Attachment C

Department of **Biodiversity, Conservation and Attractions**

SWAN CANNING RIVERPARK

Swan and Canning Rivers Management Act 2006

PART 5

DETERMINATION OF DEVELOPMENT APPLICATION

FILE NUMBER	:	2022/000237
APPLICANT	:	Dynamic Planning and Developments
LANDOWNER	:	Dandenong Properties Pty Ltd
LAND DESCRIPTION	:	Lot 809 on Plan 31948, Albany Highway, Maddington
DEVELOPMENT	:	Proposed stormwater drainage basins, limestone accessway and foreshore rehabilitation
VALID FORM 1 RECEIVED	:	13 January 2022
DETERMINATION	:	**APPROVAL WITH CONDITIONS**

The application to commence development in accordance with the information received on 13 January 2022 is APPROVED subject to the following conditions:

CONDITIONS

1. Approval to implement this decision is valid for two (2) years from the date of the approval. If substantial on-site works have not commenced within this period, a new approval will be required before commencing or completing the development.
2. The applicant shall notify the Department of Biodiversity, Conservation and Attractions in writing not less than seven (7) days prior to the commencement of works.
3. The applicant must implement and adhere to the residential subdivision design principles in accordance with the Urban Water Management Plan (version 3) and the Wetland and Landscaping Management Plan (version 8) approved in conjunction with the Western Australian Planning Commission's subdivision approval No. 155487.
4. All works shall be undertaken in accordance with a Construction Environmental Management Plan as approved by the Department of Biodiversity, Conservation and Attractions, on advice from the City of Gosnells. (**Advice Notes 1** and **2**)
5. All works are to be undertaken in such a way that minimises compaction of soil within the works area. (**Advice Note 2**)
6. The applicant must ensure that the fill products used are clean as defined by the Department of Water and Environmental Regulation and geotechnically suitable and otherwise fit for purpose, unless agreed in writing by the Department of Biodiversity, Conservation and Attractions. (**Advice Note 4**)

ADVICE NOTES

1. To allow sufficient time for the Department of Biodiversity, Conservation and Attractions to consider and approve the plans required under this approval, information should be submitted no later than 42 days prior to the expected commencement date.
2. The Construction Environmental Management Plan required under **Condition 4** shall describe how the proposed works will be managed to minimise potential environmental

impacts to the foreshore, riverbank, or waterway (including naturally occurring vegetation) and shall address:

a. scope of works and construction methodology;
b. site access and management, including fencing requirements;
c. methods to minimise compaction of drainage areas;
d. management of machinery and equipment, including a refueling procedure and spill response;
e. the location of any temporary structures;
f. on-site storage and bunding of materials (sediment control), equipment, chemicals and fuel;
g. erosion and sedimentation methods;
h. details of any excavation works and management of acid sulfate soils (if required);
i. protection of the river (and nearby stormwater drains) from inputs of debris, rubbish or other deleterious material;
j. protection of vegetation, including use of tree protection zones;
k. air and dust management;
l. public access and safety;
m. dewatering management (if required);
n. hours of operation and schedule of works;
o. notification of commencement of work (to be emailed to rivers.planning@dbca.wa.gov.au); and
p. complaints and incident response procedures.

3. In case of damage or pollution events, the Department of Biodiversity, Conservation and Attractions can be contacted on 9278 0981 (Riverpark Duty Officer) or 9480 9924 (Marine Pollution Response).
4. Regarding **Condition 5**, the applicant is advised to refer to the Department of Water and Environmental Regulation's fact sheet *Amendments to the Environmental Protection Regulations 1987 - clean fill and uncontaminated fill* for the requirements of clean fill.

Hon Reece Whitby MLA
MINISTER FOR ENVIRONMENT

Date: 23/08/2023

FILE: 2022/0237

DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRACTIONS REPORT

PROPOSAL	Proposed stormwater drainage basins, limestone accessway and foreshore rehabilitation
LOCATION	Lot 809 on Plan 31948, Albany Highway, Maddington
COST	$1,000,000
APPLICANT	Dynamic Planning and Developments
LANDOWNER	Dandenong Properties Pty Ltd
LOCAL GOVERNMENT	City of Gosnells
MRS CLASSIFICATION	Parks and Recreation Reserve
DECISION TYPE	Part 5, *Swan and Canning Rivers Management Act 2006*, Ministerial Determination
ATTACHMENTS	1. Subject Lot (1 page) 2. Western Australian Planning Commission subdivision approval (13 pages) 3. Proposed works a. Urban Water Management Plan (36 pages) b. Wetland and Landscape Management Plan (48 pages) 4. Summary of proposed works - Stormwater basin and landscape overlay (1 page) 5. External referral responses: a. City of Gosnells (1 page) b. Department of Water and Environmental Regulation (DWER) (1 Page) 6. City of Gosnells submission on draft report
RECOMMENDATION	**APPROVAL WITH CONDITIONS**

1. INTRODUCTION

1.1 The Department of Biodiversity, Conservation and Attractions (DBCA) has received an application from Dynamic Planning and Developments, on behalf of landowners Dandenong Properties Pty Ltd, for the construction of stormwater detention basins, a limestone maintenance access/pedestrian footpath, and rehabilitation and revegetation work on private property adjacent to the Canning River in Maddington.

1.2 The land, which is the subject of this application, Lot 809 (the subject lot) is reserved under the Metropolitan Region Scheme for Parks and Recreation (P&R) and wholly contained within the Swan Canning Development Control Area (DCA). The subject lot is shown in **Attachment 1**.

1.3 The subject lot is located within the City of Gosnells, and is approximately 3.5 hectares in area. It borders Stokely Creek (a tributary to the Canning River) to the northwest and the Canning River to the south.

1.4 The subject lot forms part of the Canning River floodplain and comprises a small, degraded wetland. The only significant, local native vegetation present is associated with the adjacent Canning River and Stockley Creek – Lots 808 and 809 are devoid of native vegetation and comprise weeds and grasses.

1.5 The proposal follows a conditional subdivision approval by the Western Australian Planning Commission (WAPC) (refer **Attachment 2**) to create 118 residential lots that applies over both Lot 808 on Plan 31948 and Lot 809 on Plan 31948. The works are required to facilitate compliance with the subdivision approval.

1.6 The subdivision approval required the preparation of an Urban Water Management Plan (UWMP), a Wetland and Landscaping Management Plan (WLMP) and a Foreshore Management Plan. These plans, which are generally consistent with the subdivision approval, necessitate works within the DCA and therefore require approval from the Minister for Environment under Part 5 of the *Swan and Canning Rivers Management Act 2006* (SCRM Act). These conditions have been addressed in the UWMP (**Attachment 3a**) and WLMP (**Attachment 3b**). The proposed works contained in these plans are the subject of this application.

1.7 **Attachment 4** provides a summary of the proposed works.

1.8 Five stormwater drainage detention basins (the basins) are proposed for the entire subdivision, three of which, designated as Basins C, D1 and D2, are proposed within the subject Lot and thus within the DCA. The basins have been designed to temporarily detain piped, surface water run-off from the residential subdivision and attenuate contaminants prior to discharge to groundwater or overland to the adjacent waterways (including stormwater run-off from impervious surfaces such as roads). The three basins are designed in parallel and have a combined length of approximately 200 metres.

1.9 The banks of the basins will be planted with appropriate native plants to facilitate stabilisation, enhance their appearance and aid in attenuating any contaminants within the stormwater. The riparian margins of the Canning River, Stokely Creek and the area surrounding the wetland within the subject Lot will also be rehabilitated and revegetated as appropriate.

1.10 A portion of the subject lot will also comprise a grassed area and include a limestone maintenance access track/pedestrian footpath to act as a physical buffer to the Canning River foreshore.

1.11 DBCA has prepared this report in accordance with section 76 of the SCRM Act.

2. CONSULTATION

City of Gosnells

2.1 The City of Gosnells (the City) advises that it has no objections to the proposal. The City has been closely involved in the detailed design of the subdivision and associated stormwater and landscaping infrastructure plans.

2.2 The City's full comments are provided in **Attachment 5a**.

Department of Water and Environmental Regulation (DWER)

2.3 The submission from DWER advises that it has not undertaken an engineering assessment of the UWMP, however, it does not object to the proposed drainage basins provided that the UWMP includes mapping to show that the drainage basins are located

outside of the floodplain (as proposed by the subdivision) and that post-development modelling demonstrates that there will be no upstream impacts.

2.4 DWER's full comments are provided in **Attachment 5b**.

3. PUBLIC CONSULTATION – SUBMISSIONS ON DRAFT REPORT

3.1 In accordance with the requirements of Part 5 of the SCRM Act, a copy of the draft report and proposed recommendation was provided to the applicant and the relevant stakeholder being the City. A copy was also published on the DBCA website for a period of three weeks between 8 and 30 May 2023 with an invitation for public submissions.

3.2 One submission was received from the City of Gosnells (**Attachment 6)**.

3.3 The City of Gosnells noted that it has received an altered subdivision application for the adjacent Lot 808 Albany Highway, which is currently under review. If approved, this will lead to a decrease in lot numbers by two (from 62 lots on the currently approved plan to 60 lots). It does not expect there will be substantial changes to drainage requirements as a result. The City is supportive of the application with the following conditions applied:

- A Construction Environmental Management Plan, especially relating to erosion and sedimentation, be approved and implemented prior to earthworks, and applied during both subdivisional and housing development works.
- Remnant trees identified to be worthy of protection should be protected in accordance with AS4970-2009 Protection of trees on development sites.
- Compaction of drainage areas during construction is to be minimised.

3.4 The City's recommendations have been addressed within **Conditions 4** and **5** with additional context being provided within **Advice Note 2**.

4. RELEVANT POLICIES AND PLANS

- State Planning Policy 2.10 – Swan-Canning River System (SPP 2.10)
- Corporate Policy Statement No. 42 – Planning for Land Use, Development and Permitting Affecting the Swan Canning Development Control Area (Policy 42)
- Corporate Policy Statement No. 45 – Planning for Miscellaneous Structures and Facilities in the Swan Canning Development Control Area (Policy 45)
- Corporate Policy Statement No. 49 – Planning for Stormwater Management Affecting the Swan Canning Development Control Area (Policy 49)

5. ENVIRONMENTAL AND PLANNING CONSIDERATIONS

- Stormwater management
- Amenity and public access
- Ecological health and landscape protection

6. BACKGROUND

6.1 In July 2017, WAPC approved a subdivision over Lots 808 and 809 Albany Highway, Maddington (WAPC Approval 155487). Lot 808 will be subdivided into 118 residential lots and local and public open space. The approval and associated subdivision design

requires the construction of stormwater drainage-detention basins within the DCA (refer **Attachments 3 and 4**).

6.2 Stokely Creek flows adjacent to the disused orchard (Lot 808) before joining the Canning River to the south of the subject lot. To the north of Lot 808 and the subject lot, the creek has been piped (engineered) to enable it to flow as part of the Helm Street Drain that passes under the Armadale Rail Line and Albany Highway before entering Lot 808 as a remnant of the natural creek. The creek then flows into the Canning River which forms the cadastral boundary of the subject lot. This section of the Canning River is upstream of the Kent Street Weir, making it predominately a freshwater system.

6.3 Stokely Creek is approximately one to two metres wide and meanders across the floodplain to Lot 808 and is associated with a steep embankment that falls to the floodplain of the confluence of Stokely Creek and Canning River (adjacent to the subject lot). This floodplain also includes a wetland depression area which is within the subject lot. The wetland is predominately vegetated with *Typha orientalis*, a native wetland sedge species.

6.4 The current vegetation over the subdivision area mainly comprises pasture and exotic garden plants as well as the remnants of a former citrus orchard (Lot 808), and the vegetation condition of the site is classified as Completely Degraded. Native flora species are present along the embankments of Stokely Creek, however, there is considerable weed presence in this area, with the vegetation condition along Stokely Creek considered to vary between Completely Degraded to Good. The remnant native riparian vegetation along the Canning River is very degraded along its northern banks.

6.5 In accordance with the WAPC's Better Urban Water Management advice policy and DBCA's Policy 49, the subdivision process has followed a planning framework that considered water management and resources at each stage. Principally, this includes the preparation of a Local Water Management Strategy (LWMS) during structure plan preparation and an UWMP submitted with the subdivision application. The UWMP (refer to **Attachment 3**) has subsequently been endorsed by the City, in consultation with DBCA and DWER.

6.6 Policy 49 also details actions that aim to protect and enhance waterway ecosystems through the utilisation of best practice water management. While most of Stokely Creek is outside of the DCA, it flows into the Canning River and any improvements in Stokely Creek will benefit the Canning River. Through the assessment of the UWMP and LWMS, DBCA negotiated positive environmental outcomes, including ecological buffers and revegetation within the 30 metre buffer to the waterways and the wetland.

6.7 A condition of the subdivision works also required the preparation of a WLMP to ensure the protection and management of the subject lot's environmental assets.

6.8 The WLMP outlines the proposed subdivision works and best management practices to protect and enhance the associated waterways and wetland. The WLMP details the types of plants, site preparation, weed management, pedestrian pathways infrastructure and ongoing maintenance associated with the subdivision. The WLMP has subsequently been endorsed by the City of Gosnells, in consultation with DBCA (refer to **Attachment 5**).

7. DISCUSSION

Stormwater management

7.1 Policy 49 seeks to ensure that land development which includes or uses stormwater management systems in or affecting the DCA do not result in further water quality degradation of the Swan Canning River system, and where possible, improve the condition. Additionally, stormwater design should protect and enhance the ecological health, community benefits and amenity of the river system.

7.2 Where there is a demonstrated need to use land in the DCA for stormwater management as part of an adjoining subdivision, the policy recommends that this is identified in a LWMS.

7.3 Policy 49 requires DBCA to apply DWER's *Stormwater Management Manual for Western Australia* and *Decision Process for Stormwater Management in WA* (Decision Process) as a means to achieve water sensitive urban design. In this respect:

- stormwater management systems are to be designed to enhance the environmental quality of the Swan Canning River system through the use of water sensitive urban design;
- imperviousness of developments is to be minimised. In particular, stormwater runoff from constructed impervious surfaces (road surfaces for example) generated by one-year Annual Exceedance Probability (AEP) rainfall event (approximately 15 mm rainfall depth on the Swan Coastal Plain) should be retained and/or detained at the runoff source (on lots and in road reserves) as much as practical;
- proponents are to identify how their stormwater quantity management measures have been selected to maximise water quality improvement objectives and how environmental flows to the river will be maintained; and
- post-development flood level, floodplain storage volumes, peak flow rates and total volume runoff is to be maintained relative to predevelopment conditions.

7.4 The subdivision has an approved LWMS and UWMP endorsed by the City in consultation with DBCA. The stormwater design of the subdivision also includes detention and treatment basins within the road reserves outside of the DCA. All detention basins will provide additional treatment of stormwater effectively providing a stormwater treatment train before entering Stokely Creek in accordance with best practice urban water management. There will be no direct stormwater discharge from the subdivision to Stokely Creek or the Canning River.

7.5 DWER supports the stormwater detention basins on the provision that their design, function and placement does not impact upstream processes for Stokely Creek, such as additional flooding.

7.6 The stormwater basins are located outside of the mapped 1 per cent AEP (1%AEP = 1 in 100-year flood event) flood level. Detailed stormwater mitigation and flood impacts were considered by DWER and the City of Gosnells as part of proper land use planning at the time of the subdivision approval. Additionally, the size of the stormwater basins have been engineered to mitigate stormwater from the subdivision to pre-development levels as per the objectives of Policy 49.

7.7 If in the event of 1%AEP flood event, the stormwater detention basins will not generate additional adverse environmental impacts to the waterways. The proposed revegetation

within the DCA and Stokely Creek reserve will help maintain bank stability and sediment control in the event of a flood.

Amenity and public access

7.8 Policy 42 seeks to ensure that provisions are made for public access and enjoyment of the Swan Canning River system including its foreshores in a manner that is consistent with the multiple use of the DCA and the preservation of the values of the land itself. Recreation facilities should provide visitors with a choice of recreation activities and experiences. Furthermore, proposals should seek to ensure that the river foreshores are linked through the provision of walking and cycle trails that connect places of natural and cultural interest, as well as commercial and community facilities.

7.9 Policy 45 and SPP2.10 require developments to enhance the public's access to and enjoyment of the river. The policy acknowledges that pathways for pedestrians and/or cyclists provide public access to the river system and can enrich visitor experiences. The policies acknowledge that pathways designed solely for pedestrians may have a variety of surfaces (limestone or concrete for example) depending on the local context and may be constructed close to the river.

7.10 The proposed infrastructure works includes a three metre wide crushed limestone maintenance access track/pedestrian footpath. This will provide walking and cycling opportunities along the Canning River in an area that is currently not accessible to the public. The limestone treatment is generally in keeping with the natural setting of this portion of the Canning River. The track/path will also provide access to emergency services in the event of bushfire or flooding and acts a physical barrier between the subdivision and the revegetation and landscaping.

7.11 The proposed revegetation works will improve the visual amenity of the area and the overall landscape design will provide a formalised playground and maintained lawn area outside of the DCA with more natural areas along Stokely Creek and the Canning River foreshores.

Ecological health and landscape protection

7.12 Policy 42 states that natural vegetation should be promoted, maintained and restored, and existing native vegetation should be retained as a means of protecting linkages and natural vegetation corridors. The policy also states that stormwater management systems in the DCA should be designed to protect and enhance the amenity and landscape character of the river system. Landscaping associated with the system is to utilise local native plant species.

7.13 It is considered that the subdivision approval has included these requirements into the design and layout.

8. SWAN RIVER TRUST

8.1 In accordance with section 75(3A) of the SCRM Act, the Swan River Trust considered DBCA's draft report at its meeting of 21 March 2023 and resolved to advise the Director General of DBCA that it recommends the application be approved subject to the conditions outlined in DBCA's draft report.

9. CONCLUSION

9.1 The proposed works associated with the subdivision, comprising stormwater infrastructure and revegetation will not detract from the riverine environment.

9.2 Potential environmental impacts from the works can be addressed through the implementation of a Construction Environmental Management Plan which will be a condition of approval.

9.3 For these reasons, the proposal is recommended for approval, subject to conditions and advice.

10. RECOMMENDATION – APPROVAL WITH CONDITIONS

That the Director General of DBCA advises the Minister for Environment that the proposal to construct stormwater detention drainage basins, a limestone maintenance access track/pedestrian footpath and undertake rehabilitation and revegetation works on Lot 809 on Plan 31948, Albany Highway, Maddington, as described in the development application, be approved subject to the following conditions:

CONDITIONS

1. Approval to implement this decision is valid for two (2) years from the date of the approval. If substantial on-site works have not commenced within this period, a new approval will be required before commencing or completing the development.
2. The applicant shall notify the Department of Biodiversity, Conservation and Attractions in writing not less than seven (7) days prior to the commencement of works.
3. The applicant must implement and adhere to the residential subdivision design principles in accordance with the Urban Water Management Plan (version 3) and the Wetland and Landscaping Management Plan (version 8) approved in conjunction with the Western Australian Planning Commission's subdivision approval No. 155487.
4. All works shall be undertaken in accordance with a Construction Environmental Management Plan as approved by the Department of Biodiversity, Conservation and Attractions, on advice from the City of Gosnells. (**Advice Notes 1** and **2**)
5. All works are to be undertaken in such a way that minimises compaction of soil within the works area. (**Advice Note 2**)
6. The applicant must ensure that the fill products used are clean as defined by the Department of Water and Environmental Regulation and geotechnically suitable and otherwise fit for purpose, unless agreed in writing by the Department of Biodiversity, Conservation and Attractions. (**Advice Note 4**)

ADVICE NOTES

1. To allow sufficient time for the Department of Biodiversity, Conservation and Attractions to consider and approve the plans required under this approval, information should be submitted no later than 42 days prior to the expected commencement date.
2. The Construction Environmental Management Plan required under **Condition 4** shall describe how the proposed works will be managed to minimise potential environmental impacts to the foreshore, riverbank, or waterway (including naturally occurring vegetation) and shall address:
   a. scope of works and construction methodology;
   b. site access and management, including fencing requirements;
   c. methods to minimise compaction of drainage areas;
   d. management of machinery and equipment, including a refueling procedure and spill response;
   e. the location of any temporary structures;
   f. on-site storage and bunding of materials (sediment control), equipment, chemicals and fuel;

g. erosion and sedimentation methods;
h. details of any excavation works and management of acid sulfate soils (if required);
i. protection of the river (and nearby stormwater drains) from inputs of debris, rubbish or other deleterious material;
j. protection of vegetation, including use of tree protection zones;
k. air and dust management;
l. public access and safety;
m. dewatering management (if required);
n. hours of operation and schedule of works;
o. notification of commencement of work (to be emailed to rivers.planning@dbca.wa.gov.au); and
p. complaints and incident response procedures.

3. In case of damage or pollution events, the Department of Biodiversity, Conservation and Attractions can be contacted on 9278 0981 (Riverpark Duty Officer) or 9480 9924 (Marine Pollution Response).
4. Regarding **Condition 5**, the applicant is advised to refer to the Department of Water and Environmental Regulation's fact sheet *Amendments to the Environmental Protection Regulations 1987 - clean fill and uncontaminated fill* for the requirements of clean fill.

FINAL REPORT ENDORSED

Signed: _____ Date: 07/08/23

Stuart Smith
Director General, Chief Executive Officer

Attachment A - 1

Legend

- Subject Lot
- Swan Canning Development Control Area

N

1:5,000 (A3)

0 50 100 150 200 250 m

Geographic Projection
Datum: GDA94

Western Australian Planning Commission

Approval Subject To Condition(s)
Freehold (Green Title) Subdivision

Application No : 155487

Planning and Development Act 2005

Applicant	:	Dynamic Planning And Developments Pty Ltd P O Box 688 INGLEWOOD WA 6932
Owner	:	Claymont Land Pty Ltd Level 1, 189 St Georges Terrace PERTH WA 6000
Application Receipt	:	25 July 2017

Lot Number	:	3430 & 808
Diagram / Plan	:	Deposited Plan 31948 Diagram 64956
Location	:	-
C/T Volume/Folio	:	2520/560, 2917/526
Street Address	:	Lots 3430 And 808 Albany Highway, Maddington
Local Government	:	City of Gosnells

The Western Australian Planning Commission has considered the application referred to and is prepared to endorse a deposited plan in accordance with the plan date-stamped **25 July 2017** once the condition(s) set out have been fulfilled.

This decision is valid for **four years** from the date of this advice, which includes the lodgement of the deposited plan within this period.

The deposited plan for this approval and all required written advice confirming that the requirement(s) outlined in the condition(s) have been fulfilled must be submitted by **30 August 2022** or this approval no longer will remain valid.

Reconsideration - 28 days

Under section 151(1) of the *Planning and Development Act 2005*, the applicant/owner may, within 28 days from the date of this decision, make a written request to the WAPC to reconsider any condition(s) imposed in its decision. One of the matters to which the WAPC will have regard in reconsideration of its decision is whether there is compelling evidence by way of additional information or justification from the applicant/owner to warrant a

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 35 482 341 493

Western Australian Planning Commission

reconsideration of the decision. A request for reconsideration is to be submitted to the WAPC on a Form 3A with appropriate fees. An application for reconsideration may be submitted to the WAPC prior to submission of an application for review. Form 3A and a schedule of fees are available on the WAPC website: http://www.planning.wa.gov.au

Right to apply for a review - 28 days

Should the applicant/owner be aggrieved by this decision, there is a right to apply for a review under Part 14 section 251 of the *Planning and Development Act 2005.* The application for review must be submitted in accordance with part 2 of the *State Administrative Tribunal Rules 2004* and should be lodged within 28 days of the date of this decision to: the State Administrative Tribunal, Level 6, State Administrative Tribunal Building, 565 Hay Street, PERTH, WA 6000. It is recommended that you contact the tribunal for further details: telephone 9219 3111 or go to its website: http://www.sat.justice.wa.gov.au

Deposited plan

The deposited plan is to be submitted to the Western Australian Land Information Authority (Landgate) for certification. Once certified, Landgate will forward it to the WAPC. In addition, the applicant/owner is responsible for submission of a Form 1C with appropriate fees to the WAPC requesting endorsement of the deposited plan. A copy of the deposited plan with confirmation of submission to Landgate is to be submitted with all required written advice confirming compliance with any condition(s) from the nominated agency/authority or local government. Form 1C and a schedule of fees are available on the WAPC website: http://www.planning.wa.gov.au

Condition(s)

The WAPC is prepared to endorse a deposited plan in accordance with the plan submitted once the condition(s) set out have been fulfilled.

The condition(s) of this approval are to be fulfilled to the satisfaction of the WAPC.

The condition(s) must be fulfilled before submission of a copy of the deposited plan for endorsement.

The agency/authority or local government noted in brackets at the end of the condition(s) identify the body responsible for providing written advice confirming that the WAPC's requirement(s) outlined in the condition(s) have been fulfilled. The written advice of the agency/authority or local government is to be obtained by the applicant/owner. When the written advice of each identified agency/authority or local government has been obtained, it should be submitted to the WAPC with a Form 1C and appropriate fees and a copy of the deposited plan.

If there is no agency/authority or local government noted in brackets at the end of the condition(s), a written request for confirmation that the requirement(s) outlined in the condition(s) have been fulfilled should be submitted to the WAPC, prior to lodgement of the deposited plan for endorsement.

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 35 482 341 493

Western Australian Planning Commission

Prior to the commencement of any subdivision works or the implementation of any condition(s) in any other way, the applicant/owner is to liaise with the nominated agency/authority or local government on the requirement(s) it considers necessary to fulfil the condition(s).

The applicant/owner is to make reasonable enquiry to the nominated agency/authority or local government to obtain confirmation that the requirement(s) of the condition(s) have been fulfilled. This may include the provision of supplementary information. In the event that the nominated agency/authority or local government will not provide its written confirmation following reasonable enquiry, the applicant/owner then may approach the WAPC for confirmation that the condition(s) have been fulfilled.

In approaching the WAPC, the applicant/owner is to provide all necessary information, including proof of reasonable enquiry to the nominated agency/authority or local government.

The condition(s) of this approval, with accompanying advice, are:

CONDITION(S):

Administration

1. The plan of subdivision being modified in accordance with the plan received by the Department of Planning lands and Heritage on 10 July 2018 (refer to Attachment 9 - Modified Plan of Subdivision). (Western Australian Planning Commission)

Contributions

2. The landowner/applicant contributing towards development infrastructure provisions pursuant to the City of Gosnells Town Planning Scheme No. 6. (Local Government)

Road and Movement Network

3. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, to ensure that those lots not fronting an existing road are provided with frontage to a constructed road(s) connected by a constructed road(s) to the local road system and such road(s) are constructed and drained at the landowner/applicant's cost.

   As an alternative, and subject to the agreement of the Local Government the Western Australian Planning Commission (WAPC) is prepared to accept the landowner/applicant paying to the local government the cost of such road works as estimated by the local government and the local government providing formal assurance to the WAPC confirming that the works will be completed within a reasonable period as agreed by the WAPC. (Local Government)

Western Australian Planning Commission

4 Engineering drawings and specifications are to be submitted and approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications to ensure that:

(a) street lighting is installed on all new subdivisional roads to the standards of the relevant licensed service provider and/or
(b) roads that have been designed to connect with existing or proposed roads abutting the subject land are coordinated so the road reserve location and width connect seamlessly and/or
(c) temporary turning areas are provided to those subdivisional roads that are subject to future extension
(d) embayment parking to the specification of the Local Government,

to the satisfaction of the Western Australian Planning Commission. (Local Government)

5. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, for the provision of shared paths through and connecting to the application area in accordance with the Central Maddington Outline Development Plan. The approved shared paths are to be constructed by the landowner/applicant. (Local Government)

6. Prior to subdivisional works, a plan is to be submitted and approved, detailing the waterway crossing and indicating how design and construction will minimise detrimental impacts on the waterway form and function is to be submitted and approved, on advice from the Department of Biodiversity, Conservation and Attractions. The waterway crossing plan is to be implemented as part of the subdivisional works. (Local Government)

7. Uniform fencing, comprising a 2.4 metre high noise wall, being constructed along the boundary of the site including Public Open Space where they abut the Railway Reserve, and the existing/proposed Primary Regional Road reserve in accordance with the recommendations of the *Transport Noise Assessment, Lot 808, 1993 Albany Highway, Maddington*, *Lloyd George Acoustics (March 2015)*. (Local Government)

8. A notification, pursuant to Section 70A of the *Transfer of Land Act 1893* is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows:

'The lots are situated in the vicinity of a transport corridor and is currently affected, or may in the future be affected by transport noise.' (Local Government)

9. A notification, pursuant to Section 70A of the *Transfer of Land Act 1893* is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows:

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 35 482 341 493

'The proposed grade separation of Albany Highway being bridged over the existing Perth to Armadale passenger railway will cause visual intrusion.' (Local Government)

10. Local Development Plan(s) being prepared and approved for Lots 201-204 shown on the plan dated 10 July 2018 (attached) that address the following:

    (a) Quiet House Design Package A requirements, as per State Planning Policy 5.4 - Road and Rail Transport Noise and Refight Considerations in Land Use Planning,

    to the satisfaction of the Western Australian Planning Commission. (Local Government)

11. Suitable arrangements being made with the local government for the provision of vehicular crossovers to service Lots 201, 202, 204, 216, 217, 225, 232, 234, 242, 243, 245, 257, 261, and 262 as shown on the approved plan of subdivision. (Local Government)

12. Pursuant to Section 150 of the *Planning and Development Act 2005* and Division 3 of the *Planning and Development Regulations 2009* a covenant preventing vehicular access onto Albany Highway being lodged on the certificate(s) of title of the proposed lot(s) at the full expense of the landowner/applicant. The covenant is to prevent access, to the benefit of Main Roads, in accordance with the plan dated 25 May 2018 (attached) and the covenant is to specify:

    "*No vehicular access is permitted to and from Albany Highway.*" (Local Government)

13. Redundant vehicle crossover(s) to be removed and the kerbing, verge, and footpath (where relevant) reinstated with grass or landscaping to the satisfaction of the Western Australian Planning Commission and to the specifications of the local government. (Local Government)

Drainage

14. Prior to the commencement of subdivisional works, a revised Urban Water Management Plan (UWMP) is to be prepared and approved, on advice from the Department of Water and Environmental Regulation and the City of Gosnells, consistent with any approved Central Maddington Local Water Management Strategy. (Local Government)

15. Engineering drawings and specifications are to be submitted and approved, and works undertaken in accordance with the approved engineering drawings and specifications and approved plan of subdivision, for the filling and/or draining of the land, including ensuring that stormwater is contained on-site, or appropriately treated and connected to the local drainage system. Engineering drawings and specifications are to be in accordance with an approved UWMP for the site, or where no UWMP exists, to the satisfaction of the Western Australian Planning Commission. (Local Government)

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
Tel: (08) 6551 8002; Fax: (08) 6551 9001; Infoline: 1800 626 477
e-mail: info@dplh.wa.gov.au; web address http://www. dplh.wa.gov.au
ABN 35 482 341 493

16. The land being filled, stabilised, drained and/or graded as required to ensure that
    (a) lots can accommodate their intended development; and
    (b) finished ground levels at the boundaries of the lot(s) the subject of this approval match or otherwise coordinate with the existing and/or proposed finished ground levels of the land abutting; and
    (c) stormwater is contained on-site, or appropriately treated and connected to the local drainage system. (Local Government)

17. Drainage easements and reserves as may be required by the local government for drainage infrastructure being shown on the diagram or plan of survey (deposited plan) as such, granted free of cost, and vested in that local government under Sections 152 and 167 of the *Planning and Development Act 2005.* (Local Government)

Subdivisional Works

18. Prior to the commencement of subdivisional works, the landowner/applicant is to provide a pre-works geotechnical report certifying that the land is physically capable of development or advising how the land is to be remediated and compacted to ensure it is capable of development. In the event that remediation works are required, the landowner/applicant is to provide a post geotechnical report certifying that all subdivisional works have been carried out in accordance with the pre-works geotechnical report. (Local Government).

