocol for the Control of Disease in Frogs and apply a suitable strategy.

Field hygiene kit

When planning to survey frogs in the field a portable field hygiene kit should be assembled to assist with implementing this protocol. Recommended contents of a field hygiene kit would include:

- Small styrofoam eski
- Disposable gloves
- Disinfectant spray bottle (atomiser spray) and/or wash bottle
- Disinfecting solutions
- Wash bottle
- Scraper or scrubbing brush
- Small bucket
- Plastic bags large and small
- Container for waste disposal
- Materials for dealing with sick and dead frogs (see section 4.2)



appendix 2

Always contact the relevant specialist prior to sending a sick or dead frog. In some cases, only wild frogs will be assessed for disease. Analysis may also attract a small fee per sample.

designated sick and dead frog recipients

Contact one of the following specialists to arrange receipt and analyse sick and dead frogs. Make contact prior to dispatching package:

Karrie Rose
Australian Registry of Wildlife Health
Taronga Conservation Society, Australia
PO Box 20
MOSMAN NSW 2088
Phone: 02 9978 4749
Fax: 02 9978 4516
Krose@zoo.nsw.gov.au

Diana Mendez or
Rick Speare
School of Public Health,
Tropical Medicine and
Rehabilitation Sciences
James Cook University
Douglas Campus
TOWNSVILLE QLD 4811

Phone: 07 4796 1735
Fax: 07 4796 1767
Diana.Mendez@jcu.edu.au
Richard.Speare@jcu.edu.au

Michael Mahony
School of Biological Sciences
University of Newcastle
CALLAGHAN NSW 2308

Phone: 02 4921 6014
Fax: 02 4921 6923
bimjm@cc.newcastle.edu.au

For information on frog keeping licences and approvals to move some species of displaced frog contact:

Co-ordinator, Wildlife Licensing
Wildlife Licensing and Management Unit
DECC
PO Box 1967
Hurstville NSW 1481
Ph 02 9585 6481
Fax 02 9585 6401
wildlife.licensing@environment.nsw.gov.au

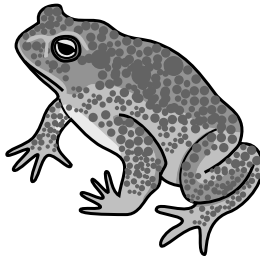
For information on the possible identity of displaced frogs contact:

Frog and Tadpole Society (FATS)
Frogwatch Helpline
Ph: 0419 249 728

appendix 3

NSW Animal Welfare Advisory Council methodology

The NSW Animal Welfare Advisory Council procedure for humanely euthanasing cane toads or terminally ill frogs is stated as follows:



- Using gloves, or some other implement, place cane toad or terminally ill frog into a plastic bag.
- Cool in the refrigerator to 4°C.
- Crush cranium with a swift blow using a blunt instrument.

Note: Before killing any frog presumed to be a cane toad, ensure that it has been correctly identified and if outside the normal range for cane toads in NSW (north coast) that local DECC regional office is informed.

appendix 4

licensed wildlife carer and rescue organisations

Following is a list of wildlife rehabilitation groups licensed by
Department of Environment and Climate Change (NSW):

Northern NSW

Australian Seabird Rescue
For Australian Wildlife Needing Aid
(FAWNA)
Friends of the Koala
Friends of Waterways (Gunnedah)
Great Lakes Wildlife Rescue
Koala Preservation Society of NSW
Northern Rivers Wildlife Carers
Northern Tablelands Wildlife Carers
Tweed Valley Wildlife Carers
Seaworld Australia
WIRES branches in Northern NSW

Southern NSW

Looking After Our Kosciuszko Orphans
(LAOKO)
Native Animal Network Association
Native Animal Rescue Group
Wildcare Queanbeyan
WIRES branches in Southern NSW

Sydney, Hunter and Illawarra

Hunter Koala Preservation Society

Ku-ring-gai Bat Colony Committee
Kangaroo Protection Co-operative
Native Animal Trust Fund
Organisation for the Rescue and Research of
Cetaceans (ORRCA)
Sydney Metropolitan Wildlife Services
Wildlife Aid
Wildlife Animal Rescue and Care (Wildlife
ARC)
Waterfall Springs Wildlife Park
Oceanworld
Wildlife Care Centre, John Moroney
Correctional Centre
Koalas in Care
WIRES branches around Sydney, Hunter and
Illawarra

Western NSW

Rescue and Rehabilitation of Australian
Native Animals (RRANA)
RSPCA Australian Capital Territory Inc.
Wildlife Carers Network (Central West)
WIRES branches in Western NSW
Cudgegong Wildlife Carers

appendix 5 — sick or dead frog collection form

Sender details:

name: _____ address: _____ postcode: _____
 phone: (w) _____ (h) _____ fax: _____ email: _____

Collector details: (where different to sender)

name: _____ address: _____ postcode: _____
 phone: (w) _____ (h) _____ fax: _____ email: _____

