Riparian Vegetation Management Plan

381 Anambah Road

Prepared for

DB20 Pty Ltd

June 2025

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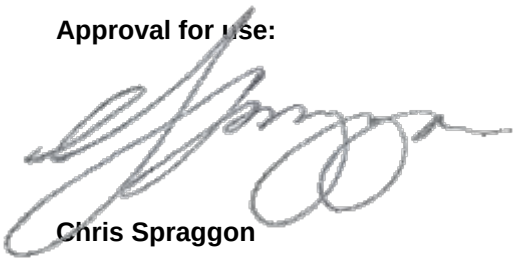

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3 June 2025

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SHORTENED FORMS

AABR	Australian Association of Bush Regenerators
APZ	Asset Protection Zone
BC Act	Biodiversity Conservation Act 2016 (NSW)
CEEC	Critically Endangered Ecological Community
Council	Maitland City Council
DBH	Diameter at Breast Height over bark (tree)
DCCEEW	Australian Government Department of Climate Change, Environment, Energy & Water
NSW DCCEEW	NSW Government Department of Climate Change, Environment, Energy & Water
DPHI	NSW Department of Planning, Housing & Infrastructure
EC	Ecological Community listed under the EPBC Act
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EEC	Endangered Ecological Community
HTW	High Threat Weed
LLS Act	Local Land Services Act 2013 (NSW)
MCC	Maitland City Council
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
PCT	Plant Community Type
Provenance	Refers to the location of the natural population of origin of propagative material for revegetation, including seed or cuttings, translocation and grafting stock or scion
Rehabilitation	Any attempt to restore elements of structure or function to an ecological system
▪ Reconstruction	Establishment of native vegetation in a location with a high degree of disturbance and a dearth or absence of native vegetation, seed bank or symbiotic soil function
▪ Regeneration	Describes the restoration of natural ecosystems through the natural cyclic processes of renewal and self-maintenance of species and their populations.
▪ Restoration	Re-establish exactly the original native plant community.
▪ Revegetation	Replanting of native vegetation.
TEC	Threatened Ecological Community
VEC	Vulnerable Ecological Community
Vegetation SEPP	State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (NSW)
VIS	NSW BioNet Vegetation Information System
VMA	Vegetation Management Area
VMP	Vegetation Management Plan
WoNS	Weeds of National Significance

RIPARIAN VEGETATION MANAGEMENT PLAN

1. Introduction

1.1 Purpose if this Plan

This Plan has been prepared to accompany a development application for a staged subdivision and residential development. This plan is intended as a summary of constraints and commitments associated with the rehabilitation of a portion of riparian corridor adjacent to the development. This Plan has been prepared in anticipation of constructive feedback with the Consent Authority (Maitland City Council). It is anticipated that over progressive development within AURA (outside the bounds of this VMP) an overall riparian corridor will be progressively rehabilitated, and this VMP presents the first stage.

This Plan has been prepared to ultimately comply with the requirements of relevant legislation and guidelines as outlined in **Sections 1.3** & **1.6**.

1.2 Aims & Objectives

The overarching aim of the VMP is to create a weed-free, resilient and self-sustaining ecosystem with minimal maintenance requirements, as a secure riparian habitat corridor. The following objectives are set:

- Remove priority weeds and their propagules from the riparian corridor;
- Establish native canopy and understorey, and riparian channel revegetation in alignment with an appropriate plant community assemblage;
- Maintain native revegetation at a density that resists weed infestation;
- Monitor and report on the progress of rehabilitation of the management area over a prescribed period (5 years).

1.3 Legislative Considerations

Key legislation generally relating to this VMP and the site project approvals include the following:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1997
- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- NSW Environmental Planning and Assessment Act 1979
- NSW Water Management Act 2000

The VMP has been prepared with due reference to the NSW DPI Guidelines for Vegetation Management Plans on Waterfront Land (2012), and the Maitland DCP (2025 in draft) Appendix C Biodiversity Guidelines.

1.3.1 NSW Water Management Act (2000)

Controlled activities carried out in, on or under waterfront land are regulated by the Water Management Act 2000 (WM Act). The department administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the

highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the department before commencing the controlled activity.

When a proposed controlled activity disturbs or substantially modifies the riparian corridor, its restoration or rehabilitation will be a requirement of the controlled activity approval. A vegetation management plan (VMP) details how the restoration or rehabilitation will be carried out. The main objective of a VMP is to provide a stable watercourse and riparian corridor which will emulate local native vegetation communities.

A Riparian Assessment under the Water Management Act is **Appendix B**.

1.4 Proposed development

1.4.1 Development overview

The proposal consists of an extension to the lead in road from the west with the creation (over four stages) of 173 standard residential lots and 2 super lots (for future subdivision), with a new public road and active movement network along with associated works including bulk earthworks, stormwater management, vegetation riparian zones, bushfire management, landscaping, pathways, utilities and other typical subdivision works. Two temporary secondary accesses are proposed (to River Road and to Anambah Road) and a temporary APZ is applied around the perimeter of the subdivision pending future progressive development as zoned.

1.4.2 Proposed development and the subject land

Locality	The site is in Anambah, NSW
Land Title/s	Part Lot A/-/DP431640, Part Lot 1 and Lot 2/-/DP1110433
LGA	Maitland City Council
Area	Development Works Extent – 34.28 ha
Zoning	R1 General Residential, C4 Environmental Living
Boundaries	The site is generally bound by a riparian corridor in the north-west. In all other directions, boundaries are undefined in the landscape (refer to **Figure 1**)
Current Land Use	The site is part of a pastoral landholding, grazed by beef cattle.
Hydrology	The site is crossed by a 2nd order nonperennial natural watercourse, flowing SW to NE. Outside the site, the watercourse crosses the Anambah Road corridor by means of pipe culverts, joining a broad wetland network on the floodplain of the Hunter River (a 9th order Perennial Natural Watercourse 1.5 km west of the site.
Topography	The site slopes generally to the north (to creek) and east (to Anambah Rd) from a low hill, with elevation ranging from 16 to 43 m AHD.

1.4.3 Supplied Information

Below documentation have been supplied to the authors and considered in the context of this appraisal:

- Extent of Works Plan — GCA (2025)

1.5 Roles & Responsibilities

The key stakeholders associated with this VMP are:

- The person/firm preparing the VMP – Chris Spraggon, MJD Environmental.
- The proponent – DB20 Pty Ltd.
- The contractor(s) engaged for VMP implementation – Vegetation Contractor (TBC).
- The person/ firm who will undertake compliance of VMP implementation by the vegetation contractor(s) on behalf of the proponent and prepare monitoring statements – Ecology Consultant (TBC).

1.5.1 Qualifications of author/s

Author	Title & Role	Qualifications
Chris Spraggon	**Senior Ecologist**, Lead Author	▪ Accredited BAM Assessor (#BAAS25009) ▪ AABR Accredited Practitioner #1320 ▪ B. Science (Honours) ▪ Conservation & Land Management Cert III
Matt Doherty	**Director**, Reviewer	▪ Accredited BAM Assessor (#BAAS17044) ▪ B. Landscape Management and Conservation (Soil and Water Management) ▪ Bush Regeneration Cert IV

1.6 Future Approvals

This VMP has been prepared to accompany an application for development and as such is not subject to conditions of approval. Below, **Table 1** cross references sections of the VMP which address relevant (abridged) requirements of listed guidelines.

Table 1. VMP Requirements

NSW Office of Water Controlled activities – Guidelines for vegetation management plans on waterfront land	
VMP should be prepared by a suitably qualified person	See **Section 1.5.1**
An appropriate width for the riparian corridor should be identified. The VMP should consider the full width of the riparian corridor and its functions including accommodating fully structured native vegetation.	See **Appendix B** and **Section 4**
Maps or diagrams which clearly identify the riparian corridor and proposed activities	See **Figure 3**
The location of the bed and banks or foreshore of waterfront land and the footprint of the riparian corridor should be clearly identified. Vegetated riparian zones must be indicated.	See **Appendix B**
Photographs of the site should be supplied and photo points should be identified	See **Section 6**, **Appendix B**
Measures for controlling long-term access and encroachments	TBC Post-approval
Vegetation species composition, planting layout and densities should be identified. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse.	See **Section 2.1.4**, **Section 5.3**, **Appendix C**
Seed or plant sources should be identified. Where possible, native plants and seed sources of local provenance should be used.	See **Section 5.3**

Exotic vegetation should be avoided. The use of exotic species for temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.	Note
Details of the planting program, rehabilitation methods and staging should be provided. Techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.	See **Section 5.3**
Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.	See **Table 7**
Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance which includes plant replacement, monitoring and reporting should be prepared	TBC Post-approval
Processes for monitoring and review, including a method of performance evaluation should be identified.	See **Section 6**
Regular reporting on the implementation and status of works covering progress, success or failures and completion should be provided	See **Section 6**
Security such as bank guarantees may be required before a controlled activity involving the implementation of a VMP is commenced.	TBC Post-approval
Maitland DCP 2011 Part B	
The current DCP has limited requirements pertaining to VMP standards or implementation, other than the requirement for VMP production.	See below
Maitland DCP (Draft) Appendix C: Biodiversity Guidelines	
The VMP must be prepared by a qualified ecologist with experience in bush regeneration.	See **Section 1.5.1**
The existing site context must be clearly described with references to a range of mapping, including historical, if relevant.	See **Section 2**
The aims and objectives are to be site specific and led by the following principles: a. Maintain or enhance biodiversity, habitat and natural values b. Manage, control and eliminate invasive species c. Establish a low-maintenance, self-sustaining vegetation community that supports long-term ecological resilience and minimal intervention d. Promote and educate on native ecological sustainability through revegetation and restoration.	See **Section 1.2**
All areas covered within the VMP must be separated into management zones to reflect the extent and type of management required.	See **Section 4**
Each management zone must be clearly mapped and described within the VMP.	See **Figure 3**
Management actions required to meet the objective of each zone must be described in sufficient detail	See **Section 5**
All boundaries between the development and the natural areas/revegetation area of the VMP must be fenced with fauna friendly materials. Signage is to be placed along the fence line to educate on the restoration efforts.	TBC Post-Approval
Completion criteria must be set as a benchmark for regular monitoring. Targets are to be prescriptive, and percentage based.	See **Section 6**
The completion criteria are to include a trending target for the end of each year's maintenance period. End of year targets may be management zone specific	See **Section 6**
Monitoring methodologies must be detailed within the VMP. A monitoring report is to be submitted annually to Council	See **Section 6**

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FIGURE 1:
SITE LOCATION

Legend

- Construction Works Zone - refer Extent of Works Map (Appendix A)
- Cadastral Boundary
- Roads

N
W E
S

0 200 400 600 800

Metres
1:10000

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-06-03 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250530_LP.qgz | This plan should not be relied upon for critical design dimensions.

2. Site Context

2.1 Existing Environment

2.1.1 General location

The site is located in the locality of Anambah, in Maitland LGA in the Lower Hunter Valley. The locality is one of four (4 – Gosforth, Anambah, Windermere and Windella) generally bounded by the New England Highway and a broad meandering bend in the Hunter River. This area comprises of approximately 4000 hectares of undulating land, defined by a minimum elevation of at most approximately 20 m AHD, with a series of generally central low hills peaking at approximately 180 m AHD at Winders Hill. The area has a substantial catchment area extending south of the New England Highway, and a significant proportion of the area is flood-prone.

The subject site is located to the north-east of the locality of Windella, approximately 2.5 km north of the New England Highway. The development area has a minimum elevation of 24 m and a maximum elevation of 43 m AHD. The watercourse has a low point of 15 m AHD in association with the development site.

2.1.2 Current and past land-use history

Land is currently used for low intensity grazing of beef cattle, and the broader area has been subject to intensive agricultural activities over many generations. Aerial photo interpretation (API) of NSW Historical Imagery shows the site in a completely cleared state as early as 1954. API did not detect any management of regrowth vegetation over 1954-2001.

2.1.3 Landscape features

The site is gently sloping, centred on a very low ridge of peak elevation 42 m AHD which grades to the north, east and south into riparian corridors. A watercourse associated with the development footprint occurs to the north, as a 2nd order natural nonperennial watercourse with a wide bed. The watercourse is part of a wide network of tributaries to a wetland located 500 m east of the site, associated with the Hunter River floodplain. The wetland is generally defined by the 10 m elevation contour. The site and associated watercourse occur near to the confluence of these watercourses, which originate up to 2 km from the wetland.

The site is founded on Permian basalt geology associated with the Lochinvar formation: Undulating rises with elevation ranging from 20 – 80 m. Local relief is around 20 m, with slope gradients of 4 – 6%. Average slope lengths are 800 – 1,000 m. Drainage lines occur at 400 – 800 m intervals. The main soils are Non-calcic Brown Soils on the gentle slopes with Brown Podzolic Soils on the steeper areas. There are Yellow Solodic Soils on the mid to lower slopes of the steeper hills and in some drainage lines.

2.1.4 Native vegetation

NSW State Vegetation Type Map shows a range of communities over the site in the watercourse, however these are generally mapped over exotic vegetation, not based on floristic plots, often list inappropriate formations or are placeholder communities that are not intended for assessment. NSW SVTM 1750 modelling indicates the site was once at the interface between Dry Sclerophyll Forest and the Swamp Forests and Wetlands marginal to Riparian Rainforests of the Hunter River.

Site assessment confirmed there is no extant plant community on the site. There is extremely limited native vegetation present in the watercourse. Species which persist are generally common and associated with

riparian areas, and occur at low densities. Exotic and pasture improvement species dominate throughout the site. Native species opportunistically recorded regularly or notably in the broader riparian corridor included the following assemblage:

Table 2. Native Species associated with Riparian Corridor

Species Name	Common Name	Growth Form
Angophora floribunda	Rough-barked Apple	Tree
Casuarina glauca	Swamp Oak	Tree
Paspalum distichum	Water Couch	Grass
Ranunculus inundatus	River Buttercup	Forb

On the basis of the above, the low elevations associated with the riparian corridors on the site, and local remnant ecosystems, PCT 4042 has been selected as most appropriate for target community.

Table 3. Plant Community Type Details

PCT ID	4042
PCT name	Lower North Riverflat Eucalypt-Paperbark Forest
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Floodplain Wetlands

A species list for this community is **Appendix C**.

Rounded benchmarks for PCT 4042 are listed below, as targets for established revegetation. Listed benchmarks are indications of Foliage Projected Cover at maturity.

Foliage Projective Cover (FPC) is defined as the vertically projected percentage cover of photosynthetic foliage from green trees and shrubs taller than two metres.

Revegetation planting densities are prescribed in **Section 5.3**.

Table 4. PCT 4042 Vegetation Cover Benchmarks

Stratum	Foliage Projected Cover at Establishment (understorey) / Maturity (canopy)
Tree FPC (approx. 50% of canopy area coverage)	20%
Shrub FPC (effectively 100% of shrub area coverage)	20%
Groundcover FPC*	75%

*Ground Cover includes species listed in NSW BioNet VIS under Graminoid, Forb and Other

Other native vegetation communities in the locality include PCT 3446 (*Lower North Foothills Ironbark-Box-Gum Grassy Forest*), PCT 3433 (*Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*), and PCT 3328 (*Lower Hunter Red Gum-Paperbark Riverflat Forest*).

2.1.5 Connectivity & Corridors

The site has no meaningful extant native vegetation, however forms a riparian corridor that forms a currently unvegetated link between remnant native forest and woodland west of the landholding and the broad wetland (and associated woodland remnants) to the east.

It is acknowledged that current landscape connectivity is limited, and achieving the riparian corridor linkages will require coordinated strategic management over time, beyond the scope of this plan.

2.1.6 Weeds

The site is generally dominated by pasture, and exotic species associated with highly disturbed agricultural land. Weeds on site that are listed by DPI or NSW DCCEEW are tabled in **Section 3**. In general, the priority species for management on the site is *Juncus acutus* (Spiny Rush). Tussock and rhizomatous grasses are likely to require management under the plan, however these are likely to be manageable under a similar regime with most other common species.

2.2 Riparian Areas & Watercourses

2.2.1 Hydroline Mapping Matrix

Desktop assessment of mapped waterlines was subject to ground-truthing during site investigations. The modelled waterlines, and the outcomes of a Water Management Act Riparian Assessment are compared and justified in **Appendix B**.

The primary watercourse originates to the west, as a large dam (approx. 2 ha) with several 1st order tributaries. At the western extent of the development, the main watercourse is joined by a second watercourse where it spills from a moderate (approx. 0.5 ha) dam. Upstream of this second dam, the watercourse becomes poorly defined, however is tributed by overflow from a third dam of similar size. In the region of this third dam, water flows are generally overland. A significant proportion of the catchment of the primary watercourse is gained directly rather than tributary.

The primary watercourse is assessed as a 2nd order Strahler, natural nonperennial watercourse with a channel width ranging from 10 m (in the west, outside of the site) to 100 m (in the east, outside of the site).

2.3 Information sources

Existing information sources used to assist siter context for this VMP include:

- NSW State Vegetation Type Map (DCCEEW 2022)
- NSW BioNet (VIS)
- NSW Landscape - Modified (DEM-S) Elevation layer
- NSW DPI Hydroline Spatial Data

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FIGURE 2: ECOLOGICAL CONTEXT

Legend

- Construction Works Zone - refer Extent of Works Map (Appendix A)
- Cadastral Boundary
- Roads
- Watercourse

State Vegetation Type Map

- 3083 - Lower Hunter Tuckeroo Riparian Rainforest
- 3244 - Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
- 3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
- 3442 - Lower Hunter Lowland Ironbark-Paperbark Forest
- 3446 - Lower North Foothills Ironbark-Box-Gum Grassy Forest
- 3975 - Southern Lower Floodplain Freshwater Wetland
- 4023 - Coastal Valleys Swamp Oak Riparian Forest
- 4042 - Lower North Riverflat Eucalypt-Paperbark Forest

N W E S

0 140 280 420 560

Metres
1:7000

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025), © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water (2020) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-06-03 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250530_LP.qgz | This plan should not be relied upon for critical design dimensions.

3. Weeds

3.1 Weeds of National Significance

Weeds of National Significance (WoNS) are the highest priority species targeted for sustained nationally coordinated action under the Australian Weeds Strategy. This strategy provides for national management to eradicate WoNS species from parts of the country where Australia's productive capacity & natural ecosystems are affected. Each WoNS has a strategic plan that outlines strategies and an action required to control the weed and identifies those responsible for each action. Individual landowners and managers are ultimately responsible for managing WoNS species. State and territory governments are responsible for overall legislation and administration. WoNs which occur on site based on field assessment:

- *Senecio madagascariensis* (Fireweed)

3.2 NSW Biosecurity Act 2015

The NSW Biosecurity Act 2015 replaces the repealed Noxious Weeds Act as of July 2017. The new Act establishes a General Biosecurity Duty as well as several key management tools to allow for effective, risk-based management of biosecurity matters (Refer to Table 3). Applicable to all species determined either State level priority weeds (by NSW DPI) or Regional listed priority weeds (by Hunter Local Land Services), the General Biosecurity Duty requires that "any person [landholder] who deals with a biosecurity matter and has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised." Commensurate with this requirement, the Hunter Regional Strategic Weed Management Plan categorises specific management objectives to demonstrate compliance in relation to priority weeds occurring in the Hunter Local Land Services Region.

The Hunter Regional Strategic Weeds Management Plan contains demonstrated outcomes that fulfil the general biosecurity duty for priority weeds. Priority weeds which occur on site based on field assessment:

- *Juncus acutus* (Spiny Rush)

3.3 NSW Biodiversity Conservation Act 2016

The Biodiversity Assessment Method (BAM) is established under the NSW Biodiversity Conservation Act 2016 which assesses 'high threat weeds' or 'high threat exotic plant cover' as plant cover composed of vascular plants not native to Australia that if not controlled will invade and out compete native plant species plant cover composed.

High threat exotics should be suppressed where they occur and excluded and eradicated from vegetation management areas during establishment.

3.4 Site Weed Matrix

Table 5. Weeds present on site

Species	Common Name	Biosecurity Area	Biosecurity Act 2015	WoNs	HTE
Axonopus fissifolius	Carpet Grass	NA	NA	NA	Yes
Briza subaristata	NA	NA	NA	NA	Yes
Cenchrus clandestinus	Kikuyu	NA	NA	NA	Yes
Juncus acutus	Spiny Rush	All of NSW; Hunter	General Biosecurity Duty; Regional Recommended Measure*	NA	Yes
Paspalum dilatatum	NA	NA	NA	NA	Yes
Romulea rosea var. australis	Onion Grass	NA	NA	NA	Yes
Senecio madagascariensis	**Fireweed**	**All of NSW**	**General Biosecurity Duty & Prohibition on Dealings**	**Yes**	Yes

*Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

Table 6. Hunter Regional Strategic Weed Management Plan 2023-2027 – Regional priority weed category – Asset Protection

***Juncus acutus* (Spiny Rush)**		
Land area where requirements apply	Outcomes to demonstrate compliance with general biosecurity duty	Strategic response in the Hunter Region
Entire Hunter Local Land Services region	▪ Land managers should mitigate the risk of the plant being introduced to their land. ▪ Land managers should mitigate spread of the plant from their land. ▪ A person should not buy, sell, move, carry or release the plant into the environment. ▪ Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.	▪ The plant is managed by all landholders to reduce its extent and spread. ▪ Where the plant poses a risk to assets of high economic, environmental and/or social value (section 4.1) it is managed by all landholders to mitigate the risk. ▪ Improved collaborative management across all landholder boundaries. ▪ Promoting and using best-practice quarantine and weed hygiene procedures. ▪ Development of local plans and guidelines that assist all landholders in demonstrating compliance with their general biosecurity duty. ▪ Particular focus on protecting high value environmental assets such as the Ramsar listed Hunter Estuary and Myall Lakes Wetlands

4. Vegetation Management Areas

Unless otherwise stated, all areas subject to management under this plan are limited to the southern side of the primary watercourse (see **Figure 3**). Some actions will be implemented outside of the development interface to facilitate the overall goals of the plan, as described. For areas outside of the VMP area, refer to approved Landscape Plans.

The VMP area exceeds an area identified as Drainage Reserve in the proposal. This is intended to capture effective weed control within the channel, without constraining future works to the north of the watercourse. High intensity weed control works are only proposed in mapped areas under the VMP.

4.1 Channel

The channel or bed of the primary watercourse varies in width adjacent to the development from 10 to 30 m and is defined by a broad flat area subject to regular inundation and periodic significant water flow. The substrate is likely to be perennially wet outside of sustained dry periods, and support macrophyte vegetation in addition to flood-tolerant canopy species.

The channel occurs as an irregular mosaic of a low-flow erosional channel and minor depositional point bars on the inner meandering bends. These point bars are likely to be inundated briefly and regularly in high rainfall events, with high flows only occurring in low percentage events. The low-flow channel regularly holds water and would be subject to water flow in any rainfall event.

Current Condition

The channel is nearly devoid of native vegetation, with very occasional canopy trees (*Angophora floribunda* and *Casuarina glauca*) on the margins and some native species in the ground layer. It is dominated by *Juncus acutus* (Spiny Rush) and pasture grasses in the low-flow channel and depositional bars, respectively.

Priorities

- No loss of existing canopy trees;
- Effectively eradicate *Juncus acutus* from the VMA;
- Establish a self-sustaining riparian vegetation community;
- Establish a physically stable, meandering watercourse that can tolerate associated flows and resist erosion.

Target Condition

Macrophyte cover should be extremely dense, sufficient to exclude aggressive riparian weeds and maintain a stable watercourse. Canopy should generally be restricted to point bars to avoid impeding water flows or creating erosional obstacles. The channel should ultimately take the form of a dense sedge-land (replacing the exotic *Juncus acutus* with a diversity of native macrophytes, dominated by sedges and rushes) with occasional emergent canopy (comprised of species tolerant of regular inundation).

Plate 1. Channel target condition example

4.2 Inner VRZ

For a 2nd order Strahler watercourse, the inner VRZ has been adopted per guidelines as being 0-10 m from channel. This area is expected to be periodically inundated by water, and may also be subject to active flows.

Current Condition

The inner VRZ is nearly devoid of native vegetation, with very occasional canopy trees (*Angophora floribunda* and *Casuarina glauca*) on the margins. It is dominated by pasture grasses. The priority weed *Juncus acutus* is generally confined to the channel, however does occur on the margins of the Inner VRZ. The Inner VRZ is therefore effectively cleared, for the most part.

Priorities

- No loss of existing canopy trees;
- Establish a self-sustaining riparian vegetation community;
- Establish a physically stable, meandering watercourse that can tolerate associated flows and resist erosion;
- Establish a functional riparian corridor contributing to a wider connectivity network.

Target Condition

Benchmark canopy, shrub and groundcover densities (see **Section 2.1.4**) using a mosaic of canopy clusters and dense shrub and groundcover revegetation. Species selection is to grade with tolerance to modelled inundation. Canopy gaps should not exceed 50 m between clusters. The ultimate form of the Inner VRZ will be a forested wetland in alignment with **Section 2.1.4**.

4.3 Outer VRZ

For a 2nd order Strahler watercourse, the outer VRZ has been adopted per guidelines as being 10-20 m from channel. This area is expected to be periodically inundated by water, and may also be subject to active flows.

The Outer VRZ will require some ground disturbance to establish a stable landform for stormwater infrastructure, however no encroachment of final form is proposed within the VRZ as assessed. Therefore, no application of the Averaging Rule as per the NRAR Guidelines is required or proposed.

Current Condition

The Outer VRZ is dominated by pasture grasses, and effectively cleared.

Priorities

- Establish a self-sustaining riparian vegetation community;
- Establish an effective interface between the riparian corridor and the development;
- Establish a functional riparian corridor contributing to a wider connectivity network.

Target Condition

Benchmark canopy, shrub and groundcover densities (see **Section 2.1.4**) using a mosaic of canopy clusters and dense shrub and groundcover revegetation. Canopy gaps should not exceed 50 m between clusters. The ultimate form of the Outer VRZ will be a forested wetland in alignment with **Section 2.1.4**.