19. Prior to the commencement of subdivisional works a detailed Subdivision Works Management Plan is be prepared and approved with satisfactory arrangements being made for the implementation of the approved plan. (Local Government)

20. Other than buildings, outbuildings and/or structures shown on the approved plan for retention, all buildings, outbuildings and/or structures present on the site at the time of subdivision approval being demolished and materials removed from the lot(s). (Local Government)

21. An acid sulphate soils self-assessment form and, if required as a result of the self-assessment, an acid sulphate soils report and an acid sulphate soils management plan shall be submitted to and approved by the Department of Water and Environmental Regulation before any subdivision works or development are commenced. Where an acid sulphate soils management plan is required to be submitted, all subdivision works shall be carried out in accordance with the approved management plan. (Department of Water and Environmental Regulation)

22. All septic sewer systems including all tanks and pipes and associated drainage systems (soak wells or leach drains) and any stormwater disposal systems are to be decommissioned, in accordance with the Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, removed, filled with clean sand and compacted. Proof of decommissioning is to be provided in the form of either certification from a licensed plumber or a statutory declaration from the landowner/applicant, confirming that the site has been inspected and all septic

tanks, soak wells, leach drains and any associated pipework have been removed. (Local Government)

Servicing

23. Arrangements being made with the Water Corporation so that provision of a suitable water supply service will be available to the lots shown on the approved plan of subdivision. (Water Corporation)

24. Arrangements being made with the Water Corporation so that provision of a sewerage service will be available to the lots shown on the approved plan of subdivision. (Water Corporation)

25. Suitable arrangements being made with the Water Corporation for the drainage of the land either directly or indirectly into a drain under the control of that body. (Water Corporation)

26. Arrangements being made to the satisfaction of the Western Australian Planning Commission and to the specification of Western Power for the provision of an underground electricity supply to the lot(s) shown on the approved plan of subdivision. (Western Power)

27. The transfer of land as a Crown reserve free of cost to Western Power for the provision of electricity supply infrastructure. (Western Power)

Public Open Space

28. The proposed reserve(s) shown on the approved plan of subdivision being shown on the diagram or plan of survey (deposited plan) as reserve(s) for Public Open Space and vested in the Crown under Section 152 of the *Planning and Development Act 2005*, such land to be ceded free of cost and without any payment of compensation by the Crown. (Local Government)
29. Arrangements being made for the proposed public open space to be developed by the landowner/applicant to a minimum standard and maintained for two summers through the implementation of an approved landscape plan providing for the development and maintenance of the proposed public open space in accordance with the requirements of Liveable Neighbourhoods and to the specifications of the local government. (Local Government)

30. Measures being taken to ensure the identification and protection of any vegetation on the site worthy of retention that is not impacted by subdivisional works, prior to commencement of subdivisional works. (Local Government).

31. Prior to the commencement of subdivision works a revised Wetland and Landscape Development and Management Plan is to be prepared, approved and implemented, to ensure the protection and management of the sites environmental assets, to the specifications of the City of Gosnells in consultation with the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section. (Local Government)

32. Prior to the commencement of subdivision works a Revised Revegetation and Landscaping Plan is to be prepared, approved and implemented to the specifications of the City of Gosnells in consultation with the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section. (Local Government)

33. Suitable vehicle barrier/bollards are to be provided along the boundary or within the roads abutting the Public Open Space areas to the satisfaction of the Western Australian Planning Commission. (Local Government)

Parks and Recreation Reserve

34. Prior to the commencement of subdivision works a Foreshore Management Plan for works within the Swan Canning Development Control Area (Lot 809) shall be prepared, approved and thereafter implemented to the satisfaction of the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section in consultation with the Department of Planning Lands and Heritage and the City of Gosnells. (Department of Biodiversity, Conservation and Attractions)

35. Prior to commencement of subdivision works, drawings and specifications for the development interface with the Parks and Recreation and Public Open Space are to be prepared and approved to the satisfaction of the Western Australian Planning Commission, on advice of the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section. (Local Government)

36. A management plan detailing how risk of erosion and sedimentation impacts into nearby water bodies will be minimised during subdivision is to be:
    (a) prepared by the landowner/applicant and approved prior to the commencement subdivisional works; and
    (b) implemented during subdivisional works.
    (Department Biodiversity, Parks and Attractions - Rivers and Estuaries section)

Bushfire

37. Prior to commencement of subdivisional works the RUIC Bushfire Management Plan (dated 20 December 2017) shall be updated to the satisfaction of the Western Australian Planning Commission, in consultation with the City of Gosnells which addresses the modified plan of subdivision and deletes any reference to the Local Government maintaining the Public Open Space to ensure low threat vegetation. (Local Government)

38. A Notification, pursuant to Section 165 of the *Planning and Development Act 2005* is to be placed on the certificate(s) of title of the proposed lot(s) with a Bushfire Attack Level (BAL) rating of 12.5 or above, advising of the existence of a hazard or other factor. Notice of this notification is to be included on the diagram or plan of survey (deposited plan).

    The notification is to state as follows:

'This land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and is the subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land' (Western Australian Planning Commission)

39. Information is to be provided to demonstrate that the measures contained in the updated bushfire management plan required by Condition 38 that address the following:
    (a) Maintenance of Asset Protection Zones during development;
    (b) Land management and fire breaks as required under the City of Gosnells Firebreak notice and Fuel Hazard Reduction Notice;
    (c) Public Roads to be constructed in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (v1.3) prior to subdivision clearance;
    (d) Temporary Emergency Access Ways/Fire Service Access Routes to be constructed in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (v1.3) prior to subdivision clearance; and
    (e) Temporary cul-de-sacs to be constructed in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (v1.3) prior to subdivision clearance,

    have been implemented during subdivisional works. have been implemented during subdivisional works. (Local Government)

40. A compliance certificate/report for the BAL Contour Map relating to the approved subdivision shall be completed prior to the issuing of titles to the satisfaction of the Western Australian Planning Commission. (Local Government)

41. A plan is to be provided to identify areas of the proposed Lot 262 that have been assessed as BAL-40 or BAL-Flame Zone.

    A restrictive covenant to the benefit of the local government, pursuant to section 129BA of the *Transfer of Land Act 1893*, is to be placed on the certificate(s) of title of the proposed lot(s) advising of the existence of a restriction on the use of the land within areas that have been assessed as BAL-40 or BAL-Flame Zone. Notice of this restriction is to be included on the diagram or plan of survey (deposited plan).

    The restrictive covenant is to state as follows:

    'No habitable buildings are to be built within areas identified as BAL-40 or BAL-Flame Zone.' (Local Government)

Miscellaneous

42. The applicant is to implement the noise mitigation measures as set out in the Environmental Noise Assessment undertaken by Lloyd George Acoustics (dated 20 October 2017) to the satisfaction of the City of Armadale. (Local Government)

ADVICE:

Western Australian Planning Commission

1. Conditions 14 and 15 have been imposed in accordance with *Better Urban Water Management Guidelines (WAPC 2008).* Further guidance on the contents of Urban Water Management Plans is provided in *'Urban Water Management Plans: Guidelines for preparing and complying with subdivision conditions' (Department of Water 2008).*

2. Department of Biodiversity, Conservation and Attractions advises that the Urban Water Management Plan required under Condition 14 should address, as a minimum, further details on the design, shape, location and proposed planting of the basins following liaison with relevant authorities including the Department of Biodiversity, Conservation and Attractions . If any subsoil drains are proposed beneath Public Open Space Basins, further information to demonstrate that the subsoils will be set above the pre-development maximum groundwater level to minimise the risk of groundwater mobilisation. The basins should be designed so as to blend with the surrounding natural environment and the additional planting areas proposed as part of the *Stokely Creek Wetland and Local Open Space Strategy* (Tranen, 2013).

3. With regard to Condition 20, planning approval and/or a demolition licence may be required to be obtained from the local government prior to the commencement of demolition works.

4. Condition 21 makes reference to an 'acid sulphate soils self-assessment form'. This form can be downloaded from the Western Australian Planning Commission's website.

   The 'acid sulphate soils self-assessment form' makes reference to the Department of Water and Environment Regulation's 'Identification and Investigation of Acid Sulphate Soils' guideline. This guideline can be obtained from the Department of Water and Environment Regulation's website.www.der.wa.gov.au

5. With regard to Conditions 23, 24 and 25 the landowner/applicant shall make arrangements with the Water Corporation for the provision of the necessary services. On receipt of a request from the landowner/applicant, a Land Development Agreement under Section 83 of the *Water Services Act 2012* will be prepared by the Water Corporation to document the specific requirements for the proposed subdivision.

6. With regard to Condition 26, Western Power provides only one underground point of electricity supply per freehold lot.

7. In regard to Condition 30, the applicant is advised that no vehicle access is permitted during subdivisional works for vehicles other than the residing residential vehicle and upon completion of stage 1, as per condition 32 the crossover is to be removed and the kerbing, verge and footpath (where relevant) reinstated with grass or landscaping.

8. The applicant is advised that any works within the public open space reserve should be consistent with works proposed in the Parks and Recreation Reserve and

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ABN 35 482 341 493

address the ongoing management of the landscaping to minimise the impact of nutrient transport to the river and to provide a cohesive area of public open space. Landscaping should enhance the viewscape of the river and seek to minimise visual intrusion of the development on the landscape. The Department of Biodiversity, Conservation and Attractions advises the planting of local native species to reduce water and fertiliser requirements and provide habitat for native riparian fauna.

9. In regard to the Condition 32 the applicant is advised that the the revised landscape management plan is to provide details on the species and rate of growth of the proposed low threat land scaped area adjacent. The landscape management plan shall be included as an appendix of the the Bushfire Management Plan.

10. With regard to Condition 33, the Foreshore Management Plan for the works within the Swan Canning Development Control Area (Lot 809) shall include, as a minimum, those works outlined the revised Revegetation and Landscaping Plan. The Foreshore Management Plan will need to obtain the approval of the Minister for Environment under Part 5 of the *Swan and Canning Rivers Management Act 2006*. The Foreshore Management Plan shall be implemented to the specifications of the Department of Biodiversity, Conservation and Attractions (Rivers and Estuaries) and is required to address the ongoing care, maintenance and management responsibilities, including vesting arrangements, for the Parks and Recreation reserve

11. With regard to Condition 35, drawings and specifications should include, but not be limited to, details on any proposed development (including filling, battering, retaining, fencing) within 10 metres of the Swan Canning Development Control Area (DCA) boundary. Such specifications are to include details on heights and materials (which are required to be low fire threat). The development should demonstrate that the visual amenity of the interface between the development and the DCA is desirable when being viewed from within the public reserve and not increase bushfire threat.

12. With regard to Condition 37, the revised Bushfire Management Plan should demonstrate that all necessary precautions to manage fire risk will be incorporated into the development area. Please note that the onus of fire management sits with the developer and should be contained on the developable land, not within the adjacent public land. It is important that any public open space areas proposed to be revegetated or rehabilitated as part of agreed improvements, are not impacted or reduced.

13 The Department Biodiversity, Parks and Attractions - Rivers and Estuaries section advises the following:

(a) Notification shall be provided, in writing, to the Swan River Trust and Western Australian Planning Commission, not less than fourteen (14) days prior to commencement of subdivisional works.

(b) No building materials, soil, fill, rubbish or any other deleterious matter shall be allowed to enter Stokely Creek or the Canning River as a result of the works.

(c) Access through or the placing of equipment, building materials, soil, fill, rubbish or any other deleterious matter on the Parks and Recreation reserve will require the consent of the Western Australian Planning Commission.

(d) All fill, gravel and any other material imported onto the site and surrounding area shall be clean and uncontaminated in accordance with the definition of 'clean fill' outlined in the Department of Environment and Conservation's *Landfill Waste Classification and Waste Definitions 1996* (as amended December 2009).

14. Prior to the commencement of subdivisional works, the landowner/applicant is advised to investigate whether or not approval is required pursuant to the *Aboriginal Heritage Act 1972*. The landowner/applicant should conduct a search of the Register of Aboriginal Sites to determine if any aboriginal sites have been recorded in the vicinity of their application, and this heritage information should be submitted to the Department of Indigenous Affairs with a request for advice.

15. The Public Transport Authority advises that no stormwater drainage is to be discharged into the railway reserve.

16. The Department of Fire and Emergency Services (DFES) advises that historical research has revealed that during the past 100 years, former elements of the Australian Defence Forces may have conducted training and/or operational activities within or close to the area of the proposed subdivision. It is possible that as a result of these activities, the subject area may contain unexploded ordnance (UXO). Whilst it is considered that the possible risk from UXO on the land subject to this approval is minimal, an absolute guarantee that the area is free from UXO cannot be given. Should, during subdivisional works, or at any other time, a form or suspected form of UXO be located, DFES has advised that the following process should be initiated:

(a) do not disturb the site of the known or suspected UXO;
(b) without disturbing the immediate vicinity, clearly mark the site of the UXO;
(c) notify Police of the circumstances/situation as quickly as possible; and
(d) maintain a presence near the site until advised to the contrary by a member of the WA Police Service or Defence Forces.

Further advice on this issue may be obtained by contacting the Unexploded Ordnance Unit, Department of Fire and Emergency Services.

17. Main Roads Western Australia advises the following:

- A strategic network review of Albany Highway through Maddington is ongoing however it has so far identified that additional road reservation may be required;
- The project for the upgrading/widening of Albany Highway is not in Main Roads current 4-year forward estimated construction program and all projects not listed are considered long term. Please be aware that timing information is subject to change and that Main Roads assumes no liability whatsoever for the information provided;
- No earthworks are to encroach onto the road reserve;
- No stormwater drainage is to be discharged onto the road reserve;

Western Australian Planning Commission

- The landowner/applicant shall make good any damage to the existing verge vegetation within the road reserve.

Ms Sam Fagan
Secretary
Western Australian Planning Commission
30 August 2018

Enquiries : Gary Mcgowan (Ph 6551 9594)

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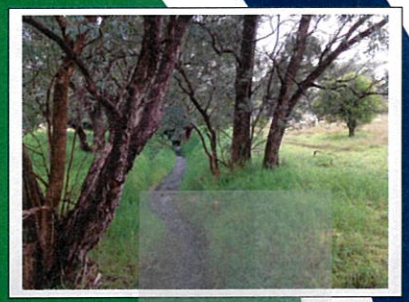
ABN 35 482 341 493

Oversby Consulting

Lot 808 Albany Highway, Maddington

URBAN WATER MANAGEMENT PLAN



DOCUMENT QUALITY CONTROL

Project Reference		B21015
Ver No.	Purpose	Date
	Previous version C by Calibre	*May 2020*
Draft	Client Review	November 2021
V1	Submission for agency approval	November 2021
V2	Re submission for agency approval	October 2022
V3	Re-submission to address DBCA final comments	November 2022

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Appendices

1 EXECUTIVE SUMMARY

The Lot 808 Albany, Highway, Wellesley Urban Water Management Plan (UWMP) articulates the range of management practices that are being considered for the proposed development area. The objective of this UWMP is to outline how the proposed development will manage the total water cycle in a sustainable manner. This includes water conservation, stormwater management, groundwater management and management of associated water dependent ecosystems. The management of these issues is articulated through the strategies that follow.

It follows on from the Central Maddington LWMS that covers the site, providing more refined details specific to the subject land and the area immediately surrounding it.

It also considers water management in the adjoining Parks and Recreation Reserve (lot 809), as there will be some discharge and treatment of water in this area.

1.1 SITE SUMMARY

The subject land is composed of Lot 808 Albany Highway, Maddington within the City of Gosnells. It is located south of Albany Highway, directly west of the Armadale train line and east of Stokely Creek. To the south is a Parks and Recreation Reserve that adjoins the Canning River. The subject land area is shown in Figure 1. The UWMP also considers relevant water management work in the adjoining lot 809.

The subject area contains some limited native vegetation and cleared areas. There is also a large disused orchard and some buildings that are no longer used.

There is a Conservation Category Wetland in the area set aside as Local Open Space (LOS). Much of the rest of the LOS is considered Multiple use. The native vegetation present on the site is predominately

contained within this proposed LOS area. There are also some wetlands outside of the subject land to the south that are within the Canning River Floodplain Bush Forever site.

Groundwater is generally 1.5m or deeper below the site, except for small areas within the LOS or localised perching in isolated areas. It is likely there is some groundwater seepage into the wetland to the southwest of the site and to Stokely Creek.

The sandy top soil and vegetated nature of the site means that there is a low surface runoff directly after a rain event. The majority of the water infiltrates to the groundwater or is utilised by the on site vegetation. In larger events, water discharges off the site in a western and southerly direction to Stokely Creek and the Canning River Floodplain.

1.2 PLANNING SUMMARY

The UWMP provides evidence that the subject land can proceed to subdivision while managing the water characteristics of the site. It is proposed that the subject Land will be subdivided into 118 lots comprising of 57 survey strata lots and 61 green title lots. There is also a considerable area of Public Open Space/Local Open Space provided, in keeping with the Outline Development Plan.

The UWMP has been produces in response to the following subdivision conditions:

WAPC Application Number 155487

14. Prior to the commencement of subdivisional works a revised Urban Water Management Plan (UWMP) is to be prepared and approved, on advice from the Department of Water and Environmental Regulation and the City of Gosnells, consistent with any approved Central Maddington Local Water Management Strategy (Local Government)

WAPC Application Number 1036-18

7. Prior to the commencement of subdivisional works a revised Urban Water Management Plan (UWMP) is to be prepared and approved, on advice from the Department of Water and Environmental Regulation and the City of Gosnells, consistent with any approved Central Maddington Local Water Management Strategy (Local Government)

The site is located within the City of Gosnells' Central Maddington Outline Development Area which has provides a framework to allow for increasing density within the ODP area . The area is identified as residential in the ODP.

The lot is wholly encompassed within this approved Outline Development Plan.

The UWMP adheres to the principles outlined in the approved LWMS and Draft UWMS (2014) that had in principle support from the City, that covers the subject land. Where there have been modifications to the LWMS and Draft UWMP, justification has been provided as to the benefit of the proposed change.

Stokely Creek with mix of native and weed species

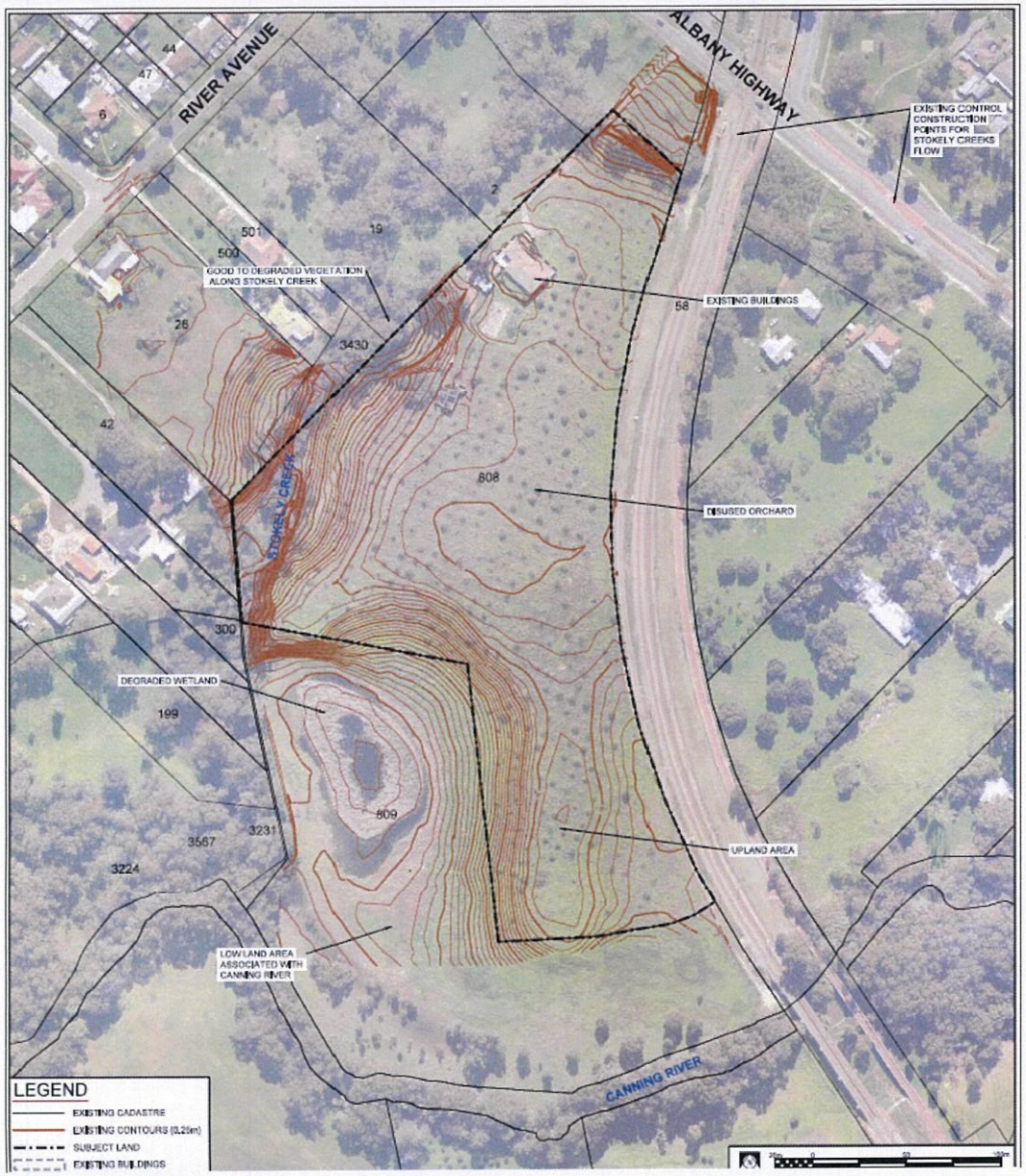


Figure 1 Subject Land: Existing Summary

2 KEY ELEMENTS PLAN

The water management strategies for the subject land are based on best practice water sensitive urban designs that integrate sustainability and the provision of functional residential areas. The strategies will be achieved through the synthesis of planning and designs to manage, protect and conserve the total water cycle. The plans and designs for the development are appropriate for the subject land's development constraints, existing development of the site, surrounding environment and future residential use.

The subject land is within the Stokely Creek and Canning River catchments. This strategy details actions that will assist with protecting and enhancing these ecosystems through the utilisation of best practice water management practices.

A summary of the WSUD elements that will be implemented within the development to achieve best management practices are outlined below, and visually represented in Figure 2 - Key Elements Plan.

WATER CONSERVATION AND SERVICING

- A target of less than 100KL per person per annum has been set for the development.
- All houses are to be connected to a potable reticulated water main to provide security of supply.
- All houses are to be connected to a reticulated sewage main.
- Provision of awareness raising material on water saving measures. A residential household on average per annum could save between 31 and 46KL inside the house alone using adequate water efficient appliances and fixtures.

STORMWATER MANAGEMENT

- Bioretention gardens, both separate and within the main basins will be used to treat the 1 hour 1:1EY event, and are sized at 2% of the effective impervious area.
- The bioretention gardens and planted detention basin will attenuate and discharge stormwater at predevelopment rates for all events up to the 1%AEP storm event.
- All lots have a connection to the stormwater pipe system.

FLOOD PROTECTION

- All lots levels will be designed to maintain a clear separation between the habitable floor levels and the 1% Annual Exceedance Probability (AEP) flood levels generated on site.
- The drainage network will flow at capacity and excess water will be directed down the road reserves to the LOS/POS areas to protect houses and other infrastructure.
- The residential lots are outside of the Canning River and Stokely Creek floodplain.

GROUNDWATER MANAGEMENT

- Inflows to the groundwater are to be treated in bioretention gardens and basins to improve the quality of water prior to it entering the groundwater reducing impacts on downstream significant ecosystems.
- Adequate separation to groundwater is to be maintained in all residential areas, through grading of the subsurface loam/clay, with the use of free draining sand above.
- Lot subsoils will be used to control groundwater under lots, with subsoils containing treatment media as appropriate (if near effluent disposal areas).
- The use of appropriate wastewater treatment systems will assist with managing contaminates entering the groundwater.
- The vegetated swales and bioretention gardens will treat stormwater prior to it entering the groundwater.

WATER DEPENDENT ECOSYSTEM MANAGEMENT

- New water habitat creation will be achieved within the bioretention and detention basins.
- The WSUD elements used on site will treat stormwater, improving the water quality prior to it entering downstream ecosystems.
- A Landscaping and Wetland Management Plan has been completed to guide the protection and restoration of the LOS and Parks and Recreation Reserve areas, which will provide greater riparian habitat then is currently present.

Typical low roadside basin side vegetation to manage fire risk and treat stormwater

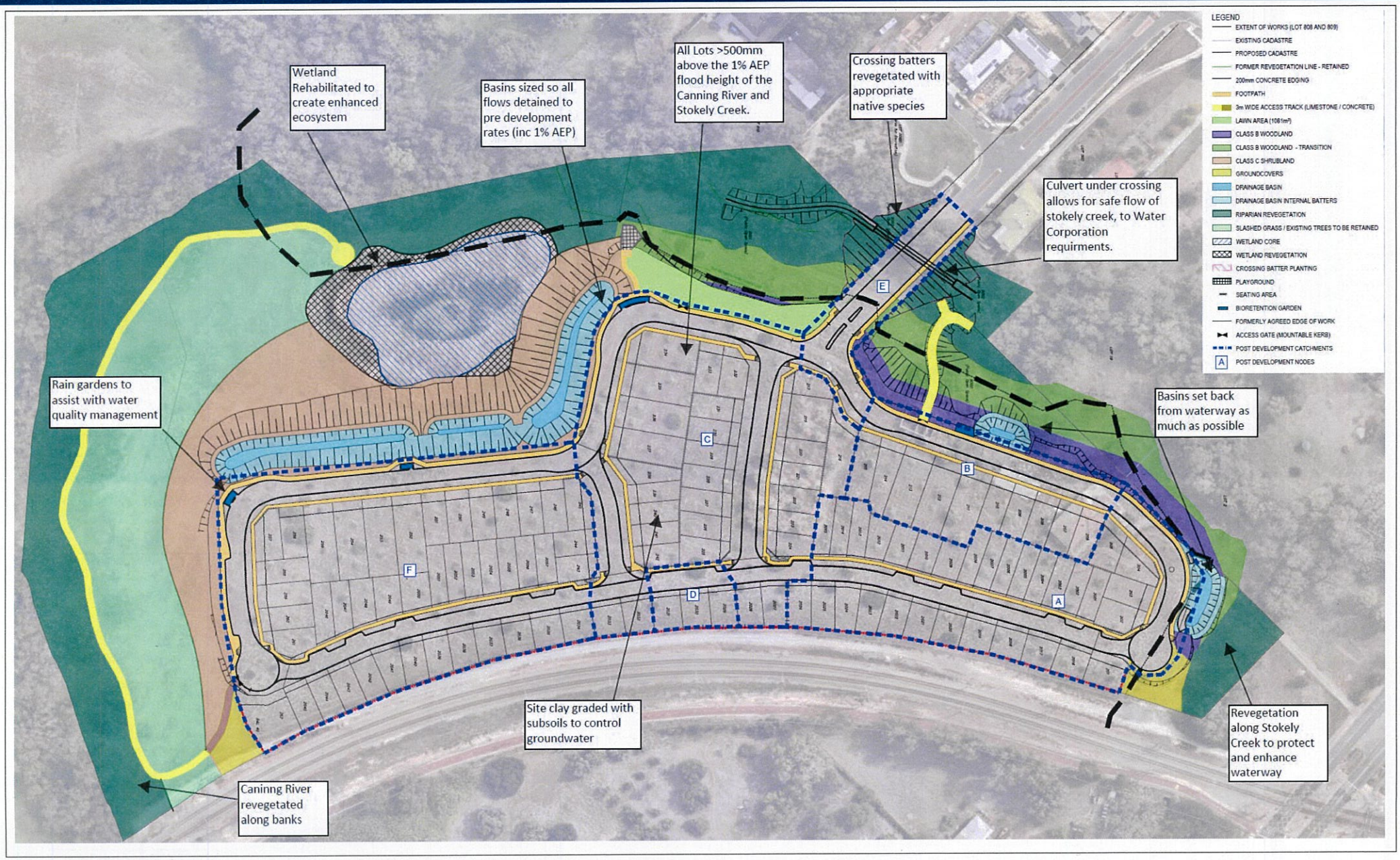


Figure 2 Key Elements Plan

3 LANDFORM PLAN

The subject area is mainly composed of a gently undulating plain that drops down an embankment to the, north south and west. The general grade within the plain area is between 0.4 and 2%. The highest point on the site of approximately 11.1mAHD is located within the middle of the eastern edge of this plain. The edge of the plain tends to be around 10mAHD. Here the site drops over the embankment.

The Stokely Creek is at the bottom of the embankment to the north and west. This embankment has slopes between 7 and 15%, with the steepest areas being next to the stream channel. A similar embankment occurs on the south western and southern side. Here the embankments fall to the flatter Canning River floodplain. Within this floodplain there is also a degraded wetland that is seasonally inundated. These slopes of the embankment in this area tend to be between 11 and 15%. The Stokely Creek and Canning River floodplain are consider geomorphic wetlands as well.