Specimen details:

record no: _____ no. of specimens: _____ species name: _____ date collected: _____
day/month/year

time collected: _____ sex: _____ status at time of collection: _____ date sent: _____
male/female healthy(H)/ sick(S)/ dead(D) day/month/year

location: _____ map grid reference: _____
(easting) (northing)

reason for collection: _____

Batch details for multiple species collection:

species	no.	locality	(AMG)	date	sex	status (H/S/D)

habitat type: _____ vegetation type: _____ micro habitat: _____
eg creek, swamp, forest eg rainforest, sedgeland eg creek bank, under log, amongst emergent vegetation,
on ground in the open

unusual behaviour of sick frogs: _____
eg lethargic, convulsions, sitting in the open during the day, showing little or no movement when touched.

dead frogs appearance: _____
eg thin, reddening of skin on belly and/or toes, red spots, sore, lumps or discolouration on skin

deformed frogs: _____ dead/sick tadpoles: _____
eg limb(s) missing, abnormal shape or length eg numbers/behaviour

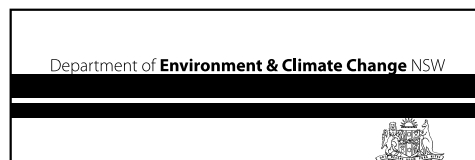
unusual appearance of egg masses: _____ recent use of agricultural chemicals in area: _____
eg grey or white eggs eg pesticides, herbicides, fertilisers

other potential causes of sickness/mortality/comments/additional information: _____



**NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE**

General inquiries: PO Box A290 South Sydney 1232
Phone: 9995 5000 or 1300 361967
Fax: 02 9995 5999 **Web site:** www.environment.nsw.gov.au



Appendix C: Priority Weeds in Strathfield Council Area

COMMON NAME	BOTANICAL NAME	WEED OF NATIONAL SIGNIFICANCE	NATIONAL ENVIRONMENTAL ALERT LIST WEEDS
African boxthorn	<i>Lycium ferocissimum</i>	Yes	No
African olive	<i>Olea europaea</i> subsp. <i>cuspidata</i>	No	No
Alligator weed	<i>Alternanthera philoxeroides</i>	Yes	No
Anchored water hyacinth	<i>Eichhornia azurea</i>	No	No
Asparagus fern	<i>Asparagus virgatus</i>	No	No
Athel pine	<i>Tamarix aphylla</i>	Yes	No
Bellyache bush	<i>Jatropha gossypifolia</i>	Yes	No
Bitou bush	<i>Chrysanthemoides monillifera</i> subsp. <i>rotundata</i>	Yes	No
Black knapweed	<i>Centaurea x moncktonii</i>	No	No
Black willow	<i>Salix nigra</i>	Yes	No
Blackberry	<i>Rubus fruticosus</i> species aggregate	Yes	No
Boneseed	<i>Chrysanthemoides monillifera</i> subsp. <i>monillifera</i>	Yes	No
Boxing glove cactus	<i>Cylindropuntia fulgida</i> var. <i>mamillata</i>	Yes	No
Bridal creeper	<i>Asparagus asparagoides</i>	Yes	No
Bridal veil creeper	<i>Asparagus declinatus</i>	Yes	No
Broomrapes	<i>Orobanche</i> species	No	No
Cabomba	<i>Cabomba caroliniana</i>	Yes	No
Cane cactus	<i>Austrocylindropuntia cylindrica</i>	Yes	No
Cape broom	<i>Genista monspessulana</i>	Yes	No
Cat's claw creeper	<i>Dolichandra unguis-cati</i>	Yes	No
Chilean needle grass	<i>Nasella neesiana</i>	Yes	No
Chinese knotweed	<i>Persicaria chinensis</i>	No	No
Chinese violet	<i>Aystasia gangetica</i> subsp. <i>micrantha</i>	No	No
Climbing asparagus	<i>Asparagus africanus</i>	Yes	No
Climbing asparagus fern	<i>Asparagus plumosus</i>	Yes	No
Common pear	<i>Opuntia stricta</i>	Yes	No
East Indian hygrophila	<i>Hygrophila polysperma</i>	No	No
Eurasian water milfoil	<i>Myriophyllum spicatum</i>	No	No
Fireweed	<i>Senecio madagascariensis</i>	Yes	No
Flax-leaf broom	<i>Genista linifolia</i>	Yes	No
Foxtail fern	<i>Asparagus densiflorus</i>	Yes	No
Frogbit	<i>Limnobium laevigatum</i>	No	No
Gamba grass	<i>Andropogon gayanus</i>	Yes	No
Giant devil's fig	<i>Solanum chrysotrichum</i>	No	No
Giant rat's tail grass	<i>Sporobolus pyramidalis</i>	No	No
Giant reed	<i>Arundo donax</i>	No	No
Glory lily	<i>Gloriosa superba</i>	No	No
Gorse	<i>Ulex europaeus</i>	Yes	No