Plate 2. VRZ target condition example

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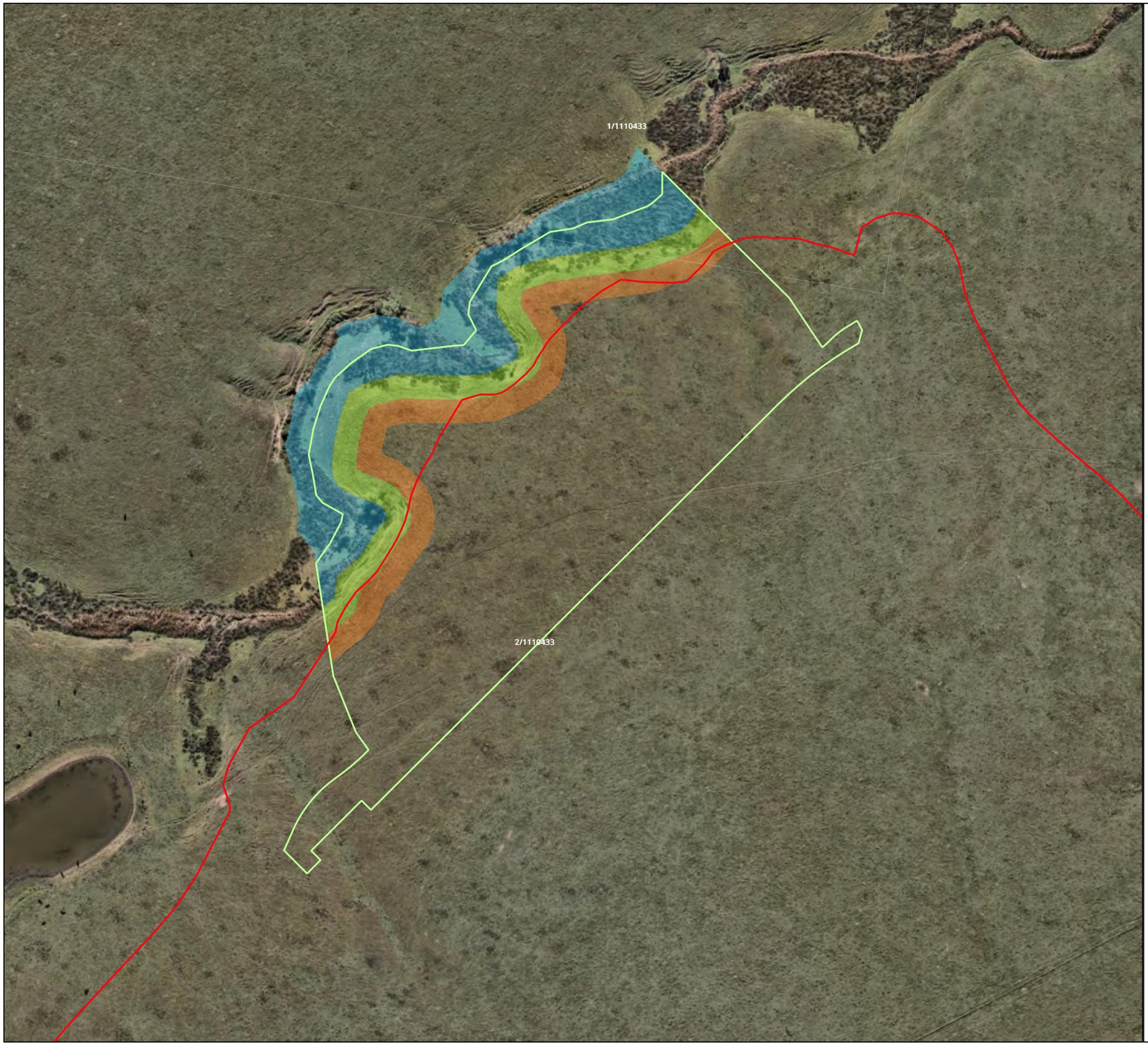
FIGURE 3:
VEGETATION MANAGEMENT AREAS



Legend

- Construction Works Zone - refer Extent of Works Map (Appendix A)
- Cadastral Boundary
- Proposed Drainage Reserve

Vegetation Management Areas

- Channel
- Inner VRZ
- Outer VRZ

N
W E
S

0 30 60 90 120

Metres
1:1500

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-06-03 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250530_LP.qgz | This plan should not be relied upon for critical design dimensions.

5. Vegetation Management Actions

Table 7. Summary table – Statement of management commitments

Objective	Management Action & Timing	Notes
Weed Control	▪ Primary weed control of priority weeds and disposal of refuse to be complete within six months of commencement of this plan ▪ Secondary weed control of priority weeds over at least one growing season (at least 4 months between October and April). Must be complete prior to revegetation of understorey (canopy may be installed prior if long-stem method is used) ▪ Maintenance weed control to suppress late recruitment from seedbank or seed donation from upstream to be undertaken ongoing, and must be actively undertaken post-revegetation.	▪ Burn outside of hazard period. ▪ Apply herbicide when plants are actively growing (spring).
Revegetation	▪ Revegetation of all strata to required densities to be established within three years of commencement of this plan.	▪ Plant at conclusion of hot or dry weather (early autumn) ▪ Long-stem Canopy planting.
Establishment	▪ Planting density targets to be met and demonstrated ▪ Native vegetation structure to be demonstrably approaching a reasonable measure of the PCT benchmark (see **Section 2.1.4**) ▪ To be achieved and demonstrated to the satisfaction of Council by the conclusion of the prescribed plan lifetime (5 years).	▪ 100% of benchmark is not a realistic goal for the VMP outcomes, however planting densities and strata are all aimed at benchmark vegetation integrity
Monitoring	▪ Regular reports to be issued by vegetation contractor ▪ Monitoring of compliance with this plan to be conducted annually and report issued. ▪ Photo points to be established with star pickets no later than concurrently with commencement of revegetation of the understorey	
Risk management	▪ Erosion and sediment control plan compliant with NSW standards approved by council and implemented prior to primary treatment of priority weeds.	▪ Potential water quality disruptions to downstream areas must be minimised

5.1 Risk Management

5.1.1 Access

Delineation of VMP areas will be by flagging tape and 'No-go' construction signage demarcating the replanting area during construction (once replanting commences). Educational signage informing of the restoration efforts will be installed when construction is complete.

5.1.2 Erosion & Sediment Management

Earthworks and primary weed removal create an inherent risk of erosion and sedimentation in watercourses. All works should be guided by an approved Erosion & Sediment Control Plan, compliant with *Managing Urban Stormwater: Soils and Construction* (the NSW 'Blue Book', Landcom 2004 https://www.environment.nsw.gov.au/publications/managing-urban-stormwater-soils-and-construction-volume-1)

5.1.3 Vehicle and Machinery Clean Down

To reduce the risk of introducing weeds to the site, or transporting them from the site to unaffected areas, vehicles and machinery should be washed down prior to float to or from the site. DPI guidelines are **Appendix F**.

5.2 Weed Control

5.2.1 Weed Control Stages

Primary Weed Control

The strategic initial removal of parts of a weed infestation, generally targeting the most heavily affected areas. Primary weed control extent should not exceed an area that can be effectively maintained following secondary weed control. Clearing of large infestations followed by inaction will result in the reinfestation of the area, and wasted resources. Conversely, failing to control weeds that threaten a strategic area (e.g. upstream infestations that will continue to donate seed) will create a greater management burden for strategic areas. Primary weed control is generally undertaken in a short time, either in a single effort or over a single season.

Secondary Weed Control

Following initial strategic weed removal, follow-up is required to control recovery from seed bank or surviving adult material such as crowns or rhizomes. This serves to deplete the seed bank, ensure total destruction of adult weed material and prepare the site for rehabilitation. It is not expected that secondary control will destroy all weed seeds or weed resilience in the strategic area but it must be sufficient to reduce the weed incidence to a manageable level in parallel with revegetation. Secondary weed control may require multiple efforts over a season, monitoring, and may require a second season.

Maintenance Weed Control

Ongoing control of emergent weeds from the seed bank. Generally conducted in parallel with rehabilitation such as replanting, brush matting or direct seeding. Best practice bush regeneration methods as per **Appendix D** should be used for maintenance weeding, and herbicide use kept to a minimum to reduce off-target damage to revegetation and desirable or benign vegetation.

5.2.2 Herbicides

Chemical control should be considered as part of an integrated weed management regime, and not relied upon above other control methods. Application of herbicides in riparian areas must be undertaken in accordance with approved directions of use for suitable herbicides, and the suite of chemicals available for use in these areas without contradicting the label is generally very limited. Caution should be taken when considering use of any herbicide within the low-flow erosional channel (see **Section 4.1**). Herbicides registered for use in pasture should be suitable for application in the Channel *outside* of the low-flow area (i.e. on depositional point bars only) if no rain is predicted (timing per the herbicide label) and groundwater saturation is low.

Particularly in the case of the priority weed on the site (*Juncus acutus*), the use of adjuvants and other agents to increase the effectiveness of herbicide (and therefore minimise cumulative herbicide use) should be considered. Penetrants such as organosilicones and ammonium sulphate have been shown to be effective in *J. acutus*.

5.2.3 Burning

Burning can be a useful component of integrated weed management, and should be implemented early in the plan before significant development works or infrastructure have been commenced, to avoid potential damage. Burning is useful as a method of disposal of biomass that may contain propagative material, and for in-situ removal of biomass, destruction of seed and stimulation of weed seed bank. All appropriate notifications and permits should be in place prior to burning.

A sound plan for the implementation of burning in combination with other treatment should be established in advance. For example, a spray/burn/spray protocol or spray/burn/scalp protocol for the control of established infestations and reduction of viable seed. Burning or slashing to stimulate regrowth prior to herbicide application can also increase herbicide effectiveness.

5.2.4 Priority Weeds – *Juncus acutus*

Juncus acutus – DPI Weedwise

- Mechanical removal
    - Dense infestations can be removed using cutters, graders or ploughs. Cultivation can also be effective but plants need to be collected and disposed of. Burning is an effective disposal method. Resow pastures or revegetate treated areas. Use salt tolerant species in saline areas.
- Herbicide
    - Wiping – Wiping can be used on spiny rush growing in crops or pastures. The wiper needs to be at least 10 cm higher than the crop or pasture and the spiny rush must be at least 15 cm higher than the crop or pasture. If plants have many dead leaves or stems it is best to slash first and then wipe when the spiny rush regrows to a suitable height.

Juncus acutus – Other Publications

- *Government of South Australia – Declared Plant Policy* (Juncus acutus):
    - Due to the lack of accessibility for dense infestations, mechanical control is often the most effective method of control. Machinery is used to cut spiny rush just below the ground surface. After physical removal, plants are heaped and burnt, and then the soil is cultivated to encourage the growth of seedlings. Follow-up cultivations over the following two summers are necessary to destroy seedlings, although some seed will remain to germinate in following years.
    - Burning or slashing and then spraying or wiping new growth with herbicide can increase herbicide uptake, making the treatment more effective.
    - Plants do not flower until at least two years old. The rhizomes and associated fibrous root system enables regeneration after cutting or clearance. Seed may persist for many years in the soil.

5.2.5 Other Weeds

Other weeds on the site should be managed according to best-practice techniques. Techniques will vary by the stage of management, with early works generally requiring landscape-scale weed treatment and earthworks. Late stages of the plan should be managed using best-practice bush-regeneration techniques.

Weed control methods post primary and secondary priority weed control should be in alignment with **Appendix D**.

5.2.6 Disposal

Physically removed weed material, especially that which might contain viable seed, must be disposed of appropriately:

- Manageable volumes may be disposed of at a waste management facility.
- Larger volumes may require on-site disposal.
- Locations must be selected to reduce the risk of introducing seed to management areas.
- Some species (*Juncus acutus*) should be allowed to dry and the refuse burned to destroy seed.

5.3 Revegetation

5.3.1 Canopy

Canopy plantings are recommended to be installed using the Long-Stem planting technique. While the time to initial establishment of stock is increased, the increased survival, reduced maintenance and deep root structure are of great benefit. This is particularly true in a riparian setting where water flow can result in new plants being washed out of the ground. Long-Stem planting is detailed in **Appendix E**.

Canopy plantings should be installed in clumps, at a density within the clump of not more than one (1) tree per 16m^2 (this should not be averaged – each tree should have at least 4 x 4 m to establish roots). This is to ensure sufficient spacing for the development of wide and deep root structures, and to prevent stunting of canopy resulting from crowding.

To achieve benchmark FPC (see **Section 2.1.4**) for canopy, assuming six (6) metre canopy spread at maturity, an average across the site of one (1) tree per 70 m^2 will need to be established to maturity. In order to take account of losses and reduce replanting and maintenance, an ideal initial target would be one (1) tree per 50 m^2 (averaged across the site).

It is recommended that canopy planting occur prior to understorey and channel revegetation, as the long-stem method does not integrate efficiently. This could be done following primary weed control, as long as clumps are located away from areas where they may be lost to off-target herbicide damage.

5.3.2 Understorey

'Understorey' in this plan refers to all vegetation growing below the canopy including shrubs and groundcovers, but generally excluding macrophytes (these are not proposed for installation under a canopy).

Planting should be preferably undertaken in cool weather (ideally early autumn, secondarily early spring, and winter if other times are not practical) to minimise heat and water stress, and allow plants to establish good root systems prior to cold winter weather. This stratum should not be installed until weed control reaches a maintenance phase as large losses can be expected from off-target herbicide damage.

Terrestrial groundcovers, shrubs and macrophytes (see **5.3.3** below) can be planted in a single allocation of resources. Shrubs should be installed at a density of one (1) plant per 10 m^2 (averaged across the site). Groundcovers and macrophytes should be installed at a density of four (4) plants per square metre. This is to ensure that plants can establish at a sufficient density to exclude weed infestation, or at a minimum, slow it to an easily managed degree. A higher initial cost will be offset as infill planting and off-target losses can be minimised or avoided. Native *Juncus* spp. should be avoided initially to reduce the risk of overlooking emergence of *Juncus acutus* from soil seed bank.

5.3.3 Macrophytes

Planting can coincide with understorey and shrub planting. The only specific consideration will be the risk of substrate erosion, or water flows washing out plants. If higher than average rainfall is predicted for the season, installation of macrophytes may be delayed or advanced, and may be undertaken in warmer weather as the substrate is likely to remain hydrated.

A diversity of macrophyte species should be selected to give the greatest chance of native species colonising the channel in its entirety with minimal infill planting. Ensure particularly that a diversity is established at the upper reaches of the planting area, to donate seed downstream once mature.

5.3.4 VMA Planting Density Matrix

Target foliage cover and planting densities for each VMA described in **Section 4** are tabled below. Canopy is not required in the Channel as the substrate may not have the stability to support canopy over the life of the VMP, or may support a much reduced canopy spread if individuals are constrained. Shrub density targets in the VRZ are reduced from benchmarks to align with expectations for a development interface and suitable visibility.

Table 8. VMA Target FPC and Install Densities

VMA	Channel	Inner VRZ	Outer VRZ
Stratum/Growth Form	Foliage Projected Cover (FPC) Target / Installation Density		
Canopy	None	20% / 1 per 50m^2	20% / 1 per 50m^2
Shrub	None	10% / 1 per 10m^2	10% / 1 per 10m^2
Groundcover	0-10%**	85% / 4 per m^2	85% / 4 per m^2
Macrophyte	85% / 4 per m^2	0-10%**	None

*aggregate FPC across growth forms
**non-binding target (on interface between Channel and Inner VRZ, to increase cross-establishment)

5.4 Irrigation and Mulching

5.4.1 Irrigation

Given the substantial volume of water available on the site from the established dams, water for irrigation should be sourced therefrom if practical. The riparian area has a large catchment, heavy soils that hold water, and a large proportion of the catchment is directly gained. Therefore irrigation needs are likely to be minimal given careful timing of revegetation (see **Section 5.3**; Long-stem planting typically is not dependent on irrigation).

Irrigation regimes should encourage deep rooting, and rapid acclimation of tubestock. As such, initial irrigation should be planned (at a minimum) for the first day, the first week (end of), and the first month (end of). These should be targeted waterings utilising a high volume per hectare to ensure soil penetration. Frequent light irrigation is undesirable, as it will encourage shallow rooting of canopy and woody shrubs, and fail to harden off tubestock over the establishment period rendering them vulnerable to hot or dry weather.

Additional irrigation may be required if conditions at the time of planting are warm or dry. As a guide, an increased regime may be first day, fourth day, eighth day, 16th day and 24th day. If conditions persist, irrigation fortnightly should be sustained until typical conditions return. Irrigation ultimately to be determined by vegetation contractor to achieve survival outcomes.

5.4.2 Mulching

Mulching is unlikely to be feasible give the substantial water flows carried by the subject watercourse, and the lack of vegetation proposed for removal. To avoid compromising public infrastructure, no mulch application is proposed under this plan.

5.5 Maintenance

Maintenance of native vegetation rehabilitation with a natural landform target is best undertaken by qualified and experienced bush regeneration contractors. Bush regeneration is generally carried out with less equipment and herbicide, and relies on care and knowledge of native and exotic species at different growth stages. A willingness to “get knees dirty” is preferable to a reliance on powered gear or sprays.

5.5.1 Maintenance Weed Control

As per **Section 5.2.1**, however of particular note is that herbicide application should be absolutely minimised once groundcover and shrub revegetation is installed. Manual removal of weed recruitment before a significant root structure is established is ideal to reduce ground disturbance. Herbicide wands may be used with care to target *Juncus acutus* seedlings while reducing off-target damage.

5.5.2 Revegetation Maintenance

If herbicide application is to be carried out among revegetation (this should be minimised), then it must be undertaken judiciously. Resource wastage from off-target damage is far too common on landscaped sites and can set back the establishment of the community years, and increase costs significantly (see below).

Revegetation maintenance may include infill planting as required to maintain density. Note carefully if similar species or growth forms have all failed in one area. This area should be replanted with a different assemblage that may be more suited, if the losses cannot be put down to other particular causes.

Plate 3. (left) large bare areas resulting from careless herbicide use; (right) dense infestation of exotic grass in bare areas devoid of native plantings

6. Monitoring & Reporting

A key component of the VMP implementation is monitoring and compliance of works carried out by contractors on Site and preparation of compliance reports.

Table 9 shows trending targets for vegetation works over the life of the VMP, to be assessed against Councils minimum standards at completion:

- Woody weed/priority weed cover of <1%
- Other weeds at <5%
- Revegetation survival rate of >80%

Table 9. Trending Targets for Action Monitoring

End of Year Target	Year 1	Year 2	Year 3	Year 4	Year 5
Primary weed control	100%	Complete	Complete	Complete	Complete
Secondary Weed control	In progress	100%	Maintenance	Maintenance	Maintenance
Canopy planting	In progress	100%	Maintenance	Maintenance	Maintenance
Understorey planting	Pending	In progress	100%, in maintenance	Maintenance	Maintenance
Channel planting	Pending	In progress	100%, in maintenance	Maintenance	Maintenance

NB revegetation works will not commence until earthworks and construction zones associated with establishing the basins have been completed. No flagging or exclusion will be applied to VMP areas prior to completion of construction of basin batters.

6.1 Monitoring

Key vegetation metrics for ongoing monitoring of VMP outcomes:

- Count of tree stems >5cm per size class (refer baseline number installed)
- Total aggregate area of canopy species clumps (smallest convex polygon)
- DBH of all trees (<5cm, 5-10, 10-19, 20+)
- Foliage cover of shrubs
- Foliage cover of groundcover & macrophytes
- Weed frequency (total of management areas)
- Weed hotspots
- Erosion or other unanticipated issues
- Photo monitoring points – established at time of understorey revegetation. Photo points should be marked with steel star-pickets oriented in the direction of photos to ensure consistent replication of monitoring. Photos should be taken at a 1:1 zoom ratio (assuming a mobile phone is used) with the device placed at the top of the star picket.

A monitoring report is to be submitted annually to Council. At the submission of each annual monitoring report, Council may require a site walkover with relevant stakeholders.

6.2 Reporting

To assist in tracking monitoring and compliance, vegetation contractors must submit regular update reports to the proponent and person / firm undertaking compliance on activities carried out within the VMP. These updates should include (but not be limited to):

- Status of rehabilitation – success of natural regeneration and comments on revegetation as required including plant survival;
- Establish photo monitoring locations and provide updated photos with each report,
- Weeds– areas and extent of treatment required including methods employed;
- Issues relating to unsolicited access or damage, dumping of rubbish etc; and
- Detail any corrective actions that are required and/or have been employed.

To ensure ongoing maintenance of riparian values under the VMP a compliance report on the progress of the VMP implementation will be prepared

- one (1) year following commencement of works and then
- monitoring reports produced annually thereafter for five (5) years
- at completion of works, prior to assessment for dedication.

Reports are to be submitted to Council within one (1) month of each compliance inspection such that any overarching approval obligations can be met.

7. References

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NSW Department of Planning & Environment (2022) *Controlled activities – Guidelines for vegetation management plans on waterfront land* Factsheet

Robinson, L. (1997). Field Guide to the Native Plants of Sydney. 3rd Edition. Kangaroo Press, Sydney.

Royal Botanic Gardens and Domain Trust, 2024 – *PlantNET (The Plant Information Network System)*, Sydney, https://plantnet.rbgsyd.nsw.gov.au (accessed ongoing).

SA Government (2021) *Declared Plant Policy Spiny Rush (*Juncus acutus*)*

Appendix A. Appendix A Plan of Proposal

ANAMBAH URBAN RELEASE AREA

ANAMBAH ROAD

DEVELOPMENT APPLICATION

CLIENT: ROCHE GROUP

CONSENT AUTHORITY: MAITLAND CITY COUNCIL

DATE: MAY 2025

DRAWING SCHEDULE

DWG No.	SHEET TITLE	REV
LD1070	COVER SHEET	2
LD1071	DA1 - OVERALL PLAN	2
LD1072	DA1 - OVERALL ZONING PLAN	2
LD1073	DA1 - LOT LAYOUT PLAN	2
LD1074	DA1 - STAGING PLAN	2
LD1075	DA1 - LOT SIZE PLAN	2

REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

North

Scale

Designed: DB

Scale: -

Cad Reference: 22311LD LD1070-1073 r2

Project Approval: IAN HILL (B.E) Consulting Civil Engineer

Client: ROCHE GROUP

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PHONE: (02) 4964 1811

ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH

COVER SHEET

Project No: 22311LD

Drawing No: LD1070

Revision: 2

A1 SHEET

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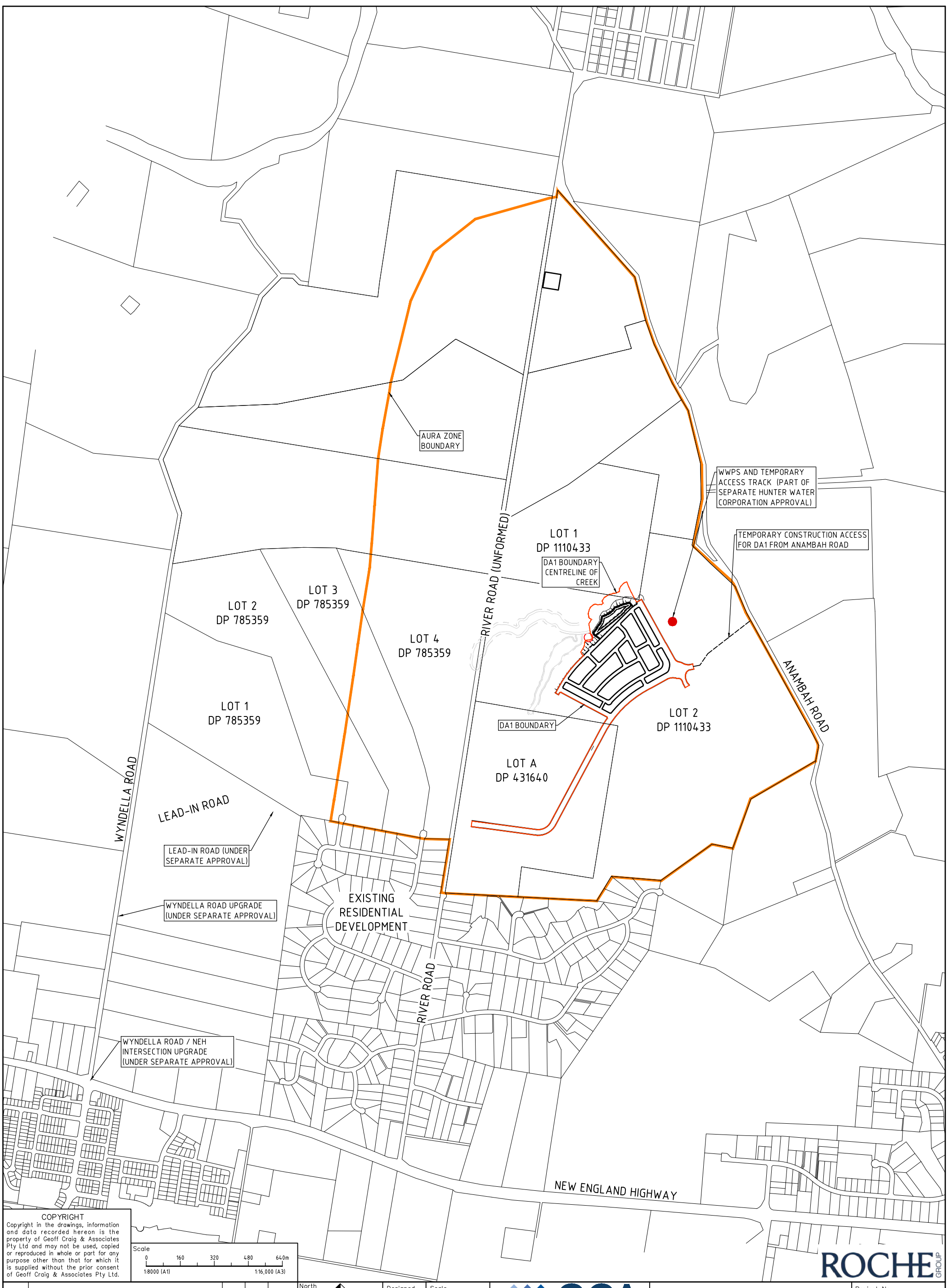

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1	ORIGINAL ISSUE	DB	IH	26.05.25

North

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Cad Reference: 22311LD LD1070-1073 r2
Project Approval: IAN HILL (B.E) Consulting Civil Engineer

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - OVERALL PLAN

Project No: 22311LD
Drawing No: LD1071
Revision: 2
A1 SHEET

ROCHE GROUP

RESIDENTIAL LOTS

LARGE RESIDENTIAL LOTS (>3000m^2)

LARGE LOTS (1-3ha)

PUBLIC PARK & RECREATION

ENVIRONMENTAL

TOWN CENTER

AURA ZONE BOUNDARY

WWPS AND TEMPORARY ACCESS TRACK (PART OF SEPARATE HUNTER WATER CORPORATION APPROVAL)

TEMPORARY CONSTRUCTION ACCESS FOR DA1 FROM ANAMBAH ROAD

LOT 1 DP 1110433

DA1 BOUNDARY CENTRELINE OF CREEK

LOT 2 DP 785359

LOT 3 DP 785359

LOT 4 DP 785359

RIVER ROAD (UNFORMED)

LOT 1 DP 785359

DA1 BOUNDARY

LOT 2 DP 1110433

ANAMBAH ROAD

LOT A DP 431640

WYNDELLA ROAD

LEAD-IN ROAD

LEAD-IN ROAD (UNDER SEPARATE APPROVAL)

EXISTING RESIDENTIAL DEVELOPMENT

WYNDELLA ROAD UPGRADE (UNDER SEPARATE APPROVAL)

RIVER ROAD

R1

WYNDELLA ROAD / NEH INTERSECTION UPGRADE (UNDER SEPARATE APPROVAL)