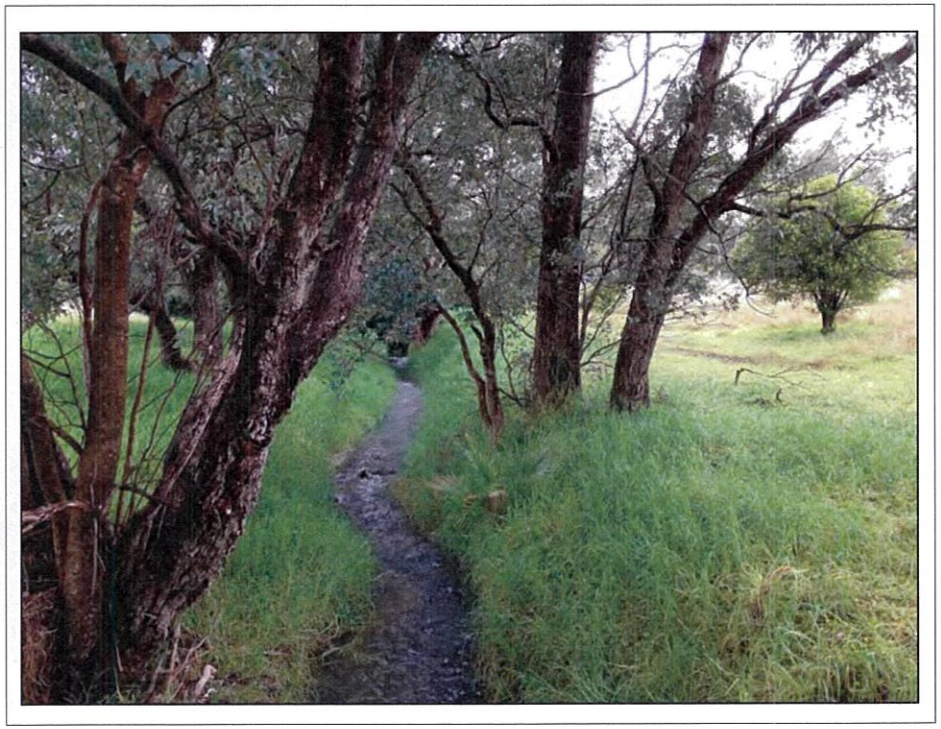
This lowest area on the site is within Stokely Creek, with a level of approximately 4.8mAHD.

There are no drains within the subject land.

The sites contours can be seen in Figure 3 - Landform Plan..

Winter wet flat floodplain of CanningRiver in the south of the subject land

Stokely Creek



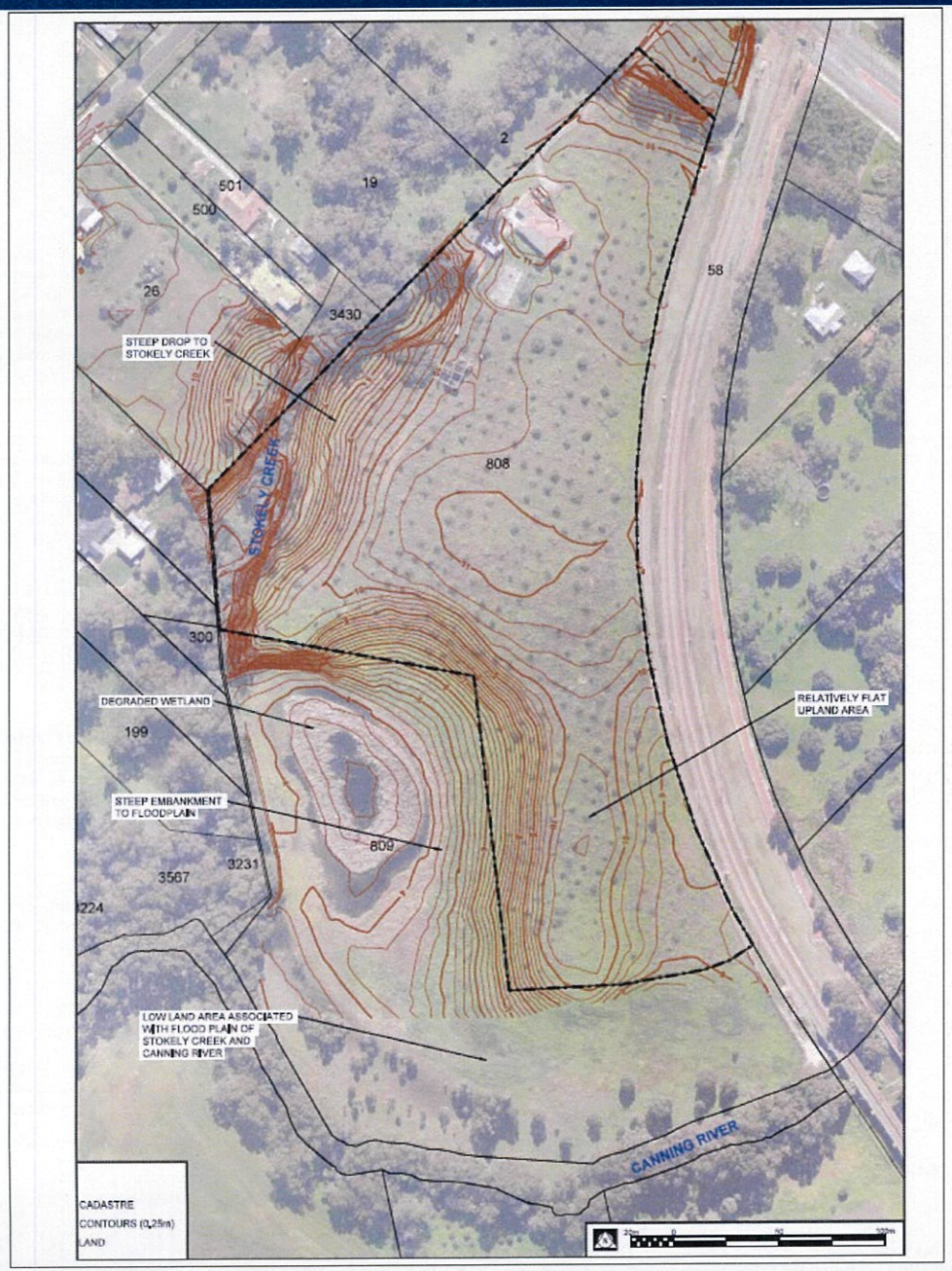


Figure 3 Landform Plan

4 GEOTECHNICAL PLAN

Geotechnical investigations were initially undertaken by Douglas Partners with the information recorded in the report titled; Geotechnical Investigation – Proposed Residential Subdivision Lot 808 Albany Highway, Maddington WA.

Field work was undertaken in September 2013. 18 test pits were dug to a maximum depth of 3.2m.

Further investigations were undertaken by Galt Geotechnics in 2018, with the findings outlined in the Geotechnical Study: Proposed Residential Development Lot 808 Albany Highway, Maddington. Fieldwork was undertaken on the 27th September and 2nd October, 2018.

Both reports are included in the CD of Attachments.

4.1 Soil Conditions

The field studies showed the site to be generally a silty sand (1.1m deep) overlying slightly clayey gravelly sand (1.2-2.4m deep) and sandy clay/ sandy gravel (2-3m deep). The topsoil over this was generally 0.1 to 0.15m deep. No swamp or Lacustrine deposits were encountered.

4.2 Permeability

In 2013, three in situ falling head infiltration tests were also undertaken next to pits TP4, TP10 and TP17. The permeability ranges from 1.0x10-6 m/s through to 2.5x10-7m/s. In 2018, 6 infiltration tests were performed with results ranging from 1.1m/day to 15m/day. However, it was noted that this was in loose sand and the permeability is likely to decrease when compacted. This low permeability would suggest that soakwells are not suitable within the insitu soils. On site stormwater disposal may be possible with 1.2m of sand fill above the clay layer, with 2m/day being used as a permeability in this situation.

4.3 Acid Sulphate Soils

Preliminary ASS investigations were not undertaken as part of the geotechnical investigation. The ASS risk mapping for the site shows the area associated with Stokely Creek to be of a high risk within 3m of the surface. The rest of the site is characterised as high to medium risk with 3m of the surface.

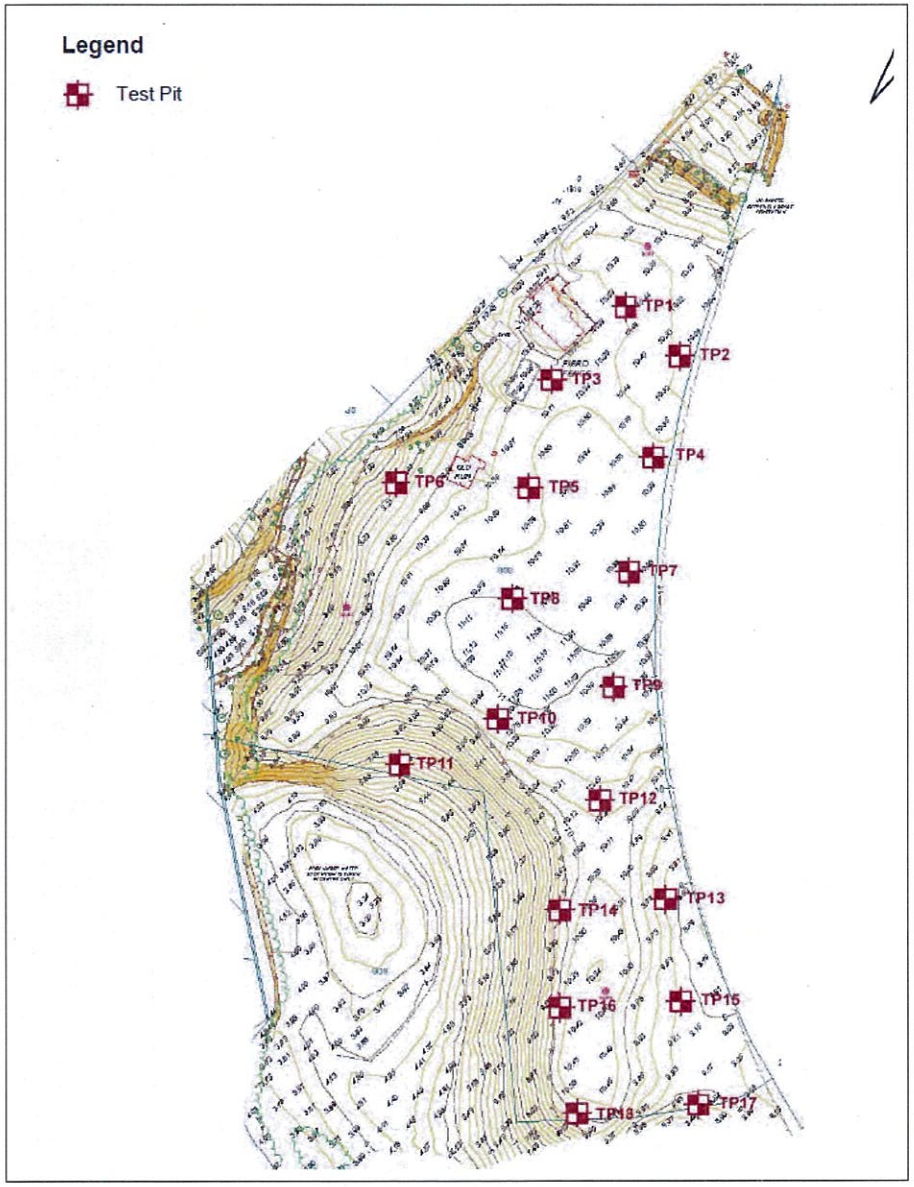
4.4 Phosphorus Retention Index

Phosphorous Retention Index (PRI) indicates the ability of the subject land's soils to absorb and treat nutrients within the soil (soil microbe disinfecting ability). While no PRI testing was undertaken, it is likely to be moderate to high for most of the site based on the silty sands and clays present.

4.5 Groundwater

Groundwater was encountered in 7 of the bores in the 2013 review and 5 pits in the 2018, with depths ranging from 0.5 to 3m below the surface and most likely due to localised perching. It was generally seen as seepage. The onsite groundwater monitoring bore was also sampled which showed groundwater to be 2.9m below the surface. It is likely that the higher readings within the test pits are due to pockets of short term perching on the less permeable substrata. As the testing was taken during the wet spring period, this also supports the options that this is short term perching, rather than a shallow continuous superficial aquifer.

Figure 4 2013Geotechnical Test Pit Locations



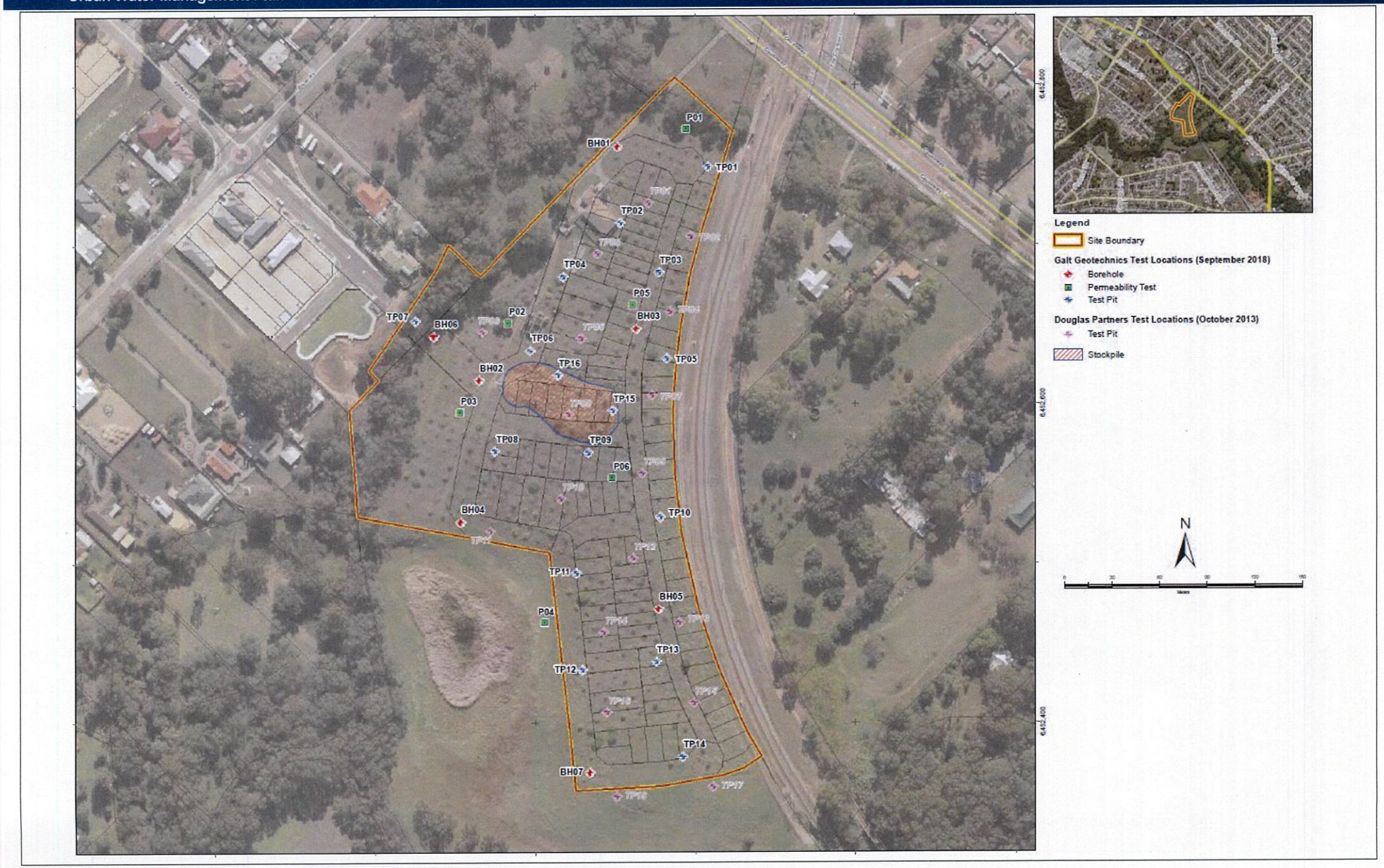


Figure 5 2018 Geotechnical test pit locations and information

5 ENVIRONMENTAL CONDITIONS

The following is a summary of the environmental characteristics of the site. This information is taken mainly from the LWMS, Stokely Creek Wetland and Local Open Space Strategy and on- site inspections.

WETLANDS

According to the Geomorphic Wetland Database the subject land contains the Conservation Category Wetland UFI 7796, which is associated with Stokely Creek. The rest of the site is considered Multiple Use (UFI 15768). The attributes of much of the site, outside of the waterway area, are however unlikely to support wetland vegetation. This includes the groundwater not being within 1.5m of the surface, nor is there any areas of standing water.

The area surrounding the subject land is also part of this Multiple Use wetland. To the south of the site there is a defined seasonally inundated wetland. The river floodplain also exhibits characteristics which would support its wetland classification, including riparian species and waterlogging.

WATERWAYS

The main waterway on the site is Stokely Creek. It traverses the northern edge of the site and a portion of the western edge. A Water Corporation drain feeds into this waterway upstream of the subject land. As mentioned above, the waterway's condition ranges from Completely Degraded to Good. Most of the banks are relatively stable. The Canning River is located south of the subject land. It retains a thin line of native vegetation along its banks. The floodplain of the River extends to the embankment which rises up to the subject land.

VEGETATION

The subject land contains some limited native vegetation plus a disused orchard, pasture species and some garden plants.

The majority of the native species are located along Stokely Creek, although there is still a considerable weed presence in this area. The main native species were *Eucalyptus rudis, Melaleuca rhaphiophylla, Juncus pallidus* and Cory*mbia calophylla*.

The weed species along the waterway included the declared species *Asparagus asparagoides* (Bridal creeper) and *Zantedeschia aethiopica* (Arum Lily).

The vegetation condition varies between Completely Degraded to Good.

FAUNA

No detailed fauna assessments were undertaken for the site. Due to the degraded nature of the vegetation and its discontinuous nature, the likely fauna habitat and therefore population density and diversity is predicted to be low. Some generalist riparian species are likely to use Stokley Creek.

Figure 6 Wetlands map

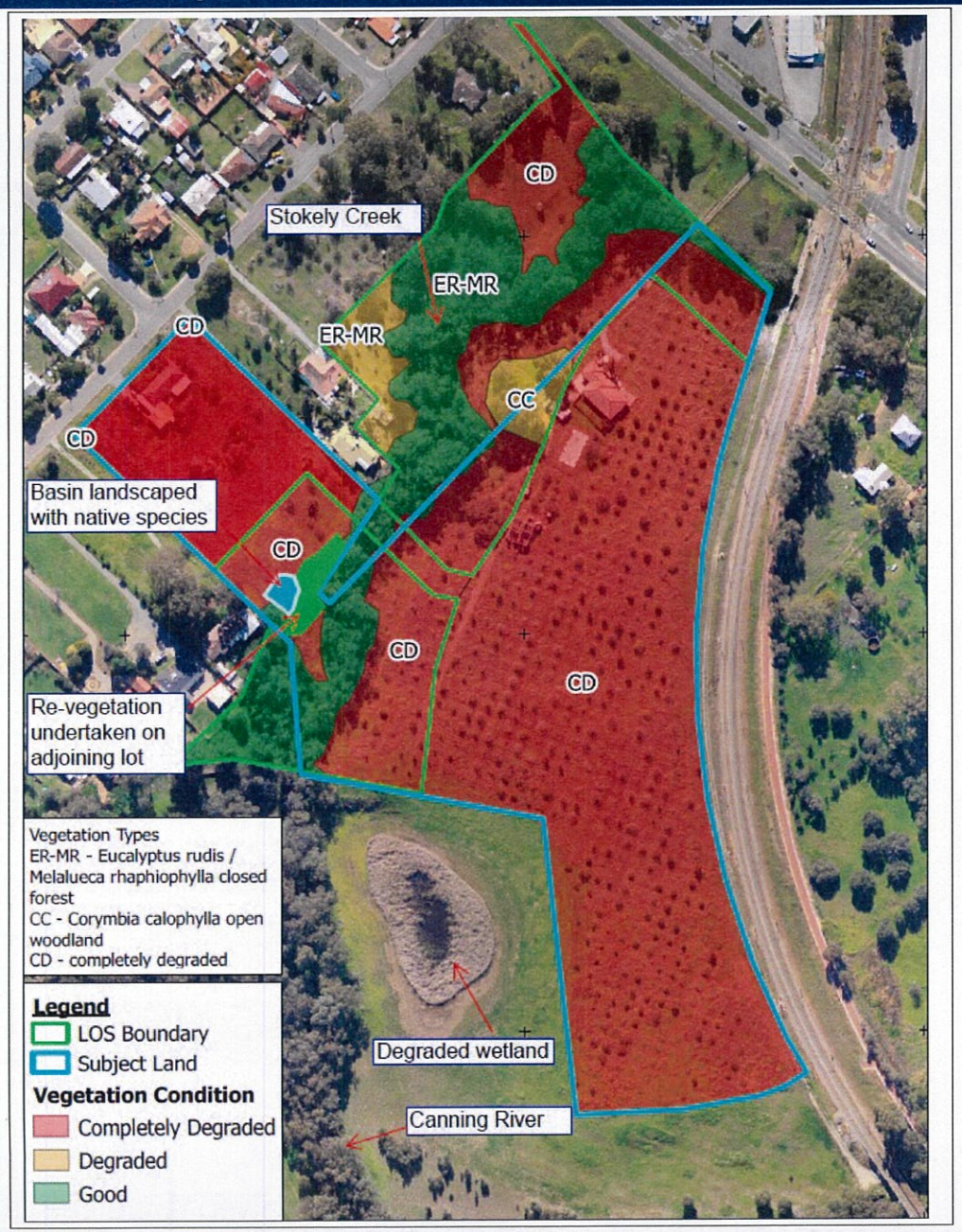


Figure 7 Environmental characteristics of subject land and surrounds

6 PRE DEVELOPMENT SURFACE WATER SITUATION

The predevelopment run off rate for the site were calculated by Shawmac as part of the drainage analysis of the site. The site is composed of 7 sub catchments. A summary of each catchment is outlined in Table 1 - Summary of Pre Development Catchments.

Catchment	Area (ha)	Fraction Impervious (F)	Discharge Coefficient	General Flow Direction	Discharge Water Body
A	1.040	0	0.254	North East	Stokely Creek
B	1.188	0.05 (due to isolated buildings and hard-stand)	0.254	North West	Stokely Creek
C	0.954	0	0.254	West	Stokely Creek
D	1.224	0	0.254	South West	Wetland Depression – Canning River
E	0.903	0	0.254	South/East	Canning River
F	0.084	0	0.254	South West	Canning River
G	0.107	0	0.254	South	Canning River

Table 1 Summary of Pre Development Catchments

The silty sand surface soil type and on site vegetation means that a runoff coefficient of 0.254 is appropriate for the pre development situation.

6.1 Flooding

The site adjoins Stokely Creek. The 1% AEP flood level that results from the tail water effect up the creek from the Canning River is approximately 5.8mAHD, based on Department of Water and Environmental Regulation mapping.

The design flow provided by Water Corporation for Stokely Creek (as it is also used as a Water Corporation Drain upstream) for a 20% AEP event is 7.7m3/s

The area where development of buildings is to occur is approximately 10m AHD and above, so there is no impact on the site from flooding within Stokely Creek/Canning River.

6.2 Water Quality

Water Quality Sampling was undertaken along Stokely Creek by Astron Soil and Water. 8 Samples were taken between November 2011 and October 2013. A summary of the data can be seen in Table 2 - Summary of Stokely Creek Surface Water Quality.

SW1 was located on the northern boundary of the site, just downstream of the rail bridge.

SW2 was located near the exit point for Stokely Creek from the site, which is in the south west corner of the subject land. Table 2. SW2 is downstream of SW1.

Sampling Point	pH	Electrical Conductivity (uS/cm)	DO (ppm)	Total N (mg/L)	Total P (mg/L)
SW1					
Mean	7.32	951	7.76	1.14	0.15
Max	9.7	2012	15.10	2.4	0.92
Min	6.2	444	1.31	0.35	0.02
SW2					
Mean	6.93	1133	5.65	1.19	0.08
Max	7.57	1900	10.40	2.3	0.15
Min	6.33	240	0	0.35	0.04

Table 2 Summary of Stokely Creek Surface Water Quality

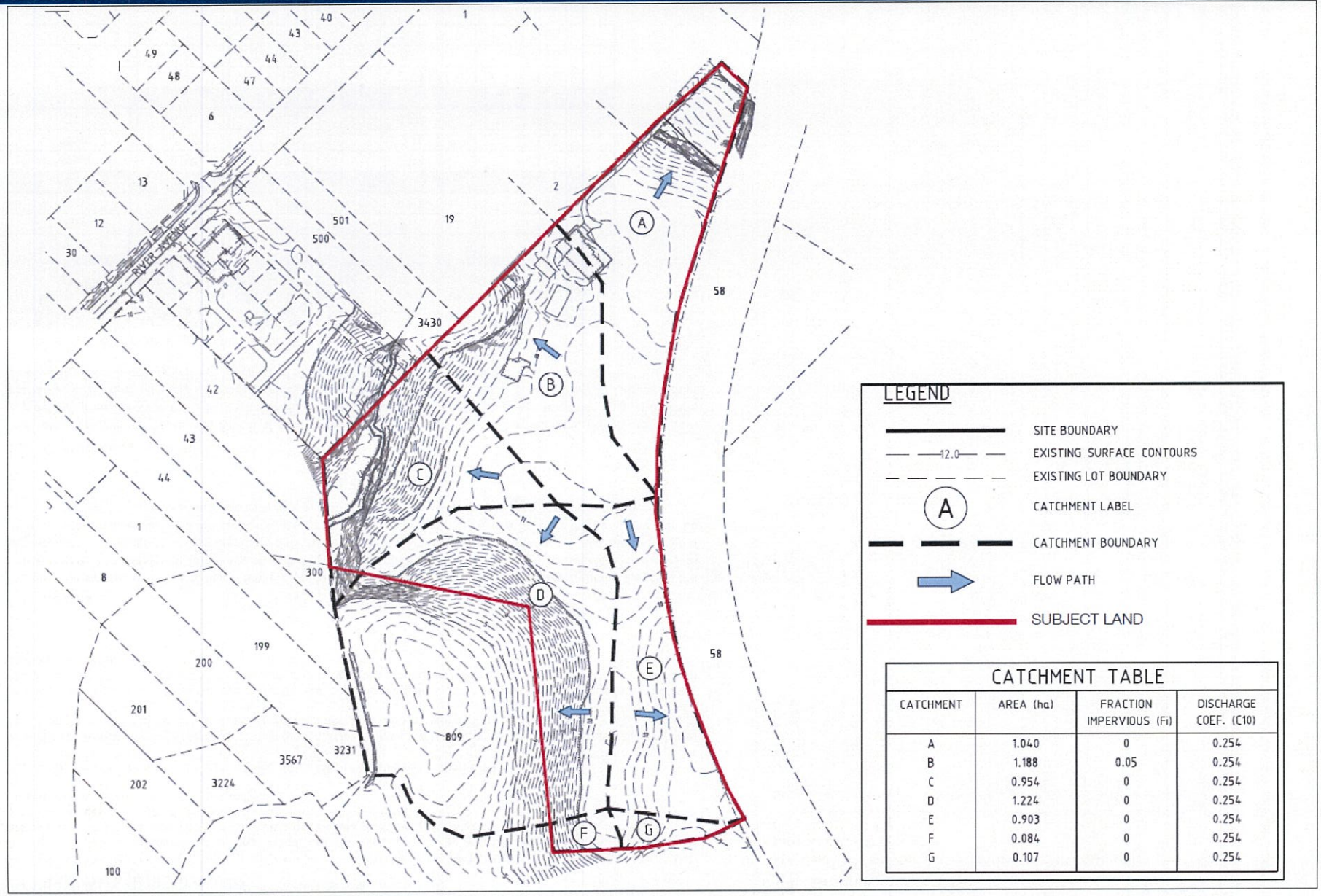


Figure 9 Predevelopment Surface Water

7 GROUNDWATER (PRE DEVELOPMENT)

7.1 Shallow Superficial Aquifer

Groundwater Monitoring of the superficial aquifer has been undertaken for the subject land by Astron Soil and Water. The results were summarised in the report titled; Lot 808 Albany Highway and Lot 26 River Avenue, Maddington predevelopment groundwater and surface water. Both levels and quality of the groundwater was investigated. The site was sampled monthly between November 2011 and October 2013, with 8 quality samples taken during this period (quarterly).

The location of the 3 bores on the subject land (MB1-MB3) can be seen in Figure 10.

As well as an Annual Average Maximum Groundwater Level (AAMGL), a Maximum level was also predicted, which was determined to be 0.5m above the maximum level recorded after the very wet spring of 2013.

The levels in the bore are representative of the general superficial aquifer across the site. Due to the underlying clayey soil, there is also likely to be isolated short term perching of the groundwater within the sandy layers of soil above, in localised locations.

7.2 Levels

The groundwater tends to flow towards Stokely Creek in the northern portion and towards the Canning River for the southern end. The maximum groundwater contours fall from approximately 8mAHD on the eastern boundary to approximately 5.4mAHD on the western boundary and 5.0m AHD on the southern Boundary. For the vast majority of the area where residential uses are proposed, the depth to the maximum groundwater is more than 3m. This can be seen in Figure 8. The shallower areas are within areas where revegetation and public open space are proposed.

7.3 Groundwater quality

The water quality in the bores was typical of soils within the Swan Coastal Plain. The neutral to slightly acidic soils suggest that there is little in the way of active Acid Sulphate Soils. The nutrient levels were sometimes higher then the freshwater guidelines, although are not unusual for previous agricultural land. Table 3 - Summary of Ground Water Quality contains a summary of these results. Full results can be seen in the attached CD groundwater.

Table 3 Summary of groundwater quality

Sampling Point	pH	Electrical Conductivity (uS/cm)	Total N (mg/L)	Total P (mg/L)
MB1				
Mean	6.52	731	1.33	0.94
Max	7.62	900	2.7	2.10
Min	5.94	506	0.57	0.16
MB2				
Mean	6.57	855	0.93	0.20
Max	7.65	1184	2.0	0.46
Min	5.92	402	0.37	0.05
MB3				
Mean	6.87	1134	2.34	0.38
Max	7.34	1830	6.1	1.10
Min	6.35	399	0.5	0.08

7.4 Groundwater quality

The Leederville and Yarragadee confined aquifers occur under the subdivision. Neither is known to express into the superficial aquifer on the site.

There is no allocation available from the Yarragadee or Leederville. There is approximately 2GL available in the Superficial, however the water quality is generally poor and low yielding.