Green cestrum	<i>Cestrum parqui</i>	No	No
Grey sallow	<i>Salix cinereal</i>	Yes	No
Ground asparagus	<i>Asparagus aethiopicus</i>	Yes	No
Groundsel bush	<i>Baccharis halimifolia</i>	No	No
Hawkweeds	<i>Hieracium</i> species	No	Yes
Holly leaved senecio	<i>Senecio glastifolius</i>	No	Yes
Horsetails	<i>Equisetum</i> species	No	Yes
Hudson pear	<i>Cylindropuntia pallida</i>	Yes	No
Hydrocotyl	<i>Hydrocotyle ranunculoides</i>	No	No
Hygrophila	<i>Hygrophila costata</i>	No	No
Hymenachne	<i>Hymenachne amplexicaulis</i> and hybrids	Yes	No
Karoo thorn	<i>Vachellia karroo</i>	No	Yes
Kei apple	<i>Dovyalis caffra</i>	No	No
Kidney-leaf mud plantain	<i>Heteranthera reniformis</i>	No	No
Kochia	<i>Bassia scoparia</i>	No	No
Koster's curse	<i>Clidemia hirta</i>	No	No
Kudzu	<i>Pueraria lobate</i>	No	No
Lagarosiphon	<i>Lagarosiphon major</i>	No	No
Lantana	<i>Lantana camara</i>	Yes	No
Leaf cactus	<i>Pereskia aculeate</i>	No	Yes
Ludwigia	<i>Ludwigia peruviana</i>	No	No
Madeira vine	<i>Anredera cordifolia</i>	Yes	No
Mesquite	<i>Prosopis species</i>	Yes	No
Mexican feather grass	<i>Nassella tenuissima</i>	No	No
Miconia	<i>Miconia</i> species	No	No
Mikania vine	<i>Mikania micrantha</i>	No	No
Mimosa	<i>Mimosa pigra</i>	Yes	No
Ming asparagus fern	<i>Asparagus macowanii</i> var. <i>zuluensis</i>	No	No
Mysore thorn	<i>Caesalpinia decapetala</i>	No	No
Nodding thistle	<i>Carduus nutans</i> subsp. <i>nutans</i>	No	No
Pampas grass	<i>Cortaderia</i> species	No	No
Parkinsonia	<i>Parkinsonia aculeata</i>	Yes	No
Parthenium weed	<i>Parthenium hysterophorus</i>	Yes	No
Pond apple	<i>Annona glabra</i>	Yes	No
Prickly acacia	<i>Vachellia nilotica</i>	Yes	No
Prickly pears - Austrocylindropuntias	<i>Austrocylindropuntia</i> species	No	No
Prickly pears - Cylindropuntias	<i>Cylindropuntia</i> species	No	No
Prickly pears - Opuntias	<i>Opuntias</i> species	No	No
Rope pear	<i>Cylindropuntia imbricate</i>	Yes	No
Rubber vine	<i>Cryptostegia grandiflora</i>	Yes	No
Sagittaria	<i>Sagittaria platyphylla</i>	Yes	No

Salvinia	<i>Salvinia molesta</i>	Yes	No
Scotch broom	<i>Cytisus scoparius</i> subsp. <i>scoparius</i>	Yes	No
Sea spurge	<i>Euphorbia paralias</i>	No	No
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	No	Yes
Serrated tussock	<i>Nassella trichotoma</i>	Yes	No
Siam weed	<i>Chromolaena odorata</i>	No	Yes
Sicilian sea lavender	<i>Limonium hyblaenum</i>	No	No
Sicklethorn	<i>Asparagus falcatus</i>	No	No
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	Yes	No
Singapore daisy	<i>Sphagneticola trilobata</i>	No	No
Skunk vine	<i>Paederia foetida</i>	No	No
Smooth tree pear	<i>Opuntia monacantha</i>	Yes	No
Snakefeather	<i>Asparagus scandens</i>	No	No
Spanish broom	<i>Spartium junceum</i>	No	No
Spongeplant	<i>Limnium spongia</i>	No	No
Spotted knapweed	<i>Centaurea stoebe</i> subsp. <i>micranthos</i>	No	No
Tiger pear	<i>Opuntia aurantiaca</i>	Yes	No
Tropical soda apple	<i>Solanum viarum</i>	No	No
Velvety tree pear	<i>Opuntia tomentosa</i>	Yes	No
Water calltrop	<i>Trapa</i> species	No	No
Water hyacinth	<i>Eichhornia crassipes</i>	Yes	No
Water lettuce	<i>Pistia stratiotes</i>	No	No
Water poppy	<i>Hydrocleys numphoides</i>	No	No
Water soldier	<i>Stratiotes aloides</i>	No	No
Water star grass	<i>Heteranthera zosterifolia</i>	No	No
White blackberry	<i>Rubus niveus</i>	No	No
Willows	<i>Salix</i> species	Yes	No
Witchweeds	<i>Striga</i> species	No	No
Yellow burrhead	<i>Limnocharis flava</i>	No	No