SP2

B5

NEW ENGLAND HIGHWAY

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North

REVISION	Description	Drawn	App'd	Date
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1	ORIGINAL ISSUE	DB	IH	26.05.25

Designed: DB
Scale: 1:8000
Cad Reference: 22311LD LD1070-1073 r2
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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - OVERALL ZONING PLAN

Project No: 22311LD
Drawing No: LD1072
Revision: 2
A1 SHEET

ROCHE GROUP

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LEGEND

	LOT NUMBER
SUPER LOTS	LOTS = 2
STANDARD RESIDENTIAL	LOTS = 173
TOTAL	LOTS = 175

FUTURE 3.0m WIDE CYCLE ONLY PATH
SECOND ORDER STREAM
NO PARKING ADJACENT TO DRAINAGE RESERVE
OUTER MJD VRZ 10m
INNER MJD VRZ 10m
3.0m WIDE CYCLE ONLY PATH
EXISTING DAM
FIRST ORDER STREAM
DRAINAGE RESERVE 2.847ha
SECOND ORDER STREAM
100yr FLOOD LEVEL (R.L 19.9m)
DRAINAGE RESERVE BOUNDARY
BASIN 1
FUTURE 3.0m WIDE CYCLE ONLY PATH
FUTURE 2.5m WIDE SHARED PATHWAY
STR5
PROPOSED PARKING ADJACENT TO LOT FRONTAGE
2.5m WIDE SHARED PATHWAY
PROPOSED PARKING AT 90° TO KERB (2 DISABLED AND 8 STANDARD SPACES)
12m LONG x 4.5m WIDE CONCRETE GPT MAINTENANCE ACCESS PAD
2.5m WIDE SHARED PATHWAY
BLISTERED KERB LOCAL AREA TRAFFIC MANAGEMENT FEATURE
STENCIL CONCRETE ENTRY LOCAL AREA TRAFFIC MANAGEMENT FEATURE (TYP)
GREEN STREET
DA1 BOUNDARY
TR1
PEDESTRIAN REFUGE IN ACCORDANCE WITH TRANSPORT ROADS & TRAFFIC AUTHORITY TDT 2011/01a FIG 2
'FLAG SIGN' TYPE BUS STOP IN ACCORDANCE WITH MCC STD DWG SD023
200m OFFSET FROM RECREATIONAL AREA
TR2
3.0m WIDE OFFROAD CYCLEWAY
PEDESTRIAN REFUGE IN ACCORDANCE WITH TRANSPORT ROADS & TRAFFIC AUTHORITY TDT 2011/01a FIG 2
'FLAG SIGN' TYPE BUS STOP IN ACCORDANCE WITH MCC STD DWG SD023
RAISED PEDESTRIAN CROSSING (TYP)
TR5
STR2/4
FUTURE PARK (MIN AREA 1ha)

REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

North

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Designed DB
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Cad Reference 22311LD LD1070-1073 r2
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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - LOT LAYOUT PLAN

Project No 22311LD
Drawing No LD1073
Revision 2
A1 SHEET

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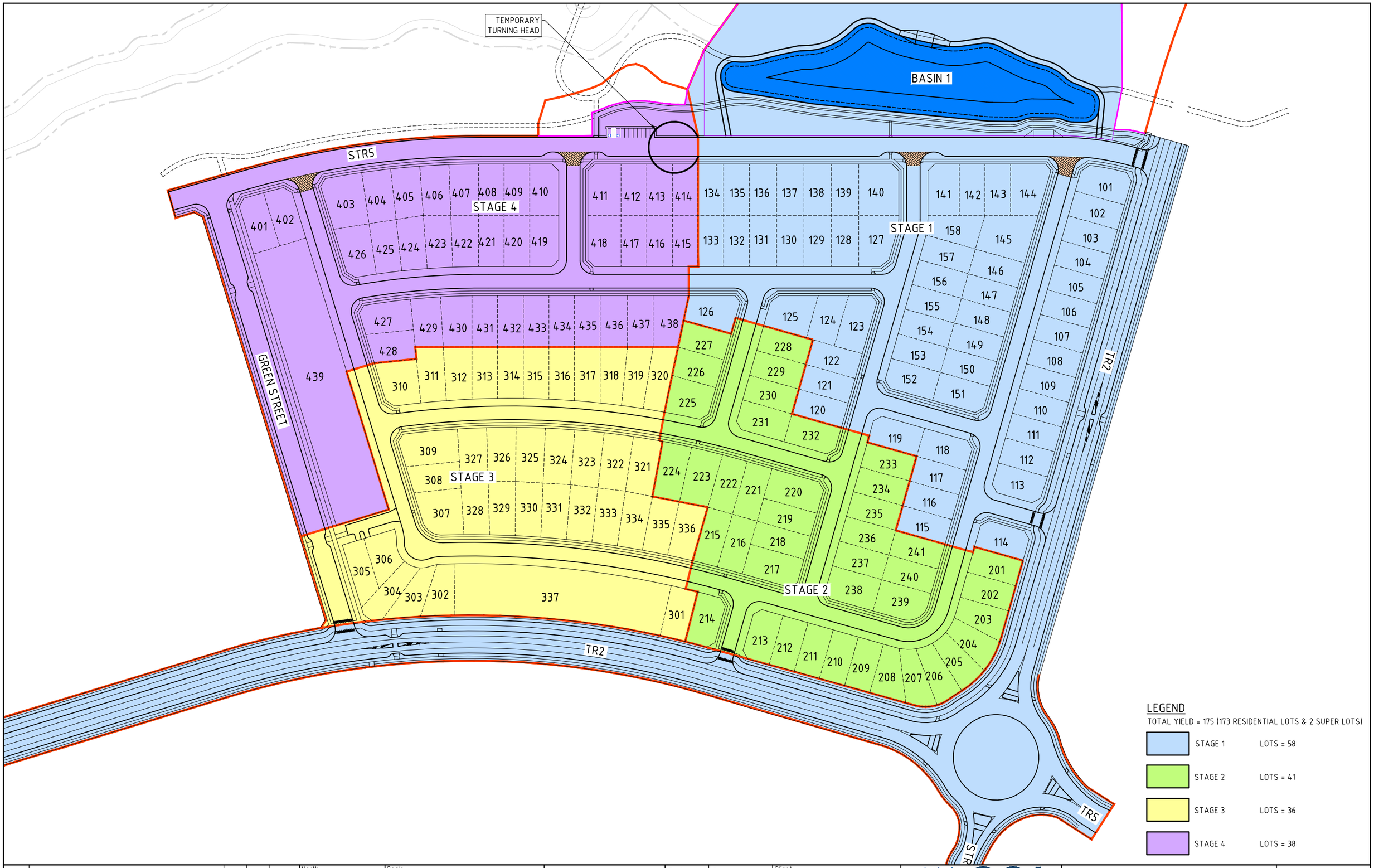

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Project Approval
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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - STAGING PLAN

Project No 22311LD
Drawing No LD1074
Revision 2
A1 SHEET

PLOT DATE: 30/05/2025 2:35:57 PM
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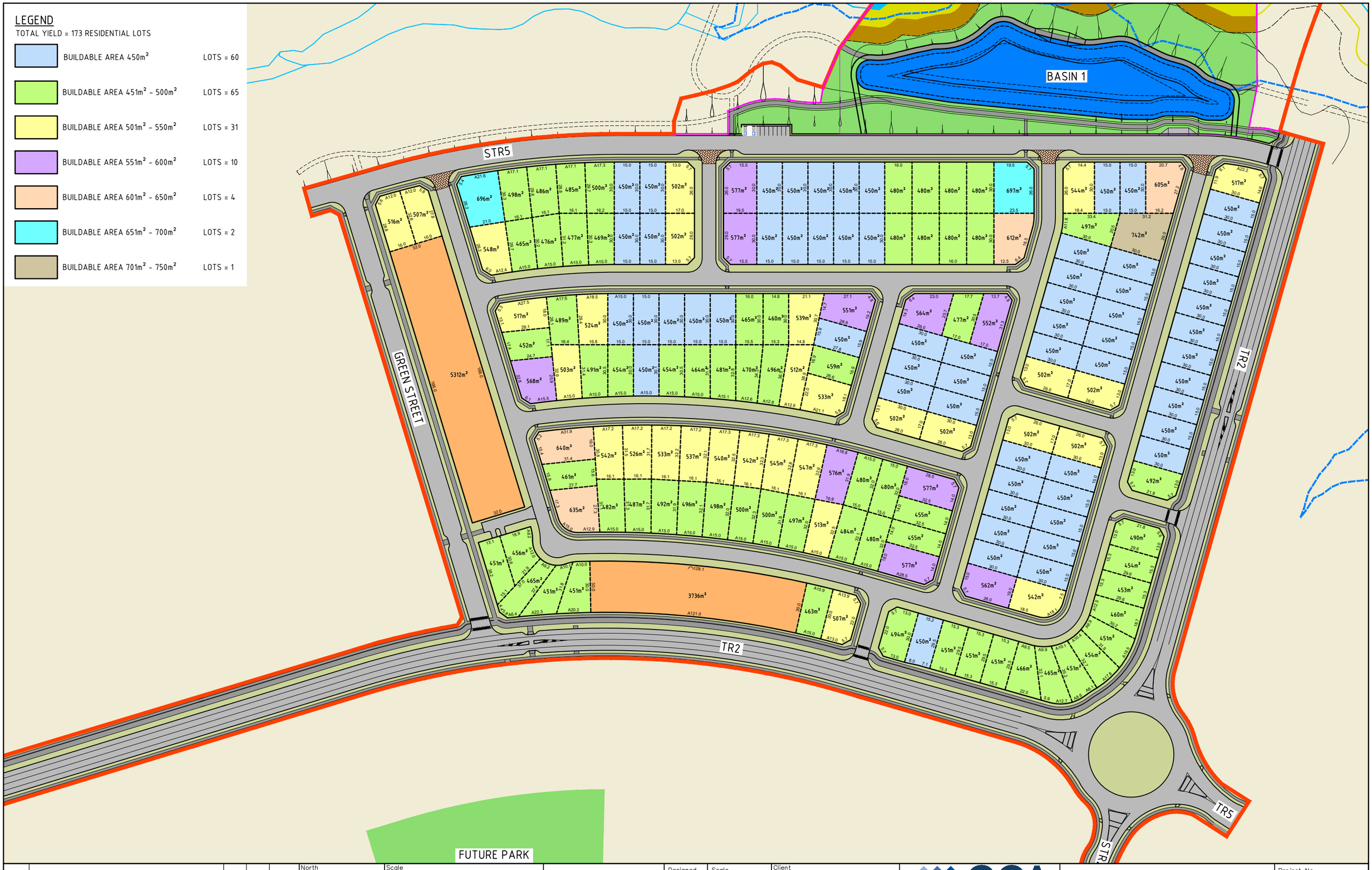
LEGEND

TOTAL YIELD = 173 RESIDENTIAL LOTS

BUILDABLE AREA 450m²	LOTS = 60
BUILDABLE AREA 451m² - 500m²	LOTS = 65
BUILDABLE AREA 501m² - 550m²	LOTS = 31
BUILDABLE AREA 551m² - 600m²	LOTS = 10
BUILDABLE AREA 601m² - 650m²	LOTS = 4
BUILDABLE AREA 651m² - 700m²	LOTS = 2
BUILDABLE AREA 701m² - 750m²	LOTS = 1



REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

North

Scale
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1:1000 (A1) 1:2000 (A3)

Designed DB | Scale 1:1000

Cad Reference 22311LD LD1075 r2

Project Approval
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Consulting Civil Engineer

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PHONE: (02) 4964 1811

ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - LOT SIZE PLAN

Project No 22311LD

Drawing No LD1075 | Revision 2

A1 SHEET

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Appendix B. WMA Act Riparian Assessment

Riparian Assessment Report

381 Anambah Road

Prepared for

DB20 Pty Ltd

June 2025

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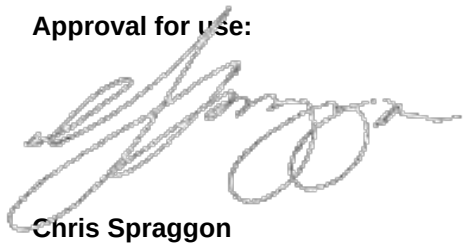
DOCUMENT CONTROL

Project Particulars			
Project Name	**381 Anambah Road**		
Job Number	**23067**		
Client	**DB20 Pty Ltd**		
Status	**RAR**		
Version	Date	Author	Details
1	3/06/2025	CS/MD	For submission

Approval for use:



Chris Spraggon

Senior Ecologist
Accredited BAM Assessor #BAAS25009
AABR Accredited Practitioner #1320

3 June 2025

CONTENTS

LIST OF TABLES

LIST OF FIGURES

SHORTENED FORMS

AABR	Australian Association of Bush Regenerators
APZ	Asset Protection Zone
BC Act	Biodiversity Conservation Act 2016 (NSW)
CEEC	Critically Endangered Ecological Community
Council	Maitland City Council
DBH	Diameter at Breast Height over bark (tree)
DCCEEW	Australian Government Department of Climate Change, Environment, Energy & Water
NSW DCCEEW	NSW Government Department of Climate Change, Environment, Energy & Water
DPHI	NSW Department of Planning, Housing & Infrastructure
EC	Ecological Community listed under the EPBC Act
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EEC	Endangered Ecological Community
HTW	High Threat Weed
LLS Act	Local Land Services Act 2013 (NSW)
MCC	Maitland City Council
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
PCT	Plant Community Type
Provenance	Refers to the location of the natural population of origin of propagative material for revegetation, including seed or cuttings, translocation and grafting stock or scion
Rehabilitation	Any attempt to restore elements of structure or function to an ecological system
▪ Reconstruction	Establishment of native vegetation in a location with a high degree of disturbance and a dearth or absence of native vegetation, seed bank or symbiotic soil function
▪ Regeneration	Describes the restoration of natural ecosystems through the natural cyclic processes of renewal and self-maintenance of species and their populations.
▪ Restoration	Re-establish exactly the original native plant community.
▪ Revegetation	Replanting of native vegetation.
TEC	Threatened Ecological Community
VEC	Vulnerable Ecological Community
Vegetation SEPP	State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (NSW)
VIS	NSW BioNet Vegetation Information System
VMA	Vegetation Management Area
VMP	Vegetation Management Plan
WoNS	Weeds of National Significance

RIPARIAN ASSESSMENT REPORT

1. Introduction

1.1 Purpose if this Plan

MJD Environmental have been engaged by Roche Group Pty Ltd on behalf of DB20 Pty Ltd to prepare a riparian assessment to inform development constraints with regard to the NSW Water Management Act 2000, the NSW Biodiversity Conservation Act 2016, and Maitland City Council Development Control Plan.

The proposal consists of an extension to the lead in road from the west with the creation (over four stages) of 173 standard residential lots and 2 super lots (for future subdivision), with a new public road and active movement network along with associated works including bulk earthworks, stormwater management, vegetation riparian zones, bushfire management, landscaping, pathways, utilities and other typical subdivision works. Two temporary secondary accesses are proposed (to River Road and to Anambah Road) and a temporary APZ is applied around the perimeter of the subdivision pending future progressive development as zoned.

1.2 Aims and Objectives

This riparian assessment aims to present a ground-thruthed and accurate assessment of the hydrology of the site and the required riparian corridor widths, vegetated riparian zones and documentation required to accompany the development application, to establish and preserve the integrity of riparian corridors.

The objectives of this riparian assessment:

- Identify whether or not there is a watercourse present and determine its order in accordance with the Strahler System.
- If a watercourse is present, define the applicable RC/VRZ.

1.3 Legislative Considerations

Key legislation generally relating to this report and the site project approvals include the following:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1997
- Biodiversity Conservation Act 2016
- Biosecurity Act 2015
- NSW Environmental Planning and Assessment Act 1979
- NSW Water Management Act 2000

1.3.1 NSW Water Management Act (2000)

Controlled activities carried out in, on or under waterfront land are regulated by the Water Management Act 2000 (WM Act). The department administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the department before commencing the controlled activity.

2. Site Context

General Location	The site is located in the locality of Anambah, in Maitland LGA in the lower Hunter valley. The locality is one of four (4 – Gosforth, Anambah, Windermere and Windella) generally bounded by the New England Highway and a broad meandering bend in the Hunter River. This area comprises of approximately 4000 hectares of undulating land, defined by a minimum elevation of at most approximately 20 m AHD, with a series of generally central low hills peaking at approximately 180 m AHD at Winders Hill. The area has a substantial catchment area extending south of the New England Highway, and a significant proportion of the area is flood-prone.
Land Title/s	Part Lot A/-/DP431640, Part Lot 1 and Lot 2/-/DP1110433
LGA	Maitland City Council
Area	Combined Lots approx. 182 ha (Lot 1: 34.3 ha, Lot 2: 147.5 ha)
Zoning	R1 General Residential, C4 Environmental Living
Boundaries	The site is generally bound by a riparian corridor in the north-west. In all other directions, boundaries are undefined in the landscape (refer to **Figure**)
Current Land Use & History	Land is currently used for low intensity grazing of beef cattle, and the broader area has been subject to intensive agricultural activities over many generations. Aerial photo interpretation (API) of NSW Historical Imagery shows the site in a completely cleared state as early as 1954. API did not detect any management of regrowth vegetation over 1954-2001.
Topography	The site in undulating with several incised gullies associated with watercourses and associated riparian zones. The watercourses are part of a wide network of tributaries to a wetland located 500 m east of the site, associated with the Hunter River floodplain. The wetland is generally defined by the 10 m elevation contour. The site and associated watercourse occur near to the confluence of these watercourses, which originate up to 2 km from the wetland.
Vegetation	NSW State Vegetation Type Map shows a range of communities over the site in the watercourse, however these are generally mapped over exotic vegetation, not based on floristic plots, often list inappropriate formations or are placeholder communities that are not intended for assessment. NSW SVTM 1750 modelling indicates the site was once at the interface between Dry Sclerophyll Forest and the Swamp Forests and Wetlands marginal to Riparian Rainforests of the Hunter River. Site assessment confirmed there is no extant plant community on the site. There is extremely limited native vegetation present in the watercourse. Species which persist are generally common and associated with riparian areas, and occur at low densities. Exotic and pasture improvement species dominate throughout the site.
Proposed Development	The proposed development includes residential subdivision within the Anambah Urban Release Area.

381 ANAMBAH ROAD, ANAMBAH

FIGURE 1:
SITE LOCATION

Legend

- Development Site
- Cadastral Boundary
- Roads

N
W E
S

0 200 400 600 800

Metres
1:10000

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-05-30 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250528.qgz | This plan should not be relied upon for critical design dimensions.

3. Site Assessment

3.1 Desktop Assessment

3.1.1 Information sources

Existing information sources used to assist siter context for this VMP include:

- NSW State Vegetation Type Map (DCCEEW 2022)
- NSW BioNet (VIS)
- NSW Landscape - Modified (DEM-S) Elevation layer
- NSW Hydroline Spatial Data (DPI 2025)
- NSW Natural Resources Access Regulator Waterfront land tool (DPIE 2020)
- NSW Office of Water Guidelines for riparian corridors on waterfront land (DPI 2012)

3.1.2 Preliminary Mapping

Desktop assessment of mapped waterlines was subject assessment by:

- Accessing *Water Management (General) Regulation 2018 Hydroline spatial data 1.0*;
- Using GIS software (QGIS) to clip data to include any part of any catchment mapped as occurring on the subject lots;
- Utilising a model to apply default stream orders to mapped watercourses following Strahler and the NSW Guidelines for riparian corridors **Table 1** (reproduced below);
- Overlaying results in QGIS with the NSW Digital Elevation Model (DEM);
- DEM used to highlight areas likely to require review by site survey

Table 1. Recommended riparian corridor (RC) widths (DPI RC Guidelines 2018)

Watercourse type	VRZ width (each side of watercourse)	Total RC Width
1st order	10 metres	20 m + channel width
2nd	20 metres	40 m + channel width
3rd	30 metres	60 m + channel width
4th or greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

3.2 Site Assessment

Site assessments were carried out in November and December 2023, and following significant rainfall in April and May 2025, traversing the extent of the subject lots on foot. All watercourses mapped on the subject lots were assessed for having a defined bed & bank, watercourse features as per the Natural Resources Access Regulator, 2020, Waterfront Land Tool (WFL Tool), presence and nature of vegetation (aquatic/macrophyte or otherwise) and current standing or flowing water.

Photographs were taken of any areas where channels, beds, banks, features or water flows may be required to justify the outcomes of the assessment under the WM Act.

381 ANAMBAH ROAD, ANAMBAH

FIGURE 2:
PRELIMINARY (DESKTOP) MAPPING

Legend

- Development Site
- Cadastral Boundary
- Roads
- Watercourse
  (Strahler order as labelled)

N
W E
S

0 140 280 420 560

Metres
1:7000

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-05-30 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250528.qgz | This plan should not be relied upon for critical design dimensions.

4. Water Management Act Outcome

As a result of the assessment, the hydrology of the site has been considered as follows:

- A 2nd order stream originates as a large dam west of the landholding, forming the primary watercourse associated with the proposal;
- South of the primary watercourse a mapped stream terminating in a large dam was assessed for defined bed and banks, and their independence of excluded infrastructure (agricultural dams).
    - The upper reaches of this stream were assessed for status as “watercourses” in alignment with the NRAR Tool. The assessment was undertaken on site following a significant rain event in April 2025, with site dams at capacity with subsurface discharge.
    - The watercourses were determined not to be present as they exhibited no bed, bank, channel, or watercourse features. As a result, the watercourse is assessed as 1st order
    - Photographs of the condition of the mapped tributaries at this time are below. Photo Locations are shows on **Figure 3**.

    - The extent of the watercourse as assessed is in alignment with a previously concordant layout endorsed by Office of Water for concept development in the URA.
- The watercourse associated with the proposal is assessed as 2nd order in accordance with Strahler:
    - VRZ width (each side of watercourse) = 20 metres
    - Total RC Width = 40 m + channel width

The proposal includes a construction works extent that is mapped into the Outer VRZ, however no encroachment of final form is proposed within the VRZ as assessed. Therefore, no application of the Averaging Rule as per the NRAR Guidelines is required or proposed.

Under the proposal, only the southern banks of the watercourse are captured in the VMP works, as no works are proposed on the northern lands, and future works will be associated with the northern banks. The VMP extent has been confined to secure areas, unaffected by future works. Excluded areas are likely to be subject to future disturbance for road construction, extension of cycleways, works to existing dam/s and upstream stormwater management associated with future development. Future works will be subject to VMP requirements that will consolidate the riparian corridor.

381 ANAMBAH ROAD, ANAMBAH

FIGURE 3:
WATER MANAGEMENT ACT OUTCOME – WATERCOURSES

Legend

- Development Site
- Cadastral Boundary
- Roads
- 1st Order Stream
- 2nd Order Stream
- Riparian Assessment Photos

N
W E
S

0 140 280 420 560

Metres
1:7000

MJD Environmental

Aerial: Nearmap (2025) | Data: MJD Environmental, GCA, Roche, NSW Spatial Services (2025) | Datum/Projection: GDA2020 / MGA zone 56 | Date: 2025-05-30 | Version: 1 | Z:\23067 - AURA Anambah\QGZ\23067_DA1_Master_20250528.qgz | This plan should not be relied upon for critical design dimensions.