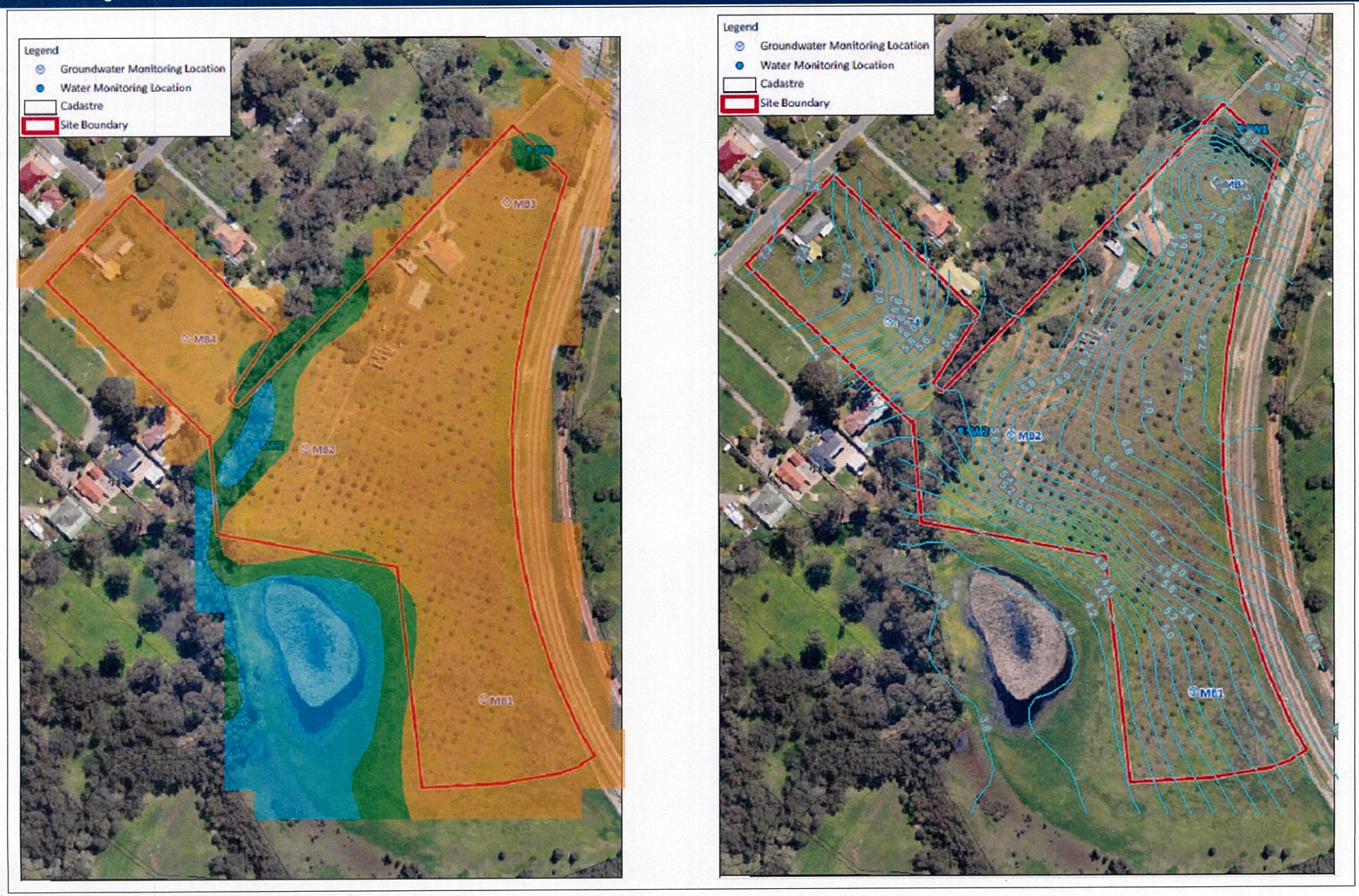


Figure 10 Pre-groundwater AAMGL contours and plan of depth (maximum)

8 DRAINAGE MANAGEMENT STRATEGY OVERVIEW

The post development subject land is divided into 4 residential catchments (A-D). Catchment E covers the entrance road, including a portion of the crossing. These catchments can be seen in Figure 11.

The POS/LOS catchments are to be retained in a similar fashion to their existing state, and therefore have the same discharge coefficient. This has meant they have not been modelled in detail as there is no need for detention or treatment of water for these areas.

There is also to be some modification to the Parks and Recreation reserve to the south of the subject land, with the addition of a basin to store the 20%AEP. The overall flow generated from within this reserve however won't fundamentally change and so has therefore not been modelled in detail. All of the POS/ LOS and recreation areas have however been carefully considered in terms of how water will move through them from the residential catchments and the treatment of this stormwater.

The focus of the onsite drainage modelling is therefore on the 4 residential catchments with consideration as to how this water is managed through the residential areas and as it moves through the POS/LOS and park areas before final discharge to either Stokely Creek or the Canning River.

Each of the four residential catchments have their own treatment and attenuation basins, with the locations noted on Figure 11. There are no roadside soakwells due to the low hydraulic conductivity of the existing soil profile, and the fact that each catchment is relatively small. This lends itself to all water being directed to basins on the edge of the residential areas. This will also minimise and localised mounding of the groundwater under the residential areas.

The basins are also to be constructed to function as biofiltration units, along with street side bioretention gardens. The sizing of the basins takes into account both road runoff and lot runoff, with each lot having a connection to the stormwater system. Catchment D's basin is further divided into 2 sub basins, to assist with detaining flows to predevelopment levels, through the use of the internal choke pipe.

The aim of drainage management for the subject land is to treat all necessary drainage water before it is discharged off site and to retain flows to the existing designed capacities of the downstream drainage system. All flows up to the 1EY storm event will be treated to reduce nutrients, sediments and other contaminants prior to discharge to natural systems. This will effectively capture approximately 95% of all stormwater flow and in doing so; will provide protection to the ecological functions for all receiving natural environments post development.

Above 1EY storm events, the main function will be to control the flow of drainage water throughout the subdivision and its final release from the subject land.

Runoff from storms up to an including the 20%AEP event will be conveyed through the subdivision via a piped systems linked to storage areas. Storage areas are covered in the 20%AEP event and associated Section 8.2

Runoff from storms up to and including the 1%AEP event will be conveyed through a combination of the 20%AEP system, with excess runoff conveyed within the road reserves and POS areas. The primary objective in designing for these extreme events will be the protection of private property from inundation and detaining flows to the downstream drainage system requirements.

The following three sections discuss and provide further details on how water is to be treated and conveyed in the three different ARI scenarios

A – Up to and including the 1:EY event

B – The 20% storm event

C – The 1% flood event

They outline the guidelines that the development will follow to ensure that best management practices of stormwater management and flood protection are achieved. Catchment boundaries, discharge points and volumes of flow are depicted within the respective sections plans and can also be seen in Figures11, 12 and 13.

Further details of the drainage plans can be seen in Appendix A.

Table 4 Drainage system summary

Item	Basin A	Basin B	Basin C	Basin D1	Basin D2
Road Reserve Area (m2)	2619	1502	4398	1023	4063
Lot Area (m2)	6450	3300	6477	1548	8847
Total Catchment (m2)	9069	4802	10875	2571	12910
Base Level (mAHD)	8.25	8.05	7.20	7.10	7.00
Top Level (mAHD)	9.55	9.00	8.20	7.70	7.70
Base Area (m2)	98.00	33.00	234.00	56.00	254.00
Top Area (m2)	372	177	838	337	935
5yr Water Level (mAHD)	8.71	8.30	7.38	7.34	7.30
5yr Water Area (m2)	170.00	70.00	340.00	170.00	550.00
100yr Water Level (mAHD)	9.09	8.41	7.61	7.52	7.51
100yr Water Area (m2)	260.00	90.00	480.00	250.00	760.00
5yr Water Volume (m3)	42.00	13.00	52.00	27.00	121.00
100yr Water Volume (m3)	120.00	22.00	146.00	64.00	259.00
Outlet Pipe Dia. (mm)	225/300	225/225	225/225	N/A	225/250
Pre Flow Rate Q5 (m3/s)	0.048	0.053	0.110		
Pre Flow Rate Q100 (m3/s)	0.086	0.095	0.197		
Post Flow Rate Q5 (m3/s)	0.053	0.047	0.046	0.051	
Post Flow Rate Q100 (m3/s)	0.081	0.097	0.087	0.114	

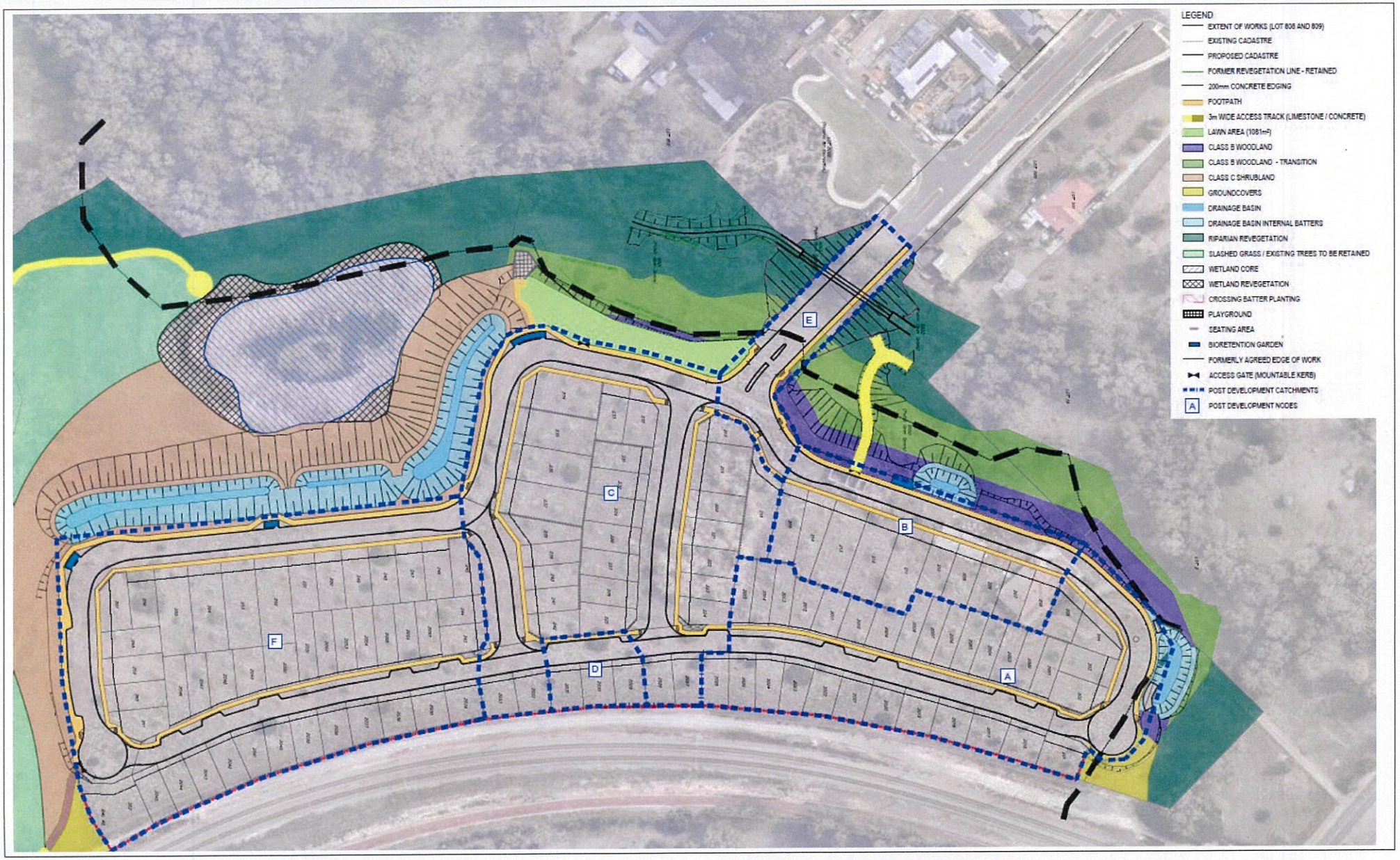


Figure 11 Post Development catchments

8.1 Drainage Management Strategy – 1EY Storm Event and Water Quality

Bioretention Raingardens

The 1EY detention and treatment will utilise bioretention gardens. The design parameters for treatment and attenuation of minor storms up to the 1EY event will be to provide treatment area within the bioretention gardens.

Street reserve flows will initially be directed from the road surface to the kerb line and into side entry pits or where possible streetside bioretention gardens. Flows from the lots (roof and ground) will generally be directed to the lot pit (13 lots will include soakwells). From here water will be discharged via the pipe network directly into the basins which include a bioretention base.

The treatment areas have been sized to treat approximately 2% of the feeding impervious catchment. The outlet pipe is set to 150mm above the base, so as to infiltrate the 1EY volume. The areas can be seen in Table 5.

The base of these street side and basin structures will be layered with bioretention media and planted with appropriate species to assist with treatment of low flows. These species will be composed of *Ficinia nodosa* and *Juncus subsecundus* under a range of Melaleuca species.

The bioretention areas are designed according to the latest FAWB Adoption Guidelines for Filter Media in Biofiltration Systems and the Stormwater Management Manual for WA design guidelines. The design for the gardens is composed of a filter media of amended soils to 500mm below the surface, with an average particle size of 0.5mm. The plants will also assist with nutrient absorption because of the surface area provided by their roots for the formation of bio-films and nutrient uptake.

In summary the media will:

- have a hydraulic conductivity of 100-300mm/hr
- have the top 100mm to be ameliorated with appropriate organic matter and trace elements to assist plant establishment (see table 1 in the attachment)
- have a transition layer to be a washed sand (100mm deep)
- have impermeable side barriers eg plastic to stop water flowing sideways preferentially and not being treated.

The bioretention areas will be watered via temporary irrigation for the first summer. A review will be undertaken to determine if a second summer of watering is required, based on initial plant survival.

Planting is to be undertaken in May-July to assist with plant establishment over winter rains.

They should require no fertiliser application and irrigation demands should be met by stormwater alone, after this initial establishment period.

Further details on establishment and maintenance are to be found in the Wetland and Landscaping Development Management Plan.

The gardens will be designed to assist in the removal of nutrients, sediments and other potential contaminants from stormwater as the water infiltrates through to the groundwater.

Bioretention gardens have been demonstrated to achieve a 50% decrease in nitrogen, 80% decrease in phosphorus and a 90% decrease in total suspended soils (Department of Water's Stormwater Management Manual).

Subsoil networks are also to be included below each raingarden and basin to assist with moving treated water out of the treatment structures. These can be seen in Figures 12-15.

Location	Road Pavement Area (m2)	2% Area (m2)	RG Bioretention area/Basin Base Area provided (m2)	15mm runoff volume (m3)	Storage Depth (m)	1hr infiltration (m2, 2.5m/day)	Total volume provided (m3)
RG1	332	6.64	7	5.0	0.2	0.7	2.1
RG2	1361	27.22	28	20.4	0.2	2.9	8.5
Basin A - Floor Area	-	-	98	-	0.05	10.2	15.1
Combined RG1/RG2/Basin A				*25.4*		*13.9*	*25.8*
RG3	468	9.36	10	7.0	0.3	1.0	4.0
Basin B -Bioretention Zone	339	6.78	8	5.1	0.3	0.8	3.2
Basin B - Floor Area	-	-	25	-	0.1	2.6	5.1
Combined RG3/Basin B				*12.1*		*4.5*	*12.4*
RG4	1145	22.9	24	17.2	0.3	2.5	9.7
Basin C - Bioretention Zone	650	13	15	9.8	0.3	1.6	6.1
Basin C - Floor Area	-	-	219	-	0.00	22.8	23.0
Combined RG4/Basin C				*26.9*		*26.9*	*38.8*
RG5	540	10.8	11	8.1	0.3	1.1	4.4
Basin D1 - Bioretention Zone	372	7.44	8	5.6	0.3	0.8	3.2
Basin D1 - Floor Area	-	-	48	-	0.1	5.0	9.8
Combined RG5/Basin D1				*13.7*		*7.0*	*17.5*
RG6	1380	27.6	30	20.7	0.3	3.1	12.1
Basin D2 - Bioretention Zone	1144	22.88	25	17.2	0.3	2.6	10.1
Basin D2 - Floor Area	-	-	229	-	0.2	23.9	69.7
Combined RG6/Basin D2				*37.9*		*29.6*	*91.9*

Table 5 1EY Storage

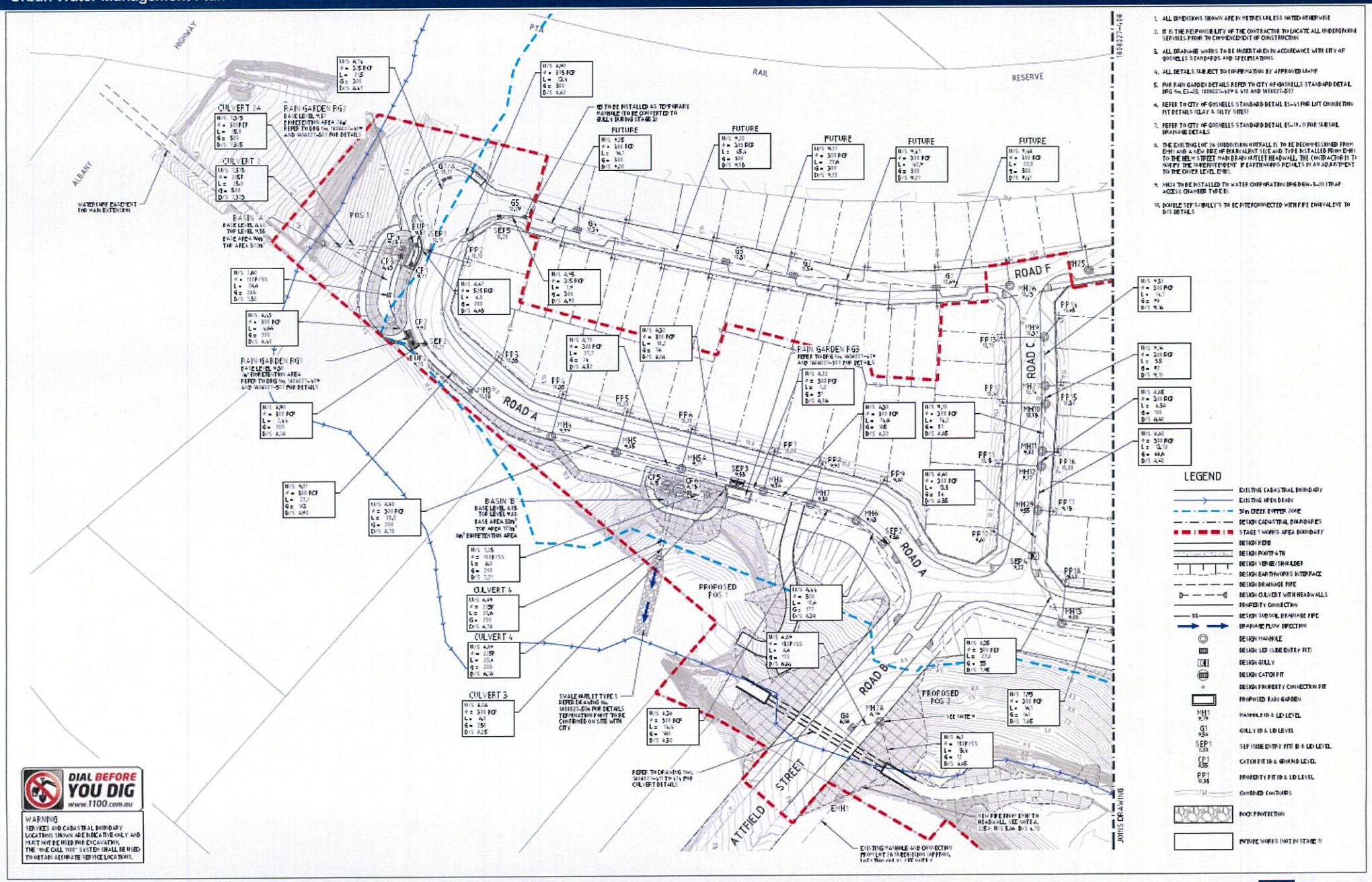


Figure 12 Post Development Flow Direction and Drainage Infrastructure – Northern portion

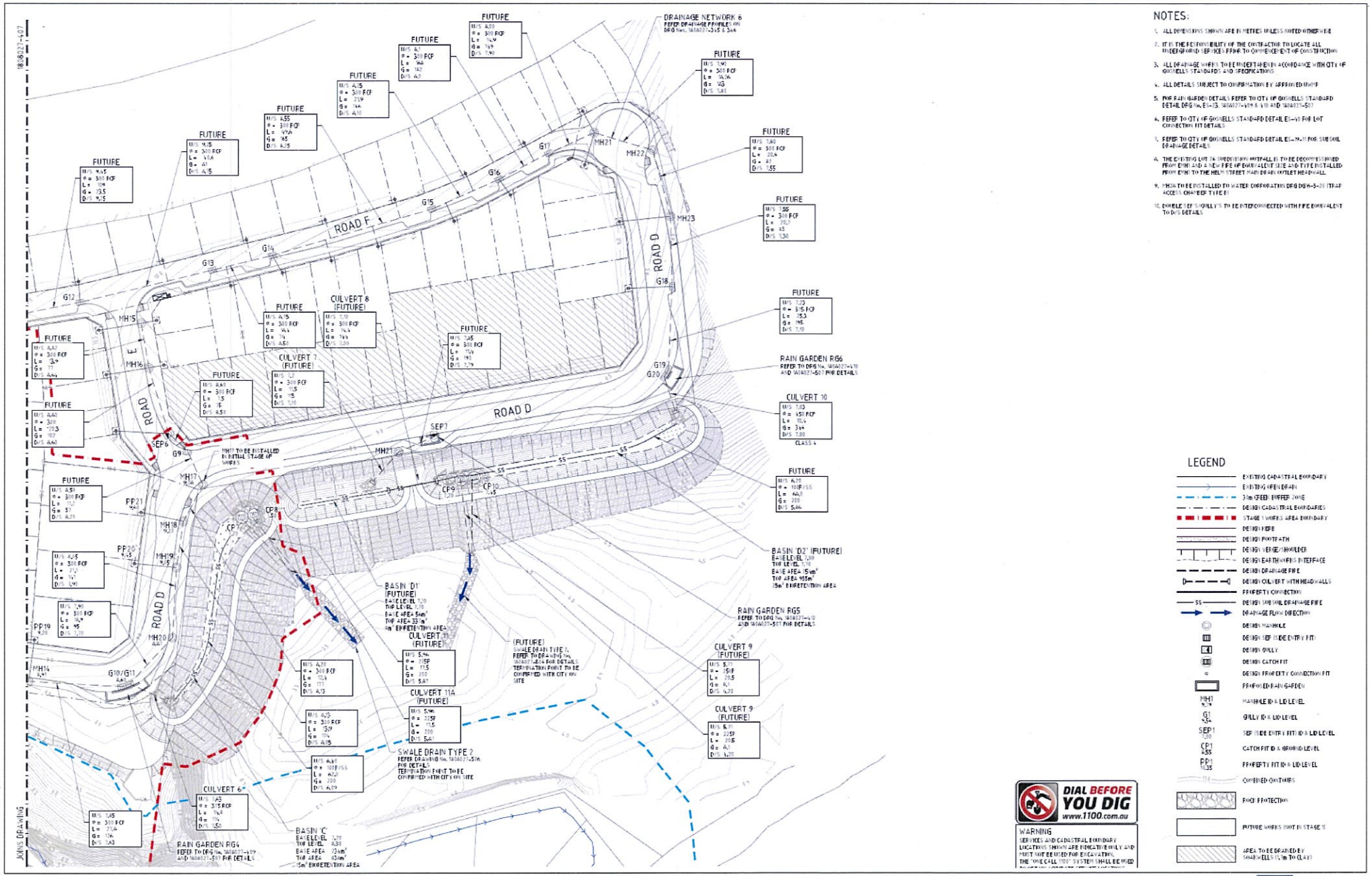


Figure 13 Post Development Flow Direction and Drainage Infrastructure – Southern portion

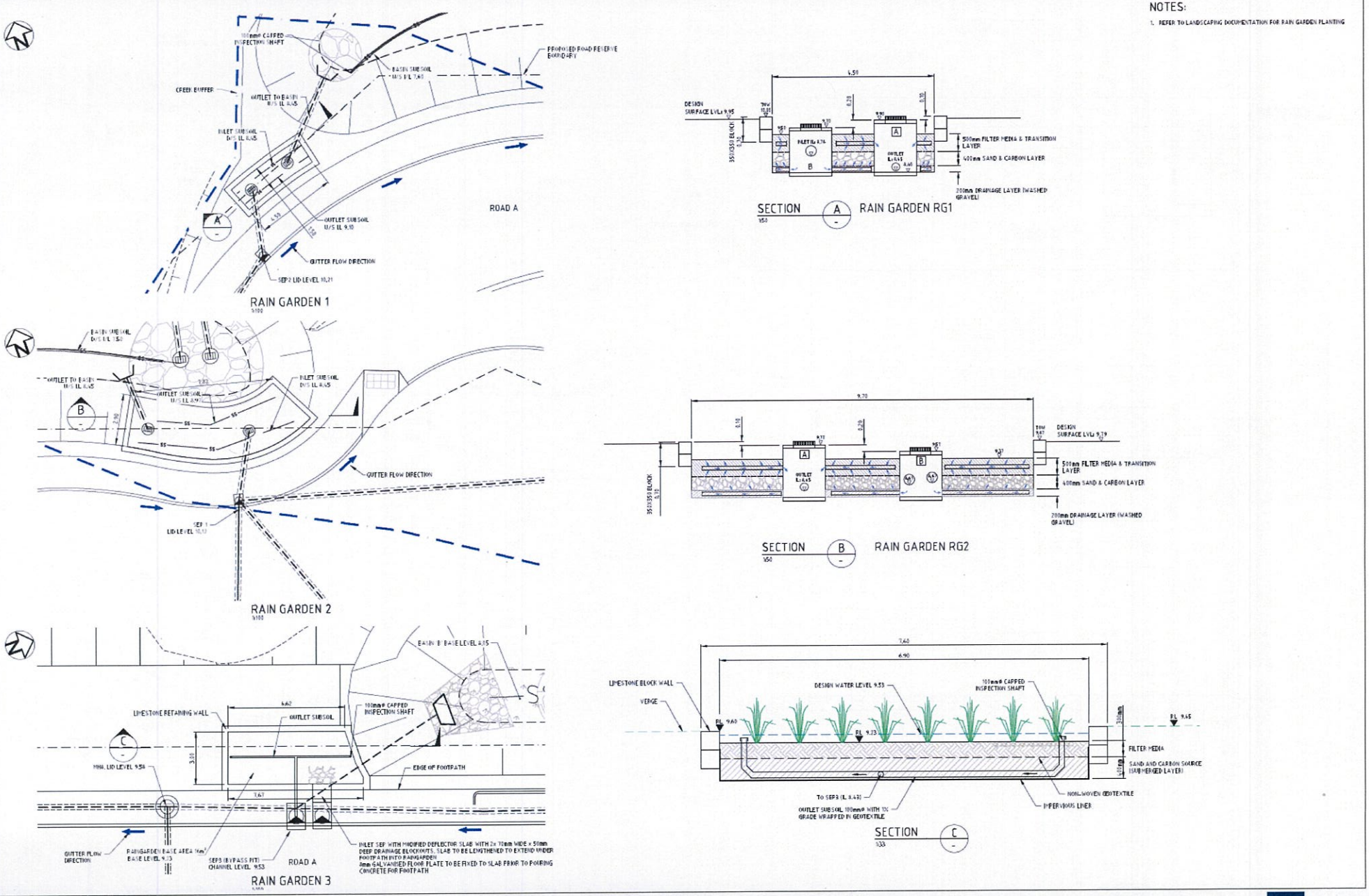


Figure 14 Raingarden detail 1

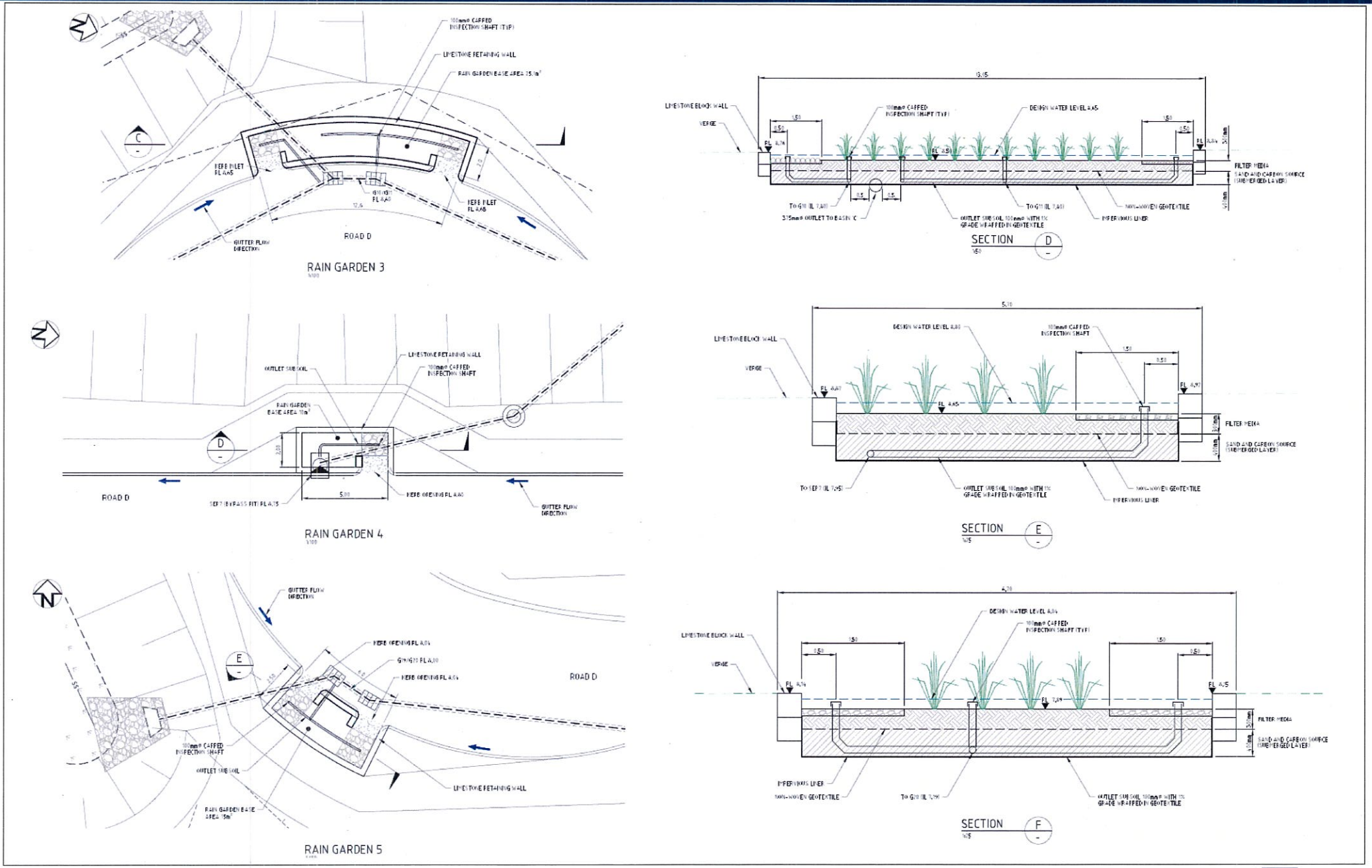


Figure 15 Raingarden detail 2

8.2 DRAINAGE MANAGEMENT PLAN – 20%AEP

Lot Management

Due to the small size of the lots, the drainage system has been designed on the assumption that there is no on lot storage. As detailed above, lots are generally provided with connections directly into the road drainage system with only 13 lots having on lot soakwells.