5. References

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NSW DCCEEW (2022), *NSW State Vegetation Type Map,* NSW Department of Climate Change, Energy, Environment and Water, Parramatta

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NSW DCCEEW (2024d), *NSW BioNet (VIS),* NSW Department of Climate Change, Energy, Environment and Water, Parramatta, Accessed online June 2024, https://vegetation.bionet.nsw.gov.au/

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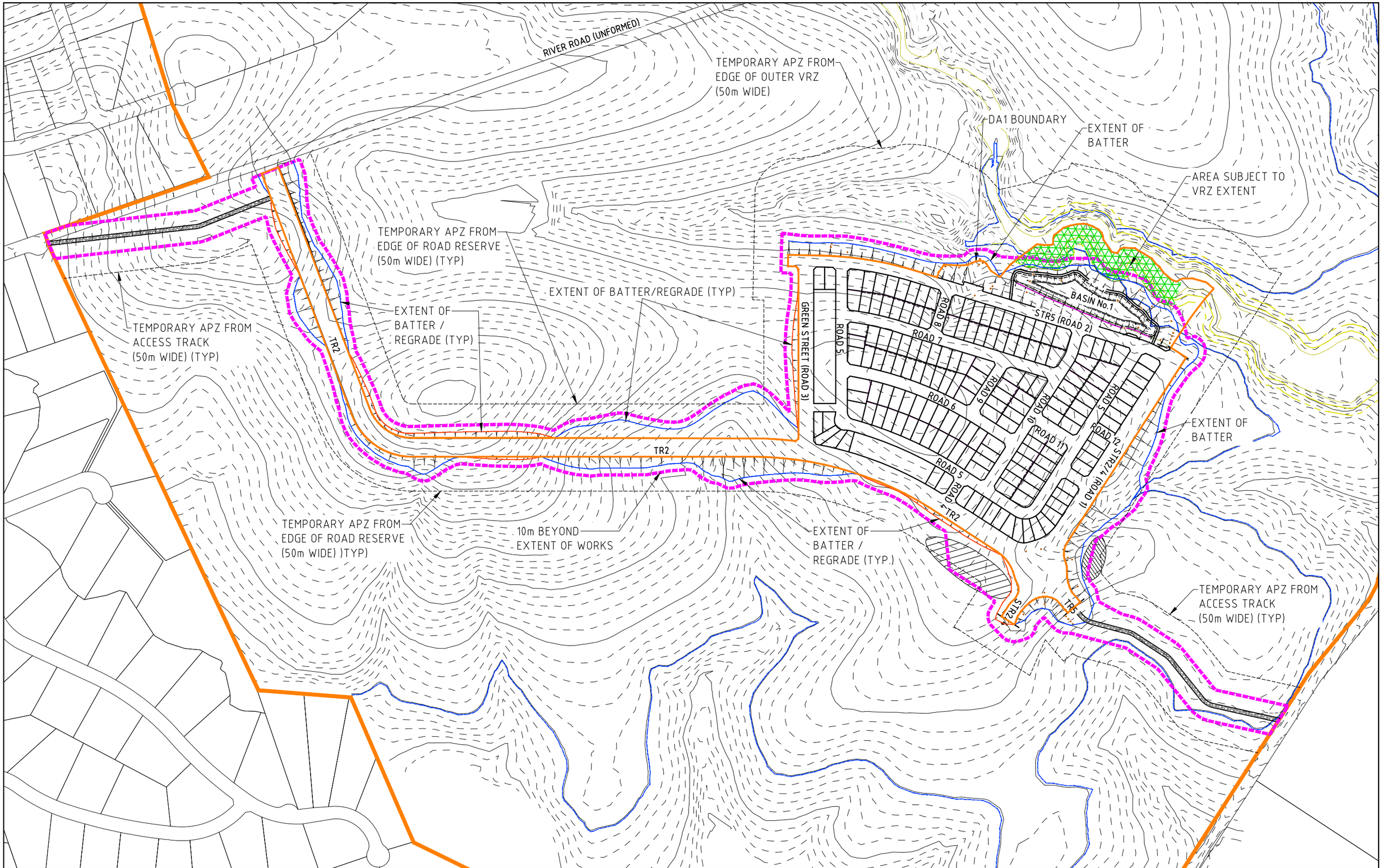
Appendix A. Appendix A Plan of Proposal



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4	CLIENT COMMENTS	A.M	I.H	14.05.25
3	GENERAL AMENDMENTS	A.M	I.H	13.05.25
2	CLIENT COMMENTS	A.M	I.H	05.05.25
1	ORIGINAL ISSUE	AM	IH	01.05.25

North

Scale
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Designed AM | Scale 1:2500
Cad Reference 22311C dE01 r5
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH - DA1
EXTENT OF WORKS PLAN

Project No 22311C
Drawing No E01 | Revision 5
A1 SHEET

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ANAMBAH URBAN RELEASE AREA

ANAMBAH ROAD

DEVELOPMENT APPLICATION

CLIENT: ROCHE GROUP

CONSENT AUTHORITY: MAITLAND CITY COUNCIL

DATE: MAY 2025

DRAWING SCHEDULE

DWG No.	SHEET TITLE	REV
LD1070	COVER SHEET	2
LD1071	DA1 - OVERALL PLAN	2
LD1072	DA1 - OVERALL ZONING PLAN	2
LD1073	DA1 - LOT LAYOUT PLAN	2
LD1074	DA1 - STAGING PLAN	2
LD1075	DA1 - LOT SIZE PLAN	2

REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

North

Scale

Designed: DB

Scale: -

Cad Reference: 22311LD LD1070-1073 r2

Project Approval: IAN HILL (B.E) Consulting Civil Engineer

Client: ROCHE GROUP

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH

COVER SHEET

Project No: 22311LD

Drawing No: LD1070

Revision: 2

A1 SHEET

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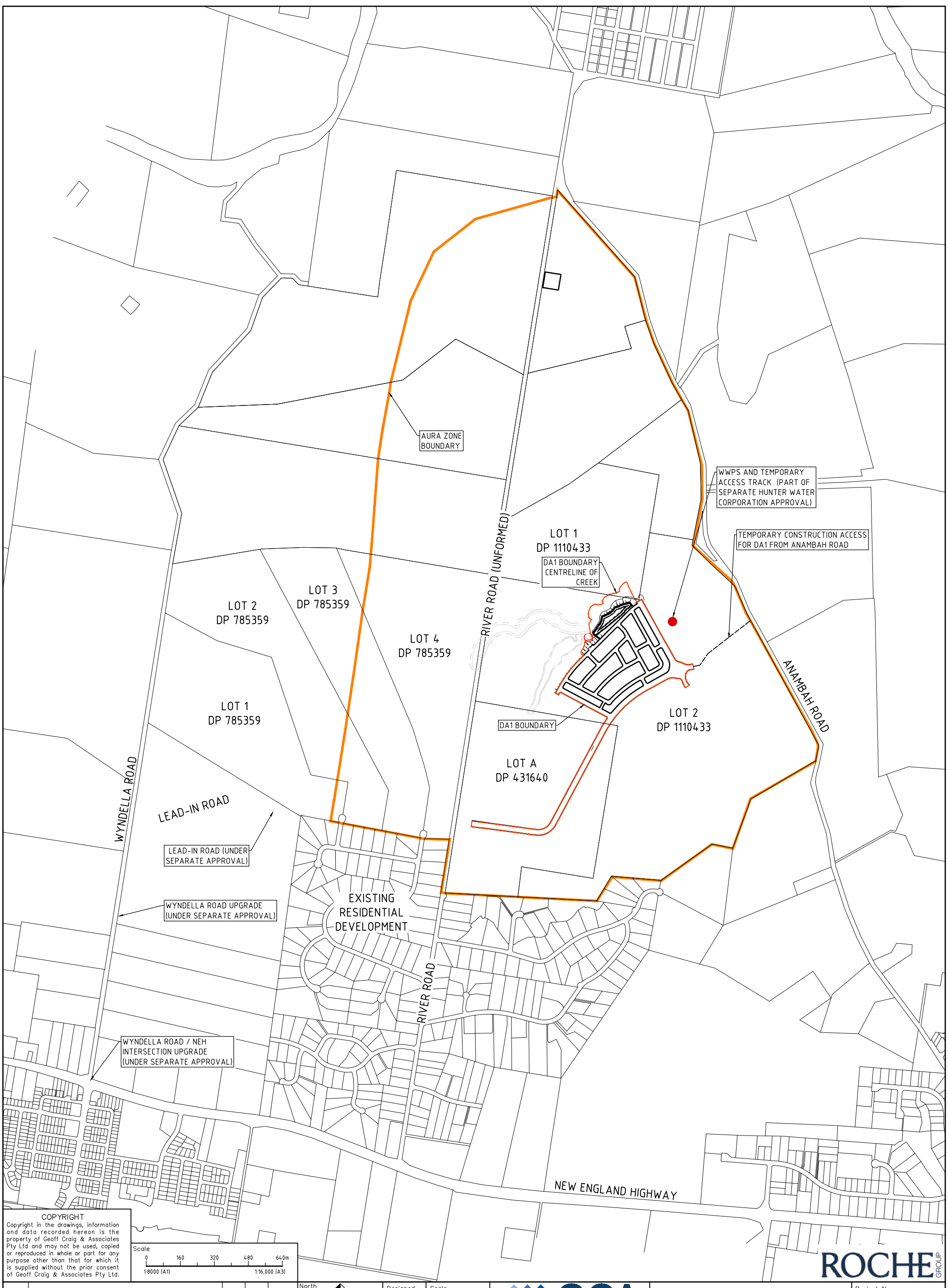

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1	ORIGINAL ISSUE	DB	IH	26.05.25

North

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Scale: 1:8000
Cad Reference: 22311LD LD1070-1073 r2
Project Approval: IAN HILL (B.E) Consulting Civil Engineer

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - OVERALL PLAN

Project No: 22311LD
Drawing No: LD1071
Revision: 2
A1 SHEET

ROCHE GROUP

RESIDENTIAL LOTS

LARGE RESIDENTIAL LOTS (>3000m^2)

LARGE LOTS (1-3ha)

PUBLIC PARK & RECREATION

ENVIRONMENTAL

TOWN CENTER

AURA ZONE BOUNDARY

WWPS AND TEMPORARY ACCESS TRACK (PART OF SEPARATE HUNTER WATER CORPORATION APPROVAL)

TEMPORARY CONSTRUCTION ACCESS FOR DA1 FROM ANAMBAH ROAD

LOT 1 DP 1110433

DA1 BOUNDARY CENTRELINE OF CREEK

LOT 2 DP 785359

LOT 3 DP 785359

LOT 4 DP 785359

RIVER ROAD (UNFORMED)

LOT 1 DP 785359

DA1 BOUNDARY

LOT 2 DP 1110433

ANAMBAH ROAD

LOT A DP 431640

WYNDELLA ROAD

LEAD-IN ROAD

LEAD-IN ROAD (UNDER SEPARATE APPROVAL)

EXISTING RESIDENTIAL DEVELOPMENT

WYNDELLA ROAD UPGRADE (UNDER SEPARATE APPROVAL)

RIVER ROAD

R1

WYNDELLA ROAD / NEH INTERSECTION UPGRADE (UNDER SEPARATE APPROVAL)

SP2

B5

NEW ENGLAND HIGHWAY

Scale
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North

REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

Designed: DB
Scale: 1:8000
Cad Reference: 22311LD LD1070-1073 r2
Project Approval: IAN HILL (B.E) Consulting Civil Engineer

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - OVERALL ZONING PLAN

Project No: 22311LD
Drawing No: LD1072
Revision: 2
A1 SHEET

ROCHE GROUP

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LEGEND

	LOT NUMBER
SUPER LOTS	LOTS = 2
STANDARD RESIDENTIAL	LOTS = 173
TOTAL	LOTS = 175

FUTURE 3.0m WIDE CYCLE ONLY PATH
SECOND ORDER STREAM
NO PARKING ADJACENT TO DRAINAGE RESERVE
OUTER MJD VRZ 10m
INNER MJD VRZ 10m
3.0m WIDE CYCLE ONLY PATH
EXISTING DAM
FIRST ORDER STREAM
DRAINAGE RESERVE 2.847ha
SECOND ORDER STREAM
100yr FLOOD LEVEL (R.L 19.9m)
DRAINAGE RESERVE BOUNDARY
BASIN 1
FUTURE 3.0m WIDE CYCLE ONLY PATH
FUTURE 2.5m WIDE SHARED PATHWAY
STR5
PROPOSED PARKING ADJACENT TO LOT FRONTAGE
2.5m WIDE SHARED PATHWAY
PROPOSED PARKING AT 90° TO KERB (2 DISABLED AND 8 STANDARD SPACES)
12m LONG x 4.5m WIDE CONCRETE GPT MAINTENANCE ACCESS PAD
2.5m WIDE SHARED PATHWAY
BLISTERED KERB LOCAL AREA TRAFFIC MANAGEMENT FEATURE
STENCIL CONCRETE ENTRY LOCAL AREA TRAFFIC MANAGEMENT FEATURE (TYP)
GREEN STREET
DA1 BOUNDARY
TR1
PEDESTRIAN REFUGE IN ACCORDANCE WITH TRANSPORT ROADS & TRAFFIC AUTHORITY TDT 2011/01a FIG 2
'FLAG SIGN' TYPE BUS STOP IN ACCORDANCE WITH MCC STD DWG SD023
200m OFFSET FROM RECREATIONAL AREA
TR2
3.0m WIDE OFFROAD CYCLEWAY
PEDESTRIAN REFUGE IN ACCORDANCE WITH TRANSPORT ROADS & TRAFFIC AUTHORITY TDT 2011/01a FIG 2
'FLAG SIGN' TYPE BUS STOP IN ACCORDANCE WITH MCC STD DWG SD023
RAISED PEDESTRIAN CROSSING (TYP)
TR5
STR2/4
FUTURE PARK (MIN AREA 1ha)

REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
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North

Scale
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1:1500 (A1) 1:3000 (A3)

Designed DB
Scale 1:1500
Cad Reference 22311LD LD1070-1073 r2
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - LOT LAYOUT PLAN

Project No 22311LD
Drawing No LD1073
Revision 2
A1 SHEET

PLOT DATE: 30/05/2025 2:35:50 PM
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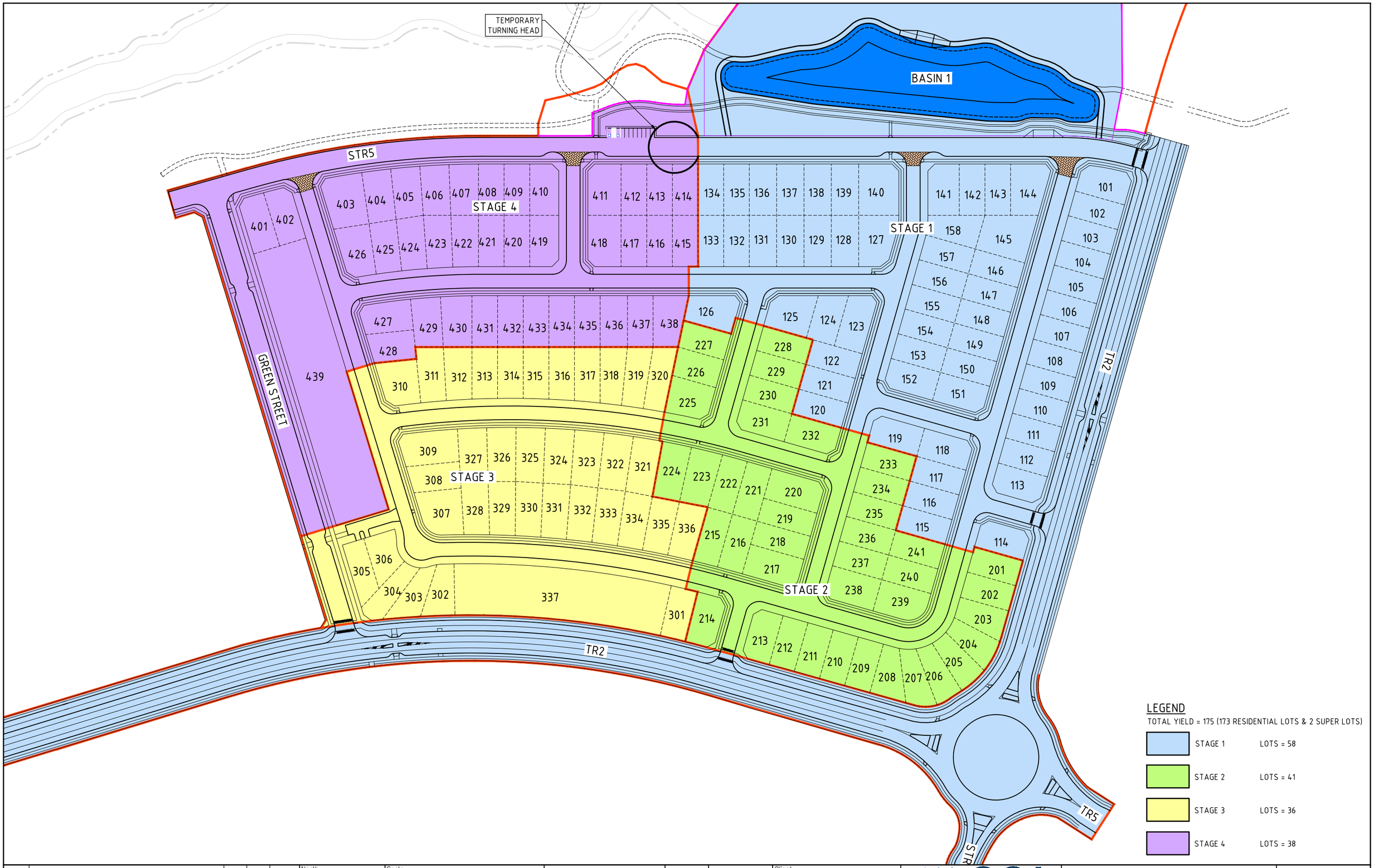

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North

Scale
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1:1000 (A1) 1:2000 (A3)

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Scale 1:1000
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ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - STAGING PLAN

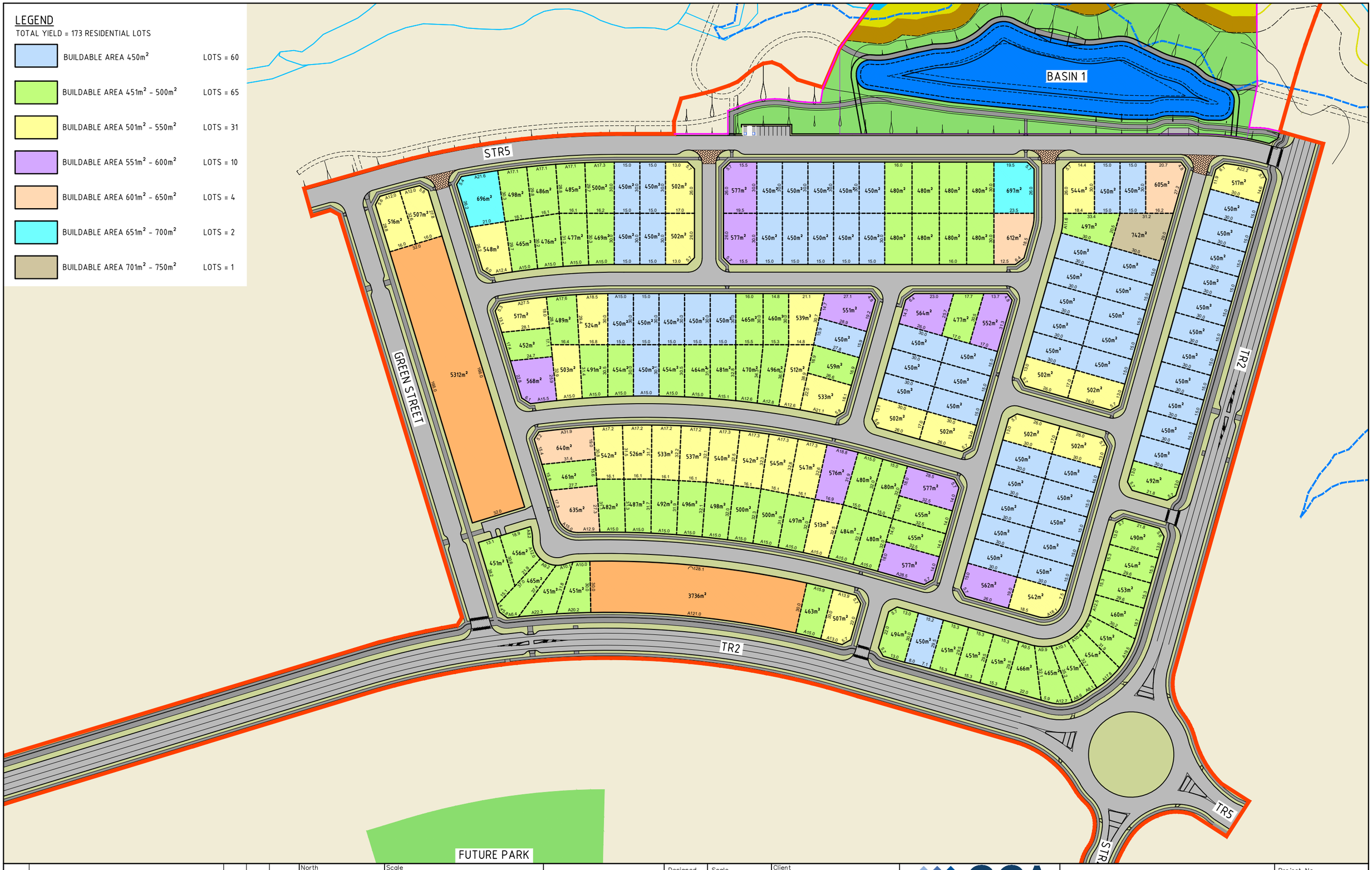
Project No 22311LD
Drawing No LD1074
Revision 2
A1 SHEET

PLOT DATE: 30/05/2025 2:35:57 PM
CAD FILE: Q:\22\22311 Anambah Urban Release Area DA\02_CAD\AutoCAD\LD\1000 series DA1\22311LD LD1074 r2.dwg

LEGEND

TOTAL YIELD = 173 RESIDENTIAL LOTS

BUILDABLE AREA 450m²	LOTS = 60
BUILDABLE AREA 451m² - 500m²	LOTS = 65
BUILDABLE AREA 501m² - 550m²	LOTS = 31
BUILDABLE AREA 551m² - 600m²	LOTS = 10
BUILDABLE AREA 601m² - 650m²	LOTS = 4
BUILDABLE AREA 651m² - 700m²	LOTS = 2
BUILDABLE AREA 701m² - 750m²	LOTS = 1



REVISION	Description	Drawn	App'd	Date
2	CLIENT COMMENTS	DB	IH	30.05.25
1	ORIGINAL ISSUE	DB	IH	26.05.25

North

Scale
0 20 40 60 80m
1:1000 (A1) 1:2000 (A3)

Designed DB | Scale 1:1000

Cad Reference 22311LD LD1075 r2

Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client
ROCHE GROUP

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
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PHONE: (02) 4964 1811

ANAMBAH URBAN RELEASE AREA
ANAMBAH ROAD
ANAMBAH
DA1 - LOT SIZE PLAN

Project No 22311LD

Drawing No LD1075 | Revision 2

A1 SHEET

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Appendix C. PCT 4042 Species List

Flora species in all growth forms are listed below in order of frequency in PCT 4042. Consideration of the placement of the species in the growth form list should be taken prior to selecting one species over another.

Tree Species	Shrub Species	Graminoid Species	Forb Species	Fern Species	Other Species
Glochidion ferdinandi	Breynia oblongifolia	Lomandra longifolia	Dichondra repens	Adiantum aethiopicum	Parsonsia straminea
Notelaea longifolia	Melaleuca linariifolia	Microlaena stipoides	Dianella caerulea	Pteridium esculentum	Polymeria calycina
Angophora floribunda	Callistemon salignus	Oplismenus imbecillis	Lobelia purpurascens	Cheilanthes sieberi subsp. sieberi	Glycine clandestina
Eucalyptus siderophloia	Melaleuca nodosa	Entolasia marginata	Pseuderanthemum variabile	Botrychium australe	Geitonoplesium cymosum
Eucalyptus tereticornis	Melaleuca styphelioides	Imperata cylindrica	Vernonia cinerea	Doodia aspera	Eustrephus latifolius
Eucalyptus resinifera	Acacia irrorata	Entolasia stricta	Centella asiatica	Hypolepis muelleri	Gynochthodes jasminoides
Allocasuarina littoralis	Leucopogon juniperinus	Carex longebrachiata	Oxalis perennans	Adiantum hispidulum	Pandorea pandorana subsp. pandorana
Allocasuarina torulosa	Denhamia silvestris	Gahnia clarkei	Brunoniella australis	Adiantum formosum	Billardiera scandens
Eucalyptus amplifolia	Hibbertia aspera	Echinopogon ovatus	Desmodium gunnii	Asplenium australasicum	Hibbertia scandens
Eucalyptus globoidea	Leptospermum polygalifolium	Ottochloa gracillima	Hydrocotyle laxiflora	Blechnum cartilagineum	Clematis glycinoides
Eucalyptus propinqua	Pittosporum revolutum	Oplismenus aemulus	Lagenophora stipitata	Davallia solida var. pyxidata	Glycine microphylla
Alphitonia excelsa	Myrsine howittiana	Paspalidium distans	Gonocarpus tetragynus	Histiopteris incisa	Clematis aristata
Corymbia maculata	Polyscias sambucifolia	Gahnia aspera	Hydrocotyle sibthorpioides	Platycerium bifurcatum	Dioscorea transversa
Corymbia intermedia	Acacia longifolia	Lepidosperma laterale	Veronica plebeia		Glycine tabacina
Eucalyptus microcorys	Bursaria spinosa	Panicum simile	Viola hederacea		Smilax glyciphylla
Casuarina glauca	Persoonia linearis	Digitaria diffusa	Arthropodium sp. South-east Highlands		Cassytha glabella
Eucalyptus pilularis	Acacia floribunda	Echinopogon caespitosus	Galium leiocarpum		Plectorrhiza tridentata
Eucalyptus fibrosa	Dodonaea triquetra	Carex appressa	Oxalis exilis		Smilax australis
Syncarpia glomulifera	Melaleuca decora	Cymbopogon refractus	Desmodium rhytidophyllum		Hardenbergia violacea
Acmena smithii	Pultenaea villosa	Themeda triandra	Hybanthus stellarioides		Cissus hypoglauca
Eucalyptus carnea	Myrsine variabilis	Lomandra filiformis	Hydrocotyle tripartita		Cordyline stricta
Eucalyptus robusta	Rubus parvifolius	Lomandra multiflora subsp. multiflora	Commelina cyanea		Stephania japonica var. discolor
Eucalyptus saligna	Ozothamnus diosmifolius	Digitaria ramularis	Dianella revoluta		Cissus antarctica
Acacia maidenii	Melaleuca sieberi	Lomandra confertifolia	Lagenophora gracilis		Desmodium varians
Angophora costata	Pittosporum multiflorum	Ptilothrix deusta	Opercularia diphylla		Calochlaena dubia
Cryptocarya microneura	Rubus moluccanus	Eragrostis brownii	Arthropodium milleflorum		Cassytha pubescens
Clerodendrum tomentosum	Sannantha pluriflora	Juncus usitatus	Geranium solanderi		Kennedia rubicunda
Eucalyptus moluccana	Backhousia myrtifolia	Aristida vagans	Gonocarpus teucrioides		Cayratia clematidea
Eucalyptus seeana	Exocarpos cupressiformis	Carex maculata	Goodenia heterophylla		Maclura cochinchinensis
Guioa semiglauca	Synoum glandulosum subsp. glandulosum	Paspalum orbiculare	Gymnostachys anceps		Marsdenia rostrata
Acacia parramattensis	Pittosporum undulatum	Carex breviculmis	Dianella longifolia		Notothixos incanus
Corymbia gummifera	Pultenaea retusa	Digitaria parviflora	Geranium homeanum		Sarcopetalum harveyanum
Eucalyptus paniculata	Zieria smithii	Fimbristylis dichotoma	Plectranthus parviflorus		Amyema congener subsp. congener
Melaleuca quinquenervia	Acrotriche divaricata	Poa labillardierei var. labillardierei	Poranthera microphylla		Cassytha filiformis
Trochocarpa laurina	Callistemon linearis	Dichelachne micrantha	Ranunculus inundatus		Dendrophthoe vitellina
Eucalyptus placita	Duboisia myoporoides	Gahnia melanocarpa	Ranunculus lappaceus		Amyema gaudichaudii
Acacia melanoxylon	Melicope micrococca	Juncus subsecundus	Acianthus fornicatus		Convolvulus erubescens
Cupaniopsis parvifolia	Acacia falcata	Carex inversa	Arthropodium minus		Cymbidium suave
Elaeocarpus obovatus	Acacia leiocalyx subsp. leiocalyx	Cynodon dactylon	Brunoniella pumilio		Tylophora paniculata
Eucalyptus umbra	Acacia linifolia	Eragrostis leptostachya	Caladenia catenata		Calystegia marginata
Jagera pseudorhus var. pseudorhus	Elaeocarpus reticulatus	Lomandra hystrix	Eclipta platyglossa		Dendrobium linguiforme
Acacia binervata	Hibbertia empetrifolia subsp. empetrifolia	Machaerina articulata	Euchiton japonicus		Embelia australiana
Eucalyptus acmenoides	Hibiscus heterophyllus subsp. heterophyllus	Poa sieberiana	Galium binifolium		Hibbertia dentata
Eucalyptus grandis	Melaleuca thymifolia	Carex gaudichaudiana	Gonocarpus micranthus		Jasminum volubile
Eucalyptus piperita	Sannantha angusta	Chorizandra cymbaria	Hypericum gramineum		Livistona australis
Tristaniopsis laurina	Sannantha crassa	Cyperus polystachyos	Murdannia graminea		Muehlenbeckia gracillima
Acacia aulacocarpa	Sannantha similis	Eragrostis alveiformis	Solanum prinophyllum		Palmeria scandens
Acacia concurrens	Acacia implexa	Gahnia sieberiana	Tricoryne elatior		Papillilabium beckleri
Angophora bakeri	Acacia longissima	Hemarthria uncinata	Viola betonicifolia		Ripogonum album
Angophora paludosa	Callistemon rigidus	Ischaemum australe	Alternanthera denticulata		Tylophora barbata
Angophora subvelutina	Cassinia uncata	Juncus continuus	Caladenia carnea		
Angophora woodsiana	Clerodendrum floribundum var. floribundum	Lepidosperma elatius	Goodenia paniculata		

Tree Species	Shrub Species	Graminoid Species	Forb Species	Fern Species	Other Species
Brachychiton acerifolius	Cryptocarya rigida	Lepidosperma quadrangulatum	Haloragis heterophylla		
Corymbia henryi	Daviesia ulicifolia	Lomandra cylindrica	Hydrocotyle acutiloba		
Cupaniopsis anacardioides	Goodenia ovata	Machaerina juncea	Hydrocotyle geraniifolia		
Diploglottis australis	Hakea salicifolia	Poa affinis	Hypoxis hygrometrica		
Endiandra sieberi	Melaleuca biconvexa	Schoenus apogon	Pomax umbellata		
Eucalyptus eugenioides	Melaleuca ericifolia	Austrostipa pubescens	Pterostylis longifolia		
Ficus rubiginosa	Phyllanthus gunnii	Austrostipa ramosissima	Sigesbeckia orientalis subsp. orientalis		
Lophostemon confertus	Prostanthera scutellarioides	Carex fascicularis	Vittadinia cuneata		
Melia azedarach	Pultenaea myrtoides	Carex lobolepis	Alpinia caerulea		
Polyscias elegans	Solanum cinereum	Cyperus flaccidus	Artanema fimbriatum		
Schizomeria ovata	Syzygium oleosum	Cyperus gracilis	Brachyscome angustifolia		
Streblus brunonianus	Wilkiea huegeliana	Cyperus imbecillis	Caesia parviflora		
Toona ciliata	Acacia ulicifolia	Cyperus lucidus	Caladenia fuscata		
	Acronychia imperforata	Deyeuxia parviseta	Centipeda minima subsp. minima		
	Acronychia oblongifolia	Digitaria breviglumis	Chiloglottis diphylla		
	Capparis arborea	Isolepis inundata	Cryptostylis erecta		
	Commersonia dasyphylla	Juncus mollis	Cycnogeton procerum		
	Commersonia fraseri	Juncus planifolius	Dampiera purpurea		
	Elaeodendron australe	Lachnagrostis filiformis	Dampiera stricta		
	Eupomatia laurina	Lepidosperma concavum	Daucus glochidiatus		
	Ficus coronata	Lepidosperma gunnii	Dianella tasmanica		
	Hibbertia vestita	Lepidosperma urophorum	Drosera spatulata		
	Homalanthus populifolius	Lomandra obliqua	Gonocarpus humilis		
	Leucopogon ericoides	Machaerina rubiginosa	Gratiola pedunculata		
	Leucopogon lanceolatus	Oplismenus undulatifolius	Hydrocotyle pedicellosa		
	Leucopogon muticus	Paspalum distichum	Libertia paniculata		
	Lissanthe strigosa	Pseudoraphis paradoxa	Lobelia surrepens		
	Logania albiflora	Schoenus melanostachys	Microtis parviflora		
	Notelaea ovata	Sporobolus elongatus	Mitrasacme polymorpha		
	Notelaea sp. A	Sporobolus laxus	Opercularia aspera		
	Notelaea venosa	Tetraria capillaris	Oxalis chnoodes		
	Persoonia stradbrokensis		Patersonia glabrata		
	Phyllanthus hirtellus		Phyllanthus similis		
	Pimelea linifolia		Plantago debilis		
	Podolobium ilicifolium		Pterostylis collina		
	Podolobium scandens		Pterostylis erecta		
	Prostanthera incisa		Pterostylis pedunculata		
	Psychotria loniceroides		Ranunculus plebeius		
	Rhodamnia rubescens		Senecio diaschides		
	Rhodomyrtus psidioides		Senecio hispidulus		
	Rubus rosifolius		Senecio pinnatifolius		
	Syzygium australe		Thelymitra pauciflora		
	Trema tomentosa var. aspera		Veronica calycina		
			Viola banksii		

Appendix D. Weed Control Methods

Acceptable weed removal techniques

Note this list is not exhaustive, however intended to provide a guide to assist in VMP implementation.

General

- The contractor shall take all care not to poison existing desirable vegetation when undertaking herbicide control methods;
- The correct herbicide shall be selected and used appropriately to ensure effective results on all noxious weeds;
- Herbicide control is not to be used within or near water courses. The contractor shall obtain all required permits prior to use of herbicides near any water course and submit details of proposed spraying and chemicals to be used for approval prior to commencement;
- Noxious weed removal shall be carried out as described utilising weed removal techniques outlined in this specification. Should the contractor feel that techniques selected in the report will prove un-effective or inefficient; the contractor shall notify the ecologist nominating alternative procedures for review;
- All herbicide spraying is to be undertaken using apparats deemed as appropriate, generally this will be Knap-Sack or vehicle mounted spray boom in large areas. All other methods of herbicide application are not to be used onsite unless discussed and approved in writing by the Ecologist; and
- The contractor shall ensure any spray drift is kept to an absolute minimum.

Herbicide Spraying

- Herbicides should not be applied prior to rain occurring. This reduces the herbicides effectiveness as well as being transported in runoff to creek lines and waterways. The use of herbicides should be considered when;
- There are small areas of dense noxious weeds with few or no native plants to protect;
- There are large areas of noxious weeds;
- The noxious weeds are growing too rapidly for physical removal; and
- The spraying of weeds must only be undertaken by experienced persons with Chemcert or equivalent qualifications. The success of each treatment must be evaluated by the operator after a set period of time and re-applied (if Necessary) according to the labelled effectiveness for each herbicide. Care must be taken when applying herbicides near drainage lines to avoid excess use due to the sensitivity of the alter bodies into which runoff will eventually flow.

Mechanical Removal

- Mechanised removal using plant in a manner that does not impact the watercourse bed and bank.
- Once initial treatment has occurred follow up cut and paint will be required to ensure any remaining plants are treated. Should any plants be found that are small enough to pull out successfully by hand this is preferred. Ensure that all roots are removed. Hand pulling techniques are outlined below; and
- Hand removal will be required most probably after initial treatment and will be used in the event of new seedling emergence which will have recolonised after initial removal. Hand removal shall be employed ensuring that all roots are removed as described below.

Hand Removal

- Best undertaken when the soil profile is moist to ensure full and ease of removal and disposal off site;
- Apparent seeds and fruit are to be removed and placed in a bag for removal and disposal off site;
- Firmly take hold of the seedling at ground level, pull and manipulate backwards and forwards until it releases cleanly. If the plant is held too high it may break resulting in root material left behind in the soil. Remaining plant material may re-establish in this instance;
- All roots remaining within the soil shall be removed;
- Should the seedling have a spreading root system, roots will require individual removal; and
- All seedlings and hand pulled weeds are to be placed in a bag, removed from site and disposed of sensibly.

Woody Weed Removal Techniques

- Cut and Paint woody weeds to 10cm basal diameters;
- Stem injection;
- Frilling or Chipping - Plants should be actively growing and in good health;
- Deciduous plants should be treated in spring and autumn when leaves are fully formed;
- For multi-stemmed plants, inject or chip below the lowest branch to treat each steam individually; and
- Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases.

Appendix E. Long-Stem Planting Technique

The **Long-stem Planting** Guide

Australian Plants Society
NSW Ltd. Central Coast Group
www.australianplants.org

Gosford City Council
49 Mann Street, Gosford NSW 2250
www.gosford.nsw.gov.au

NSW Environmental Trust
Level 2, 1 Fitzwilliam Street, Parramatta NSW 2150
www.environment.nsw.gov.au
envirotrust@environment.nsw.gov.au
02 8837 6093

This guide has been compiled by members of The Australian Plants Society Central Coast Group and Gosford City Council and is funded by NSW Environmental Trust.
Acknowledgements: Thanks to Hunter-Central Rivers Catchment Management Authority and Bill Hicks for their contributions.

Design by Marjo Patari, Gosford City Council.
Photos on front cover: long-stem planting along Ettalong Creek, long-stem planting, long-stem root ball, long-stem seedling about to be planted. Back cover: coastal area, Patonga Beach; riparian area, Umina; saline area, Yarrawa; rainforest area, Katandra Reserve, Holgate.
Printed on recycled paper, April 2010

Contents

Long-stem planting...

Development of the long-stem planting method in Australia has seen an increase in the survival rates of seedlings planted in many different environments. The advantages of this method, such as no post-planting watering, increased growth rates and higher survival rates, have made a positive contribution to many rehabilitation projects and seen individuals and groups obtain successful outcomes in areas that were considered a challenge.

Within Katandra Reserve (Holgate, NSW) the long-stem planting method has been trialled on rainforest species, resulting in significantly greater growth rates in seedlings of some species planted using the technique (Chalmers *et al*. 2007). Furthermore, native riparian species planted using this method in the Hunter Valley (NSW) showed greater survival rates (20-50 per cent better, depending on the species) compared with standard planting methods on river banks and demonstrated that native plants could indeed be reintroduced on to river banks where previous efforts had been unsuccessful (Hicks *et al*. 1999). Within saline environments survival and growth rates of long-stem planting has been exceptional (Hicks 2003) and, recently, the long-stem planting method has been used in a sand dune environment with great success for both survival and growth rates (Bakewell *et al*. 2009).

What is long-stem planting ?

The long-stem planting method is an innovative way of planting that can result in higher survival and growth rates with minimal post-planting care. Using the long-stem method, seedlings are grown in pots for 10-18 months, so that they develop long woody stems. These seedlings are then planted with about three-quarters of their length below the soil surface, approximately 1 metre deep, which results in much of the woody stem being covered with soil.

The deep planting protects the roots from substantial changes in soil temperature, allows the plant access to deeper soil moisture and reduces competition from weeds. Once planted, the seedling develops roots from the buried stem and leaf nodes. This promotes the development of a robust root network which gives the seedling a greater chance of survival.

The long-stem planting method has challenged two long-held horticultural principles:

1. Large plants should not be grown in small containers as they will become root bound, thereby hindering the future growth of the plant.

The long-stem method uses plants that are relatively tall for the size of the pot they are grown in. This is achieved through the use of standard pots. In addition, slow-release fertilisers are placed in the centre of the pot so that the plant does not need to grow extended roots in search of further nutrients. This prevents the plant from becoming root bound in the pot and allows for the development of healthy roots when planted in the ground.

2. Stems of seedlings should not be planted below the surface of the soil as this subjects them to fungal attack and disease.

The long-stem planting method appears to challenge this long-held horticultural belief since most of the seedling's woody stem is planted underground, yet survival rates of these seedlings have been higher than that of those planted using traditional methods. While this has been observed during both scientific and field trials, further research is needed to determine why the stems of long-stem plants are not prone to disease and fungal attack.

Field trials using the long-stem method have included a variety of native species to demonstrate that seedlings can not only be grown successfully when these two traditional principles are not followed, but can have survival and growth rates that exceed those planted using traditional planting methods. It would appear that most, if not all, hard tissue plants are suitable for use in long-stem planting (Hicks 2010, pers. com.,nd).

Gmelina leichhardtii

How the long-stem method was developed

The long-stem planting method was pioneered by Bill Hicks for use on river banks in the Hunter Valley. Bill wanted to establish native species on river banks instead of willows (*Salix* spp) as was the recommended practice at the time. The spread of willows had become an environmental problem, impacting on the ecology of river systems and wetlands in much of temperate Australia. Willows affect the flow of water and reduce biodiversity. Willow species are now listed by the Australian Government as Weeds of National Significance (1998), and are no longer recommended for planting.

The riparian environment presents challenges for the planting of natives using traditional planting methods as the seedlings are continuously affected by changes in water levels, river flow, and processes of erosion and sedimentation. Once the long-stem planting method had been developed and tested, Bill conducted workshops throughout New South Wales, Victoria and South Australia to educate communities about the use of the method and its value in revegetating cleared, disturbed and hostile natural areas. Individuals and groups have since conducted scientific field experiments to examine the effectiveness of the method in a range of habitats, including rainforest, sand dunes and saline sites. The Australian Plants Society Central Coast Group have used the method for a number of years at their Bushcare site in Katandra Reserve. With assistance from Bill Hicks the method was altered slightly to suit:

- the local rainforest conditions at Katandra;
- the number of plants required each year; and
- the tools and materials available to the Bushcare group.

The long-stem method has now been used throughout Australia and overseas, including revegetation projects in New Mexico.

Clockwise from top left: Equipment and seedlings ready for planting, long-stem seedlings ready for planting with bottles of water, materials needed for potting.

Step-by-step guide to long-stem planting

The long-stem planting technique contains a number of steps which are considered to be important to the overall success of the method. However, once you have tried the technique you may be able to make changes in order to suit your site's particular needs.

Tools and materials suggested/required for plantings are:

- **seedlings or seeds** for revegetation projects, local provenance seeds or seedlings are recommended as they will provide a range of ecological benefits including providing habitat for local fauna, and maintaining local genetic integrity.
- **pots** use standard 50 mm square-cornered pots.
- **potting mix** use a good quality mix for natives. Large pieces can be sieved from the mix and used at the bottom of the pot to stop the mix from escaping.
- **trace elements** for native plants (e.g. Micromax^{R}).
- **slow-release fertilisers** suitable for native plants. Two types are required: a 5-6 month slow-release fertiliser; and an 8-9 month slow-release fertiliser.
- **potting racks** to hold the pots off the ground or bench while the seedlings are growing in your 'nursery'.
- **seaweed solution** use half-strength seaweed solution in a bucket of water to fully immerse the potted seedlings. This is recommended just before planting.
- **tools for planting** shovel, post hole digger or auger, or water lance.
- **water for planting** if a water supply is not available and the water needs to be carried to the site, the use of as little as 2 litres per plant has been successful, but more can be used if the sub-soil is dry.

Top left and right: half-fill pot and create a depression/hole for the fertiliser and seedling.

Centre left: place the fertilisers in the hole.

Centre right: select seedling.

Bottom: place potted seedling in rack.

How to grow the long-stem seedlings

1. Use seedlings that have been grown in seed-raising trays using conventional methods, or collect the seedlings from a suitable location. Within Katandra Reserve, for example, small seedlings were collected from pathways and fallen logs in the rainforest, where there was little chance the seedlings would survive to become adult trees. Collecting seedlings from the natural environment ensures that you have the strongest seedlings which have survived where others have died. These stronger seedlings transplant more successfully. Collecting seedlings from the natural environment also allows you to choose from a greater variety of species which may be representative of all layers of the forest canopy. Conditions apply to the collection of plant material in reserves and national parks. Please check with your local authorities prior to collecting seeds or seedlings.
2. Thoroughly mix the trace elements through the potting mix (5 ml of trace elements per 7.5 litres of potting mix).
3. Half fill the pots with the prepared potting mix, placing the larger sieved pieces at the bottom.
4. Create a depression deep enough to hold the slow-release fertiliser. This depression can be made with a pen or stick with a diameter of approximately 1.5 cm. Place the fertilisers in the well (half a teaspoon of 8-9 month slow-release fertiliser, then quarter of a teaspoon of 5-6 month slow-release fertiliser). Gently place the seedling in the pot, taking care not to damage the fine hair roots. Carefully fill with potting mix and tap the bottom of the pot to settle the potting mix and improve contact between the potting mix and the roots. Top up the rest of the pot with potting mix. Water the seedling thoroughly and add more potting mix if necessary.
5. Place the pots on 'potting racks' so that they do not have direct contact with the ground or table. The potting racks provide a space between the bottom of the pots and the ground/table that result in the roots being 'air pruned'. This means that when the roots reach the outside of the pot they dry off (aerial pruning) and stop growing. This allows the roots to spread out into the surrounding soil and form a strong network when the seedling is planted.

Top left: dig hole with auger.

Top right: pour 1 litre of water into the hole and allow to drain before placing the seedling.

Centre: gently backfill the hole using water to settle the soil and eliminate air pockets. Then build up dish-shaped depression.

Bottom: add remaining water.

6. Select a suitable place for the seedlings to grow in your nursery. Choose the location to suit the species you are growing. Generally a sunlit position is recommended to encourage strong stem and leaf growth.
7. Water seedlings regularly and rotate the pots periodically to ensure all plants get an equal amount of water and sunlight.
8. Seedlings can take between 10 and 18 months to reach a suitable height for long stem planting. Seedlings should reach 1 metre during this time, however this would depend on the plant species' natural growth habit.
9. Soak the seedlings (still in their pots) the night before planting in a half-strength seaweed solution to ensure the root ball is thoroughly wet. This saturates the potting mix and assists in stimulating root development once planted.

How to plant using the long-stem method

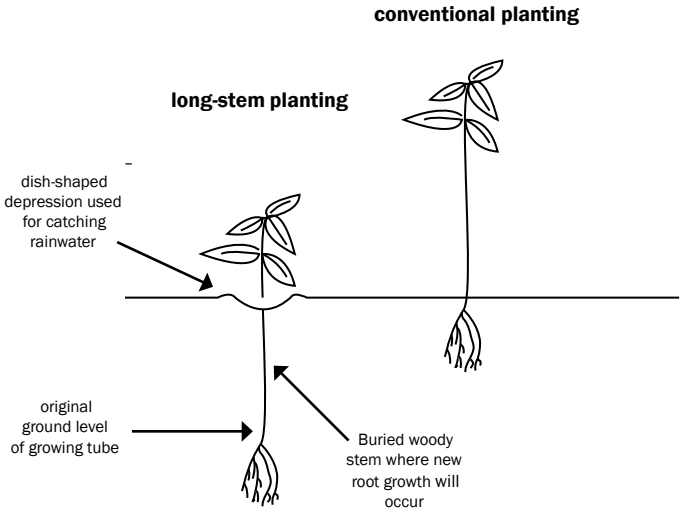
1. Dig holes that are deep enough to allow three-quarters of the plant to be buried. The use of power tools such as a soil auger in heavy clay may result in smooth walls in the hole, these may need to be roughened slightly to allow the roots to penetrate the smooth walls more easily.
2. Pour approximately 1 litre of water into the hole and allow it to soak in.
3. Prune side branches or large leaves from the lower portion of the stem that impede placement of the seedling in the hole when planting.
4. Place the plant in the hole and backfill carefully using soil and water alternately to ensure that no air pockets are left. This is important to prevent the roots from drying out.
5. Create a dish-shaped depression around the stem of the plant and add the remaining water. The depression will assist in catching any rain.
6. Generally no further maintenance is required. Since the root ball will be below the root zone of most weeds, competition from weed roots will be minimal. In moist environments, vine growth may need to be controlled.

Clockwise from top left: long-stem seedling before planting, close-up of roots developed from buried part of stem with a white line marking ground level, demonstration of original ground level and growth of roots from buried stem.

The original Bill Hicks method of long-stem planting differs slightly from the step-by-step method described above as he had a supply of water at his planting sites. The original method sourced water from the nearby stream using a water pump and then a water lance was used to dig the hole and thoroughly wet the soil. In soils prone to collapse, such as sand, a tube was used to support the hole around the lance. The plant was then placed into the tube and the plastic tube carefully removed. Water from the stream was used to water the seedlings in.

This original method of long-stem planting came out of a need to plant the seedling deep enough into the river bank so they would not be washed out during flooding in the riparian environment. While doing this Bill realised that the survival and growth rates were enhanced.

Bill grew plants from seed he collected from local sources. Shortly after germination seedlings were planted out into separate pots using the long-stem method and grown for the 10-18 month term as described above.



Above: Jessica planting a seedling at Katandra Reserve, Holgate, in 2004.

Below: Jessica next to the same plant to her left in 2009. Notice the general regeneration of the site due to long-stem planting.

General benefits

The benefits of the long-stem planting method are significant and include advantages which are of great assistance to bush regenerators and others interested in plant survival.

Firstly, the long-stem method creates an older, stronger seedling for planting. This is due to the consistent nutrients, air pruning and longer nursery period. If the seedling is also sourced from the natural environment through collection it has the added advantage of having survived the natural culling process of its local environment. This produces a much stronger plant than an ordinary seedling and increases its survival rate.

Another notable benefit is that the deeply-planted root ball is insulated from the substantial changes in soil temperature and moisture compared with traditional plantings where the plant roots are close to the soil surface.

In drier and saline environments, planting more deeply allows the root ball to be further away from the hot, dry or damaging salt-encrusted topsoils which increases the seedling's chances of survival.

Newly planted long-stem seedlings are also more stable in the ground than those planted using traditional methods. Deeper planting means that seedlings are better able to withstand soil erosion due to wind such as on sand dunes, or the effects of moving water such as flood conditions in riparian zones. The development of a deep root system allows the plant to bind greater amounts of soil, which is also why these plants are so stable in the ground.

Another benefit is the relatively small quantities of water required when planting, and that no further watering is required post-planting. This benefit is important on sites with limited water.

An unexpected benefit of long-stem planting has been the reduced loss from vandalism as it is more difficult to pull up a deeply-planted root ball (Hicks 2010, pers. com.,nd) and seedlings can survive trampling by people walking through planted areas (Bakewell et al. 2009).

Above: A long stem seedling two months after planting, along a creek bank at Umina Beach.

Below: the same seedlings three years later.

Finally, competition with shallow-rooted weeds is less likely to occur when seedlings are planted using the long stem method. The deeply-planted root ball accesses nutrients and soil moisture that is beyond the reach of shallow-rooted weed species. Given the reduced level of competition with shallow-rooted species, and that no follow-up watering is required, the after-planting care is minimised.

Riparian environment

As part of the original trials in the Hunter Valley, Bill Hicks grew seedlings to a height of up to 1.5 m and then planted 70-90 per cent of the plant below the soil surface. These trials revealed that three of the four species used exhibited greater growth rates using the long stem method. Bill showed that native plants could be reintroduced into riparian environments using the long-stem planting method where previous plantings trials had not been effective.

One of the main benefits of using the long-stem method within the riparian context is that the roots of seedlings are planted more deeply into the river bank therefore, the seedling is not washed away during a flood event. Long-stem planting also allows the root ball to be protected from extremes of temperature, including frosts and drying out that can damage plants which are planted using traditional methods.

Additionally, the restoration of riparian areas with native plants results in environmental benefits that cannot be achieved with exotic species. These benefits should not be overlooked. The use of native plants improves local biodiversity and does not impact negatively on the health of river systems.

Melaleuca quinquenervia.

Top: Newly planted White Beech (*Gmelina leichhardtii*) long-stem seedling.

Below: Katandra Reserve, Holgate, where long-stem planting has been trialled.

Rainforest environment

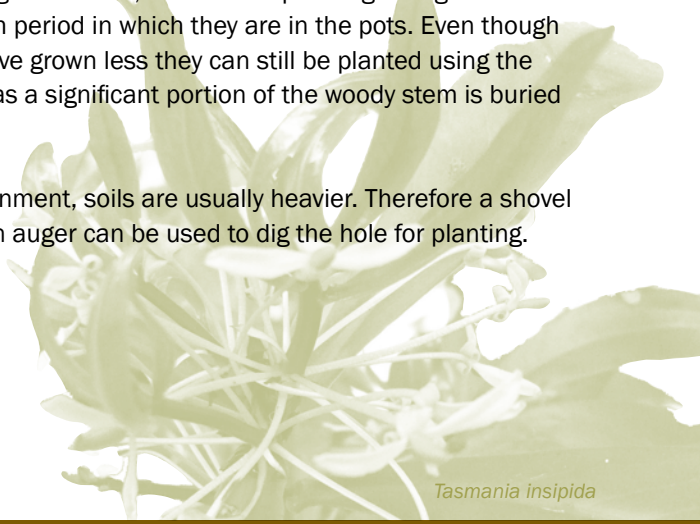
Research conducted in the rainforest at Katandra Reserve has indicated that some species show significantly greater growth rates when planted as long-stem seedlings (Chalmers et al. 2007). During these trials it was found that the growth of Cheese Tree, *Glochidion ferdinandi*, was significantly greater when planted using the long-stem method as opposed to traditional planting, while for Scentless Rosewood, *Synoum glandulosum*, the growth rate remained the same.

These trials at Katandra Reserve from 2002 to 2009 were conducted during an extended dry period. It is not known how long-stem planting would perform during a period of prolonged wet conditions. Field trials using a larger number of rainforest species are currently being undertaken to further study long-stem planting within rainforest environments.

Due to the great height of rainforest trees and the short seed 'shelf life' of many rainforest species it is often easier to collect seedlings from the forest floor in this environment. Collection of seedlings also provides benefits such as greater species selection and the harvesting of stronger individuals which have survived the germination process in forest conditions.

Rainforest species that are grown using the long-stem method show pronounced differences in growth habit, with some species growing to less than 1 metre in the 18-24 month period in which they are in the pots. Even though these species appear to have grown less they can still be planted using the long stem method as long as a significant portion of the woody stem is buried at planting.

Within the rainforest environment, soils are usually heavier. Therefore a shovel or a manual or petrol-driven auger can be used to dig the hole for planting.



Tasmania insipida

Top: Acacia long-stem seedling planted in a sand dune at Patonga Beach.

Below: Establishment of long-stem seedlings in the sand dune at Patonga Beach.

Coastal environment

It has been shown that in coastal areas long-stem planting of native sand dune plant species has been successful without the need for protective planting sleeves or follow-up watering. Seedlings planted in dune areas using the long-stem method experienced greater survival and growth rates than tube stock planted using the traditional planting method.

At Patonga Beach (Central Coast, NSW) the long-stem planting method has been used in trials of Coastal Wattle, *Acacia longifolia* var. *sophorae*, to restore the beach dune area. Results of these trials concluded that the long-stem method produced higher survival rates compared with plants using a traditional planting method (79 per cent compared with 53 per cent). Greater growth was also recorded in the long stem seedlings (19 cm mean stem growth as compared to 8 cm for the traditional method) (Bakewell et al. 2009). Also, long-stem seedlings survived trampling and breaking of stems and shoots due to human impact in the planted areas.

Long-stem plants in sand dunes benefit from having reliable soil moisture, limited root competition, and stable soil temperatures. The likelihood of the root ball being exposed in dunes as a result of sand movement is reduced when the long-stem planting method is used.

The advantages of using the long-stem planting method in this environment include the elimination of the need to build structures around the seedlings to protect them and the need for post-planting irrigation. This can significantly reduce the costs associated with regeneration work and the amount of follow-up maintenance required at the site.

In sandy environments, digging deep holes can usually be done with shovels or other hand tools.

Spinifex sp.

Top: Two and a half year old long stem seedlings planted in a high saline area near Muswellbrook (Yarrawa) continue to show significant growth.

Below: Long stem plantings in the saline environment.