Road Network

Where possible, water first enters the designated bioretention garden. Once this system is full, water is discharged via a pipe to the detention basins.

For where bioretention gardens are not possible, flows will enter the detention basins via the pipe network. Water that doesn't infiltrate through the base of the basin at a rate to match the incoming flow will flow through the outlet pipe at predevelopment rates, with detention above. Modelling assumes no soakage through the base of the basins while the storm is happening.

The water flowing from the pipe outlets from all basins, match or are slightly less than the overall pre development flow rate for a 20%AEP.

The discharging water is to be dispersed into the lower POS areas via a rock spreader, before finally entering Stokely Creek.

The basins will be planted out with appropriate native species as per the Wetland and Landscape Development Plan.

Quality

It is not an objective of managing 20%AEP events to treat for quality, but the bioretention gardens and detention basins will allow for some trapping and settling of suspended sediments, especially after the flood peak has passed. This is primarily due to the residence time in the storage structures. All water infiltrating through the soil profile during the 20%AEP event will receive treatment as it moves through the bioretention media or soil profile.

8.3 DRAINAGE MANAGEMENT PLAN – 1%AEP

The Subject area has been designed to safely convey the 1%AEP flood event so that impacts on the subject land and downstream infrastructure, the environment and people's safety are minimised.

The residential areas of the site are significantly above the 1%AEP flood level of Stokely Creek/Canning River, with the flood level being 5.8mAHD and the lowest lot level being 8.85mAHD. The estimated flow rate down Stokely Creek is estimated to be approximately 15.4m3/s.

All treatment basin are also above this height with their base being around 8m AHD or greater.

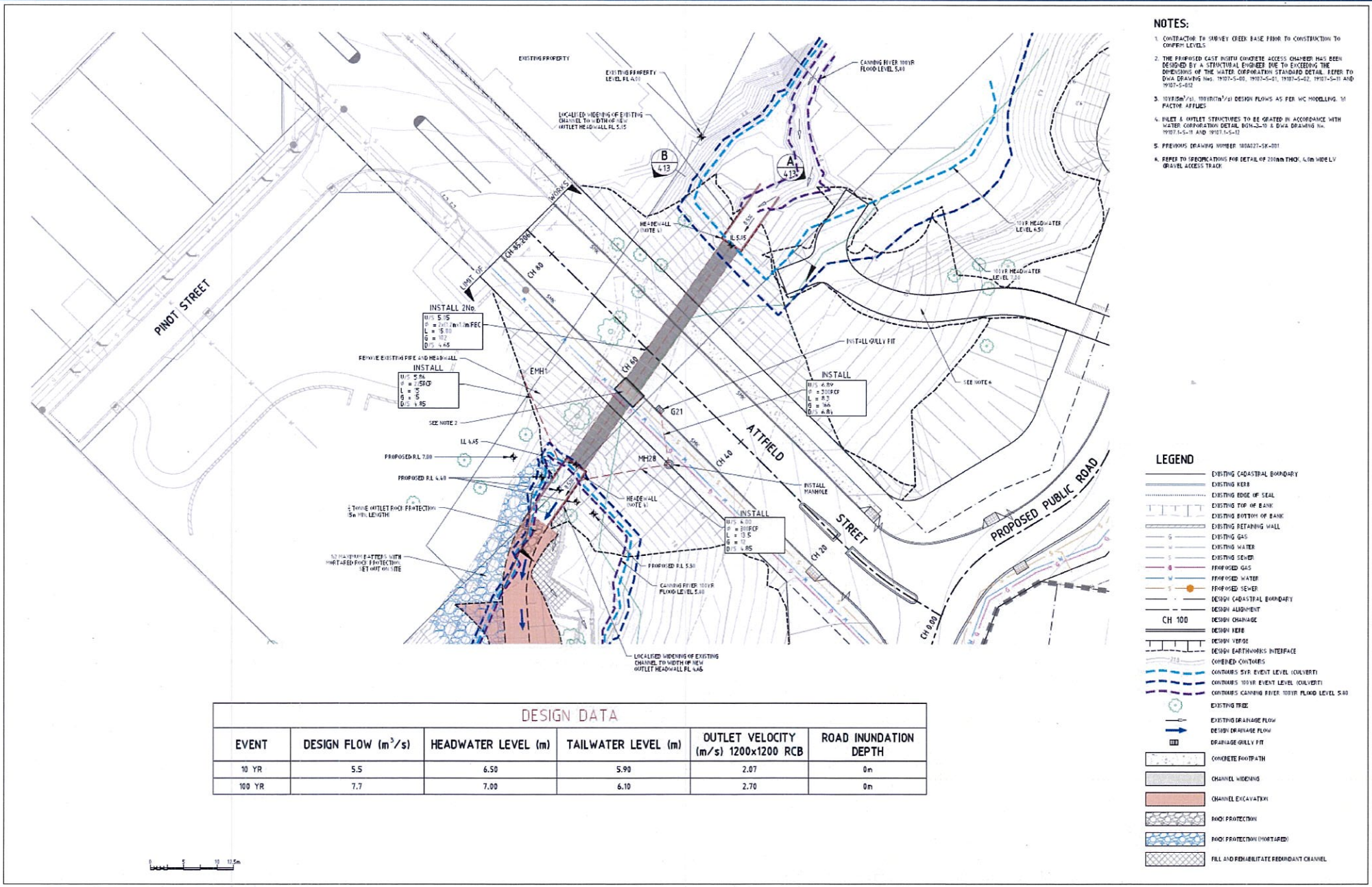
The landscaping in the POS/LOS areas is also designed to be able to handle large flows, through careful placement of hard infrastructure and the choice of riverine vegetation, designed to experience flooding, near the waterways.

Within the residential area, the 1:100 flood event predominantly be conveyed via the road reserves and the drainage network to the POS/LOS and parkland areas. Here water will disperse across to the landscaped and revegetated areas before entering either Stokely Creek or the Canning River.

Due to the short time of concentration for the subject land, the peak flows from the site, will of passed prior to the peak levels within both Stokely Creek and the Canning River. The subject land will therefore not contribute to an increase in the peak flows down these systems.

The crossing over Stokely Creek is also designed to minimise erosion from flood flows down the system.

The box culverts (2 culverts of 1200Wx1200H) will allow the 20%AEP to flow through them with water dispersed over rock scour protection areas. In larger events, water will bank up behind the crossing. The generated 1%AEP flood level is 7.00mAHD which is still more than 0.5m lower than the lowest lot, upstream of the crossing (the lowest lot level above the crossing is 10.00mAHD). There is no flow over the crossing road. This information can be seen in Figure 16.



DESIGN DATA

EVENT	DESIGN FLOW (m^3/s)	HEADWATER LEVEL (m)	TAILWATER LEVEL (m)	OUTLET VELOCITY (m/s) 1200x1200 RCB	ROAD INUNDATION DEPTH
10 YR	5.5	6.50	5.90	2.07	0m
100 YR	7.7	7.00	6.10	2.70	0m

Figure 16 Stokely Creek/Helm Street Main Drain Culvert

9 GROUNDWATER MANAGEMENT STRATEGY

The focus of groundwater management for the subject land is to maintain groundwater as close as possible to existing levels, while maintaining separation from infrastructure. Furthermore, groundwater will be managed to achieve a high water quality.

9.1 INFRASTRUCTURE SEPARATION

A vertical separation of at least 2m between lot surface levels and the measured AAMGL is to be maintained across the subject land due to the natural separation of at least 3m within the residential areas. Some areas of porous, clean fill near sections of the embankment will make sure that the necessary separation remains through to the edge of the residential areas. The steep embankment which drops approximately 3-5m from the residential area, also means that any short term mounding of groundwater can be draw away.

The subsurface clay is also to be graded so that any infiltrating groundwater flows horizontally and is not trapped in perched layers.

No subsoil system is to be installed within the residential areas. Subsoil may be used under the basis, if deemed necessary during the detailed design phase.

Through the above, the groundwater will be maintained at a similar level to the predevelopment state which means there will be minimal impact on groundwater flow to the surrounding ecosystems. These include Stokely Creek and the Canning River.

Figure 17 shows the earthworks and finished levels plan in relation to the clay grading that will be implemented throughout the subdivision. This shows a general separation between the clay and lot level of between 1.6 and 3m. This will provide good separation between groundwater temporarily sitting on the top of the clay layer, and the lot buildings and roads. The clay has also been graded so that groundwater will move through the development and discharge into the POS areas.

9.2 GROUNDWATER QUALITY MANAGEMENT

Groundwater quality will be improved through the use of engineered filter soils, in combination with the plants incorporated into the development's bioretention areas. This will provide treatment of all surface water runoff that enters the bioretention areas and infiltrates into the groundwater. These filters bind nutrients and other contaminants that are mobile within water infiltrating from the surface. The media used within the bioretention gardens will be to the latest FAWB Adoption Guidelines for Filter Media in Biofiltration Systems (2009).

9.3 USE OF GROUNDWATER

There will be no irrigation of the POS or other public places using groundwater drawn from the subject land. There is the possibility of domestic scale bores being used on some lots for non potable uses, however this is unlikely given the small size of the lots. The use of these will be subject to DWER groundwater guidelines at the time of application.

9.4 MONITORING

Due to the depth of the groundwater, and lack of private garden areas to produce excessive nutrients, post development monitoring of groundwater levels is not deemed necessary for the site.

Existing degraded wetland fed partly by groundwater from subject land. Flows to be maintained through on site infiltration and minimal change to groundwater levels.

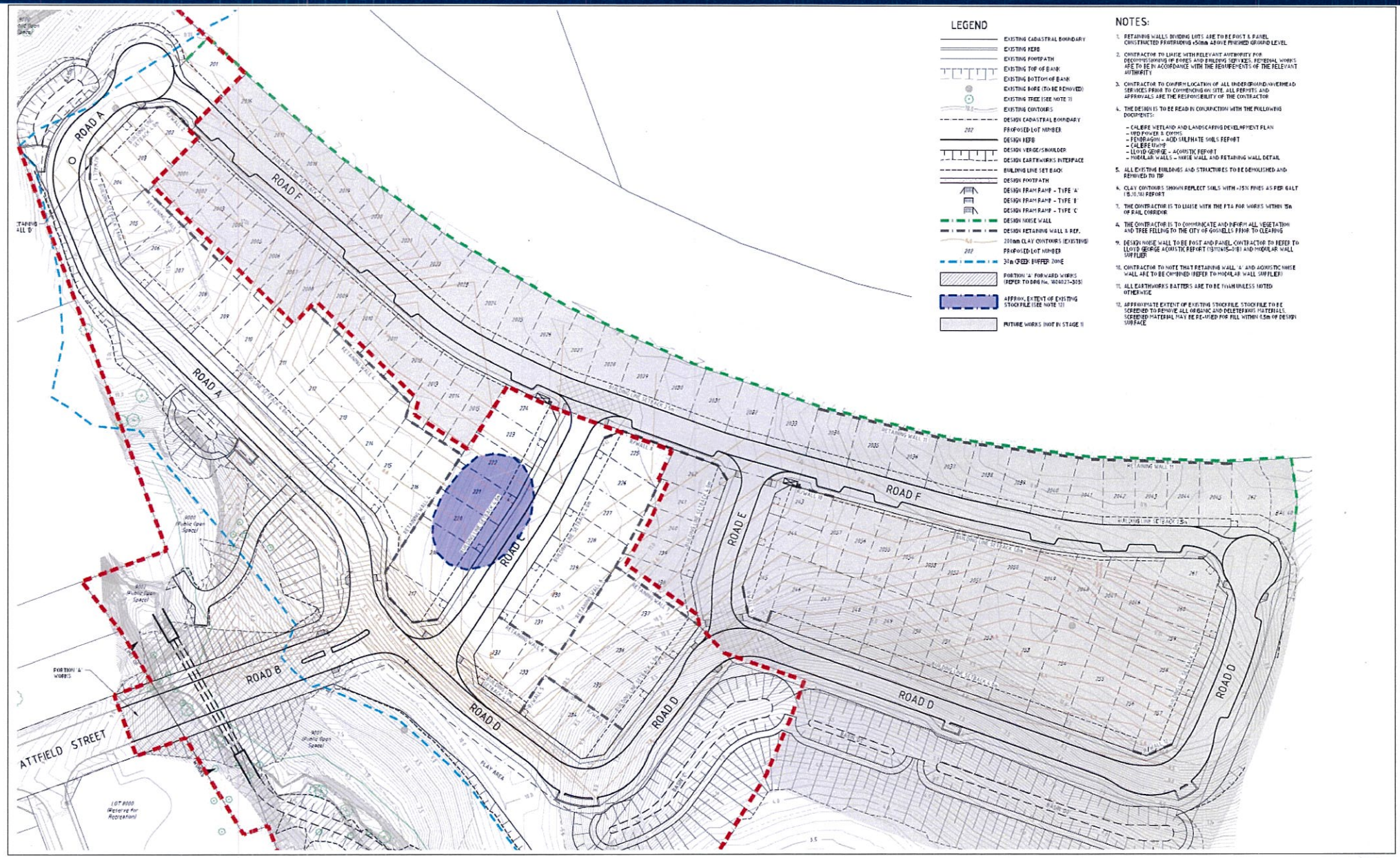


Figure 17 Finished Earthworks and Clay Grading Plan

10 WATER SERVICING AND SUSTAINABLE USAGE STRATEGY

10.1 POTABLE WATER

The subject land is to be supplied with a potable water supply through the Water Corporation. This will be through an extension of existing water mains. The water supply layout will follow the new road layout with supply available through the adjoining Lot 26 and from a main line along Albany Highway, to the north of the site. The layout can be seen in Figure 13.

10.2 WASTEWATER MANAGEMENT

All Lots are to be connected to deep sewer. This service is to be managed by Water Corporation. The Sewer layouts can be seen in Figure 13 - Servicing Plan, with detailed design in the CD of Attachments.

10.3 WATER USAGE

The State Water Plan of 2007 has set a target for water usage in Western Australia to 100 kilolitres per person a year. This target has been adopted for the subject area.

The following water conservation use strategy makes the assumptions that the average occupancy per household is 2.3 people. With this assumptions, the target water usage per house is averaged to 230KL per annum. The Water Corporation's Perth Residential Water Use Study 2008/09 (2010) found that the average Perth household (2.3 people) water use was 244KL per annum.

To achieve this reduction, a number of water conservation strategies will be encouraged. These measures will both reduce overall water usage as well as specifically reduce potable mains water. Builders and house owners will be encouraged to install water efficient devices and participate in water conservation methods to achieve potential savings. Information will be provided to lot purchasers informing them about Waterwise devices and practices at the time of purchase. This will include written information such as the Water Corporation's "Easy ways to save water in your home" brochure.

LOT GROUNDWATER / BORE

Domestic bores for residential use will be allowed as per existing legislation; however the shallow superficial aquifer tends to be of variable quality, which can reduce its value for domestic gardens if not treated or used appropriately. This water quality issue and the small areas available for private gardens make it unlikely that residents would install their own bores.

POS, STREET AND RESERVE LANDSCAPING

Landscaping will use suitable native species in streetscape plantings. The objective of POS landscaping is to implement strategies that minimise the quantity of irrigation required including mulching, low use of slow release fertilisers, retention of native trees where possible and new plantings of native species. A portion of the POS area will also incorporate the detention basins which will be planted with native vegetation designed to survive in the cycle of wet and dry periods that the basin will experience.
A POS landscaping plan can be seen in Figure 19. This plan also highlights areas of revegetation along the foreshore zone, which will be not be irrigated.
The water for the POS lawn landscaping will be provided from mains water due to the lack of viable groundwater. The area of lawn is approximately 1062m² which will require approximately 6500kl/annum. Temporary tanker watering may be used during plant establishment, should seasonal conditions require it.

RAINWATER TANKS

The very small lot size means that it is unlikely that residents will install their own rainwater tanks, due to the constraints of space

WATERWISE GARDEN AND OTHER OUTSIDE USAGE

The water savings from planning and implementing Waterwise gardens and practicing other outdoor Waterwise techniques can vary from approximately 50 to 200KL per household per annum.

Natural rainfall alone should be sufficient to maintain Waterwise gardens once established. However additional water for gardens, in particular lawns, and other outdoor use has been factored into the development area's household water balance model. The Water Corporation's Perth Residential Water Use Study 2008/09 (2010) found that 44% of water usage was for outdoor purposes. To achieve the necessary target of 230KL per household per annum, an achievable target of 80KL (approx. 35%) per annum has been allocated to garden and other outside usages. The installation of a rainwater tank could be used to supplement or possibly even substitute for the use of mains potable water for usage on garden and other outdoor requirements.

Lot owners will be encouraged to only use lawns where they will be made practical and minimise the area covered. Waterwise gardens will be encouraged through various landscape information packages. Educational material raising awareness of Waterwise gardens will be offered to new residents, including the Water Corporation's Garden Tips for the South West brochure.

The small lot size and therefore reduced garden are means that it is likely that outside water usage will be below the average water usage for Perth.

GREYWATER REUSE SYSTEMS

A water conservation measure that they can adopt is by reusing their greywater, either by manual bucketing or a specifically designed reuse system. There is limited opportunity to reuse greywater to irrigate gardens at plant root zones via a specifically designed system due to the small lot size and density of the residential lots. As such greywater systems will not be promoted by the developer.

If individuals wish to install greywater systems householders are to to follow acceptable greywater reuses practices (see Code of Practice for the Reuse of Greywater in Western Australia, Department of Health, 2005). All greywater systems must be approved by the Department of Health, Western Australia.

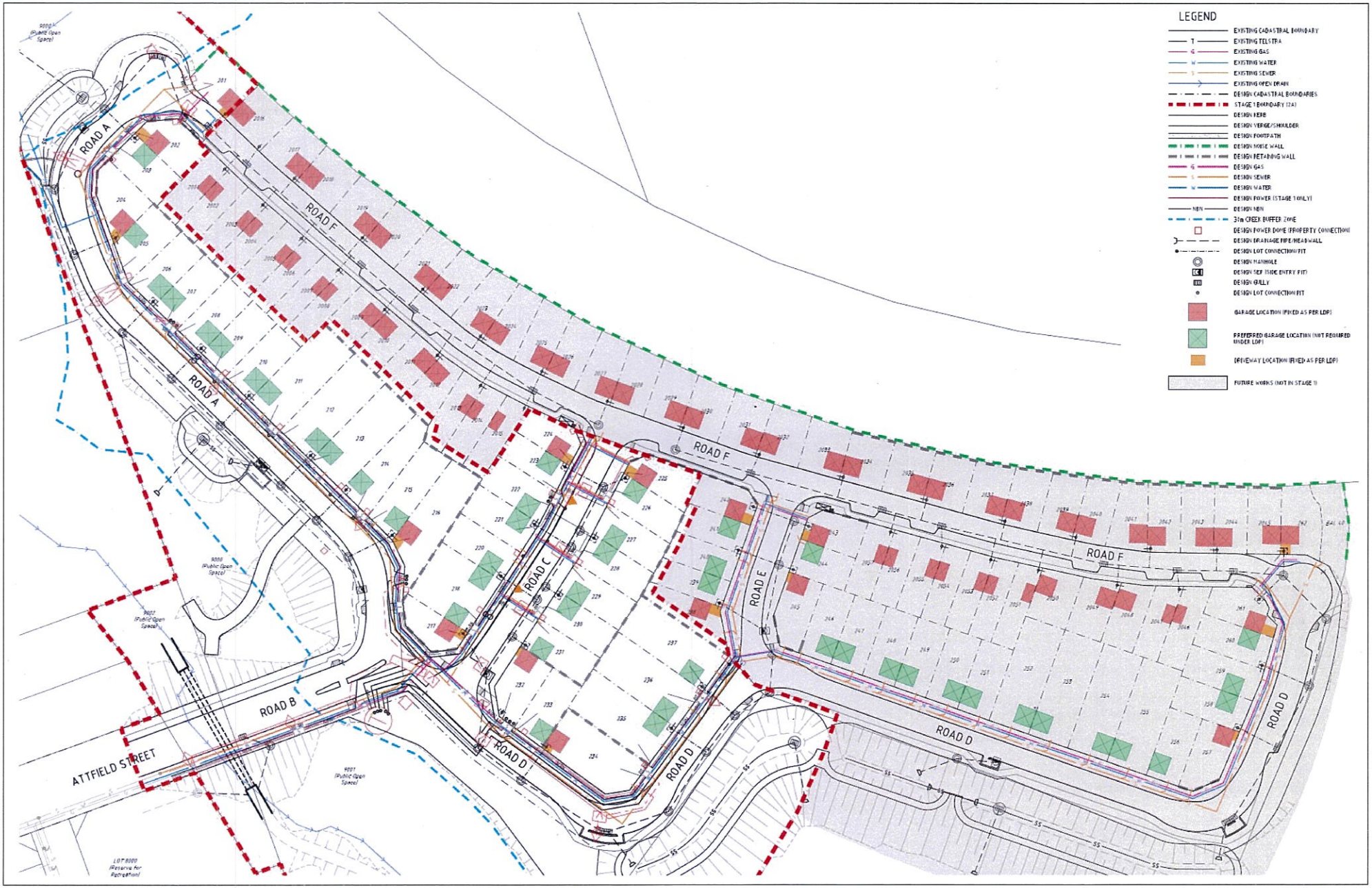


Figure 18 Servicing Plan

11 WATER DEPENDENT ECOSYSTEMS MANAGEMENT STRATEGY

The main focus of water dependent ecosystem (WDE) management will be to treat water prior to discharge into the downstream significant environments of Stokely Creek and the Canning River. There will also be the creation of new WDE habitat areas within the basin areas and bioretention garden areas.

Furthermore, the extensive revegetation works along the waterways and general riparian area, and use of native species within the Public Open Space areas means that overall the ecological benefit will be enhanced through this development, compared to the existing.

The utilisation of WSUD throughout the development will improve water quality either flowing off site as surface water or joining the superficial groundwater aquifer. By undertaking this treatment, the water that leaves the site will have significantly lower nutrient, sediment and other pollutants which have the ability to cause environmental harm. The actions being used to manage the water quality entering these systems has been outlined within the surface and groundwater management sections.

The basins and bioretention gardens constructed as part of this development will also provide some ephemeral wetland type habitat to generalist wetland and riparian species. This is due to the planting of native vegetation and the hydro regimes that will be created within these structures. As such these areas can act as areas for future colonisation by a variety of small fauna and assist with fauna movement between larger natural systems. The basin and bioretention garden areas are to include both an understorey of sedges and rushes as well as an overstorey of wetland shrubs. Where ever possible, the basins and there batters have been set back outside the 30m buffer to the waterway.

Around the basins in the POS area, as well as part of the Parks and recreation reserve, locally native plants will also be utilised. This will provide further opportunistic and more permanent habitat to riparian fauna that live within the Stokely Creek/Canning river system.

The full planting schedule for both the landscaping and more natural revegetation area is to be undertaken as part of subdivisional work.

The revegetation along the two waterways, predominately within the area highlighted as LOS has also focused on appropriate riparian species. The aim in these areas is to create functioning riparian habitat through the use of locally native species planted in a naturalised format. The works in this area will also include controlling weeds to allow the native species to survive.

Further details can be found in the the Wetland and Landscape Development Plan.

The areas of revegetation and landscape planting are shown in Figure 19.

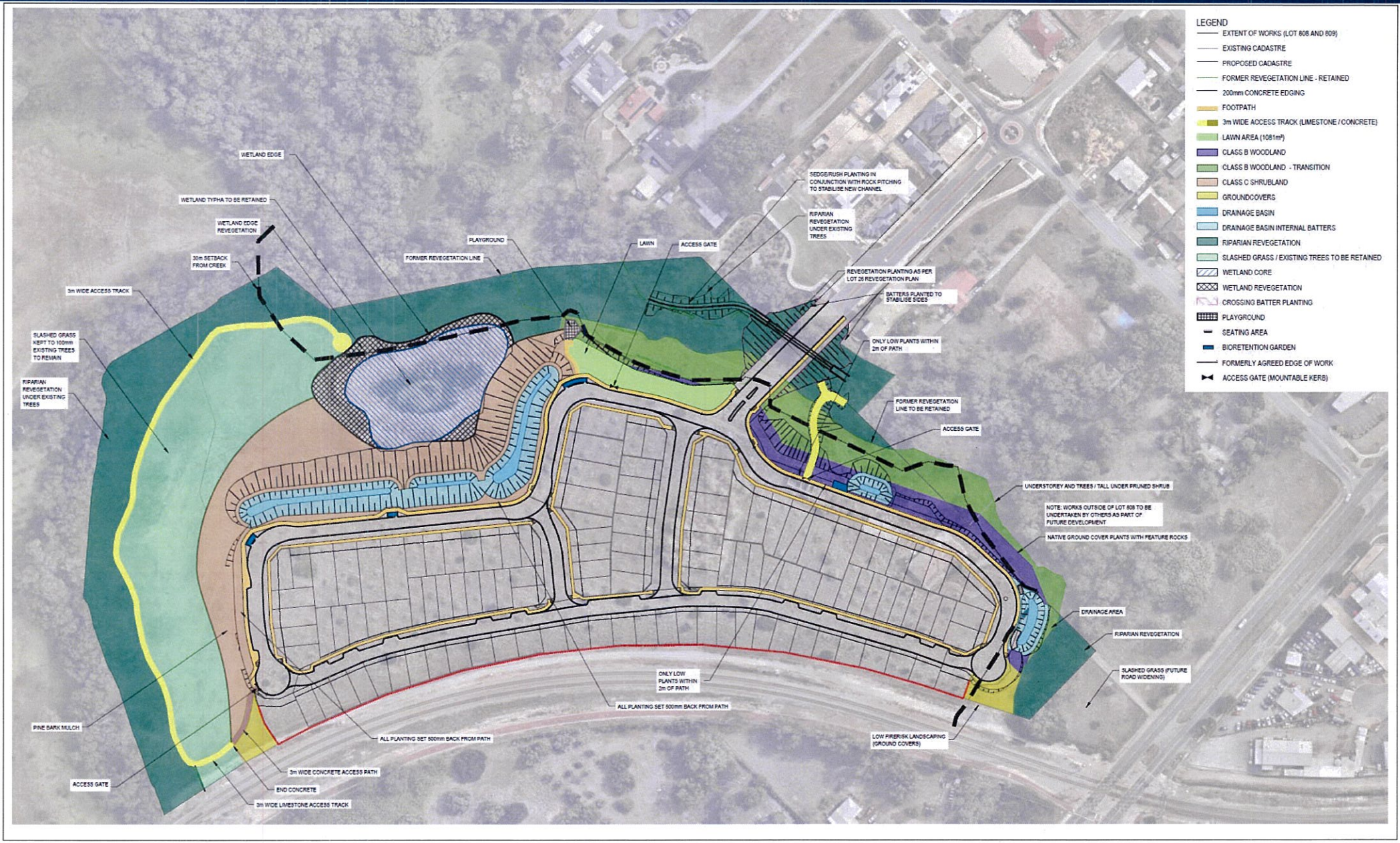


Figure 19 Landscaping and Revegetation plan

12 MONITORING & MAINTENANCE

12.1 PREDEVELOPMENT

Pre-development monitoring for the subject land has involved monitoring of groundwater levels and quality. This monitoring covered all required aspects of the pre development monitoring and provided the necessary baseline information to formulate the strategies outlined in this draft UWMP.

12.2 CONSTRUCTION PHASE

Installation of drainage control structures ahead of the construction phase of the subdivision development will be utilised. This will include the use of water sensitive urban design techniques such as sediment curtains, hydro mulching and temporary detention basins to maintain the quality of the water leaving

the development area during construction. The bioretention gardens and basins will be monitored for any damage, including compaction, sediment build up, oils, and litter during and at the completion of

construction to ensure the structure's effectiveness is not diminished. Sediment and litter on roads will be monitored, with removal as necessary with street sweeping.

12.3 POST DEVELOPMENT

Groundwater Monitoring

Due to the depth of the groundwater, and lack of private garden areas to produce excessive nutrients, post development monitoring of groundwater levels is not deemed necessary for the site.

Bioretention Performance Monitoring

Performance monitoring of WSUD elements will be undertaken to ensure the effective working of the system. Indicators will be used to provide cost effective methods to evaluate the adequacies of the operation and performance of WSUD elements. It can be assumed that if the WSUD elements operate in accordance to the designs, then it can be expected that they are delivering the desired management objectives. Inspections and maintenance should be undertaken as needed, generally ranging from monthly to 3 monthly depending on the attribute (See Table 13). In general the gardens at practical completion should meet the Facility for Advancing Water Biofiltration Guidelines (Monash University). These guidelines should be referred to for further information with the information provided as a further guide.

The key aspects monitored will include:

- ensuring the inlet and outlet structures are free of debris;
- vegetative cover of the systems is maintained (minimum 4 plants/m^2);
- sediment build up is not impeding the functionality;
- erosion is not present;
- soils are not compacted;
- litter is removed; and
- excessive hydrocarbons are not present in the system
- weeds controlled (weed cover less than 10%
- infiltration of stormwater is maintained (minimum of 150mm/hour)

Compared to traditional engineered structures for stormwater runoff management, the WSUD elements will only require minimal routine maintenance and these are generally of a landscape maintenance nature. The most common maintenance is the removal of weeds, debris and siltation. The most time intensive period of maintenance for a vegetated WSUD system is during plant establishment (which typically includes two growing seasons), when supplementary watering, plant replacement and weeding may be required. The WSUD elements will be constructed and utilised in different stages so that the functions of the WSUD elements are protected from elevated pollutant loads generated from a developing catchment.

It is recommended that vegetated WSUD elements are monitored by personnel with floristic knowledge and/or qualifications as they will be capable of identifying evasive species within the natively vegetated WSUD systems. Furthermore, personnel in charge of monitoring should have a good understanding of principles and the functional design of the WSUD elements and the treatment system. The maintenance activities prompted through monitoring activities will generally require coordination between landscape and civil services.

Maintenance inspections should be scheduled to be conducted after a significant storm event (mobilises sediments and coarse material). Inspections should focus on ponding time for the different systems, unequal surface flow distribution and scouring.

One bioretention garden will be monitored for water quality treatment performance as well.

This will include the installation of a capturing device below the bioretention media to allow for sampling of nutrients and other pollutants that may be discharged through the media.

The capturing device is to be sampled 3 times a year during the winter months for 2 years by the developer. The process will involve the emptying of the device and subsequent sampling of the collected sample after sufficient rainfall.

The sample will undergo laboratory analysis for hydrocarbons, metals and nutrients.

The capturing device will remain within the garden for later sampling by interested parties, should there be interest.

All information collected from the monitoring programs should be recorded and provided in a report, prepared by the developer, to the Department of Water and the City of Gosnells in a structure and format to be agreed upon. Reports, including data tabulations and trend analysis, to be submitted for review by the Local Authority and DWER to compare monitoring results with target design and performance criteria to ascertain what, if any, further actions may be required, and will provide ongoing assessment of the suitability of monitoring and reporting strategies. If a trigger value for a contingency action is reached, a more detailed report on the occurrence, its impact and proposed action to prevent recurrence is to be compiled by the developer and submitted to the Local Authority and DWER. After the 2 year maintenance period, post awarding of practical completion, the local authority will become responsible for the bioretention gardens and any further maintenance and monitoring.

Revegetation

Monitoring and maintenance within the riparian revegetation areas will be as per the recommendations outlined in the Wetland and Landscape Development Plan. The focus will be on weed control, replanting as required and encouragement of native species, which will assist in protecting the health of the waterways..

13 MONITORING AND MAINTENANCE SCHEDULE

Table 6 Water Management Monitoring and Maintenance Actions

Function	Item to Monitor	Trigger for Immediate Action	Maintenance Action Required	Maintenance Action Required	Monitoring Frequency	Responsible Authority(Timeline)
CONSTRUCTION PHASE & POST-DEVELOPMENT						
Drainage Management Systems (includes traditional and WSUD systems)	Structural Design	Systems are constructed to engineer detailed design specification	Systems constructed differs to design specifications.	Remedial work to rectify systems to meet design specifications.	During and after construction	Developer
	Structural Effectiveness (inlets, traps and outlets)	Inspection for debris, litter and sediments surrounding structural components	Debris, litter or sediments causing blockages or impairing functions.	Remove any debris or blockages. Inspect systems for any erosion related issues.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Erosion	Inspection for erosion.	Presence of severe erosion or erosion impairing functions.	Investigate, identify and rectify the cause of the erosion. Replace filter media as required.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Sediment Build Up	Inspection for sediment accumulation within pits, on the surface of bioretention systems and within basins.	Accumulation of large volumes of sediments and/or silts in pits or on the surface (according to Shire standards).	Investigate, identify and stabilise cause of sediment source. Remove accumulated sediments and replace filter media or plants removed.	Event based (mobilisation of sediments) and a minimum of every 3 months	Developer (2 years from PC) until handover to LocalGovernment
	Compaction	Inspection of filter media for compaction, could include being driven on.	Water remains ponding longer than designed in bioretention system after a storm event.	Investigate cause of compaction. If localised, remove top 500mm of filter media, break up the filter and then return to system without any compaction. If extensive seek expert advice.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Weeds	Inspection for the presence of weeds.	Weeds are noxious or highly invasive or if weeds cover more than 10% of area.	Manual removal or targeting herbicide application, with waterway approved products.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Plant Condition	Inspection of vegetation health and cover, and presence of dead plants.	Plants dying or a pattern of plant deaths.	Investigate cause of plant deaths and rectify. Infill planting may be required.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Organic Litter	Inspection for the presence of organic litter (e.g.. leaves) on surface.	Litter coverage is thick or extensive, or detracting from the visual appearance of the system.	Investigate source of litter and undertake appropriate response, e.g. alter landscaping maintenance practices, community education). Remove litter.	Monthly	Developer (2 years from PC) until handover to LocalGovernment
	Rubbish/Litter	Inspection for the presence of litter.	Litter is blocking structures or detracting from the visual appearance of the system.	Identify source of litter and undertake appropriate responses. Remove litter.	Every 3 months	Developer (2 years from PC) until handover to LocalGovernment
	Oil/Hydrocarbons	Inspection for the occurrence of oil on surface.	Oil coverage persists for more than 3 weeks, and is thick.	Notify the EPA of the spill and clean up requirements.	Every 3 months	Developer (2 years from PC) until handover to LocalGovernment
	Road sediment and litter	Determine level of sediment and litter build up on roads.	Visible litter and sediment that is in quantities that could have a detrimental impact on downstream WSUD systems	Sweeping of roads to remove sediment and litter	Monthly for 2 years from completion of each stage	Developer (2 years from PC) until handover to LocalGovernment
RevegetationWorks *(refer to Wetland and Landscape Development Management Plan for more detail)*	Weed encroachment	To determine if weeds are impacting revegetation works.	Weeds at levels that is impacting revegetation (more than 10%)	Maintenance as Per LOS	Monthly	Developer (2 years from PC) until handover to LocalGovernment (Handover depend on Completion criteria being met)
	Plant establishment	To determine if native planting are growing to design. Parameters as per WLDMP	Native plants at density required by WLDMP	Maintenance as Per LOS	Monthly	Developer (2 years from PC) until handover to LocalGovernment (Handover depend on Completion criteria being met)

14 IMPLEMENTATION PLAN

The construction of WSUD elements are to be coordinated with other construction activities within the catchment. This will allow for the trapping and treatment of water during construction that may contain coarse sediment and gross pollutants, for which the WSUD is not designed for. The Developer will be responsible for ensuring that sediments and erosion during the subdivisional construction work is managed.

INDIVIDUAL DEVELOPER REQUIREMENTS

- As part of Construction works:
- Assessment of the erosion risk
- Stabilisation of stockpiles,
- Minimisation of time disturbed areas are exposed
- Rehabilitation of disturbed areas
- Installation of erosion control systems such as sediment curtains/ fences/socks/inlet filters/cut off drains/ sediment basins/ hydromulching and interim planting
- Design and construct all required scheme water supply and sewage infrastructure in consultation with the approved supplier (Water Corporation).
- Drainage control structures will be installed ahead of the construction phase of the subdivision development. Water sensitive urban design techniques such as sediment curtains, hydro mulching and temporary detention basins will be used to maintain the quality of the water leaving the development area during construction.
- Appropriate fill used within the site.
- Construction of the WSUD drainage systems.
- The planting of vegetation within the bioretention gardens and basins with appropriate locally native plants and maintenance of the plants until handover to the Local Authority.
- Water sensitive landscaping/revegetation of the streetscape, POS areas and the Parks and Recreation Reserve..
- Provide lot owners with information regarding Waterwise practices.
- Undertake post development level monitoring of the groundwater level
- Undertake monitoring of Bioretention gardens.

WATER CORPORATION REQUIREMENTS

- Maintaining the sewer and potable supply system as directed through their legislation.

CITY OF GOSNELLS REQUIREMENTS

- Responsibility for the maintenance of the stormwater system installed, after a mutually agreed upon time period after construction.
- Ongoing encouragement of Waterwise and nutrient wise practices for lot owners.
- Maintain water management within the POS area and sections of the Parks and Recreation Reserve including irrigation as required after handover

15 REFERENCES

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WETLAND AND LANDSCAPE DEVELOPMENT MANAGEMENT PLAN

PREPARED FOR DANDENONG PROPERTIES PTY LTD

B21015 | 1 November 2022

Oversby Consulting Pty Ltd
ABN 41 887 270 403

DOCUMENT CONTROL

ISSUE	DATE	ISSUE DETAILS	AUTHOR
1	*18/04/2019*	*Preliminary Plan for Review (Calibre)*	*Brendan Oversby*
2	*25/02/2020*	*Submission for Approval – City and DBCA (Calibre) Up to Rev K*	*Brendan Oversby*
V5	15/11/2021	Re Submission for Approval – City and DBCA with new Company (Oversby Consulting)	Brendan Oversby
V6	22/11/2021	Minor update on plant setbacks for fire	Brendan Oversby
V7	30/09/2022	Update in response to Jan 2022 City comments	Brendan Oversby
V8	30/11/2022	Update in response to DBCA Nov 2022 comments	Brendan Oversby

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1 EXECUTIVE SUMMARY

1.1 GENERAL

This Wetland and Landscaping Development Management Plan (the Plan) has been produced for Lot 808 & 809 Albany Highway, Maddington as well as Reserve 3430. It also provides direction for surrounding lots that also interface with Stokely Creek. The works complement the works previously undertaken on Lot 26 River Avenue and a portion of Lot 3430 on Diagram 64956.

The report sets out the proposed works associated with the reserve areas and the associated waterways and wetlands. It details the types of plants, site preparation, pathways and other infrastructure and ongoing maintenance associated with these areas. It also considers the drainage infrastructure and fire management requirements.

The works outlined in this report are based on the approved Stokely Creek Wetland and Local Open Space Strategy by Tranen as well as the agreed draft landscaping concept in 2018, which considered the impact of bushfire. It also considers feedback from the Department of Biodiversity, Conservation and Attractions as well as the City of Gosnells in relation to the April 2019 version of this report. This report should be read in conjunction with the Stokely Creek Wetland and Local Open Space Strategy, where more detailed information on the predevelopment site characteristics and a context for works in the surrounding area are required.

1.2 PLANNING SUMMARY

The Plan cover's Lot 808 and Lot 3430 as per the subdivision conditions, while the works in the current Parks and Recreation Reserve (Lot 809) are undertaken as part of former agreements to use a portion of this land for drainage, recreation and ecological enhancement.

The Plan has been prepared to satisfy the subdivision conditions within WAPC Approval 155487 (Condition 31 - 35). The conditions read:

31. *Prior to the commencement of subdivision works a Wetland and Landscape Development Management Plan is to be prepared, approved and implemented, to ensure the protection and management of the sites environmental assets to the specifications of the City of Gosnells in conjunction with the Department Biodiversity, Parks and Attractions – Rivers and Estuaries section.* (Local Government)

32. *Prior to the commencement of subdivision works a Revised Revegetation and Landscaping plan is to be prepared, approved and implemented, to the specifications of the City of Gosnells in conjunction with the Department Biodiversity, Parks and Attractions – Rivers and Estuaries section.* (Local Government)

33. *Suitable vehicle barrier/bollards are to be provided along the boundary or within the roads abutting the public Open Space areas to the satisfaction of the Western Australian Planning Commission* (Local Government)

34. *Prior to the commencement of subdivision works a Foreshore Management Plan for works within the Swan Canning Development Control Area (Lot 809) shall be prepared, approved and thereafter implemented to the satisfaction of the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section in consultation with the Department of Planning Lands and Heritage and the City of Gosnells.* (Department of Biodiversity, Conservation and Attractions)

35. *Prior to commencement of subdivision works, drawings and specifications for the development interface with the Parks and Recreation and Public Open Space are to be prepared and approved to the satisfaction of the Western Australian Planning Commission, on advice of the Department Biodiversity, Parks and Attractions - Rivers and Estuaries section.* (Local Government)

The following Conditions and Advice Notes have also been considered in the production of the Plan.
Conditions

36. *A management plan detailing how risk of erosion and sedimentation impacts into nearby water bodies will be minimised during subdivision is to be:*
    (a) prepared by the landowner/applicant and approved prior to the commencement subdivisional works; and
    (b) implemented during subdivisional works. (Department Biodiversity, Parks and Attractions - Rivers and Estuaries section)

Advice Notes:

8. *The applicant is advised that any works within the public open space reserve should be consistent with works proposed in the Parks and Recreation Reserve and address the ongoing management of the landscaping to minimise the impact of nutrient transport to the river and to provide a cohesive area of public open space. Landscaping should enhance the viewscape of the river and seek to minimise visual intrusion of the development on the landscape. The Department of Biodiversity, Conservation and Attractions advises the planting of local native species to reduce water and fertiliser requirements and provide habitat for native riparian fauna.*

9. *In regard to the Condition 32 the applicant is advised that the revised landscape management plan is to provide details on the species and rate of growth of the proposed low threat landscaped area adjacent. The landscape management plan shall be included as an appendix of the Bushfire Management Plan.*

10. *With regard to Condition 33, the Foreshore Management Plan for the works within the Swan Canning Development Control Area (Lot 809) shall include, as a minimum, those works outlined the revised Revegetation and Landscaping Plan. The Foreshore Management Plan will need to obtain the approval of the Minister for Environment under Part 5 of the Swan and Canning Rivers Management Act 2006. The Foreshore Management Plan shall be implemented to the specifications of the Department of Biodiversity, Conservation and Attractions (Rivers and Estuaries) and is required to address the ongoing care, maintenance and management responsibilities, including vesting arrangements, for the Parks and Recreation reserve*

11. *With regard to Condition 35, drawings and specifications should include, but not be limited to, details on any proposed development (including filling, battering, retaining, fencing) within 10 metres of the Swan Canning Development Control Area (DCA) boundary. Such specifications are to include details on heights and materials (which are required to be low fire threat). The development should demonstrate that the visual amenity of the interface between the development and the DCA is desirable when being viewed from within the public reserve and not increase bushfire threat.*

The Plan has also been prepared to satisfy the subdivision conditions within WAPC Approval 1036-18 (Condition 11). The condition reads:

11. *A management plan detailing how risk of erosion and sedimentation impacts into nearby water bodies will be minimised during subdivision is to be:*
    (a) prepared by the landowner/applicant and approved prior to the commencement subdivisional works; and
    (b) implemented during subdivisional works. (Department Biodiversity, Parks and Attractions - Rivers and Estuaries section)

1.3 SITE SUMMARY

The following is a summary of the site's characteristics and condition. Should it be required, more detailed background information can be found in the Urban Water Management Plan or the Stokely Creek Wetland and Local Open Space Strategy.

1.3.1 LOCATION

The subject land is comprised of Lots 808 & 809 Albany Highway and Lot 3430, Maddington within the City of Gosnells. Lot 808 is approximately 5.5403ha. Lot 809 is approximately 3.8085 ha and Lot 3430 is 1544m^2. The POS area in Lot 808 is approximately 12,254m^2. In addition, the adjoining portion of Lot 3430 is to be revegetated (which covers an area of 386.95m^2.)

The subject land is situated to the south west of Albany Highway and west of the Armadale Rail line reserve. To the south is the Canning River.

The Lot 3430 has a Land Management Order to the Water Corporation. An agreement is to be undertaken prior to handover to the City, for the revegetation in this reserve to be managed by the City of Gosnell's, as per the City's request. This is in keeping with prior understanding from the Lot 26 subdivision works.

1.3.2 LANDFORM

The future non-residential areas generally slope towards Stokely Creek within Lot 808, from a height of approximately 10-11mAHD down to 5mAHD. The main Stokely Creek channel is approximately 1-2m wide and meanders across the floodplain.

On the border of Lot 808 to 809, there is a steep embankment that falls to the floodplain of the confluence of Stokely Creek and Canning River. This floodplain sits at approximately 3mAHD – 4.2m AHD. This floodplain also includes a wetland depression area. The Canning River is a defined channel on the southern boundary.

1.3.3 FLORA

The upland portion of POS area contains virtually no native species. The flora here is mainly composed of pasture and garden plants as well as the remnants of a former citrus orchard. This area has been classified as Completely Degraded (Tranen 2013)

The majority of the native species are located along Stokely Creek and immediate embankments, although there is still a considerable weed presence in this area. The main native species are *Eucalyptus rudis, Melaleuca rhaphiophylla, Juncus pallidus* and *Corymbia callophylla.*

The weed species along the waterway included the declared species *Asparagus asparagoides* (Bridal creeper) and *Zantedeschia aethiopica* (Arum Lily).

The vegetation condition varies between Completely Degraded to Good.

The main weed species in the POS area are *Opuntia sp* – Prickly Pear, *Zantedeschia aethiopica* – Arum Lily, *Tulbaghia violacea* – Pink Agapanthus and grasses (*Cynodon dactylon* – Couch grass/ *Eragrostis curvula* – African Lovegrass in higher areas and *Pennisetum clandestinum* - Kikuyu in the lower sections).

A comparison of aerial photos from 2013 and 2021 were undertaken to determine if there was any significant change along Stokely Creek. Only two small new *E. rudis* were noted, adjoining the previous riparian vegetation and all within the area that is to be fully revegetated. These photos can be seen in Appendix C.

1.3.4 FAUNA

No detailed fauna assessments were undertaken for the subject area. Due to the degraded nature of the vegetation and its discontinuous nature, the likely fauna habitat and therefore population density and diversity is predicted to be low. There is some limited riparian habitat that may suit generalists species along the actual Stokely Creek channel. There is likely to also be generalist species using the remaining riparian vegetation along the Canning River.

1.3.5 WETLANDS

According to the Geomorphic Wetland Database the subject land is a palusplain wetland. The majority is considered multiple use (15768). A conservation category section UFI7796), is associated with Stokely Creek, while another Conservation Category Wetland (UFI 7652) is associated with the Stokely Creek and Canning River confluence and Canning River itself. A floodplain depression, predominately covered with Typha is also noted as further wetland habitat. This is currently covered under UFI 15768.
The wetland boundaries can be seen in Figure 1.

1.3.6 WATERWAYS

Stokely Creek adjoins the site to the north east, after it has passed under Albany Highway and the Armadale Rail line. Above the site the waterway has been converted to a drain (Helm Street Drain). This creekline flows in and out of Lot 808 before joining the Canning River southward to join the Canning River on the edge of Lot 809.

The Canning River forms the southern boundary of Lot 809. This section of the Canning River is above the Kent Street Weir, making it predominately a freshwater system.

1.4 PREVIOUS STUDY SUMMARY

The previous Stokely Creek Wetland and Local Open Space Strategy identified the sites characteristics and how the land should be developed in relation to social and environmental outcomes. From this, areas were identified where the main focus is to be the protection and enhancement of the Stokely Creek system. These areas have been identified as areas for weed control and revegetation.
Surrounding this area, POS spaces are to be landscaped so that they complement the adjoining revegetation while also providing opportunities for drainage management and public recreation. These areas are identified as areas for landscaping. The necessary detail of required works and the subsequent implementation, for each zone (eg revegetation /landscaping), necessitates that these two zones are treated separately. This study reflects this requirement.

This detailed plan follows on from the Concept Plans discussed by the City, WAPC and DBCA between December 2013 and March 2015. An updated version was agreed to by the City in February 2018 (Rev K) to address bushfire issues which provided directions for this final version.

Further negotiations were then undertaken in 2020 with the City, Department of Fire and Emergency Services and Department of Biodiversity, Conservation and Attractions. As part of this process, setbacks between habitable dwellings and different vegetation types were set and agreed to under Rev J of the Landscape Concept Plan by Calibre in 2020. This included a boundary footpath to assist with separation and modification of the vegetation areas to meet the required vegetation types. These negotiations continued, with a meeting in May 2021 to discuss the final design outlined in this report and associated figures. This included further modification of the vegetation types to meet bushfire requirements.

The basins and stormwater treatment areas have also been modified to provide water quality improvement, 1% AEP storage and maximise the setback to Stokely Creek. There have also been the inclusion of an access track for Water Corporation maintenance of the Stokely Creek crossing.

The most recent round of changes is outlined in more detail in the accompanying table of changes (email attachment).

2 MANAGEMENT COMMITMENTS

2.1 OBJECTIVES

The objective of the Plan is to detail the works and management practices that are to be undertaken both within the landscaping and revegetation areas of the POS and adjoining reserve. These practices will;

a) provide visual appeal within the development area,
b) complement the existing native vegetation within and adjoining the site, including providing fauna linkages
c) provide new habitat areas including riparian and upland habits plus wetland habitat within the bioretention basins.
d) complement the stormwater design, including treating stormwater for pollutants and managing flood events
e) provide opportunities for passive and active recreation
f) provide movement corridors for pedestrians
g) manage potential fire hazard associated with revegetation works

Works within both the landscaping and revegetation areas will contribute to these objectives. The works however will be different in each area and will reflect the primary objectives to be achieved for each location. Fundamentally the revegetation area is for protecting Stokely Creek and providing increased vegetated areas along the Canning River. It also covers enhancing the wetland located on the Lot 809 floodplain. Areas between the revegetation line along Stokely Creek and the perimeter road will be landscaped with native species. The main difference in this area, is that the species will be chosen so that the long term impact from bushfire is managed. This is fundamentally achieved through the height of the mature vegetation species chosen, along with a perimeter footpath. Within this zone, there are 4 drainage basins, which are also to be planted with appropriate native species. An area of more active recreation is located in Lot 808 that is composed of lawn and playground, which also assists with bushfire control.

Within Lot 809, the areas not being landscape planted or revegetated are to be composed of as slashed grass under existing vegetation, to assist with providing a low maintenance and passive recreation area. This is explained in more detail below. This area is also noted as being within the Swan Canning Development Control Area.

2.2 STRATEGY OVERVIEW

The overarching strategies that will be used to achieve the above objectives are as follows:

2.2.1 LANDSCAPING AREAS

- Establishing protected vegetated buffers around the revegetation area to increase biodiversity and fauna habitat;
- Controlling invasive weeds;
- Creating public access and amenities throughout the Local Open Space (LOS);
- Establishing active recreation areas in locations that will not significantly affect ecological functioning of the area;
- Incorporating environmental values into engineering design of the stormwater basin and surrounding roads;
- Minimising irrigation to essential areas only;
- Monitoring and maintaining the site to ensure the completion criteria are achieved at the end of the maintenance period; and
- Managing stormwater runoff into the revegetation areas and the adjoining waterways, so that flows are in keeping with predevelopment rates and are low in potential pollutants.

2.2.2 REVEGETATION AREAS

- Undertaking significant native vegetation restoration work within the mapped CCW watercourse area along Stokely Creek and floodplain wetland depression, including revegetation;
- Controlling all invasive and environmental weeds;
- Creating public access throughout the LOS;
- Incorporating environmental values into engineering design of the adjoining new roads; and
- Monitoring and maintaining the site to ensure the completion criteria are achieved at the end of the maintenance period.

2.3 DETAILED WORKS

2.3.1 LAWN

The lawn areas sit on the upland area adjacent to the 30m buffer of Stokely Creek, within Lot 808.

The lawn areas area is 1044m^2. The lawn species is to be *Pennisetum clandestinum* 'Village Green'. It is to be installed as role on.

The lawn area is to be earthworked so that the area has no slopes greater that 1:6 or less than 1:100. The fill will be clean, free draining topsoil stripped from within Lot 808. Weed control is then to be undertaken using a knock down and pre-emergent to minimise weeds within the turf area, prior to the turf being laid.

It will be irrigated by sprinklers. All irrigation systems are to be in keeping with the City of Gosnells Irrigation specifications.

A 2m concrete pathway or 200mm concrete strip (depending on location) will be used to separate the lawn from the planted landscaping areas.

2.3.2 DRAINAGE BASIN

The four drainage basins have been designed to manage all flows up to and including the 1%AEP events for the site, so that flows are released at predevelopment rates. Full details of its performance can be found in the UWMP and Engineering drawings.

The basins are to be vegetated with the species and densities outlined in *Section 2.3.6*. In general, there will be an understorey of sedges at 6 plants/m^2 on the base of the basins. There will also be a shrub midstorey, planted at 1 plant every 5m^2. This will provide a high water quality outcome as well as being aesthetically pleasing.

On the internal basin banks a sedge and groundcover mix of 5plants/m^2, combined with an overstorey layer of 1 tree or large shrub per 10m^2. These species are adapted to short term inundation. External basin batters will be planted at 4 plants/m^2, using a mix of groundcover rather than sedges and rushes. These densities are as agreed with the City of Gosnells.

Where relevant, all plantings are to be set 0.5m back from the path to minimise future maintenance required to keep the path clear. Smaller plants and those less likely to spread to cover the path are to be planted within 2m of the path.

The planting of each basin is to happen concurrently with the relevant Stage of development and seasonal requirements, with planting generally taking place in late winter/early spring once the majority of large winter rain events have likely passed. This will reduce the risk of plants being inundated too often while they are small. Should a basin be constructed ahead of the adjoining stage to take stormwater, then this basin is also to be planted out at the first planting season after construction is completed.

The outlet from each basin is to be mortared rocked pitched to dissipate flows during outflow events. Jute matting is also to be used to cover soil disturbed by works around the rock mortared outlet. This is to reduce the potential for localised erosion immediately after drainage works.

Pine Bark Mulch, 75mm thick, is to be applied on the basin down to 300mm vertically from the base. The base is left mulch free due to the regular inundation of this zone which will move the mulch. The outside of the basins is to have mulch applied over the entire batter area. The mulch is to assist with stabilisation of the banks and reduce weed growth.

All earthmoving, hard landscaping works and the bioretention media associated with the basin are covered under the civil works. This includes the nearby retaining walls.

2.3.3 PATH SYSTEM

A 2m wide concrete pathway traverses the perimeter road of the development area and extends along to the existing pathway on Attfield Street. This includes a pathway on Attfield Street over the Stokely Creek Crossing. There is also a spur pathway to the playground within Lot 808. As noted partly above, the 2m wide path provides a barrier from the lawn to the surrounding landscape planting area in Lot 809 and 808, assisting with demarking the different management of these areas. The pathway detail can be seen in *Appendix A.*

A 3m wide concrete access way is to be constructed down the embankment from Lot 808 into 809. Once on the flatter floodplain area, this path coverts to a 3m wide crushed and compacted limestone pathway. This pathway is predominately to provide longterm safe access for maintenance onto the floodplain area within Lot 809, including the active POS area of lawn and playground. It will also provide an informal extension of the more formal pedestrian concrete path network, allowing residents to traverse the foreshore areas.

The pathway is relatively flat below the concreted section. This minimises the chance of erosion along or across the path.

A limestone access track is also to be conducted upstream of the Stokely Creek crossing. This track is to the requirements of the Water Corporation, so as to allow for maintenance of Stokely Creek and specifically the culvert system under the crossing. The pathways can be seen in Drawing L001.

2.3.4 IRRIGATION

Drilling and testing of groundwater for irrigation has been undertaken as part of the Lot 26 River Avenue development on the other side of Stokely Creek. This showed that the salinity was 2780ppm and there was very limited yield. Both aspects made the use of bore water unviable for Lot 26. Professional advice from drillers familiar with this area, suggests this situation is common locally and drilling on Lot 808 or 809 is likely to produce similar results. The water source is therefore to be from Mains supply. Only the lawn area is to be irrigated.

The irrigation layout is to be approved separately, as part of an irrigation report.

Annual irrigation volumes have been established. A breakdown can be seen in Table 1.

Table 1 Estimated Irrigation requirements

Location	Area	Irrigation rate m^2/ annum	Irrigation required/annum
Lawn	1034m^2	1500l/m^2	1550kl

2.3.5 FIRE MANAGEMENT

Fire Management is covered in detail with the report titled *Bushfire Management Plan Lot 808 & 809 Albany Highway, Maddington* by RUIC Fire. Through the assessment outlined in this fire management report, the existing fire hazard of the waterway vegetation and area of proposed revegetation and landscaping is identified as the dominant fire hazard. The revegetation area is generally to be planted to the City's revegetation guidelines, with a full suite of species.

To reduce potential fire impacts, lower fire risk plantings are to be planted close to the residential areas, as part of the landscaping areas. This is discussed in more detail in Section 2.3.6. In general, the proposed pathway, (in conjunction with the road network) assist with providing the necessary buffer to the proposed lots, which have a Bushfire Attack Level (BAL) of 29 or less. There is a small area of specific low threat landscaping in the areas where there is no road to separate the lots from the landscaping areas, specifically in the northern portion of the POS area and the area where the ROS adjoins the southern end of the residential areas. There is also a small strip associated with the woodland area and Basins A and B. near where they adjoin the road side path. In this location, a strip of groundcovers and plants up to 0.5m high, will be used eg solely between the flouro green line and the path. The majority of this area will be low plants (under 0.5m) solely to allow for longterm ease of maintenance along the path (eg minimise plants growing over the path). The area landscaped with groundcovers and other vegetation types in relation to the BAL setbacks and can be seen in Drawing L003.

2.3.6 REVEGETATION AND LANDSCAPE AREAS

IDENTIFICATION AND PROTECTION OF SIGNIFICANT NATIVE VEGETATION

The main significant vegetation is a small area of mature *Eucalyptus rudis* trees with isolated *Melaleuca rhaphiophylla* trees amongst them. There are also 2 *Corymbia calophylla* trees noted, one in Lot 808 and 1 in Lot 809, based on the survey undertaken and reported in the Stokely Creek Wetland and Local Open Space strategy. An aerial photo comparison was undertaken between the time the survey in 2013 and this year. There was no noticeable change in significant native trees. The comparison photos can be seen in Appendix C.

No native understorey was noted in the revegetation area. All native trees in the subject area will be marked prior to construction so that they are not damaged during construction activities. This marking will extend to the approximate drip line of the trees to minimise potential root disturbance. This marking will be via coloured tape and staking. All contractors will be advised of the need to avoid all potential damage to these trees. All significant vegetation is to be fenced to specifications outlined in AS 4970 prior to and during any adjacent subdivision and construction activities.

Given the size of the trees present and the types and dosage of herbicide present, there is no significant risk to the trees from herbicide applications, provided it is applied with care by experienced operators.
The wetland depression area is predominately dominated by *Typha orientalis*, which is now considered a native species.

INITIAL WEED CONTROL

All weed species are to be controlled from within the revegetation area. Weed control shall be achieved by a combination of chemical herbicides and physical removal as appropriate. The weed control will include:

- All 'woody' weed species being cut near ground level then painted with herbicide in areas where the ground will not be re-contoured;
- All woody weeds in areas to be re-contoured or with the future lawn area to be physically removed.
- All declared pest species being eradicated and no plants present after 2 year maintenance period; and
- Weed cover of remaining environmental weed species being maintained below 5% for the 2 year maintenance period

The physical removal will relate primarily to any remaining fruit trees in the upland areas. This will be done using a front-end loader/bobcat or similar, within areas that are to be re-contoured. Increased erosion from soil disturbance related to physical removal is not a major issue in this portion of the site as the land is to

fully re-contoured within the civil works scope and outside the foreshore area. It will be managed within the sediment and erosion control methods undertaken as part of these civil works. Any other woody weed removal in areas not being re-contoured, will be cut to ground level and appropriate woody weed herbicide applied by paint brush to the stump immediately. Small areas of agapanthus will also be dug up and removed. All of the weed plant material is to be removed from site.
Herbicides shall be selected for the target species, taking into account the surrounding environment and the constraints this may present.
In the clear areas, a glyphosate herbicide will be used to remove kikuyu, clumping grasses and broadleaf annual plants. Spraying will be after opening autumn rains, with follow up control as required. Kikuyu may also require control in November or after summer rains.
Fusilade or similar will be used to control Couch between October and December or after summer rainfall.
Arum Lily control will be by spot sprayed using Chlorsulfuron or Metsulfuron, with spraying between July and November
Close to the waterways, only herbicides considered safe for use in these environments will be applied, and alternative control methods will also be considered when water is present.
Herbicide spraying will only be conducted by operators:

- appropriately qualified and licensed in herbicide application;
- that have demonstrated experience in the ability to identify, and distinguish between native and weed species; and
- that are familiar with the most appropriate control measures, timing, herbicides, and application rates for the target species.

The revegetation sites shall be free of live weeds before planting commences. Weed control activities should ideally commence at least the spring prior to seedling planting, or earlier, but this may not be practical to implement. The growth periods of the weed species observed extend over the entire year and therefore an extensive pre and post installation weed control program is required. Post-installation weed control shall be undertaken at least each spring and autumn. Summer control may also be required to target some species as outlined above.