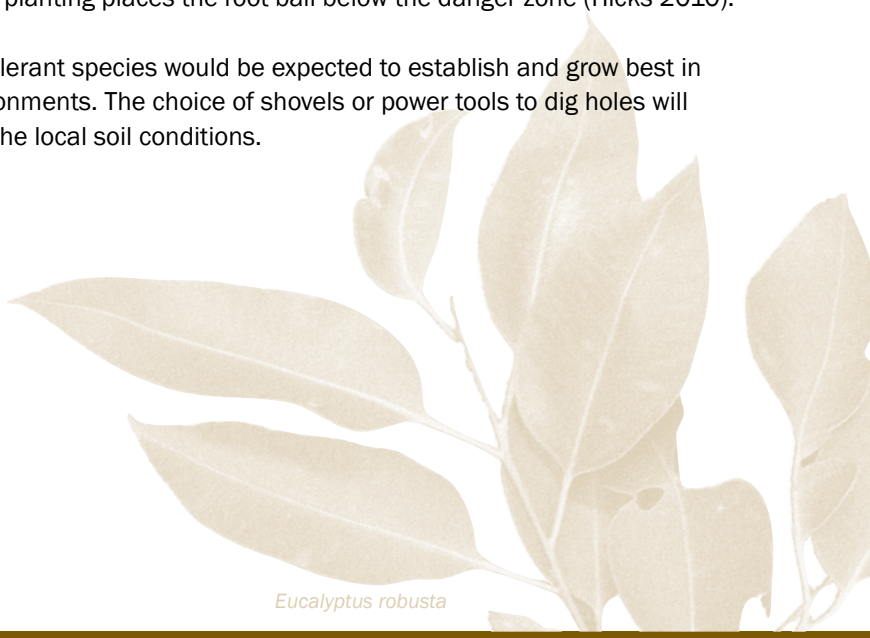
Saline environment

There has been great success in the use of long-stem planting within saline environments. After conducting trials within salt-affected lands in the Upper Hunter, Bill Hicks concluded that survival and growth rates of long-stem plantings had been outstanding (Hicks 2003). During these trials Bill planted 2,500 salt-tolerant seedlings. The trees survived a record drought, above-average temperatures and frosts as well as high salinity levels (Hicks 2003). It appears from these trials that virtually any native salt-tolerant species is suitable for long-stem planting.

The Hunter-Central Rivers Catchment Management Authority at Muswellbrook, NSW, has also used long stem planting at their saline site. Fresh water was used to water the seedlings in. At this site it was found that long-stem planting worked better on drier saline sites than wet saline ones and further research is needed to understand why.

The main benefit of this method in a saline environment is that the root system is planted below the salt-encrusted top layer of the soil. Soil salinity suppresses plant growth and creates a hot, dry and uninhabitable environment. As in other areas, deep planting places the root ball below the danger zone (Hicks 2010).

Local salt-tolerant species would be expected to establish and grow best in saline environments. The choice of shovels or power tools to dig holes will depend on the local soil conditions.



Eucalyptus robusta

Resources required

The actual cost and resource requirements for long-stem planting in comparison with traditional methods will vary between projects and site locations. The level of maintenance will be influenced by the environment being planted. The following table lists the resources that need to be considered when making comparisons between the two methods.

While long stem seedlings are kept for a longer time in the nursery, the advantages of reduced pre-planting site preparation, reduced cost of plant protection, reduced need for post-planting weed control and improved survival and growth rates are considered to be significant.

Resource	Long-stem method	Traditional method
Site preparation including soil preparation and ground cover weed control	Not usually needed. May be required for large plantings	Weed control and ripping may be required
Plant sleeves or other materials to protect against wind and frost	Not usually needed. Can be useful to protect from browsing animals	Required in some locations
Post-planting maintenance such as watering, weed control, fertilising, and mulching	Not usually needed	Weed control and watering usually required
Use of power tools/ equipment to dig holes	May be required in some environments	Usually not required for small scale projects, but may be used for larger projects to save time
Length of time to dig holes	Usually longer for long stem planting	Usually shorter for traditional method
Length of time that potted seedlings require fertiliser	Only initial slow-release fertiliser required. None required post-potting	3-6 months after potting
Length of time that potted seedlings require watering	10-18 months	3-6 months after potting
Length of time seedlings are in the nursery	10-18 months	6-12 months after potting

Conclusion

The use of the long-stem planting method provides an opportunity to improve the survival rate of native plants in the restoration of degraded ecosystems. Long-stem planting has shown to be successful in a wide range of environments and conditions.

The long-stem planting method has been shown to be a particularly successful method to use in environments where the surface soil conditions are not generally favourable for planting. This may be due to low moisture levels, high temperatures, high salinity, or surface ground movement due to flooding or human activities such as walking. In these cases the long-stem planting method offers the advantage of planting the seedling more deeply into the ground and away from these adverse effects. It is unclear whether the method provides the same advantages in environments where subsoil moisture conditions are unfavourable during drought.

We encourage others to trial the method at their work sites and would welcome feedback on the results.

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Hicks B. (2003). Revolutionary approach to tubestock planting drops natives securely into hostile territory. Ground Cover, Issue 43, Feb 2003. Grains Research Development Corporation, Canberra.



For further information

Australian Plants Society Central Coast Group: www.australianplants.org/longstem.htm
Hunter-Central Rivers Catchment Management Authority: www.hcr.cma.nsw.gov.au
Bill Hicks Longstem Tubestock DVD: www.norkhiltechnologies.com
NSW Environmental Trust: www.environment.nsw.gov.au

Appendix F. DPI Vehicle & Machinery Clean Down Guide

Department of Primary Industries
and Regional Development

NSW Department of Primary Industries and Regional Development Management Guide

Vehicle and Machinery Clean Down Procedures

April 2025

Published by the Department of Primary Industries and Regional Development

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More information

Department of Primary Industries and Regional Development

Invasive Species Biosecurity, Weeds Biosecurity team.

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Cover image: NSW Department of Primary Industries and Regional Development.

List of acronyms

DPIRD – Department of Primary Industries and Regional Development
LLS – Local Land Services
NSW – New South Wales
QLD – Queensland
VIC – Victoria
SA – South Australia
WA – Western Australia
TAS – Tasmania
NT – Northern Territory
ACT – Australian Capital Territory

Glossary of terms

Authorised officer – officers employed by the DPIRD or a local control authority that have been appointed as an authorised officer under Section 361 or 372 under the NSW *Biosecurity Act 2015*.

Biosecurity matter – means:
(a) any living thing, other than a human, or
(b) any part of an animal, plant or living thing, other than a human, or
(c) a product of a living thing, other than a human, or
(d) a disease, or
(e) a prion, or
(f) a contaminant, or
(g) a disease agent that can cause disease in a living thing (other than a human) or that can cause disease in a human via transmission from a non-human host to a human, or
(h) any thing declared by the regulations to be biosecurity matter.

Carrier – means anything (whether alive, dead, or inanimate, and including a human) that has, or is capable of having any biosecurity matter on it, attached to it, or contained in it.

Dealings – means:
(1) Deal with biosecurity matter or a carrier, or engage in a dealing with biosecurity matter or a carrier, includes any of the following —
(a) keep biosecurity matter or a carrier,
(b) have possession, care, custody or control of biosecurity matter or a carrier,
(c) produce, manufacture or supply biosecurity matter or a carrier,
(d) import biosecurity matter or a carrier into the State,
(e) acquire biosecurity matter or a carrier,
(f) buy, sell, or dispose of biosecurity matter or a carrier,
(g) move biosecurity matter or a carrier,
(h) release biosecurity matter or a carrier from captivity,
(i) use or treat biosecurity matter or a carrier for any purpose,
(j) breed, propagate, grow, raise, feed or culture biosecurity matter or a carrier,
(k) experiment with biosecurity matter or a carrier,
(l) display biosecurity matter or a carrier,
(m) enter into an agreement or other arrangement under which another person deals with biosecurity matter or a carrier,
(n) agree to deal with biosecurity matter or a carrier,
(o) cause or permit a dealing in biosecurity matter or a carrier to occur,
(p) anything prescribed by the regulations as a dealing with, or engaging in a dealing with, biosecurity matter or a carrier.

(2) An occupier of land is taken to have possession of any biosecurity matter or carrier on that land unless the occupier establishes that the biosecurity matter or carrier was in the possession, care, custody, or control of another person.
(3) The regulations may specify circumstances in which a person is taken not to be dealing with or engaging in a dealing with biosecurity matter or a carrier for the purposes of the Act or any provision of the Act.

Local control authority – is the council of a local government area unless the weed control functions for that area have been conferred on a county council or joint organisation (within the meaning of the *Local Government Act 1993*) under any other Act (see Section 370 of the NSW *Biosecurity Act 2015*).

Regional priority weeds – are weeds that are regulated through the general biosecurity duty and described in the Regional Strategic Weed Management Plan for each LLS region.

Reproductive material – includes any part of a plant that is capable of growing to become a new plant (e.g. a bulb, rhizome, a stolon, a tuber, a stem, leaf cuttings or stem or root fragments).

State priority weeds – are weeds listed in the NSW *Biosecurity Act 2015* as prohibited matter, regulated under a biosecurity zone or with a mandatory measure that prohibits sale or import in the NSW *Biosecurity Regulation 2017*, or subject to a Biosecurity Control Order under the Act.

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Introduction

Correct and thorough clean down of vehicles and machinery reduces the risk of spreading state and regional priority weeds, and soil borne pests and diseases.

These clean down procedures have been developed to promote a consistent approach to cleaning vehicles and machinery across NSW. They have been prepared specifically to minimise the introduction and spread of weeds, including their seeds and other reproductive material.

The procedures also aim to assist those undertaking the cleaning and inspection of vehicles and machinery to understand their role in helping drivers and operators to discharge their general biosecurity duty.

General biosecurity duty

When vehicles and machinery move biosecurity matter, like weed seeds and other reproductive material, they are regulated as carriers under the NSW *Biosecurity Act 2015*. Any person who deals with biosecurity matter or a carrier of biosecurity matter has a legal responsibility to take reasonable and practical measures to prevent, eliminate or minimise the risk of those dealings having an adverse impact on the economy, environment, or community. This legal responsibility is referred to as a person's general biosecurity duty.

Owners or operators of vehicles and machinery can discharge their general biosecurity duty by cleaning their vehicle or machinery in accordance with the procedures identified in this document. It is an offence for a person not to discharge their general biosecurity duty. Fines and charges may apply.

How weeds spread with machinery

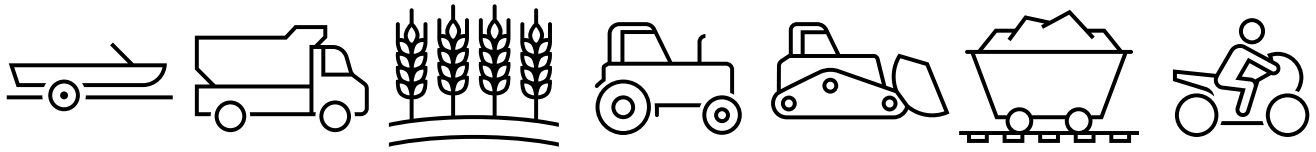
Weed fragments, seeds or other reproductive material can be carried by vehicles and machinery via animal transport and livestock vehicles (including on the feet/hooves, fur and in manure of animals), mud or dirt, radiators and other engine parts, shoes and clothing, tools and equipment, in the interior and on tyres and mudguards.

High risk vehicles, machinery, and equipment

Some vehicles, machinery and equipment have been identified as posing a high risk when it comes to the movement of weeds. Identified high risk vehicles, machinery and equipment include:

- aquatic weed harvesters
- boats and other personal watercraft

- cars, trucks, and four-wheel drives
- dozers, excavators, graders, and other heavy machinery
- farm implements such as slashers, ploughs, mulchers, and post-hole diggers
- grain harvesting machinery
- livestock trucks
- tractors, all-terrain vehicles, and other farm vehicles
- wheeled loaders and other mining and construction equipment.



Parthenium weed carriers

Grain harvesting machinery and equipment, and mineral exploration drilling rigs, are prohibited from entering NSW from QLD, unless accompanied by a Biosecurity Certificate issued by NSW DPIRD that states that:

- the machinery has been inspected at an approved facility
- the machinery has been cleaned down in accordance with Schedule 1 of the *Biosecurity Order (Permitted Activities) 2019*
- a Record of Movement has been submitted.

This is to minimise the risk of them introducing parthenium weed (*Parthenium hysterophorus*) into NSW from QLD, where it affects more than 60 million hectares.

Tips for reducing the risk of spread

To reduce spreading weeds via vehicles, machinery, and equipment, you can:

- avoid driving off-road (e.g. through paddocks) in areas known to contain state or regional priority weeds or in other areas that present a risk of vehicle or machinery contamination
- remove soil and plant material from clothing and footwear before stepping into vehicles

- clean vehicles and machinery suspected of carrying soil or plant material before leaving a site
- begin work in clean areas or in areas with the least number of weeds and work towards infested or high-density areas
- prioritise weed control efforts along roads, laneways, and buffer zones
- where possible, work infested areas separately and clean down equipment thoroughly before moving to another area
- avoid slashing and other work in infested areas during peak seed production times
- secure loads (e.g. grain, fodder) if you suspect they contain weed seeds
- avoid driving in high risk areas where state or regional priority weeds are present, especially in wet or dewy conditions.

Figure 1: Cleaning footwear after working in areas infested with high risk weed species.

High risk weed species and areas

The weeds listed in the table 1 (below) are state priority weeds, are either Prohibited Matter, Biosecurity Order or Biosecurity Zone weeds under the NSW *Biosecurity Act 2015*. Due to their dispersal mechanisms, are at high risk of being spread by vehicles, machinery and equipment if they are not thoroughly cleaned in accordance with these procedures.

It is important to note however, that there are other state and regional priority weeds (not listed below) that may also be dispersed by vehicles and machinery.

Table 1: State listed high risk weed species and known infestation locations.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
Alligator weed (*Alternanthera philoxeroides*)	Yes	QLD, VIC, and NSW (Sydney metropolitan area and many regional areas)	Plants spread from parts of the plant that break off, both on land and in water. Often with excavation machinery, boats and trailers, the movement turf, hay, soil, landscape supplies, and attached to livestock.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
Bitou bush and boneseed (*Chrysanthemoides monilifera* subsp. *rotundata* and subsp. *monilifera*)	Yes	QLD and NSW (Mostly in coastal habitats except for Western NSW)	Seeds may be spread in contaminated soil and gravel, on tyre treads, by soil adhering to vehicles and equipment, on boots, by water, wind and animals.
Black knapweed (*Centaurea* x *moncktonii*)	Yes	SA, TAS, VIC, and NSW (Tenterfield Shire Council area)	Seeds are spread by wind, water, animals, people, and vehicles. It can grow from root fragments which are spread by machinery, soil movement or water.
Bridal veil creeper (*Asparagus declinatus*)	No	WA, SA, and VIC	Rhizomes and tubers spread in dumped garden waste and soil movement. Seeds can spread in water and garden waste, or via earthmoving equipment.
Broomrape (*Orobanche* spp. exc. *O. cernua* var. *australiana* and *O. minor*)	No	SA	Seeds spread by wind, livestock, vehicles, clothing, flood waters and contaminated fodder, seed, and soil.
Chinese violet (*Asystasia gangetica*)	Yes	QLD and NSW (Currumbin in QLD and the North Coast, Hunter, and Greater Sydney LLS regions in NSW. Particularly in Port Stephens, Newcastle, and Lake Macquarie)	Plant parts and seeds can be spread by earth moving machinery, slashers, mowers, and vehicles.
Eurasian water milfoil (*Myriophyllum spicatum*)	No	Not known to occur in Australia.	Seeds and plant fragments are spread in water, by birds and by human activities such as boating.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
			May be traded as an aquarium plant.
Frogbit and spongeplant (*Limnobium* spp.)	Yes	QLD and NSW (Frogbit only)	Seeds and fruit develop in the water or in the mud which could be transported by vehicles. Has been traded as an ornamental plant for ponds. Also spreads by plant parts. Seedlings are moved by water flow, wind and can attach to birds or watercraft.
Gamba grass (*Andropogon gayanus*)	No	WA, NT, and QLD (As far south as Rockhampton)	Seeds are spread by wind, water, movement of contaminated hay, sticking to mud attached to vehicles, slashers and other machinery.
Hawkweeds (*Hieracium* and *Pilosella* spp.)	Yes	TAS, VIC, and NSW (Snowy Monaro Regional Council and Snowy Valleys Council areas)	Seeds can be spread by wind, water, contaminated fodder, garden waste and hiking equipment. Also spreads vegetatively.
Hydrocotyl (*Hydrocotyle ranunculoides*)	No	WA	Seeds, stolon, and root fragments can be spread by water movement or on vehicles and machinery.
Karoo acacia (*Vachellia karroo*)	Yes	WA, VIC, QLD, and NSW (As far south as Toowoomba QLD and Bega Valley Shire Council area in NSW)	Seeds spread by wind, water, and animal droppings.
Kochia (*Bassia scoparia* exc. subsp. *Trichophylla*)	No	WA, SA, and TAS	Branches with weeds, break off the shrub and get blown in the wind like tumbleweed. Small seeds may be spread by vehicles and machinery.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
Koster's curse (*Clidemia hirta*)	No	QLD (Recorded as far south as Tully)	Seeds spread by water machinery and vehicles. Also spread by fruit-eating birds and mammals.
Lagarosiphon (*Lagarosiphon major*)	No	Historic records only. No known infestations in Australia.	Spreads in waterways via stem fragments and creeping underground stems. Usually introduced into new water bodies by dumped aquarium waste, however, could be moved by boats and other aquatic vessels.
Mexican feather grass (*Nassella tenuissima*)	Yes	VIC, ACT, TAS, WA, and NSW (Leeton, Bathurst, and Sutherland Shire Council areas)	Seeds spread on clothing, livestock, vehicles, by contaminated seed and fodder.
Miconia (*Miconia* spp.)	Yes	QLD and NSW (North Coast region)	Seeds are spread by birds, small mammals and by humans on shoes, clothing, and on tyres. Also spreads vegetatively.
Mikania vine (*Mikania micrantha*)	No	QLD (Recorded as far south as north QLD)	Seeds are spread by wind, water, animals, and machinery. Also spreads vegetatively.
Mimosa (*Mimosa pigra*)	No	WA, NT, and QLD	Seeds are spread by water, stock and feral animals (in manure and fur) and humans (attached to clothing and mud stuck to vehicles, boats or machinery).
Parkinsonia (*Parkinsonia aculeata*)	Yes	WA, NT, SA, QLD, and NSW (Western and North West LLS regions of NSW)	Seeds are spread by water, animals (that eat the seeds), contaminated soil, and mud attached to machinery, vehicles, animals, and footwear.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
Parthenium weed (*Parthenium hysterophorus*)	Yes	QLD and NSW (Especially the QLD Central Highlands and along the Newell Highway in the North West LLS region of NSW. See Figure 2)	Seeds spread by wind, water, animals, vehicles, machinery (harvesters and bulldozers), clothing and contaminated agricultural feed.
Prickly acacia (Vachellia nilotica)	No	WA, NT, SA, and QLD (Recorded as far south as Beaudeasert - considered to be widespread in QLD)	Seeds spread primarily by livestock that eat mature pods, but also by vehicles and water.
Rubber vine (*Cryptostegia grandiflora*)	Yes	QLD, NT, WA, and NSW (Western LLS region of NSW)	Seeds spread by water, wind and attached to animal fur or soil/mud stuck to machinery.
Siam weed (*Chromolaena odorata*)	No	QLD and NT (Recorded as far south as City of Moreton Bay Council)	Seeds can attach to vehicles, machinery, clothing, footwear, and animals.
Spotted knapweed (*Centaurea stoebe* subsp. *micranthos*)	No	ACT	Seeds are spread by wind, machinery, vehicles, birds, and other animals, in water, and as contaminants of agricultural produce (such as hay). Can grow from plant parts.
Tropical soda apple (*Solanum viarum*)	Yes	QLD and NSW (North Coast, Northern Tablelands and Hunter LLS regions)	Seeds spread by animals (especially in manure), water, contaminated fodder, and soil, or by sticking to vehicles and machinery.
Water caltrop (*Trapa* spp. - all)	Yes	NSW (Woody fruit and seeds traded in Greater Sydney region)	Seeds can be spread by waterbirds and other animals, fishing nets and traps, boats, clothing, and vehicles that go in the water.

Weed name	Recorded in NSW	Current known extent* (High risk areas)	How is it spread?
Water hyacinth (*Eichhornia crassipes*)	Yes	All states, except TAS and SA.	Seeds can be moved to new locations by water flows or via mud stuck to birds, machinery, and footwear. Plants can also be spread by contaminated fishing equipment, watercraft, and boat trailers.
Water soldier (*Stratiotes aloides*)	No	Not known to occur in Australia	Seeds and plant fragments spread in water. May be traded as an ornamental pond plant.
Witchweed (*Striga* spp. exc. *S. parviflora*)	No	WA, NT, and QLD (Recorded as far south as Hervey Bay)	Seeds spread by contaminated crop seed, wind, water, and soil attached to animals, machinery, tools, footwear, and clothing.
Yellow burrhead (*Limnocharis flava*)	Yes	QLD and NSW (Lismore City Council area)	Seeds are spread by water, mud stuck to vehicles and machinery, footwear, animals, and birds. Also spreads by plant parts.

* At time of publishing

For assistance and more information

To reduce the risk of transporting invasive plant material, it is highly recommended that you consult with local council weed biosecurity officers (NSW) or other relevant government agencies (interstate) prior to moving high risk machinery or equipment.

Each of the 11 LLS regions has a Regional Strategic Weed Management Plan and Regional Inspection Plan. The Regional Strategic Weed Management Plans are five-year plans that prioritise weeds in each region based on the risk posed by the weed and feasibility of coordinated control. The Plans articulate how communities and stakeholders work together to identify, respond to and manage the identified weeds. The Regional Inspection Plans outline the procedures for inspecting and monitoring locations, including high-risk pathways and sites.

More information about state and regional priority weeds and their current known distribution in NSW can be found on the NSW WeedWise website: weeds.dpi.nsw.gov.au.

Case study: Parthenium weed

Vehicles and machinery that have been used, driven, or sourced from the QLD are at high risk of being contaminated with parthenium weed (*Parthenium hysterophorus*) seeds.

In NSW, the majority of parthenium weed detections continue to occur along roadsides in the North West LLS region of NSW, particularly along the Newell Highway (as shown in Figure 2).

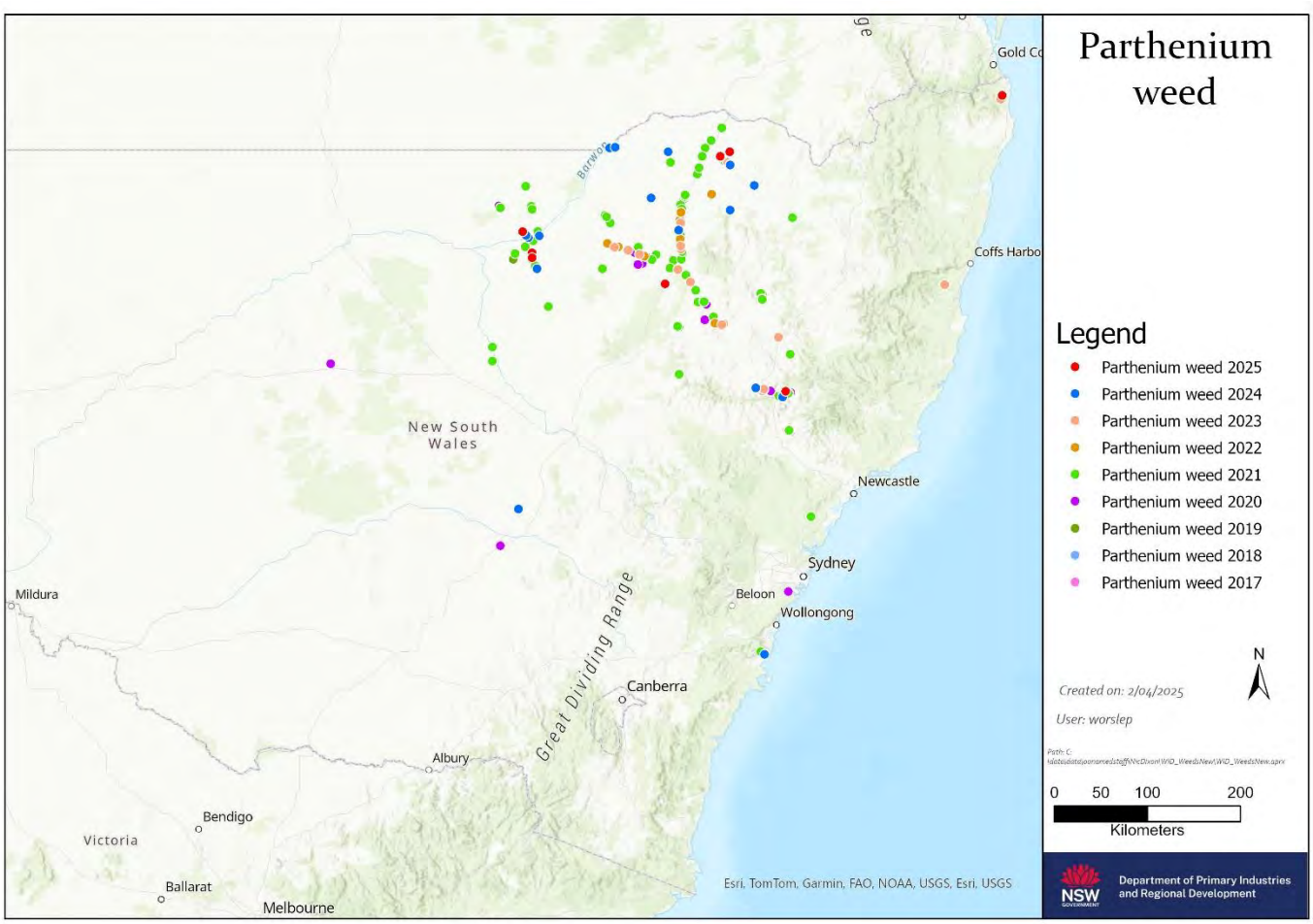


Figure 2: Parthenium weed (*Parthenium hysterophorus*) occurrences in NSW from 2017-2025.

It is suspected that these new weed incursions have resulted from contaminated vehicles, machinery or equipment entering NSW from infested areas in QLD. This is likely to be due to mud containing (parthenium weed seeds) drying and falling from vehicles as they travel along these routes, from QLD or one infested area to another destination.

Similarly, most parthenium weed infestations found on private property, have been linked to the movement of vehicles and machinery. Since 1982, around 40% of new parthenium weed incursions were associated with the introduction of headers, and a further 10% were from other vehicles/machinery entering private property (refer to Figure 3).