All weed control is to be undertaken by a qualified contractor as per the City of Gosnells Guideline *Policy 6.2.2 Retention, Rehabilitation and Revegetation of Natural Areas*. (Section 3.310.) This include that the:

- contractors must hold a current Pesticide Operators licence and be endorsed to supply and apply herbicides for reward
- contractors must be able to demonstrate an understanding of natural environmental and ecosystem issues and considerations
- contractors must be fully aware of relevant State and Federal legislation with regard to protected species, environmental harm, pollution and other issues pertinent to the carrying out of chemical weed control in natural areas
- all chemical agents are to be used strictly in accordance with the manufacturer's recommendations and in accordance with licencing provisions for that chemical
- any materials derived from manual control methods are to be removed from site by the contractor unless the City agrees to alternative arrangements
- the contractor shall effect control of the target weed species at a level of not less than 95% kill

Within the landscaping areas, 75mm of Pine Bark Mulch is to be applied post weed control, so as to suppress future weed growth. The mulch is to be certified disease free, including dieback.

ONGOING WEED CONTROL

During the Maintenance period, weeds are to be controlled on a need's basis and as per the City's Guideline To achieve compliance with the policy, there should be:

- No declared pest plants or weeds of National significance –
- Weed cover no greater than 10% across the entire site –
- Woody weeds have been removed or treated

The presence of newly planted native seedlings will need to be considered as part of the ongoing weed control program. Weed control shall be undertaken each spring and autumn at a minimum. Summer control

may also be required to target some species as outlined above. All weed control must consider the planted vegetation as well as other relevant native vegetation to be retained, so as to avoid potential damage. Weed control should be undertaken at least 3 times per year, as a minimum and prior to seed set.

The focus for monitoring and maintenance will be to make sure that the plants are establishing and that weeds are controlled. The bioretention basins and other detention basin areas are to be maintained weed free. Small weeds are to be hand pulled or sprayed with a Glyphosate bioactive herbicide or an appropriate broadleaf herbicide where applicable. Weeds higher than 100mm are to be physically removed.

REVEGETATION AND LANDSCAPE PLANTING DETAILS

Planting activities will be undertaken only when ground conditions are conducive to promoting long-term seedling survival. Typically, this will be in June after sufficient soil moisture from winter rains for most species with potentially later planting in August for sedges/rushes in the basin and bioretention bases (where there is a risk of inundation for young plants). In these areas planting of sedges should occur in late winter or at the beginning of spring when dormancy gives way to growth, should there be adequate soil moisture. Alternatively, sedges/rushes can be planted in late April to allow for establishment before the cooler winter weather, if there is an early break to the season and adequate moisture is present. Watering will also be required to allow for good establishment (See section 3.4 for further details).
In the area under the existing native overstorey, the focus will be on replacing the understorey and midstorey. The clear areas will be planted with a full suite of plants.

The planting mix will be as follows, with full plant details outlined in Tables 2-5 below:

Full Revegetation Area
Wet areas

- Understorey – 6 plants / m^2;
- Midstorey – 1 plant / $2m^2$;
- Overstorey– 1 plant / $3m^2$;

Dry areas

- Understorey – 3 plants / m^2;
- Midstorey – 1 plant / $2m^2$;
- Overstorey– 1 plant / $3m^2$;

Wetland Buffer
The Typha area will be left as it currently is. A band of general wetland species will be planted around the boundary to provide extra protection and habitat protection. This band will be planted as follows:

- Sege/rush, planting density – 6plant / m^2;
- Shrub, and understorey planting density –1 plants / $3m^2$;

Reduced Fire Risk Landscaping Area
Class B woodland to new fire standards

- Understorey planting density less than 0.5m high – 3 plants / m^2;
- Overstorey – 1 plants / 10 m^2;
- *Note, in areas near the pathway, groundcovers only are to be used either within 2m of the pathway or out to the fluoro green BAL Woodland line – which ever is the greatest.*

Forest (*formerly Class B woodland planted to old standards*) (from marked setback)

- Understorey planting density – 2 plants / m^2;

- Midstorey shrubs – 1 plant/ 5m^2
- Overstorey – 1 plants / 10 m^2;

Class C Shrubland

- Understorey planting – 3 plants / m^2;
- Shrubs – 1 plants / 2 m^2;

Basins

Base

- Sedge/rush planting – 6 plants / m^2;
- Shrubs – 1 plants / 2 m^2;

Internal Sides

- Sedge/rush planting– 4 plants / m^2;
- Groundcover – 1plant/m^2
- Shrubs – 1 plants / 10 m^2;

Outer Batters

The outer basin batter areas will be planted with stabilising groundcovers and low shrubs up to 1.5m tall. Low plants will be used so as to not impact on the integrity of the batters, while the groundcovers and lower shrubs will assist with stabilising the soil. The planting will happen after weed control. The sides will be stabilised with hydromulch prior to planting to assist with early batter stabilisation. The planting will be at the following density:

- Groundcovers– 2plant / m^2;
- Low shrubs –2 plant / m^2;

Groundcover only planting

Understorey Groundcovers only at 3 plants/m^2

General

All understorey plantings are to be set 0.5m back from the path network, with tree and large shrubs to be set back a minimum of 2m from path. This is to minimise future maintenance required within keeping the path clear. Smaller plants and those less likely to spread to cover the path are to be planted within 2m of the path.

These planting mixes and density have been developed in consultation with the City of Gosnells and DBCA as part of the writing of the Stokely Creek Wetland and Local Open Space Strategy as well as follow up discussions on the WLDMP. The different areas of revegetation planting can be seen in *Appendix A.*

The Stokely Creek channel itself is not appropriate for revegetation, as the water depth and flow rates are such that plant establishment is not possible. Planting will occur as close to the banks as possible to encourage natural edge stabilisation over time. This is also the case for the Canning River, as this bank system has reached a relatively stable equilibrium.

Periods of inundation may occur in the flatter areas of the site during large storm events. This could potentially affect the survival of understorey species depending on the depth of flooding, period of inundation, and size of the plants. Should significant plant losses occur in this zone, making it difficult to achieve the completion criteria, the Developer will liaise with the City and DBCA to ensure an agreed resolution of difficulties. In general though, the idea will be to replant to achieve the criteria set out below:

- Target plant density after two years of 70% of initial planting density; and
- 80% of planted species represented.
- Replanting to achieve the above as required within the maintenance period

Around the disturbed area associated with the modified Stokely Creek channel, dense sedge and rush planting at 6plants/m^2 will be used outside of any mortared rock pitching. If required, these areas will be

covered with pinned jute matting to assist with early stabilisation of the banks. Wherever possible, sedges and rushes will be planted between rocks were loose rock pitching is used.

Outside of the basins and bioretention bases, planting is to include soil amendments to assist with plant establishment. This is to include:

- Terracottem universal (includes fertiliser) - 5gm per tube stock, dug into planting hole
- Soil wetter – 10ml/L broadcast over surface after planting
- Seasol with soil conditioner in following spring -5ml/10L applied to plant

2.3.7 SEDIMENT AND EROSION MANAGEMENT

As part of the landscaping and revegetation works, there will be a need to manage soil erosion and sediment control. The critical aspect is to minimise any soil erosion and to ensure no soil or other material enters Stokely Creek and/or the Canning River. A Sediment and Erosion Management Plan (SEMP) will be produced and implemented by the Civil Contractor, with the details adhered to by the Landscaping/Revegetation contractor. The following points provide guidance to assist with the production and implementation of the SEMP relevant to the landscaping and revegetation areas.

- Mulching of bare landscaping planting areas to minimise runoff
- Pinned jute matting on areas likely to receive flowing water, with tubestock planted within cut holes.
- Sediment curtains immediately downstream and around areas where weeds have been removed, especially woody weed removal
- Potential hydromulching of revegetation areas where there are slopes steeper than 1:3 to provide soil protection until plants grow
- Any riplines are to be constructed along the contour to minimise erosion along the rip line
- Vehicle movement not undertaken across revegetation and landscaping areas during wet weather or when soils are waterlogged, so as to not cause soil disturbance.

2.3.8 PLAYGROUND AREA

The Playground area will utilise proprietary play equipment. The Playground equipment is Forpark Australia Essential Timber SS3-3005. Details can be seen in Figure L006 and L007. The equipment is to be centred so that all necessary setbacks are achieved from the equipment to hard infrastructure. The play equipment is to be located in clean white sand, a minimum of 300mm deep. The edging is to be a 200mm wide concrete flat kerb to assist with maintaining the adjoining lawn and garden beds.

Seating is provided on a concrete apron adjoining the playground and connected to the concrete path network. The seating is to be an aluminium Exteria Parkway Seat or similar. The details can be seen in Figures L006 and L007

3 MONITORING AND MAINTENANCE

A schedule of works including the monitoring and maintenance can be seen in *Appendix B*. It includes all items of compliance that are to be monitored. The following provides more information on the monitoring and maintenance for each area. In general the works are to be in compliance with the City's Policy 6.2.2, which is outlined in Section 3.8 , with further details in Appendix B.

3.1 REVEGETATION AREA

Vegetation and weed monitoring will take place in revegetation areas each spring and autumn for the two year maintenance period. The results of the monitoring will be used to determine remedial action requirements for the following activity period. 5 quadrats will be established at a size of 5 m x 5 m. Quadrats will be marked using wooden or metal stakes that will be removed at the end of the maintenance period. Quadrat locations shall be recorded using GPS and photos, so that if they are disturbed they can be re-established in the same location.
Records of the following will be made in each quadrat at each monitoring event, to allow for quantitative evaluation against the established completion criteria:

- Native stem density;
- Native species present;
- Weed cover;
- Dominant weed species present; and
- Photographic record.

In addition to the quadrats, the entirety of the revegetation areas will be assessed to ensure that all woody weeds have been removed and declared pest species eradicated from site. General observations will also be made of factors that could potentially affect the outcome of the revegetation and weed management programs, so that pre-emptive action may be taken if appropriate. Weed cover for non woody or declared species is to be less than 5% for the 2-year maintenance period and less than 10% at handover (see Section 3.8 below).

3.2 PATHWAYS, LOW FIRE RISK PLANTING, PLAYGROUND AND BASIN AREA

The focus for monitoring and maintenance will be to make sure that the plants are establishing and that weeds are controlled. The bioretention basins and other detention basin areas are to be maintained weed free. Small weeds are to be hand pulled or sprayed with a Glyphosate bioactive herbicide or an appropriate broadleaf herbicide where applicable. Weeds higher than 100mm are to be physically removed.

All concrete pathways will be checked for cracking and movement, with repairs undertaken as required. The limestone pathway will be monitored for weeds and erosion. All weeds are to be removed and erosion points are to be rectified. The source of the erosion issue is to be considered as part of this rectification process, with modification undertaken as required. Plants will be trimmed to make sure that they do not impact on the useability of the pathway. Plants within the Landscaping and basin area are to be monitored for high growing species which could increase the fire risk above that designated. Tall plants are to be trimmed to the level necessary to meet the plant category, eg scrubland, woodland etc. or removed as necessary. Within the Landscape areas, the density and height of the plants are to be maintained in keeping with the Class C Shrubland and Class B Woodland so that the fire risk is not increased above the original design.

Within the basin outfall areas on Lot 808 monitoring and maintenance is to be undertaken for 2 years following Practical Completion. This will include noting and rectify any potential erosion as well as sediment build up. Any sediment is to be removed, and erosional areas stabilised. Should sediment from the catchment prove to be an ongoing issue, then temporary low bunding may be installed to capture sediment around the outlet point, so as to make capture of the sediment more concentrated to a single locality and minimise smothering of plants/ destruction of media. Short term bunding of the entry pits

may also be used near active sediment producing points, noting that this may run the risk of localised flooding.
The playground equipment is to be maintained to the manufacture's standards for the first 2 years and all broken/ damaged equipment is to be replaced. The sand area is to be kept weed free via physical removal and free of rubbish.

The City will become responsible for the above works after successful Handover has been achieved and the proposed reserve area is created, with a management order in favour of the City of Gosnells. A successful handover will require that all completion criteria have been met and an A-SPEC will need to be produced and submitted to the City.

3.3 A LAWN AREA

The irrigation system will need to be checked on a fortnightly basis to make sure that it is functioning as designed. Repairs will be undertaken as required. Irrigation rates may be modified subject to seasonal changes and conditions.

Mowing will be undertaken as required to maintain a neat and manageable surface for the period of establishment. As a minimum mowing should be undertaken fortnightly in spring, summer and autumn and monthly in winter.

Weed control using manual and selective herbicide methods will be undertaken as required to keep the lawn area weed free.

3.4 WATERING

All plants are to be watered during the first 2 years of establishment. Watering is to be via tankering. Watering is to generally be undertaken fortnightly during late spring (Oct/Nov) and autumn (Mar/April), with weekly watering over summer (or when temperatures regularly exceed 28C).

3.5 OTHER MONITORING

All rubbish should be removed from the site throughout the 2 year maintenance period. This is to be undertaken as a minimum 3 monthly. Unauthorised access issues and vandalism is also to be reviewed monthly, with action taken to reduce impacts, including fixing damage and reducing ease of access. General inspection is also to be undertaken to determine any other potential issues such as presence of pest species or prolonged inundation caused by localised trapping of stormwater. Immediate action is to be undertaken to rectify issues as they arise.

3.6 FORMER RESERVE 3430 MANAGEMENT AGREEMENT

A Management agreement was to be provided to the City of Gosnell's allowing them to continue with works within the portion of former Lot 3430, that adjoins the POS area. This was to allow for the longterm maintenance works associated with the revegetation undertaken when the land parcel was managed by the Water Corporation.

The land parcel is now Lot 3430 and is owned by Claymont Land. Revegetation works will be undertaken across this reserve, as per the process outline in Section 2. Lot 3430 will be handed over to the City of Gosnell as part of the overall POS area, as part of the subdivision process of Lot 808, with initial implementation works and 2 years of maintenance to be undertaken by Claymont Land.

3.7 REPORTING TO CITY AND DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRACTIONS

The monitoring results of the on-ground works are to be reported to the City of Gosnells on a 6 monthly basis throughout the entire developer maintenance period. The reporting is to be in keeping with the City's Policy 6.2.2 – Retention, Rehabilitation and Revegetation of Natural Areas, noting that the criteria needs to also take into account the bushfire management revegetation works within the foreshore areas. Any major issues are also to be reported, and if relevant, potential changes, solutions and contingencies are to be recommended to the City for consideration. The Department of Biodiversity, Conservation and Attractions will also be copied into correspondence relevant to the revegetation areas as well as Lot 809 works.

The monitoring is to consider plant health, plant density, species diversity, weeds and vandalism as well as other aspects that may be affecting the success of the revegetation and landscaping program. This includes providing an update as to how each of the completion criteria in Appendix B is being met.

3.8 COMPLETION CRITERIA

The following Completion criteria has been taken from the City's Policy 6.2.2 Rehabilitation and Revegetation of Natural Areas. This criteria will need to be met to achieve handover after the 2 years maintenance period from agreed Practical Completion. This criteria is specifically for the areas that are to be fully revegetated outside of the reduced fire risk landscaping. Further detail is also included in Appendix B.

Characteristic	Completion Criteria
1. Revegetation – initial and infill **Based on tubestock*	**1.1 Wetland, Buffers and Foreshore** - 5 plants per square metre (m²) with an additional 0.1 tree per m² - 50% species diversity representing the vegetation complex and strata - Proof of local provenance - Sourced from a Nursery Industry Accreditation Scheme accredited nursery
	1.2 Dryland - 4 plants per m² with an additional 0.1 tree per m² - 70% species diversity representing the vegetation complex and strata - Proof of local provenance - Sourced from a Nursery Industry Accreditation Scheme accredited nursery.
	1.3 Planting - Agreed species and of local provenance - Planted in correct vegetation zones and density - Healthy in root and foliage form, height and colour - Disease and pest free - Planted firmly and at correct level - Soil amendments applied - Protection measures in place

	1.4 Infill Planting - Established and in the ground for a minimum of one summer before handover
2. Rehabilitation	**2.1 Weeds** - No declared pest plants or weeds of National significance - Weed cover no greater than 10% across the entire site - Woody weeds have been removed or treated
	2.2 Sediment and erosion control measures - Installed correctly to specifications and plans - Functioning as intended - Water quality not negatively impacted
3. Significant Areas and trees	- Protected and fenced (if required) - No damage and no indications of decline
4. Fauna	- Habitat improvement and initiatives achieved - Elimination or reduction in undesirable species
5. Infrastructure	- Installed as per the City's specifications - In a stable and functioning state
6. Other	- Unauthorised access managed and controlled - Issues identified throughout the maintenance period have been rectified - Site free of rubbish and dumped materials
7. Handover	- Monitoring reports received - Temporary structures such as tree guards, stakes and fencing removed - Minimum of 70% of the site covered by healthy revegetated species and natural regeneration - Items 1 and 2 above - Rubbish and dumped materials removed - All mapping data provided, compatible to the City's systems and in agreed format - Dead plants, or parts of, removed - Vegetation impeding access pruned

4 REFERENCES

RUIC Fire, 2017. *Bushfire Management Plan, Lot 808 & 809 Albany Highway, Maddington.* Prepared for Claymont Land.

Facility for Advancing Water Biofiltration. 2009. Version 3.01. Guidelines for Filter Media in Biofiltration Systems. Monash University, Victoria.

Western Australian Planning Commission 2007, Liveable Neighbourhoods – A Western Australian Government Sustainable Cities Initiative. Government of WA.

Tranen. 2013. Stokely Creek Wetland and Local Open Space Strategy. Report to Claymont Land

Douglas Partners.2013.Geotechnical Investigation Proposed Residential subdivision Lot 26 River Avenue, Maddington, WA. Prepared for Claymont Land

Astron. 2013. Lot 808 Albany Highway and Lot 26 River Avenue, Maddington Predevelopment Groundwater and Surface Water Monitoring – Final Report. Prepared for Claymont Land

Oversby et al. Vegetation Guidelines for Stormwater Biofilters in the South-West of Western Australia. For Monash University/Department of Water

5 PLANTING TABLES

Table 2 Reduced Fire Risk Landscape Planting – Natural Systems

Class C Shrubland Total Area 7728m²

Species	Growth Form/ Height	Density	Total numbers
Midstorey and Understorey Dry Mix Planting			
Understorey		Random planting of the following species at 3 plants/m²	
Eremophila glabra	Groundcover 0.2-0.4m		3800
Conostylis candicans	Grass like 0.3		3900
Darwinia citriodora prostrate	Low shrub 0.5-1m		3800
Acacia stenoptera	Shrub 0.2-0.7m		4000
Kennedia prostrata	Groundcover 0.25m		3900
Dianella revoluta	Herb 0.5-0.7m		3800
Understorey sub-total			*23200*
Low shrubs		Random planting of the following species at 1 plant/2m²	
Babingtonia camphorosmae	Shrub 0.5m		540
Acacia pulchella	Shrub 0.3 -1.5m		500
Adenanthos obovatus	Shrub 0.6-2m		500
Allocasuarina humilis	Shrub 0.2-2m		500
Hibbertia stellaris	Shrub 1-1.5m		500
Darwinia citriodora	Shrub1.5-2.5m		500
Grevillea bipinnatifida	Shrub 0.2-1m		440
Hypocalymma angustifolium	Shrub0.3-2m		490
Low shrub sub-total			***3970***
Total Class C Shrubland Plants			**27170**

Class B Woodland Total area: Total area 5916m²

Species	Growth Form/ Height	Density	Total numbers
Full Woodland Planting – outside BAL29 Forest line: 4397m²			
Understorey Planting –			
		Random planting of the following species at 3 plants/m²	
Eremophila glabra	Groundcover 0.2-0.4m		1100
Conostylis candicans	Grass like0.3m		800
Darwinia citriodora prostrate	Low shrub 0.5-1m		800
Acacia stenoptera	Shrub 0.2-0.7m		3500
Kennedia prostrata	Groundcover 0.25m		3500
Dianella revoluta	Herb 0.5-0.7m		3500
Understorey sub-total			***13200***
Mid and Overstorey Planting –			
Corymbia callophylla	Tree 15-30m	1 tree every 15m2	440
		Random planting of the following midstorey species at 1 plants/5m²	
Viminaria juncea	Shrub 1-4m		290
Jacksonia furcellata	Shrub0.4-4m		200
Calothamnus quadrifidus	Shrub1.5-2.5m		390
Mid and Overstorey sub-total			*1320*
Total Class B Woodland plants outside BAL29 Forest line			**14520**
Fire Compliant Woodland Planting – inside BAL 29 Forest line: 1519m²			
Understorey Planting –			
		Random planting of the following species at 3 plants/m²	
Eremophila glabra	Groundcover 0.2-0.4m		400
Conostylis candicans	Grass like 0.4m		600
Lomandra odora	Herb 0.3m		560
Acacia stenoptera	Shrub 0.2-0.7m		1000
Kennedia prostrata	Groundcover 0.25m		1000
Dianella revoluta	Herb 0.5-0.7m		1000
Understorey sub-total			***4560***
Mid and Overstorey Planting –			
		1 tree every 30m2	
Corymbia callophylla	Tree 15-30m		40
Eucalyptus wandoo			10
Overstorey sub-total			*50*
Total Class B Woodland plants– inside BAL 29 Forest line			**4610**
Total Class B Woodland			**19130**

Table 3 Groundcover Low Fire Risk Landscaping

Groundcover landscaping: Total Area 750m²
This landscaping area is composed of low groundcovers to minimise potential impact from fires on adjoining lots.

Low Fire Risk Species: Total Areas 471m²	Height	Density	Total numbers
Northern area: 409m²			
		3 shrubs/m² planted in groups of 5	
Eremophila glabra	Groundcover 0.2-0.4m		240
Grevillea thelemanniana (prostrate form)	0.1 – 0.3m		240
Hemiandra pungens Snakebush (mauve)	0.1m		350
Kennedia prostrata Running postman	0.1m		250
Conostylis candicans	Grass like 0.3		140
Northern subtotall			***4560***
Southern area:341m²			
Eremophila glabra	Groundcover 0.2-0.4m		120
Grevillea thelemanniana (prostrate form)	0.1 – 0.3m		100
Hemiandra pungens Snakebush (mauve)	0.1m		300
Kennedia prostrata Running postman	0.1m		200
Scaevola variant – King Park Midnight	0.1m		300
Southern subtotal			***1020***
Total low fire risk plants			***5580***

Table 4 Bioretention Basin Planting

The following species mix reflects that the basins are within the area where they have a fire risk impact. As such they have been designed to be generally composed of sedges and rushes and shrubs less than 2m high to be compliant with Class C Shrubland characteristics.

Species	Height	Density	Total numbers
Basin A			
Basin Base *(approx. 100m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		200
Juncus subsecundus	0.5m		200
Carex appressa	0.5m		100
Baumea juncea	0.5m		100
Melaleuca incana – dwarf variety	1m		25
Melaleuca lateritia nana (dwarf variety	1m		25
Sub total			*650*
Basin Banks – *(approx. 331m²)*		4 sedges/rushes per m², 1 groundcover/m² and 1 Shrub every 10m²	
Ficinia nodosa	0.5m		700
Juncus subsecundus	0.5m		625
Eremophila glabra	Groundcover 0.2-0.4m		165
Conostylis candicans	0.3m		165
Calothamnus quadrifidus	1.5m		11
Melaleuca incana – dwarf variety	1m		11
Melaleuca lateritia nana (dwarf variety	1m		12
Sub total			*1689*

Species	Height	Density	Total numbers
Basin B			
Basin Base *(approx. 32.5m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		70
Juncus subsecundus	0.5m		65
Carex appressa	0.5m		30
Baumea juncea	0.5m		30
Melaleuca incana – dwarf variety	1m		8
Melaleuca lateritia nana (dwarf variety	1m		8
Sub total			*211*
Basin Banks – *(approx. 228m²)*		4 sedges/rushes per m², 1 groundcover/m² and 1 Shrub every 10m²	
Ficinia nodosa	0.5m		460
Juncus pallidus	0.5m		450
Dampiera diversifolia	Groundcover 0.2-0.4m		114
Scaevola aemula	Groundcover 0.4m		114
Calothamnus quadrifidus	1.5m		8
Melaleuca incana – dwarf variety	1m		8
Melaleuca lateritia nana (dwarf variety	1m		7
Sub total			*1161*

Species	Height	Density	Total numbers
Basin C			
Basin Base *(approx. 235m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		500
Juncus subsecundus	0.5m		500
Carex appressa	0.5m		200
Baumea juncea	0.5m		210
Melaleuca incana – dwarf variety	1m		58
Melaleuca lateritia nana (dwarf variety	1m		60
Sub total			*1528*
Basin Banks – *(approx. 853m²)*		4 sedges/rushes per m², 1 groundcover/m² and 1 Shrub every 10m²	
Ficinia nodosa	0.5m		1710
Juncus pallidus	0.5m		1700
Dampiera diversifolia	Groundcover 0.2-0.4m		430
Scaevola aemula	Groundcover 0.4m		420
Calothamnus quadrifidus	1.5m		25
Melaleuca incana – dwarf variety	1m		30
Melaleuca lateritia nana (dwarf variety	1m		30
Sub total			*4345*

Species	Height	Density	Total numbers
Basin D1			
Basin Base *(approx. 55m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		130
Juncus subsecundus	0.5m		120
Carex appressa	0.5m		40
Baumea juncea	0.5m		40
Melaleuca incana – dwarf variety	1m		13
Melaleuca lateritia nana (dwarf variety	1m		13
Sub total			*356*
Basin Banks – *(approx. 533m²)*		4 sedges/rushes per m², 1 groundcover/m² and 1 Shrub every 10m²	
Ficinia nodosa	0.5m		1070
Juncus pallidus	0.5m		1060
Dampiera diversifolia	Groundcover 0.2-0.4m		270
Scaevola aemula	Groundcover 0.4m		260
Calothamnus quadrifidus	1.5m		18
Melaleuca incana – dwarf variety	1m		18
Melaleuca lateritia nana (dwarf variety	1m		17
Sub total			*2713*

Species	Height	Density	Total numbers
Basin D2			
Basin Base *(approx. 316m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		750
Juncus subsecundus	0.5m		740
Carex appressa	0.5m		200
Baumea juncea	0.5m		205
Melaleuca incana – dwarf variety	1m		80
Melaleuca lateritia nana (dwarf variety	1m		80
Sub total			*2055*
Basin Banks – *(approx. 950m²)*		4 sedges/rushes per m², 1 groundcover/m² and 1 Shrub every 10m²	
Ficinia nodosa	0.5m		2000
Juncus pallidus	0.5m		1800
Dampiera diversifolia	Groundcover 0.2-0.4m		475
Scaevola aemula	Groundcover 0.4m		475
Calothamnus quadrifidus	1.5m		32
Melaleuca incana – dwarf variety	1m		32
Melaleuca lateritia nana (dwarf variety	1m		31
Sub total			*4845*
Total for all basins			

Table 5 Streetside bioretention gardens

Species	Height	Density	Total numbers
Basin Base *(approx. 671m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		1800
Juncus subsecundus	0.5m		1800
Carex appressa	0.5m		210
Baumea juncea	0.5m		300
Melaleuca incana – dwarf variety	1m		165
Melaleuca lateritia nana (dwarf variety	1m		165
Sub total			*4440*
Basin Banks – *(approx. 3091m²)*		4 sedges/rushes per m² and 1 Shrub every 3m²	
Ficinia nodosa	0.5m		6180
Juncus pallidus	0.5m		6180
Hypocalymma robusta	1.5m		260
Calothamnus quadrifidus	1.5m		260
Melaleuca incana – dwarf variety	1m		260
Melaleuca lateritia nana (dwarf variety	1m		250
Sub total			*13390*
Streetside Bioretention gardens – *(approx. 110m²)*		6 sedges/rushes per m² and 1 Shrub every 2m²	
Ficinia nodosa	0.5m		320
Juncus subsecundus	0.5m		140
Carex appressa	0.5m		100
Baumea juncea	0.5m		100
Melaleuca incana – dwarf variety	1m		25
Melaleuca lateritia nana (dwarf variety	1m		25
Sub total			*690*
Total Bioretention/Basin Plants			***18540***

Table 6 Waterway and Wetland Revegetation Planting

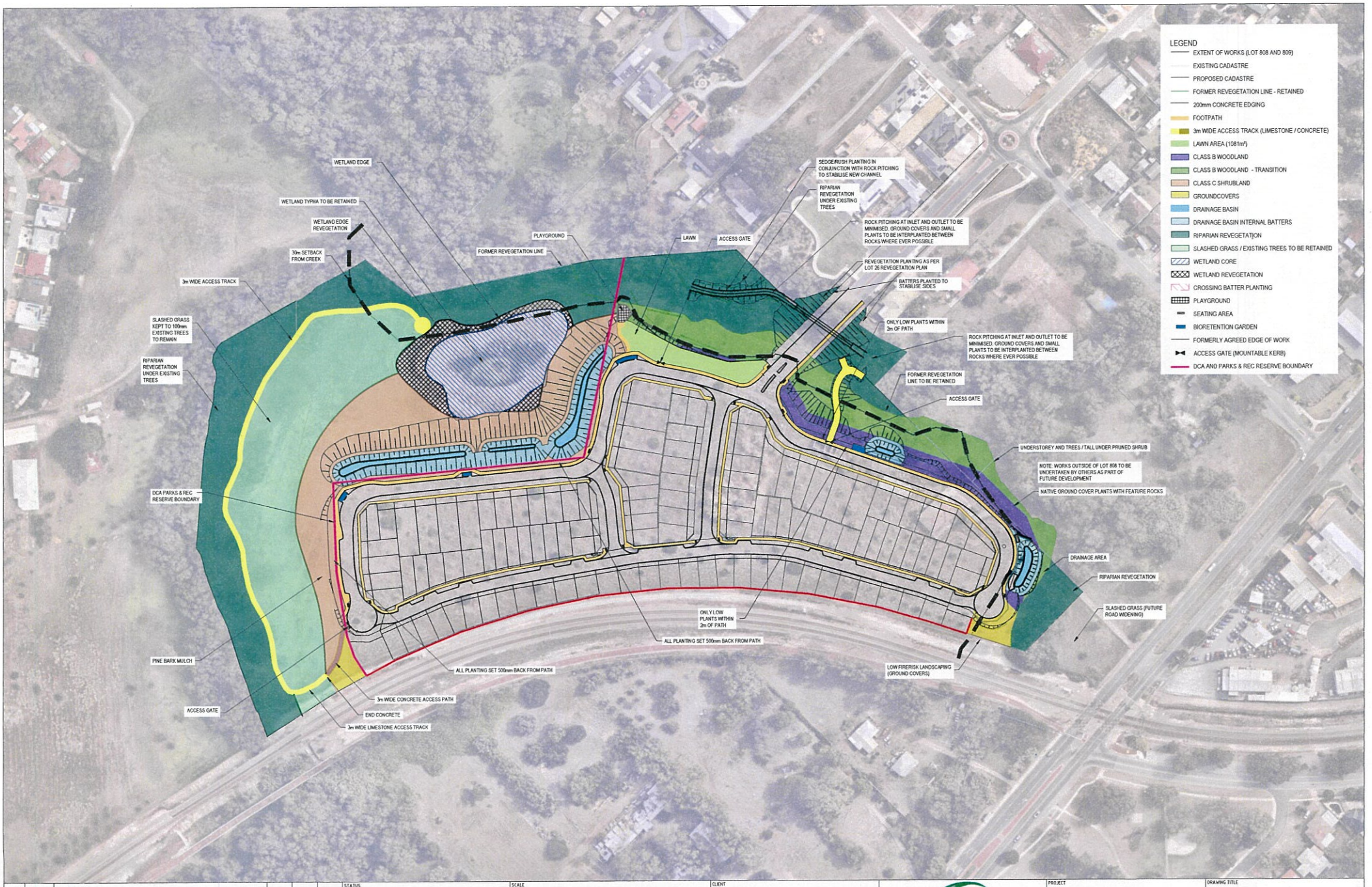
Species	Growth Form	Density	Total numbers
Stokely Creek Wet Areas: Total area 2,685m²			
Understorey		Bunch planting of the following species at 6 plants/m² *eg all plants in a m² to be the same*	
Baumea juncea	Rush / sedge		3400
Baumea preissii	Rush / sedge		3000
Juncus pallidus	Rush / sedge		4000
Juncus subsecundus	Rush / sedge		4000
Lepidosperma longitudinale	Rush / sedge		1710
Understorey Total			*16110*
Mid Storey		Radom planting of the following species at 1 plant/2m²	
Melaleuca lateritia	Shrub		300
Melaleuca preissiana	Tree		300
Melaleuca rhaphiophylla	Tree		600
Melaleuca viminea	Shrub		300
Hakea varia	Hakea varia		40
Taxandria linearifolia	Shrub		100
Midstorey Total			*1640*
Overstorey		Random planting of the following species at 1 plant/ 3m²	
Eucalyptus rudis	Tree		300
Corymbia calophylla	Tree		200
Eucalyptus lane-poolei	Tree		100
Overstorey Total			*500*
Total wet area revegetation plants			**183250**
Stokely Creek and Canning River Dry Areas: Total area 13,651m²			
Understorey		Random planting of the following species at 3 plants/m²	
Acacia pulchella	Shrub		11000
Acacia stenoptera	Shrub		11000
Kennedia prostrata	Groundcover		10900
Dianella revoluta	Herb		10000
Understorey Total			*40900*
Mid Storey		Random planting of the following species at 1 plant/2m²	
Viminaria juncea	Shrub		1200
Kunzea glabrescens	Shrub		1200
Melaleuca viminea	Shrub		1200
Jacksonia furcellata	Shrub		1100
Beaufortia purpurea	Shrub		1000
Calothamnus quadrifidus	Shrub		1100
Midstorey Total			*6800*
Overstorey		Random planting of the following species at 1 plant/ 3m²	
Corymbia calophylla	Tree		4250
Eucalyptus wandoo	Tree		*300*
Overstorey Total			*4550*
Total Dry Revegetation Plants			**52250**