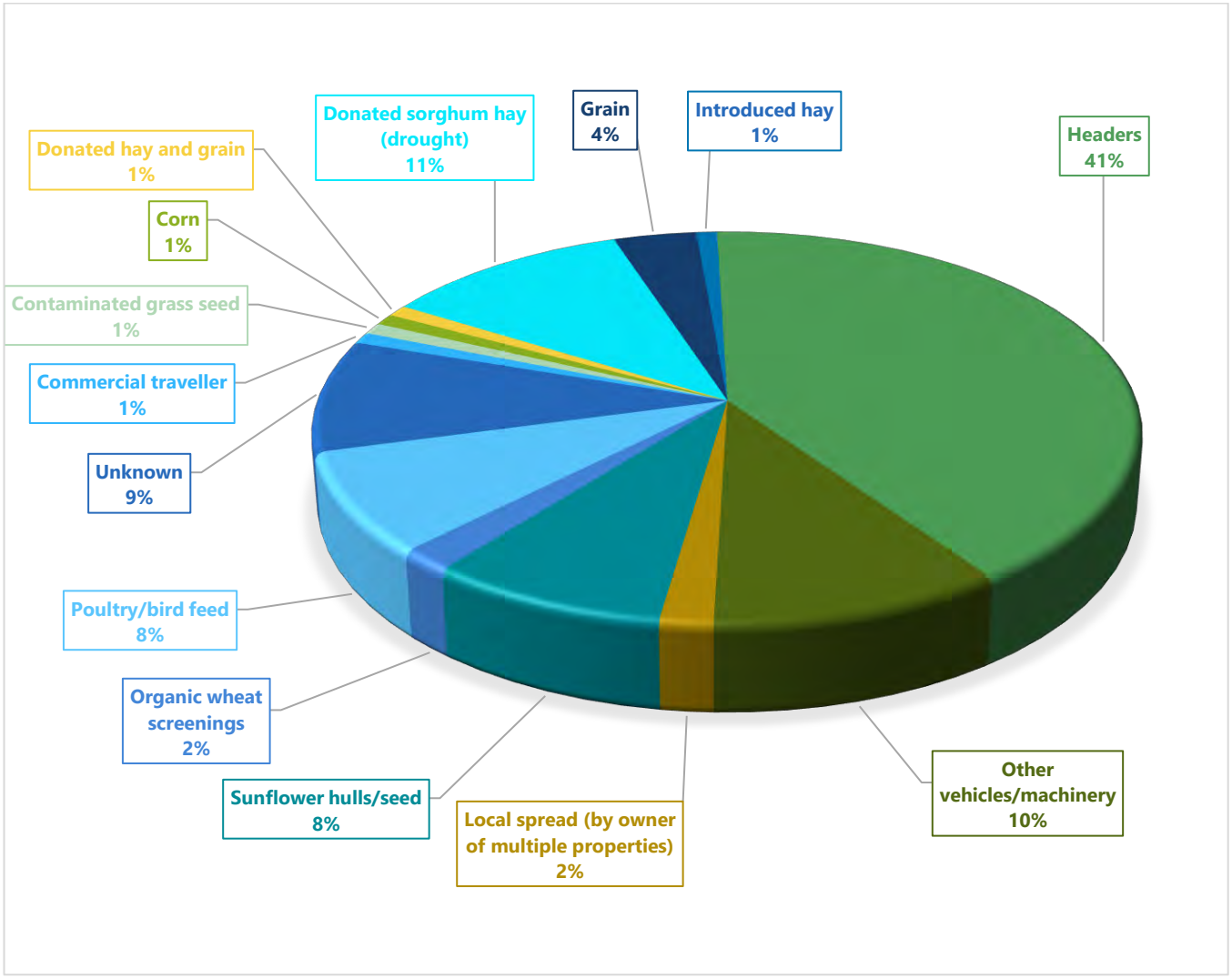


Figure 3: Sources of new parthenium weed (Parthenium hysterophorus) infestations on private properties from 1982-2023.

Clean down and maintenance sites

Cleaning vehicles and machinery before moving them to a different area helps prevent the spread of weeds to adjoining land, other parts of the property and along roads.

Choosing a mobile or field clean down site

When choosing a clean down site, consult the land manager about its location and select an area that will give the best possible results. You should:

- consider the site's run-off and ensure it is away from watercourses and drains to help prevent the spread of invasive plants and avoid grease and detergents polluting the water
- choose a relatively flat site to help prevent run-off and to ensure safety
- ensure the site can be easily identified for ongoing monitoring and notify the landholder of this location
- identify the site with a painted post, distinguishing landmark, or GPS record

- choose a well-grassed area (if possible) to reduce the amount of mud created during cleaning and so that the grass can complete with any weed seeds that may germinate
- choose a site close to the infested area to prevent further spread
- ensure that the clean down site does not cross the boundary of the infested property (unless the weed is also located on the adjoining property at similar or higher densities)
- ask the landholder/manger if you can conduct a small clean down at any existing sheds/washdown facilities before leaving the property.

Choosing a maintenance site

When maintaining, repairing, or disassembling vehicles and machinery for cleaning, select a hard surfaced area such as concrete or gravel (if possible). Selecting a firm surface will make it safer and easier to conduct work, remove parts, and monitor the site in the future. If similar work must be done in the paddock or on the roadside, mark the area for future monitoring and record its location.

> It is important to remember that reproductive material from state and regional priority weeds may fall off vehicles and machinery when maintenance work is conducted.

General clean down procedures

This section refers to general clean down procedures that should be referred to when cleaning any vehicle, machinery, or equipment. Specific clean down checklists for high risk vehicles, machinery and equipment are also provided later in this document.

Safety

Ensure all safety precautions are taken when conducting a clean down or your vehicle, machinery, or equipment, and refer to relevant operating manuals for specific safety instructions before cleaning. It is also important to:

- place the vehicle, machinery or equipment is in a safe position that is stable and immobile
- stop the engine, apply the park brake, chock the wheels, and lower all implements or secure/chock them if they need to be up for cleaning (e.g. the slasher)
- ensure the area is free of obstructions and objects that may cause injury (e.g. logs, power lines)
- have a qualified operator present if parts of the vehicle or machinery need to be moved during cleaning
- move the vehicle, machinery, or equipment with caution
- wear appropriate protective clothing like coverall clothing, a shock-proof hard hat, safety glasses or goggles and a fluorescent safety vest (if working near a roadway).

Suggested equipment

There are a range of things you can use to clean down your vehicle, machinery and equipment depending on what you have available to you and if the material is wet or dry matter. It is suggested to use a combination of the following equipment:

- leaf blowers
- brooms, brushes, cloths/rags, and a dustpan
- vacuum cleaner
- air compressor or cans of compressed air
- mobile water tanker, spray unit (ideally), or water pumped from a dam or cattle trough
- high-pressure water cleaner or pump
- garden hose (for small clean downs)
- washing machine
- flashlight
- endoscope or fiberscope
- step ladder
- general mechanic's tools.

Figure 4: Officer inspecting machinery.

General clean down guidelines

When cleaning any vehicles, machinery, or equipment, is it recommended to:

- examine the item to determine how much mud, soil and plant material has built up
- identify any areas that must be cleaned with compressed air (rather than water) and clean these first
- clean from the top down, starting with the upper body and cabin, then underneath the guards and body of vehicle/machinery, and finally any attachments or implements
- identify any areas that require special attention as outlined in the specific vehicle or machinery checklists (provided later in this document)
- clean all toolboxes and storage compartments
- check that all areas have been cleaned
- replace the guards and belly plates, if required
- move the clean vehicle or machinery carefully, avoiding re-contamination and if necessary, wash any remaining mud, soil or plant material from the tyres or tracks
- record the details of the cleaning on the appropriate forms or in the vehicle or machinery logbook
- present the vehicle or machinery to an inspector (if required)
- responsibly dispose of any plant material, seeds, dirt or mud by liaising with your local council Weed Officer.

> ### Remember!
>
> No clean down guidelines can detail all the parts to check because there are numerous different models and new models, different attachments (e.g. different types of blades on dozers), different modifications, either in the factory or by previous owners, varying conditions of the machinery (like rusted parts allowing entry of contaminants into sections that are usually sealed). Examine the item you are cleaning very carefully for any areas that could be contaminated, even if these areas are not listed in the guidelines and clean them thoroughly.

Training

Training is recommended for all people responsible for cleaning down vehicles or machinery.

Competency-based training is provided by registered training organisations through units such as AHCBIO203 – Inspect and clean machinery, tools, and equipment to preserve biosecurity. After completing this training, a person will be able to perform the tasks outlined in Table 2.

Table 2: Competencies required for satisfactory clean downs.

Element	Performance criteria
1. Prepare to inspect and clean machinery, tools and equipment	1.1 Confirm the work activity to be undertaken with supervisor 1.2 Identify health and safety hazards and risks and apply controls according to supervisor instructions and workplace procedures 1.3 Identify and select tools and equipment required according to supervisor instructions 1.4 Select, check, and use personal protective equipment and infection controls
2. Inspect machinery, tools, support vehicles and equipment	2.1 Ensure machinery is safe before inspection and ensure free moving parts are immobilised according to workplace and operating procedures 2.2 Check serviceability of tools and materials required for task 2.3 Inspect machinery and equipment for contamination according to workplace biosecurity procedures 2.4 Remove covers and guards safely 2.5 Identify contamination and cleaning requirements according to workplace biosecurity procedures 2.6 Report observed equipment faults to supervisor according to workplace procedures
3. Clean machinery, tools, equipment, and support vehicles	3.1 Select correct equipment and location of site for cleaning 3.2 Clean the machinery, support vehicles, tools, and equipment according to workplace biosecurity procedures 3.3 Replace guards and covers safely
4. Complete cleaning work	4.1 Dispose of waste materials according to workplace and environmental procedures 4.2 Record cleaning history on appropriate forms according to workplace procedures
5. Report inspection results	5.1 Document inspection results according to workplace procedures 5.2 Deliver inspection reports according to workplace procedures

To find out more information about this course, contact: invasives.training@dpird.nsw.gov.au

Specific clean down checklists

Cars, trucks, four-wheel drives, and trailers

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

Owner full name (if different from above):

Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

Check and clean the following sections of the vehicle/plant to ensure that they are clean and free of vegetative and soil material. Partial dismantling may be required.

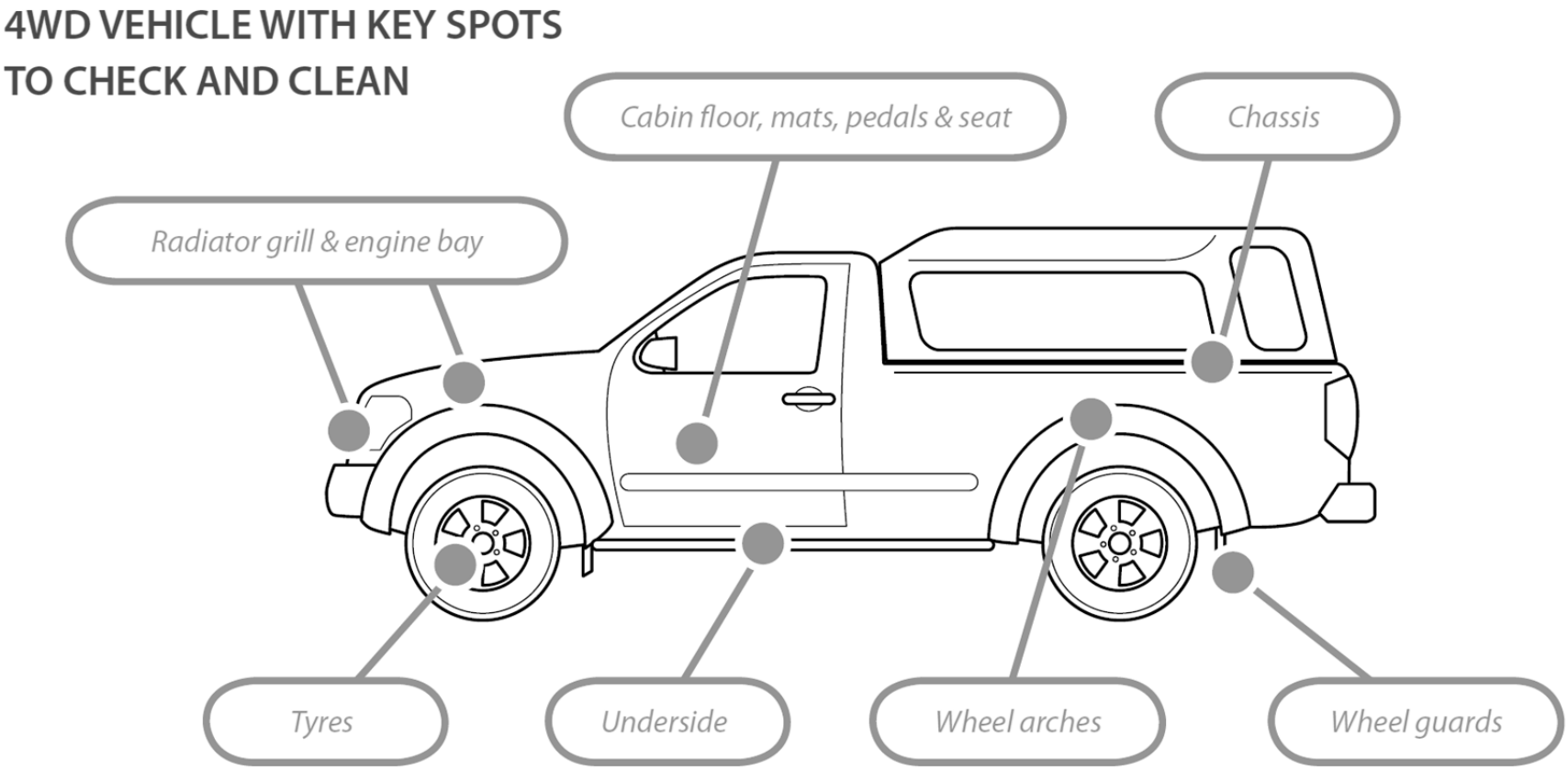


Figure 5: Four-wheel drive vehicle, check and clean spots (Source: Keeping it Clean, 2010).

CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 3: Clean down checklist for cars, trucks, four-wheel drives, and trailers.

Areas	Items	N/A	Not clean	Clean
Interior	Lights (particularly if unsealed or broken)	☐	☐	☐
	Dashboard	☐	☐	☐
	Air vents	☐	☐	☐
	Windowsills	☐	☐	☐
	All panels and inside access panels	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Foot wells	☐	☐	☐
	Floor drain plugs	☐	☐	☐
Boot	Carpet (check for deposits of hay, weed seeds, burrs and/or soil)	☐	☐	☐
	Spare tyre area	☐	☐	☐
	Recesses in the boot or rear of the vehicle	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Inside and outside box and tubular metal racks	☐	☐	☐
	Bumpers and brush guards	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads or step bars	☐	☐	☐
	Back or tray of trucks, Utes, and four-wheel drives	☐	☐	☐
	Canopy	☐	☐	☐
	Canopy bows	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen, tailgates, and doors	☐	☐	☐
	Grill	☐	☐	☐
Engine bay	Recess under the windscreen wipers	☐	☐	☐
	Top of transmission gearbox	☐	☐	☐
	Battery and battery box	☐	☐	☐
	Radiator	☐	☐	☐
	Air filters	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Air tanks	☐	☐	☐
Underside	Tyres	☐	☐	☐
	Tyre rims or wheel trims (covers)	☐	☐	☐
	Dual bogie wheels	☐	☐	☐
	Wheel arches, fender wells and flares	☐	☐	☐
	Mudflaps	☐	☐	☐
	Spare tyres (often suspended underneath)	☐	☐	☐
	Support and cross members	☐	☐	☐
	Chassis	☐	☐	☐
	Axles and differentials	☐	☐	☐
	Walls and sides	☐	☐	☐
	Under tailgates	☐	☐	☐
	Floor	☐	☐	☐
	Wheels arches	☐	☐	☐
	Tyres	☐	☐	☐
	Tyre rims or wheel trims (covers)	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Lights and reflectors	☐	☐	☐
	Greece points	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	Winch cable and drum	☐	☐	☐
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐

> CHECK, CLEAN, RECHECK – Remember the key to successful cleaning is more than just ticking off a checklist. You should be thorough, systematic, and consistent.

General comments and photos

[Add general comments and photos here]

Declaration

I declare that:

1. the inspection details; vehicle, machinery, plant, and equipment details; and transport details provided on this document are true and correct
2. I have systematically and thoroughly checked and cleaned the vehicle, machinery, plant, and equipment identified on this document, in accordance with the hygiene checklist above
3. the information recorded on the checklist above and in the general comments section of this document are true and correct
4. to the best of my knowledge, the vehicle, machinery, plant, and equipment cleaned in accordance with this checklist do not pose a significant weed biosecurity risk
5. I agree to this checklist content being retained, stored, or managed by the Department or an authorised officer, whether in hard copy or digitally
6. I release the Department, authorised officers and the State of NSW from any liability they may have to me in connection with this clean down checklist.

Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Compactors, dump trucks, and wheeled loaders

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

Owner full name (if different from above):

Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

Check and clean the following sections of the vehicle/plant to ensure that they are clean and free of vegetative and soil material. Partial dismantling may be required.

> CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 4: Clean down checklist for compactors, dump trucks and wheeled loaders.

Areas	Items	N/A	Not clean	Clean
Cabin	Cabin roof and walls (inside and out)	☐	☐	☐
	Inside light covers (particularly if unsealed or broken)	☐	☐	☐
	Dashboard	☐	☐	☐
	Air vents and air conditioning filter	☐	☐	☐
	Door rubbers and behind internal door panelling	☐	☐	☐
	Windowsills	☐	☐	☐
	All panels, inside access panels and behind wall lining	☐	☐	☐
	Inside the joystick control housing	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Under the seat, including the rubber seat shroud	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Carpets and mats	☐	☐	☐
	Rubber pedal covers (remove and clean/check)	☐	☐	☐
	Foot wells	☐	☐	☐
	Under any false floor/non-affixed floor panels	☐	☐	☐
	Floor drain plugs (flush if possible)	☐	☐	☐
Exterior	Ladder to the cabin	☐	☐	☐
	Inside and outside box and tubular metal racks	☐	☐	☐
	Bumpers and brush guards	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads or step bars	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen	☐	☐	☐
	Grill (outside and inside)	☐	☐	☐
Engine bay	Radiator and oil cooler (ensure fin/core is clean)	☐	☐	☐
	Under non-affixed engine covers	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Inside hollow support frameworks	☐	☐	☐
	Engine cover and rubbers	☐	☐	☐
	Engine block and between tappet covers	☐	☐	☐
	Engine mounts, sump, and engine block	☐	☐	☐
	Batteries and battery boxes	☐	☐	☐
	Recess under the windscreen wipers	☐	☐	☐
	Air filter pre-cleaner	☐	☐	☐
	Air filter	☐	☐	☐
	Air tanks	☐	☐	☐
	Inside fan belt flywheels (harmonic balancer)	☐	☐	☐
Underside	Tyres (especially in cracks and splits)	☐	☐	☐
	Inside each cleat/boot	☐	☐	☐
	Wheel rims (inside) and brake drums	☐	☐	☐
	Dual bogie wheels	☐	☐	☐
	Wheel arches, fender wells and hollow support frameworks	☐	☐	☐
	Mudflaps	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Spare tyres	☐	☐	☐
	Belly plates	☐	☐	☐
	Support and cross members	☐	☐	☐
	Universal joints	☐	☐	☐
	Chassis rails	☐	☐	☐
	Axles and differentials	☐	☐	☐
	Inside all wiring harnesses	☐	☐	☐
	Under hydraulic looming	☐	☐	☐
	All surfaces of the oil and fuel tanks/cells	☐	☐	☐
Front end and bucket/blade (Compactors and wheeled loaders)	Behind housing cover plate and around hydraulics	☐	☐	☐
	Cutting teeth (remove from bucket)	☐	☐	☐
	Behind non-affixed and spot-welded wear plates	☐	☐	☐
	In any cracks, splits, or repaired areas on bucket	☐	☐	☐
	Bucket push arms especially hollow areas and drainage points	☐	☐	☐
Dump tray (Dump trucks only)	All surfaces	☐	☐	☐
	In any cracks, splits, or repaired areas	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Rubber mounts under the tray	☐	☐	☐
Other	Toolboxes (inside and outside), ladders, and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	All surfaces of oil tank (often near ladder to cabin)	☐	☐	☐
	Under non-slip checker-plate surfaces	☐	☐	☐
	Hollow drawbars	☐	☐	☐
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐
	Areas contaminated with grease and around pivot points	☐	☐	☐

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General comments and photos

[Add general comments and photos here]

Declaration

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5. I agree to this checklist content being retained, stored, or managed by the Department or an authorised officer, whether in hard copy or digitally
6. I release the Department, authorised officers and the State of NSW from any liability they may have to me in connection with this clean down checklist.

Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Cotton pickers

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

Owner full name (if different from above):

Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

Check and clean the following sections of the vehicle/plant to ensure that they are clean and free of vegetative and soil material. Partial dismantling may be required.

> CAUTION – Do not use high pressure water jets in compartments that house electronic components.
>
> DO NOT – Climb underneath picking heads or basket unless they are safely secured in a raised position.
>
> DO NOT – Walk on the meshed surface area of the basket. Only walk on the perforated metal walkways that run from the back to the front of the machine.

Table 5: Clean down checklist for cotton pickers.

Areas	Items	N/A	Not clean	Clean
Row units	Outside picking heads	☐	☐	☐
	Inside picking head doors (moisture racks, doffers, spindle bars and rotor assemblies)	☐	☐	☐
	Behind and under the picking heads (via the rear inspection doors on the air ducts)	☐	☐	☐
Cabin	Outside the cabin (under and around)	☐	☐	☐
	Lights (particularly if unsealed or broken)	☐	☐	☐
	Dashboard	☐	☐	☐
	Air-conditioning dusts and filters	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	All panels and inside access panels	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Foot wells	☐	☐	☐
	Floor drain plugs	☐	☐	☐
Air ducts	Behind all cover/inspection panels	☐	☐	☐
	Air ducts	☐	☐	☐
	Basket roof	☐	☐	☐
	Parts inside the basket (accessed via the roof door with a ladder)	☐	☐	☐
	Underside of the basket (tip or elevate basket to check)	☐	☐	☐
	Drive shaft assemblies	☐	☐	☐
	Blower fan	☐	☐	☐
	Hollow basket support frames	☐	☐	☐
Exterior	Inside and outside box and tubular metal racks	☐	☐	☐
	Bumpers and brush guards	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads or step bars	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen and doors	☐	☐	☐
	Grill	☐	☐	☐
	All screens on the engine, radiator, and fuel bays	☐	☐	☐
	Top of transmission gearbox	☐	☐	☐
	Battery and battery box	☐	☐	☐
	Radiator	☐	☐	☐
	Air filters	☐	☐	☐
	Air tanks	☐	☐	☐
Underside	Tyres	☐	☐	☐
	Tyre rims or wheel trims (covers)	☐	☐	☐
	Dual bogie wheels	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Wheel arches, fender wells and flares	☐	☐	☐
	Mudflaps	☐	☐	☐
	Spare tyres (often suspended underneath)	☐	☐	☐
	Support and cross members	☐	☐	☐
	Chassis rails	☐	☐	☐
	Telescopic rear axle	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐

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General comments and photos

[Add general comments and photos here]

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Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Excavators and track type dozers

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

Owner full name (if different from above):

Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

Check and clean the following sections of the vehicle/plant to ensure that they are clean and free of vegetative and soil material. Partial dismantling may be required.

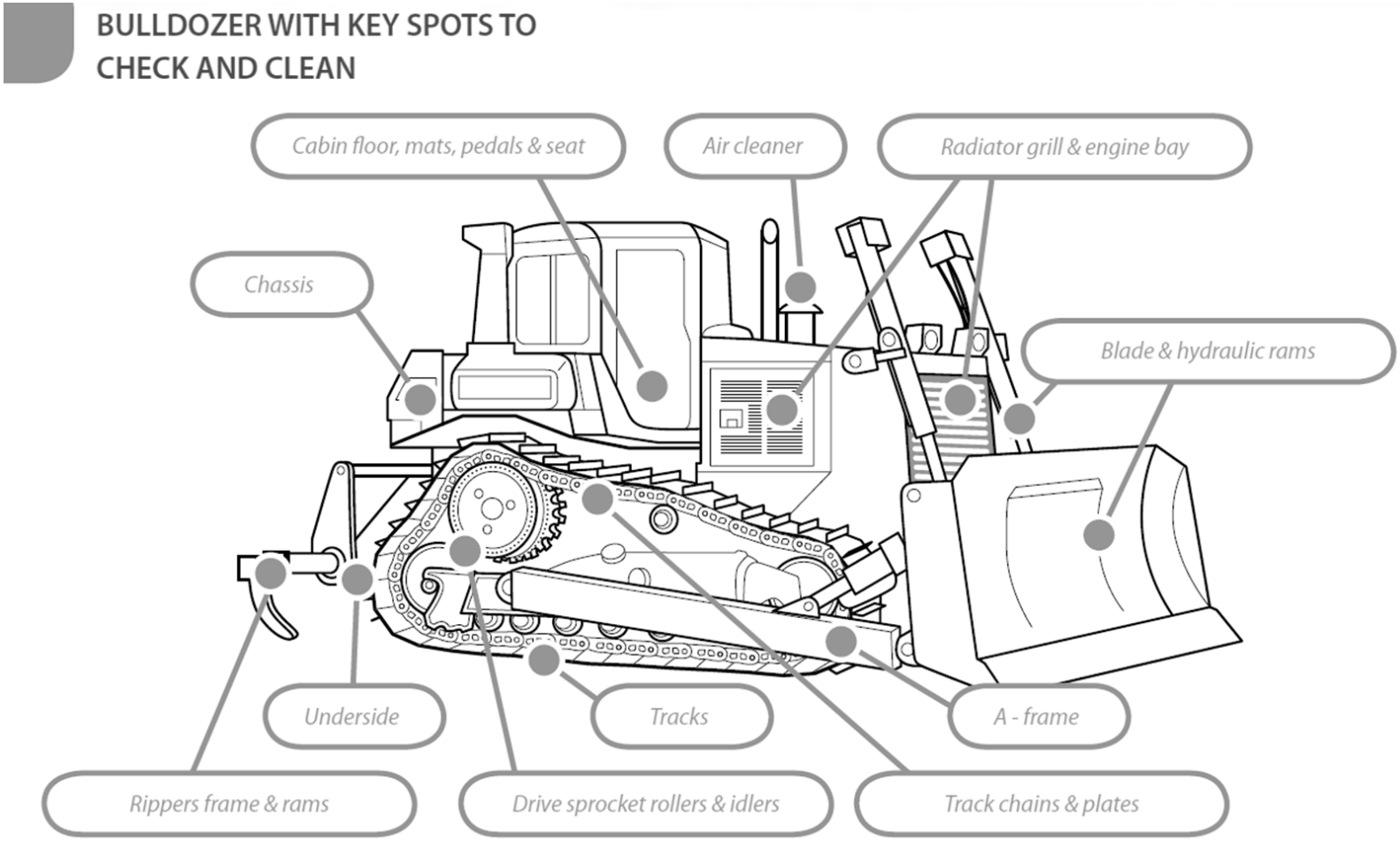

Figure 6: Dozer, check and clean spots (Source: Keeping it Clean, 2010).

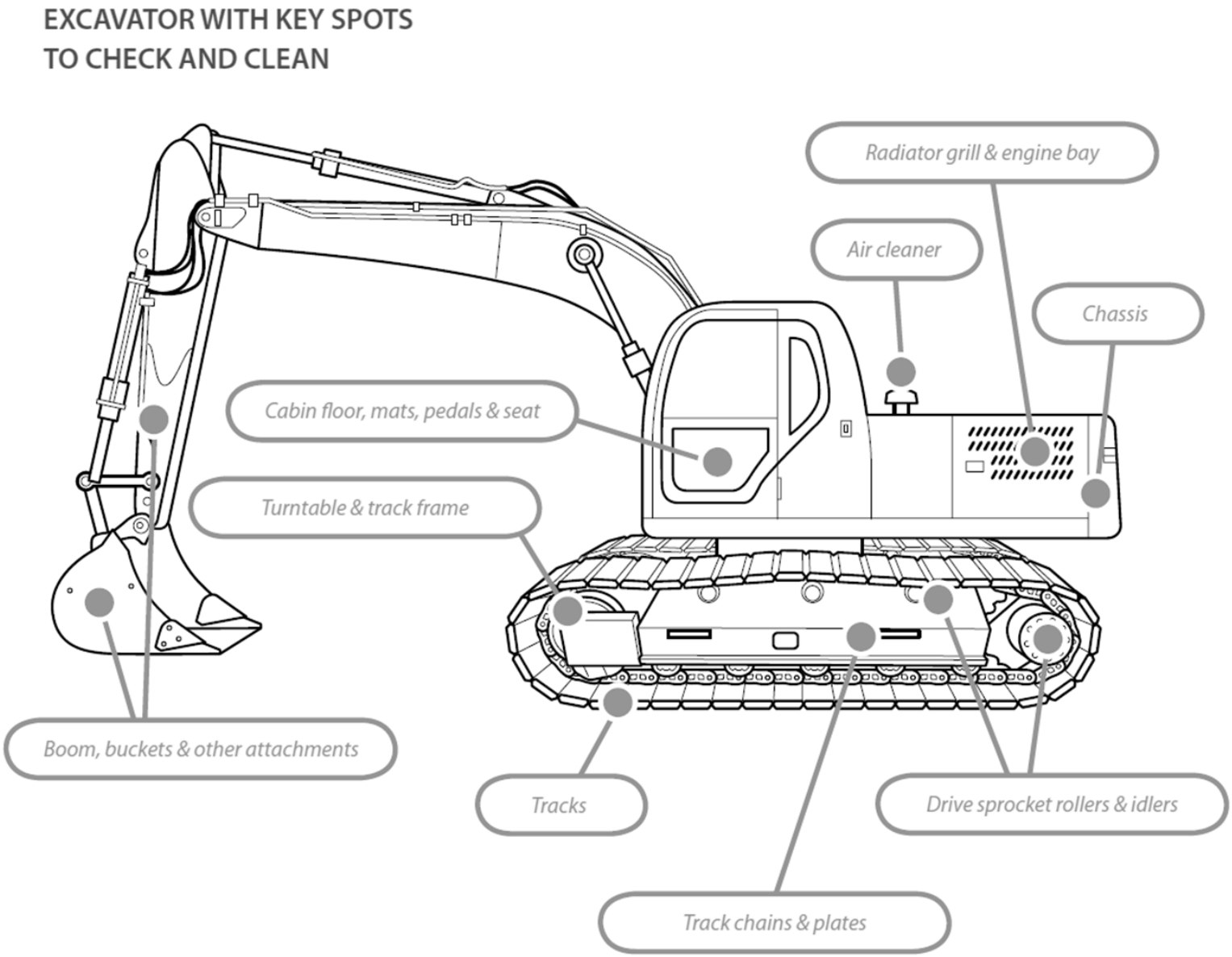

Figure 7: Excavator, check and clean spots (Source: Keeping it Clean, 2010).

> CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 6: Clean down checklist for excavators and track type dozers.

Areas	Items	N/A	Not clean	Clean
Cabin	Cabin roof and walls (inside and out)	☐	☐	☐
	Inside light covers (particularly if unsealed or broken)	☐	☐	☐
	Dashboard	☐	☐	☐
	Air vents and air conditioning filter	☐	☐	☐
	Door rubbers and behind internal door panelling	☐	☐	☐
	Windowsills	☐	☐	☐
	All panels, inside access panels and behind wall lining	☐	☐	☐
	Inside the joystick control housing	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Under the seat, including the rubber seat shroud	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Under any false floor/non-affixed floor panels	☐	☐	☐
	Top of the transmission (under seat and floor panels)	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Rubber pedal covers (remove and clean/check)	☐	☐	☐
	Floor surface	☐	☐	☐
	Floor drain plugs (flush if possible)	☐	☐	☐
Exterior	Ladder to the cabin	☐	☐	☐
	Inside and outside box and tubular metal racks	☐	☐	☐
	Under cabin	☐	☐	☐
	Bumpers and brush guards	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads or step bars	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen	☐	☐	☐
	Grill (outside and inside)	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
Engine bay	Radiator and oil cooler (ensure fin/core is clean)	☐	☐	☐
	Under non-affixed engine covers	☐	☐	☐
	Inside hollow support frameworks	☐	☐	☐
	Engine cover and rubbers	☐	☐	☐
	Engine block and between tappet covers	☐	☐	☐
	Engine mounts, sump, and engine block	☐	☐	☐
	Batteries and battery boxes	☐	☐	☐
	Recess under the windscreen wipers	☐	☐	☐
	Air filter pre-cleaner	☐	☐	☐
	Air filter	☐	☐	☐
	Inside fan belt flywheels (harmonic balancer)	☐	☐	☐
Tracks, rollers, and frame	Inside track frames behind track rock guards or inspection/cover plates	☐	☐	☐
	Idler wheels	☐	☐	☐
	Inside the frame where rock gauds attach (flush if hollow)	☐	☐	☐
	Individual rubber track pads (remove)	☐	☐	☐
	Motor cover plates	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Inside drive motor	☐	☐	☐
	Bolt holes on rollers	☐	☐	☐
	Hollow track frame ends (flush)	☐	☐	☐
	Behind all non-affixed covers and plates	☐	☐	☐
	Roll tracks on each track pad (turn one revolution)	☐	☐	☐
	Countersunk bolts on rollers and idler wheels	☐	☐	☐
	Behind sprockets	☐	☐	☐
	Spring adjuster inside track frame	☐	☐	☐
	Carrier roller support structure (above tracks)	☐	☐	☐
	Inside telescopic tracks	☐	☐	☐
	Internal ledges and hollow sections inside the track frames	☐	☐	☐
	Support and cross members	☐	☐	☐
	Universal joints	☐	☐	☐
	Chassis rails	☐	☐	☐
	Axles and differentials	☐	☐	☐
	Inside all wiring harnesses	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Under hydraulic looming	☐	☐	☐
	All surfaces of the oil and fuel tanks/cells	☐	☐	☐
Boom stick and bucket (for excavators)	Behind non-affixed plates on hollow boom arms	☐	☐	☐
	Behind non-affixed and spot-welded wear plates on bucket	☐	☐	☐
	Cutting teeth (remove from bucket or blade)	☐	☐	☐
	In any cracks, splits, or repaired areas on bucket	☐	☐	☐
	Around knuckles	☐	☐	☐
	All surfaces	☐	☐	☐
	In any cracks, splits, or repaired areas	☐	☐	☐
	Rubber mounts under the tray	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	All surfaces of oil tank (often near ladder to cabin)	☐	☐	☐
	Under non-slip checker-plate surfaces	☐	☐	☐
	Hollow drawbars	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐
	Areas contaminated with grease and around pivot points	☐	☐	☐

> CHECK, CLEAN, RECHECK – Remember the key to successful cleaning is more than just ticking off a checklist. You should be thorough, systematic, and consistent.

General comments and photos

[Add general comments and photos here]

Declaration

I declare that:

1. the inspection details; vehicle, machinery, plant, and equipment details; and transport details provided on this document are true and correct
2. I have systematically and thoroughly checked and cleaned the vehicle, machinery, plant, and equipment identified on this document, in accordance with the hygiene checklist above
3. the information recorded on the checklist above and in the general comments section of this document are true and correct
4. to the best of my knowledge, the vehicle, machinery, plant, and equipment cleaned in accordance with this checklist do not pose a significant weed biosecurity risk

5. I agree to this checklist content being retained, stored, or managed by the Department or an authorised officer, whether in hard copy or digitally
6. I release the Department, authorised officers and the State of NSW from any liability they may have to me in connection with this clean down checklist.

Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Headers, harvesters, and comb trailers

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

Owner full name (if different from above):

Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

Check and clean the following sections of the vehicle/plant to ensure that they are clean and free of vegetative and soil material. Partial dismantling may be required.

> CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 7: Clean down checklist for headers, harvesters, and comb trailers.

Areas	Items	N/A	Not clean	Clean
Interior	Lights (particularly if unsealed or broken)	☐	☐	☐
	All panels and inside access panels	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Floor	☐	☐	☐
	Floor drain plugs	☐	☐	☐
Exterior	Inside and outside box and tubular metal racks	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads or step bars	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen and doors	☐	☐	☐
	Grill	☐	☐	☐
All harvesters	Each header knife and finger	☐	☐	☐
	Auger (located horizontally across the header)	☐	☐	☐
	Behind any cover on the header	☐	☐	☐
	Area within any belts on any draper front	☐	☐	☐
	Feeder house	☐	☐	☐
	Cleaning fan	☐	☐	☐
	Area between the bottom of the fan housing and any shield under the fan housing	☐	☐	☐
	Tailing auger	☐	☐	☐
	Rear axle assembly including all pinch-points (steering pivots, power-steering ram, and tie rod assembly)	☐	☐	☐
	Sieve area (including the full length and width of the grain pan)	☐	☐	☐
	Grain bin area (including any auger)	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Grain or repeat elevator (including any cups and rubber flights)	☐	☐	☐
	Straw spreader or chopper	☐	☐	☐
Conventional harvesters	Threshing or separating area	☐	☐	☐
	Drum and concaves behind the rasp bars and lead-in plates	☐	☐	☐
	Around the concave wires	☐	☐	☐
	Beater drum	☐	☐	☐
	Between drum and walkers	☐	☐	☐
	Straw walkers	☐	☐	☐
	Beater and chaff pan underneath the straw walker	☐	☐	☐
	Concealed areas under rubber air flaps	☐	☐	☐
Rotary harvesters	External top and sides of the conical section of the rotor cage	☐	☐	☐
	Inside the top of the conical section	☐	☐	☐
	Threshing or separating area (including along the rotor cage)	☐	☐	☐
Engine	Engine compartment	☐	☐	☐
	Top of transmission gearbox	☐	☐	☐
	Battery and battery box	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Radiator core	☐	☐	☐
	Air filters	☐	☐	☐
	Air tanks	☐	☐	☐
Underside	Tyres	☐	☐	☐
	Tyre rims	☐	☐	☐
	Spare tyres (often suspended underneath)	☐	☐	☐
	Underneath the skid plate	☐	☐	☐
	Support and cross members	☐	☐	☐
	Chassis (including inside of any rail ledges)	☐	☐	☐
	Axles and differentials	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐

> CHECK, CLEAN, RECHECK – Remember the key to successful cleaning is more than just ticking off a checklist. You should be thorough, systematic, and consistent.

General comments and photos

[Add general comments and photos here]

Declaration

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6. I release the Department, authorised officers and the State of NSW from any liability they may have to me in connection with this clean down checklist.

Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Tractors and backhoes

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

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Type/make/model:

Registration number:

Odometer/hour meter reading:

Transport details

Coming from:

Going to:

Clean down checklist

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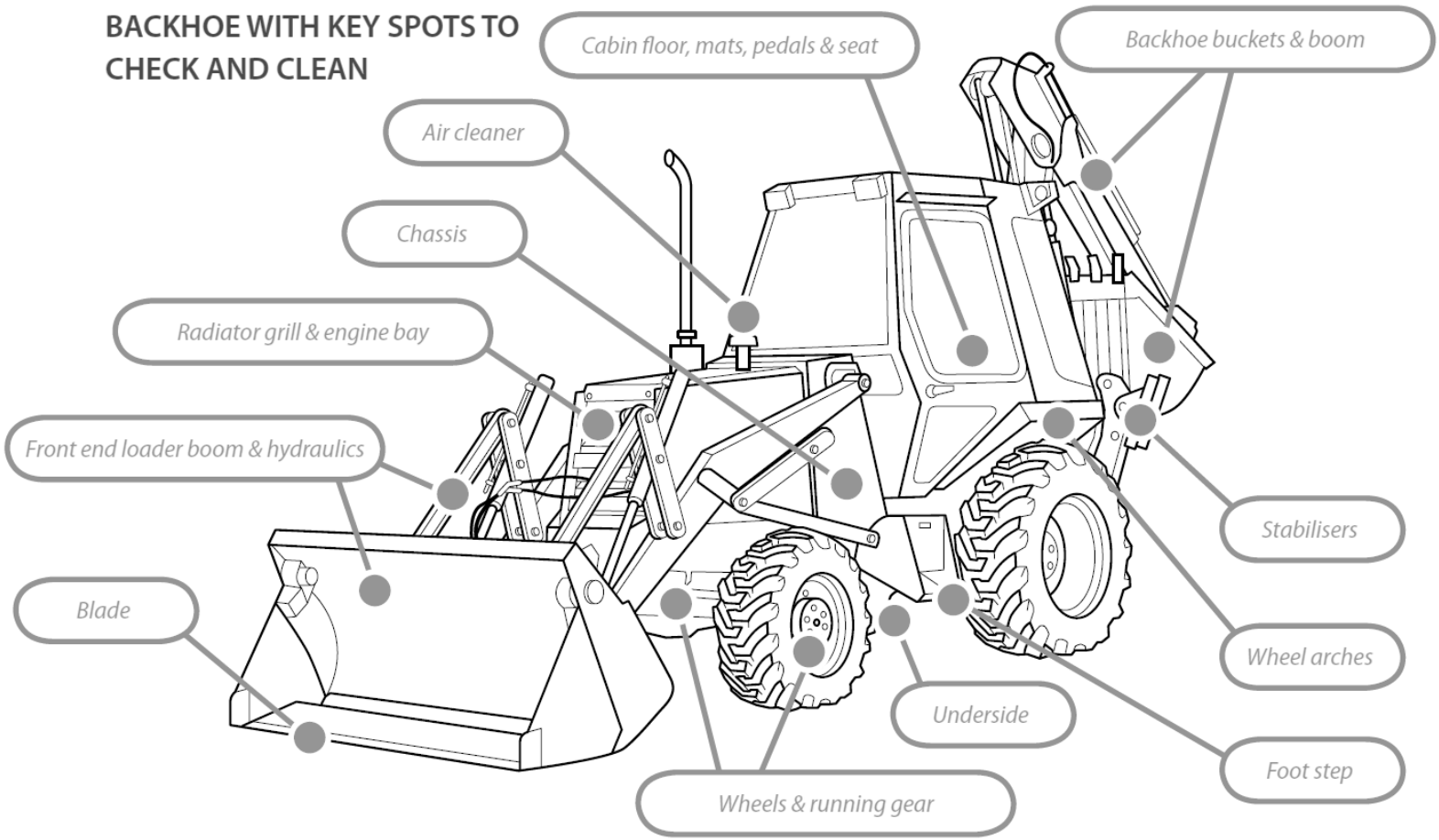

Figure 6: Backhoe, check and clean spots (Source: Keeping it Clean, 2010).

> CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 8: Clean down checklist for tractors and Power Take Off (PTO) rotary hoes.

Areas	Items	N/A	Not clean	Clean
Interior	Lights (particularly if unsealed or broken)	☐	☐	☐
	Dashboard	☐	☐	☐
	Behind dashboard and consoles	☐	☐	☐
	Air vents	☐	☐	☐
	Air conditioning filters (inside false cabin roof)	☐	☐	☐
	All panels and inside access panels	☐	☐	☐
	Seatbelts	☐	☐	☐
	Seat cushions	☐	☐	☐
	Voids or skirts under suspended seats	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Foot wells	☐	☐	☐
	Floor drain plugs	☐	☐	☐
Exterior	Inside and outside box and tubular metal racks	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐
	Step treads, step bars, or foot plates	☐	☐	☐
	Roll cages and roll bars	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
	Rubber seals around windscreen, tailgates, and doors	☐	☐	☐
	Grill	☐	☐	☐
	Rear brake assemblies	☐	☐	☐
	Common shaft for brake and clutch pedals	☐	☐	☐
	Draw bar and mounting	☐	☐	☐
	Three-point linkages and operating levers	☐	☐	☐
Engine bay	Recess under the windscreen wipers	☐	☐	☐
	Top of transmission gearbox	☐	☐	☐
	Battery and battery box (may be under the cabin)	☐	☐	☐
	Radiator core	☐	☐	☐
	Radiator mesh screen	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Fan shroud at the rear of the radiator	☐	☐	☐
	Between oil cooler and radiator	☐	☐	☐
	Air filter, pre-cleaners, and cyclone-style dust separators (replace if necessary)	☐	☐	☐
	Air filter cover	☐	☐	☐
	Around fuel tank and brackets	☐	☐	☐
	Hollow areas in the bonnet and engine bay	☐	☐	☐
	Sound-deadening foams and heat shields	☐	☐	☐
Underside	Tyres (including in any cuts and gashes)	☐	☐	☐
	Tyre rims / wheel flares (including inner sides and in any gaps in split-type rims)	☐	☐	☐
	Wheel mounted counterweights	☐	☐	☐
	Dual bogie wheels	☐	☐	☐
	Wheel arches, fender wells and flares	☐	☐	☐
	Mudflaps / guards	☐	☐	☐
	Joints between the mudflaps and guards	☐	☐	☐
	Wiring looms under mudguards	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Support and cross members	☐	☐	☐
	Axles and track width adjustment pinholes	☐	☐	☐
	Chassis rail ledges	☐	☐	☐
	Hollow areas and cover plates	☐	☐	☐
	Voids between gearbox and engine	☐	☐	☐
	Counterweights	☐	☐	☐
	Hollow sections of sub-frame under the motor	☐	☐	☐
	Torque tube (front drive shaft guard in 4WD's)	☐	☐	☐
	PTO area, shaft, universal joints, shaft covers/PTO tubes	☐	☐	☐
	Wiring looms	☐	☐	☐
Power Take Off (PTO) rotary hoes	Tyres and mounting bolts (may need to remove for cleaning)	☐	☐	☐
	Skid / wear plate (remove or loosen bolts securing the plate - only)	☐	☐	☐
	Any double skins or voids resulting from incomplete weld joints	☐	☐	☐
	Mudflaps	☐	☐	☐
	Between overlapping plates	☐	☐	☐
	Inside hollow reinforcing ribs	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Three-point linkage attachment points	☐	☐	☐
	PTO knuckles and tube	☐	☐	☐
	Universal joints and shafts	☐	☐	☐
	Ground engaging areas (particularly if worn or damaged)	☐	☐	☐
	Bearing housing at ends (or middle) of the rotary shaft and probe	☐	☐	☐
	Trailing wheel frame, supports, and mounts (often hollow)	☐	☐	☐
	Trailing wheels (usually hollow)	☐	☐	☐
Buckets, blades, and scoops	All areas of blade	☐	☐	☐
	Inside holes or double skins	☐	☐	☐
	Cutting teeth	☐	☐	☐
	Adaptors	☐	☐	☐
	Wear plates	☐	☐	☐
	Hydraulic arms and supports	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, jacks, and other equipment	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐
	Rear carryalls mounted on three-point linkages	☐	☐	☐
	Forward mounted forklift	☐	☐	☐

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General comments and photos

[Add general comments and photos here]

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6. I release the Department, authorised officers and the State of NSW from any liability they may have to me in connection with this clean down checklist.

Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

Recreational boats, personal watercraft, and trailers

Vehicles, machinery, and equipment can transport weeds, their seeds, and other reproductive material. This checklist and other information gathered may be used to reduce the risk of carrying weeds interstate or to new areas within NSW. If an authorised weed officer approves the checklist, it may also be used to discharge your general biosecurity duty under the NSW *Biosecurity Act 2015*.

Inspection details

Inspector name:

Location of inspection:

Date:

Time:

Vehicle, machinery, and equipment details

Operator full name:

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Type/make/model:

Registration number:

Odometer/hour meter reading:

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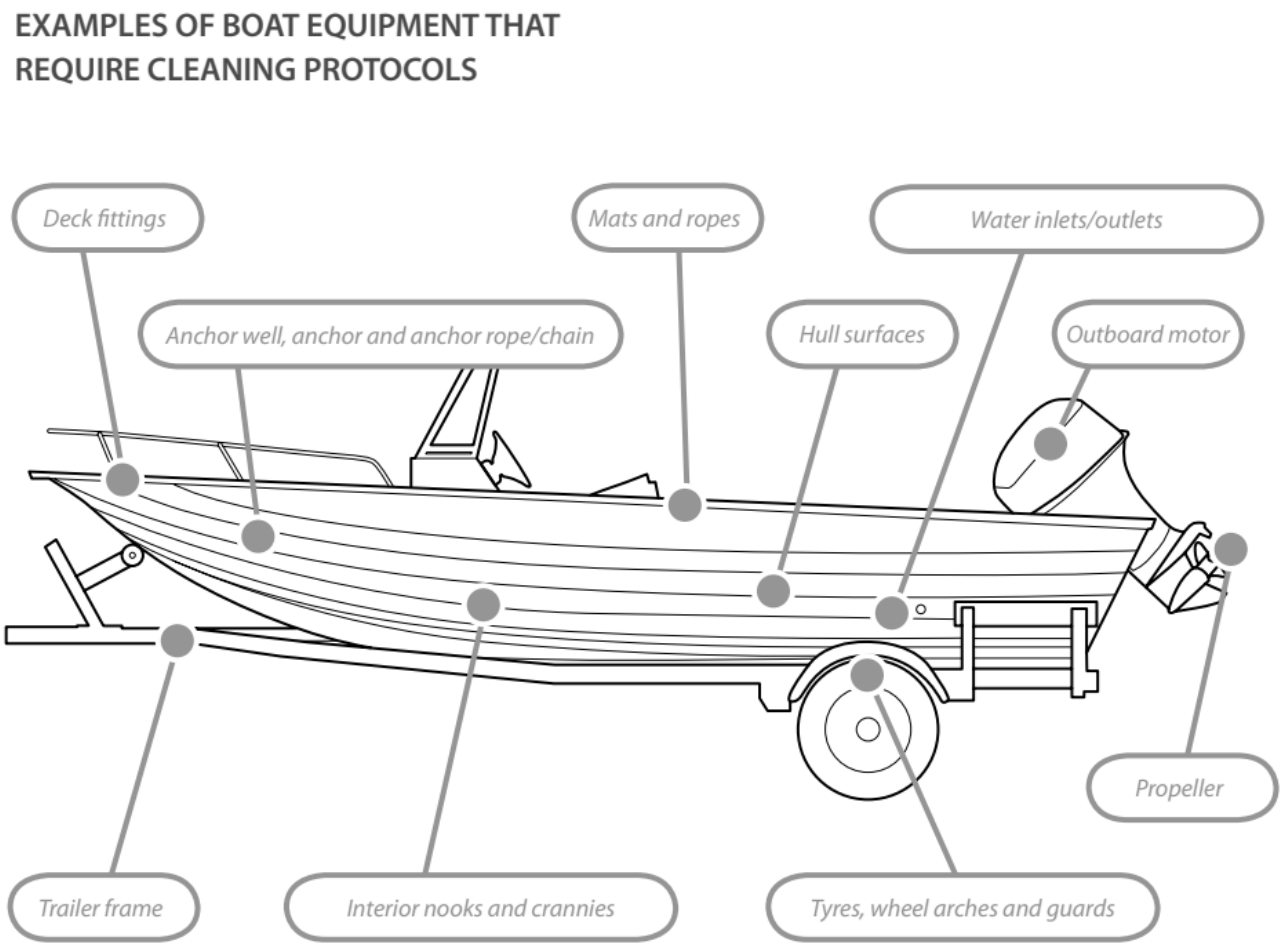

Figure 7: Recreational boat, clean and check spots (Source: Keeping it Clean, 2010).

CAUTION – Do not use high pressure water jets in compartments that house electronic components.

Table 9: Clean down checklist for recreational boats, personal watercraft, and trailers.

Areas	Items	N/A	Not clean	Clean
Interior	Dashboard	☐	☐	☐
	Seats	☐	☐	☐
	Floors and footwells	☐	☐	☐
	Carpets and mats	☐	☐	☐
	Panels and inside access panels	☐	☐	☐
	Anchor well and anchor	☐	☐	☐
	Anchor rope/chain	☐	☐	☐
	Motor and motor head	☐	☐	☐
	Motor well	☐	☐	☐
	Battery and battery box	☐	☐	☐
Exterior	Around windscreen	☐	☐	☐
	Inside and outside box and tubular metal bars	☐	☐	☐
	Bodywork (especially damaged areas or around body strips)	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Canopy	☐	☐	☐
	Canopy bows	☐	☐	☐
	Deck fittings	☐	☐	☐
	Mirror holders	☐	☐	☐
	Reflectors and lights (particularly if unsealed or broken)	☐	☐	☐
Underside	Hull surface	☐	☐	☐
	Water inlets/outlets	☐	☐	☐
	Sonar tubes/echosounder booths and transducers	☐	☐	☐
	Propellor	☐	☐	☐
	Bung plugs	☐	☐	☐
Trailers	Inside and outside box and tubular metal frame	☐	☐	☐
	Around rollers	☐	☐	☐
	Winch cable and drum	☐	☐	☐
	Wheels arches	☐	☐	☐
	Tyres	☐	☐	☐
	Tyre rims or wheel trims (covers)	☐	☐	☐

Areas	Items	N/A	Not clean	Clean
	Mud flaps	☐	☐	☐
	Lights and reflectors	☐	☐	☐
	Greece points	☐	☐	☐
Other	Toolboxes (inside and outside), ladders and storage compartments	☐	☐	☐
	Tools, fishing gear, and other equipment	☐	☐	☐
	Burley bucket	☐	☐	☐
	Under and around fuel tanks strapped to vehicle	☐	☐	☐
	Areas with electrical tape and/or insulation tape	☐	☐	☐
	Ropes, straps, and Velcro	☐	☐	☐

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General comments and photos

[Add general comments and photos here]

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Signature

[To be signed by the person cleaning the vehicle, machinery, plant, and equipment]

Name:

Signature:

Date:

Address:

Phone:

Email:

Witness

Witness name:

Signature of witness:

[If witness is an authorised (weed) officer under the NSW Biosecurity Act 2015 add the following information]

Position title:

Organisation:

Contact details:

References

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