Wetland border revegetation– Planted as Class C shrubland. Total area 1359m²			
Understorey		Bunch planting of the following species at 6 plants/m² *eg all plants in a m² to be the same*	
Juncus subsecundus	Sedge 0.5		2750
Lepidosperma longitudinale	Sedge 0.5-1m		2650
Juncus pallidus	Sedge 0.5-1.5m		2750
Understorey sub-total			*8150*
Low Shrub layer		Random planting of the following species at 1 plant/ 3m²	
Calothamnus lateralis	Shrub 0.8-1.5m		100
Melaleuca thymoides	Shrub 0.5-2m		100
Melaleuca incana – dwarf variety	Shrub 1m		100
Melaleuca lateritia nana (dwarf variety	Shrub1m		150
Low Shrub sub-total			*450*
Total Wetland Buffer Plants			**8600**
Total Revegetation Plants			**60850**

Table 7 Specimen Trees

Species	Growth Form/ Height	Density	Total numbers
Corymbia calophylla	Tree – planted as 30L pot specimens	2 as per plan, next to playground area	2
Total Specimen Trees			**2**

Appendix A Plans and Detailed Design



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6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS

PRELIMINARY

NOT FOR CONSTRUCTION

SCALE

0 10 20 30 40 50

SCALE 1:2000

NORTH

CLIENT

CLAYMONT

DISCLAIMER

ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY. DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

Oversby Consulting

PROJECT

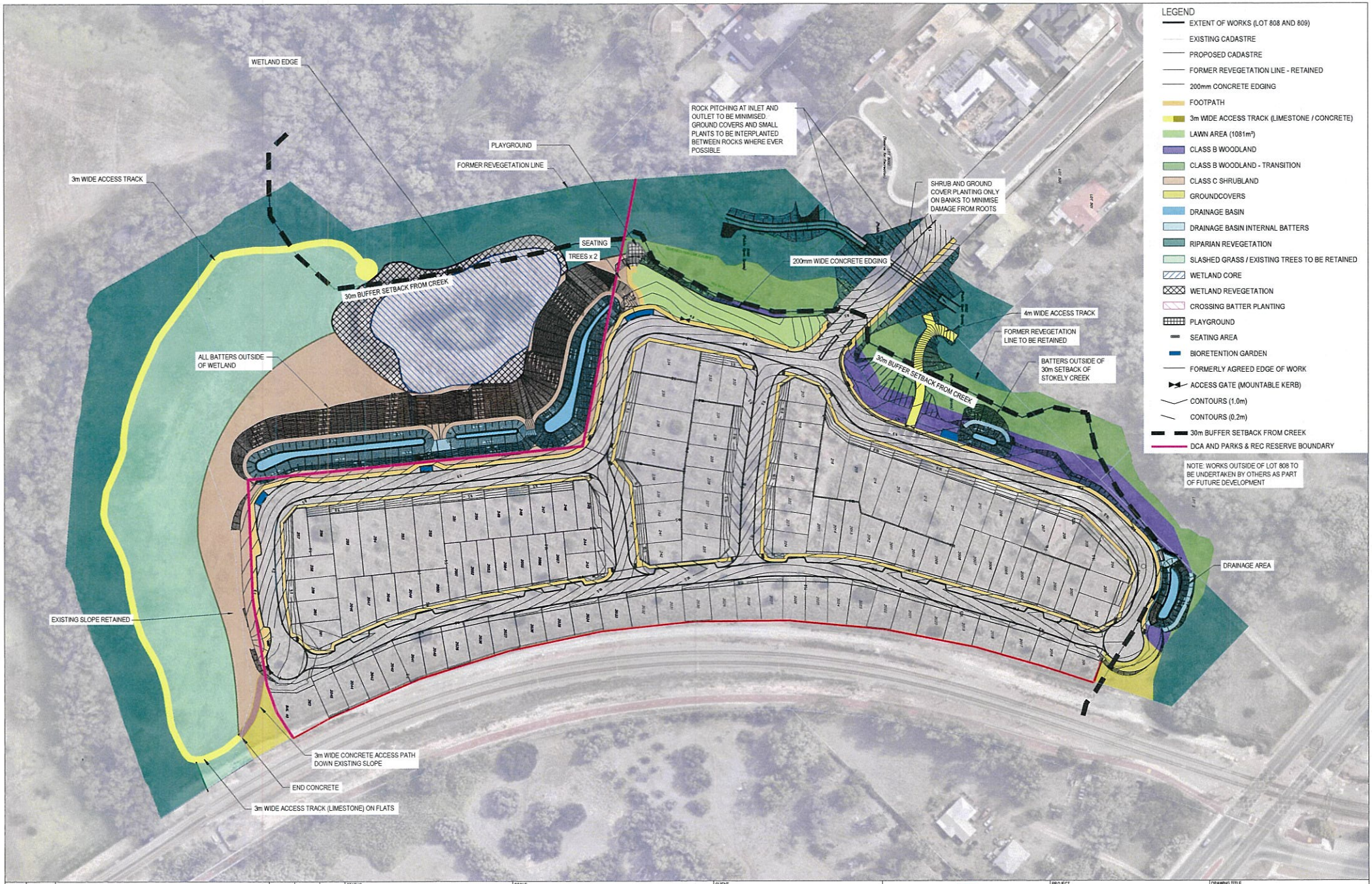
CANNING RISE MADDINGTON

STORMWATER AND LANDSCAPE MANAGEMENT

DRAWING TITLE

OVERALL LANDSCAPING AND REVEGETATION PLAN

PROJECT No.	DRAWING No.	REVISION
B21015	L001	7



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6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE

SCALE 1:750 @ A1 1:1500 @ A3

NORTH

CLIENT

CLAYMONT

DISCLAIMER
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Oversby Consulting

PROJECT

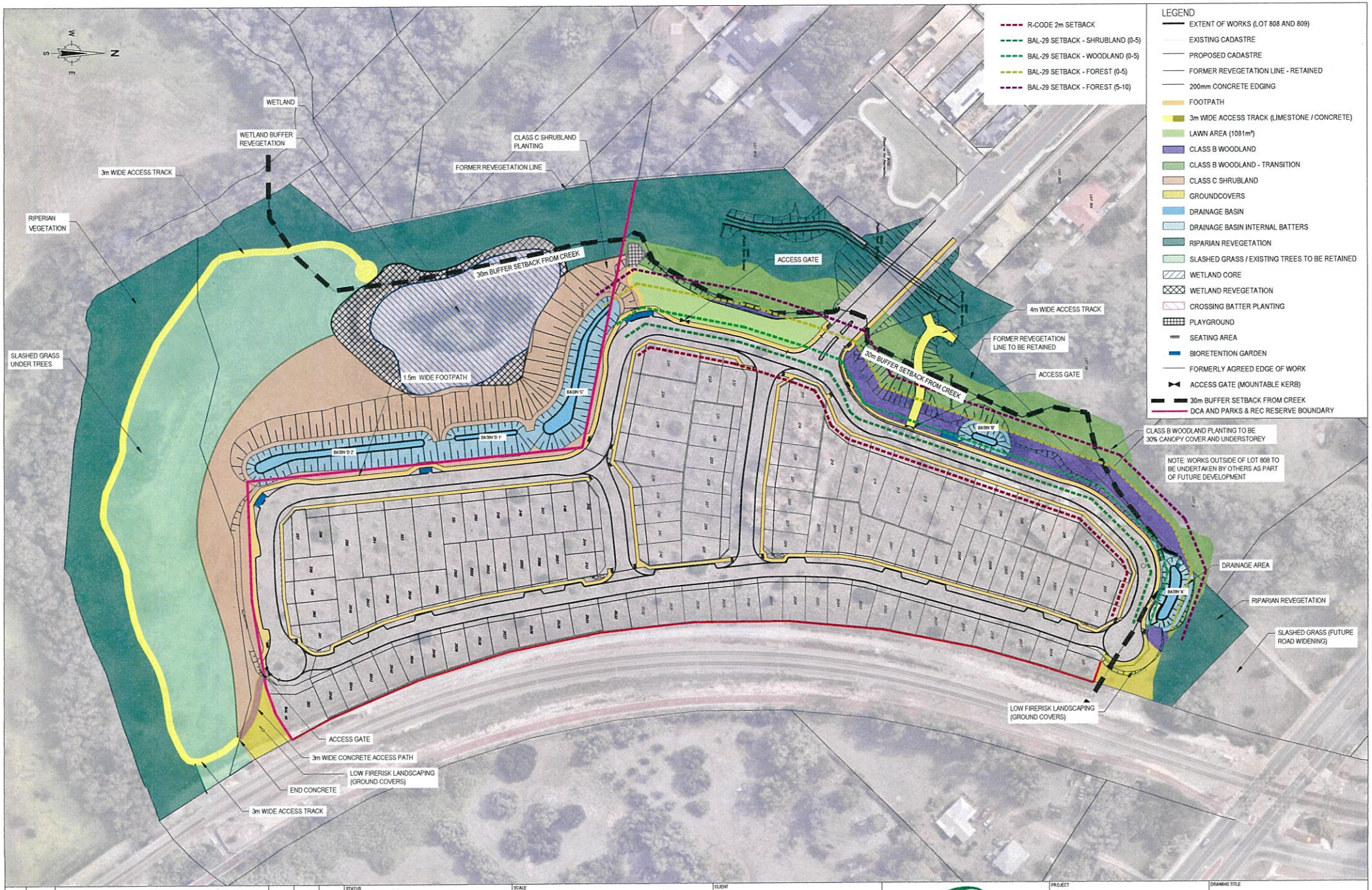
CANNING RISE MADDINGTON

STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE

EARTHWORKS

PROJECT No.	DRAWING No.	REVISION
B21015	L002	7



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5	1/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS: PRELIMINARY NOT FOR CONSTRUCTION

SCALE: SCALE 1:750 @ A1 1:1500 @ A3

CLIENT: CLAYMONT

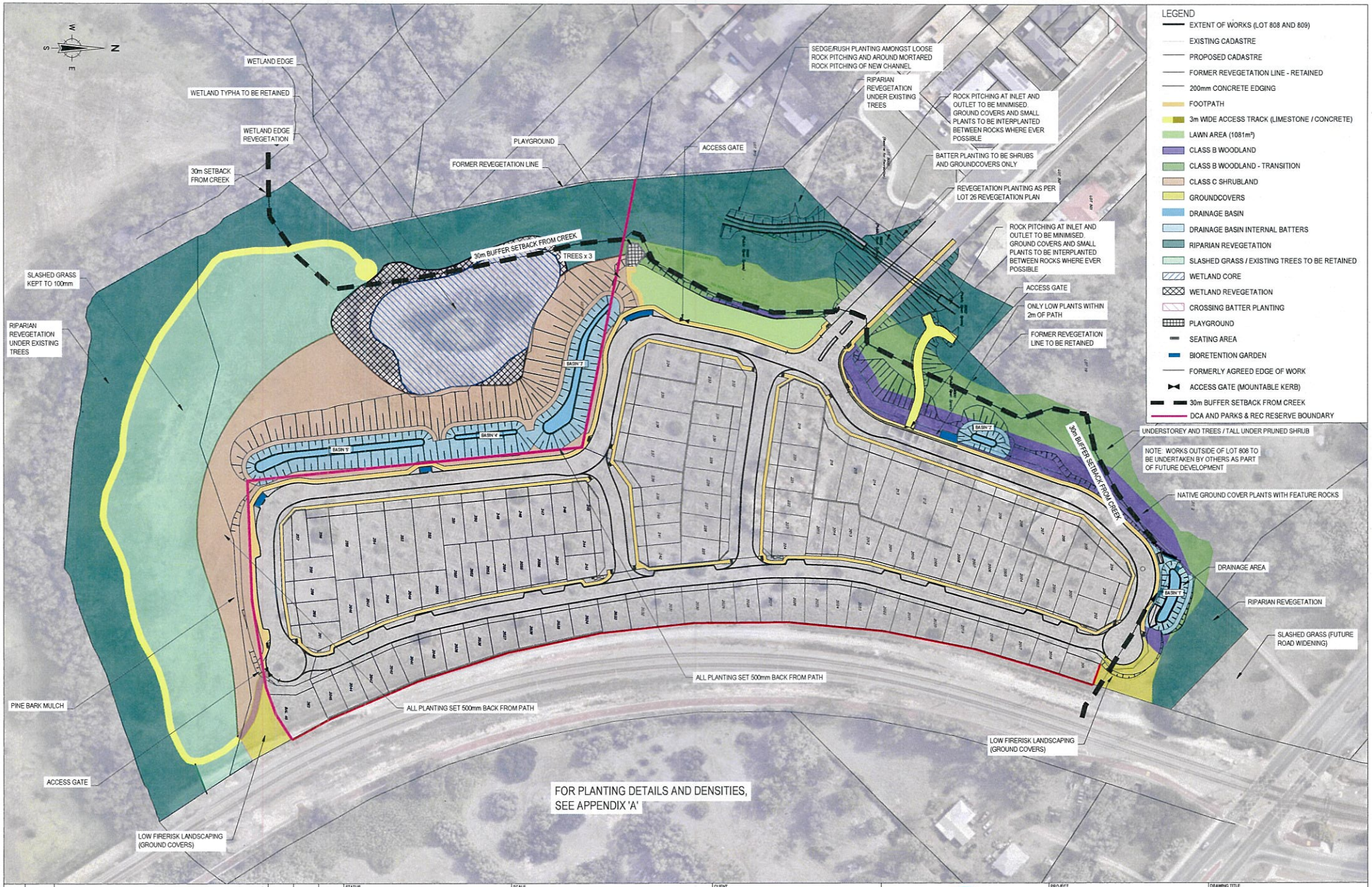
DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

Oversby Consulting

PROJECT: CANNING RISE MADDINGTON
STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE: BUSH FIRE ATTACK LEVEL (BAL) PLAN

PROJECT No.	DRAWING No.	REVISION
B21015	L003	7



REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
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6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	1/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS: PRELIMINARY NOT FOR CONSTRUCTION

SCALE: SCALE 1:750 @ A1 1:1500 @ A3 NORTH

CLIENT: CLAYMONT

DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY. DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

Oversby Consulting

PROJECT: CANNING RISE MADDINGTON
STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE: PLANTING DETAIL

PROJECT No.	DRAWING No.	REVISION
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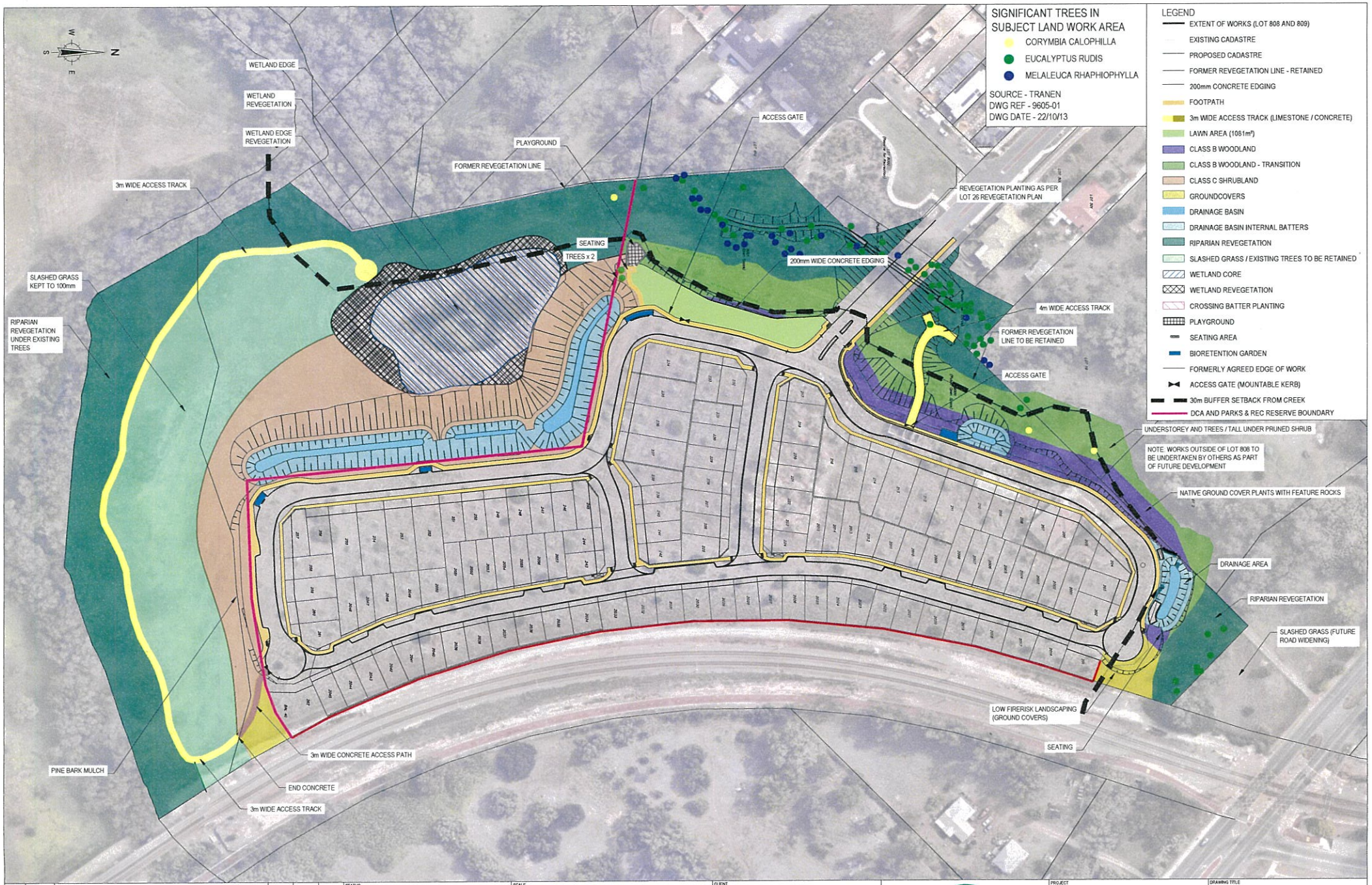

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
7	30/11/22	DCA AND PARKS & REC RESERVE BOUNDARY ADDDED	KJB	BO	BO
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS: PRELIMINARY NOT FOR CONSTRUCTION

SCALE: 1:750 @ A1 1:1500 @ A3

CLIENT: CLAYMONT

DISCLAIMER
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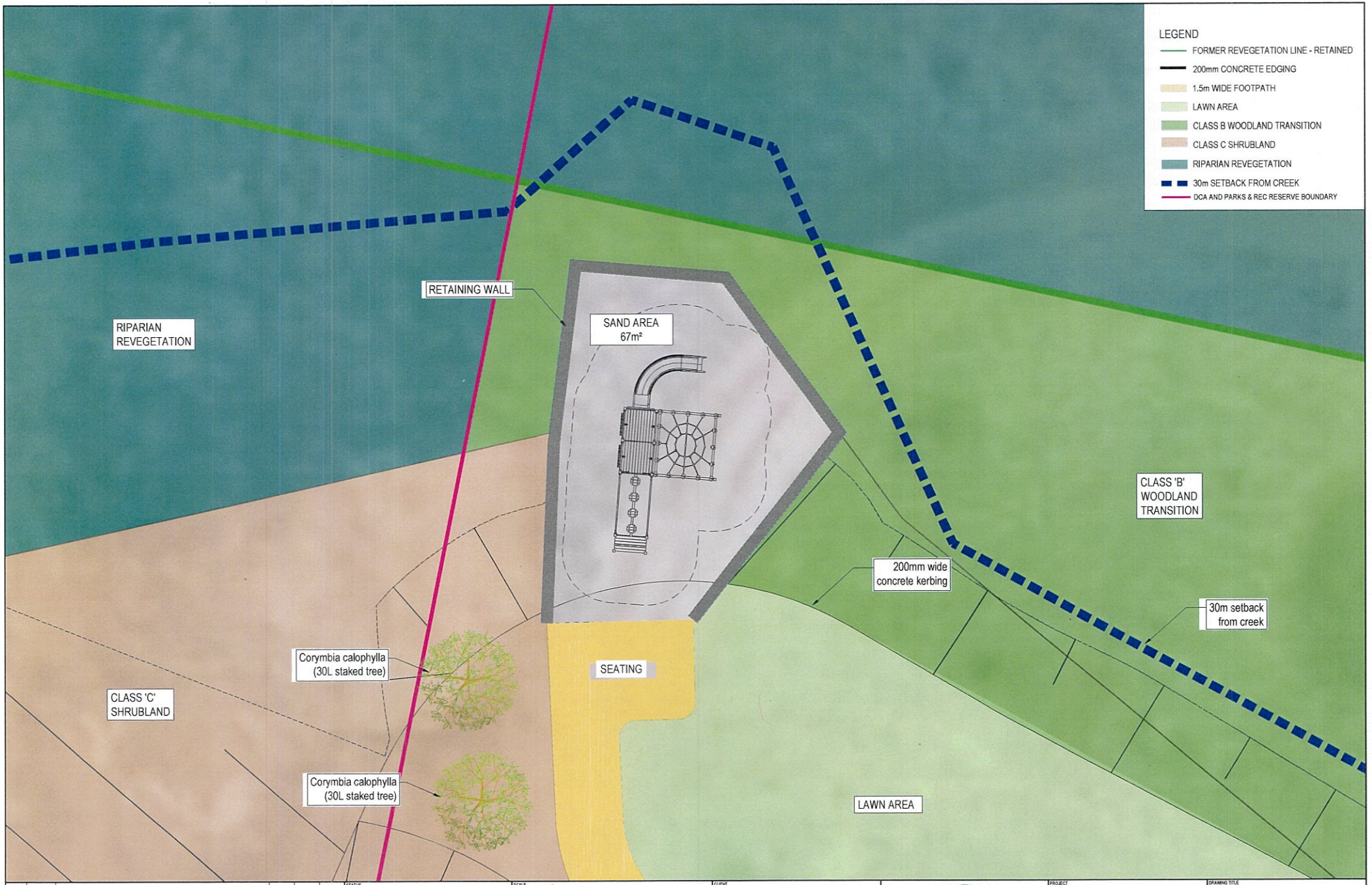
Oversby Consulting

PROJECT: CANNING RISE MADDINGTON
STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE: SIGNIFICANT TREE PROTECTION AND WEED REMOVAL PLAN

PROJECT No.	DRAWING No.	REVISION
B21015	L005	7



REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
7	30/11/22	DCA AND PARKS & REC RESERVE BOUNDARY ADDED	KJB	BO	BO
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE
0 5 10 15 20 25
SCALE 1:750
NORTH

CLIENT
CLAYMONT

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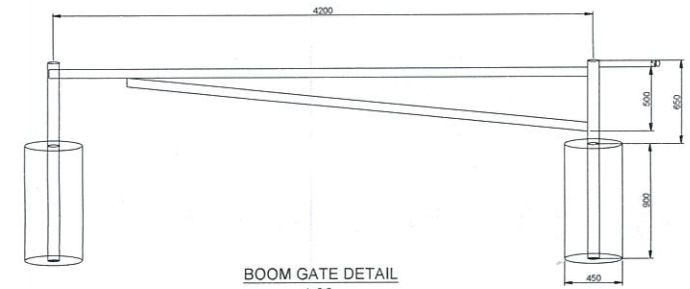
Oversby Consulting

PROJECT
CANNING RISE MADDINGTON

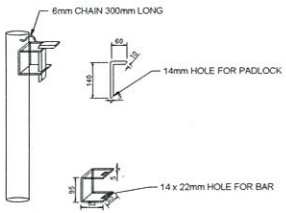
STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE
PLAYGROUND AREA

PROJECT No.	DRAWING No.	REVISION
B21015	L006	7

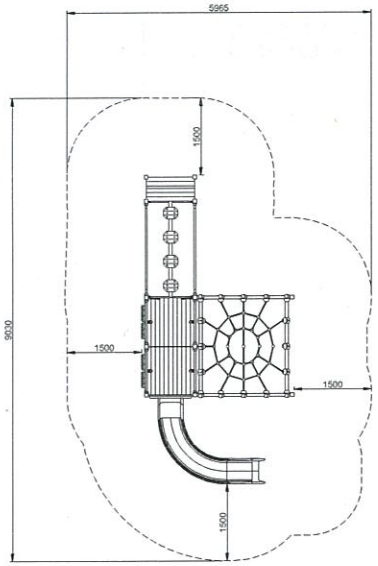


BOOM GATE DETAIL
1:20

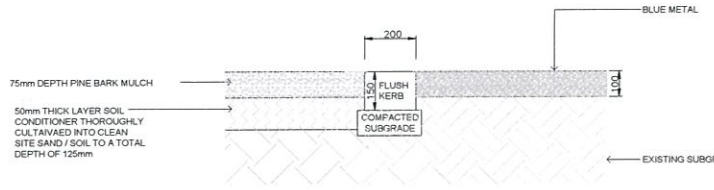


LOCKING DETAILS
SCALE 1:10

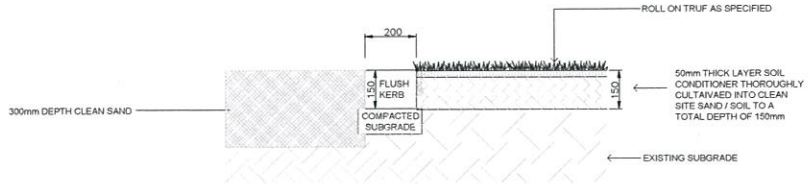
PLAYGROUND PERSPECTIVE



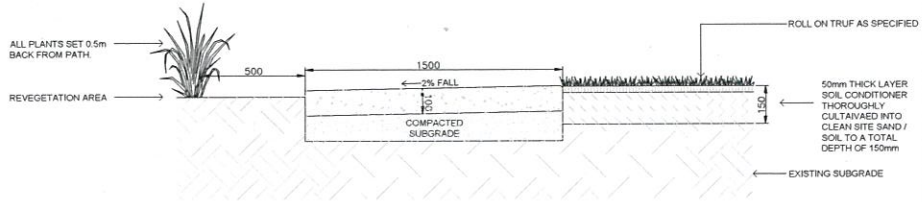
PLAYGROUND DETAIL - REFER B21015 L006
1:50



BLUE METAL, CONCRETE KERBING AND MULCH LANDSCAPING EDGE FOR TRANSFORMER SITES
1:10

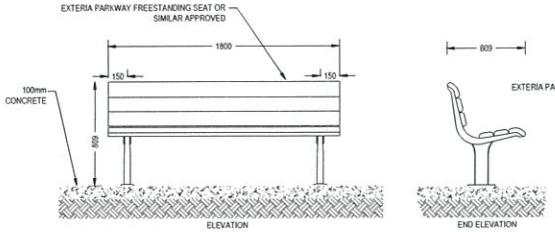


PLAYGROUND EDGE DETAIL
1:10

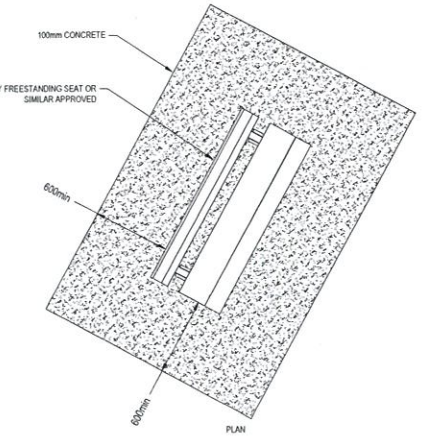


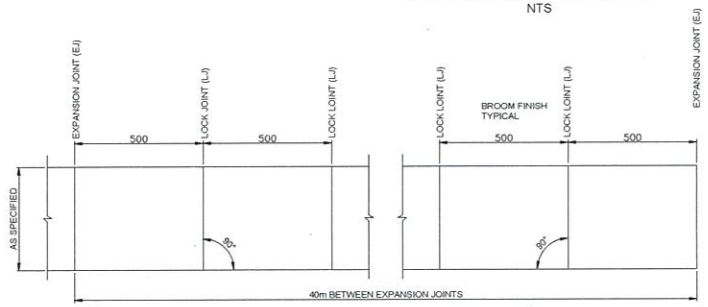
NOTES:
1) ALL TURF TO FINISH 15mm ABOVE TOP OF ANY ADJOINING SURFACE FINISH.

ROLL ON TURF, CONCRETE PATH EDGE
NTS

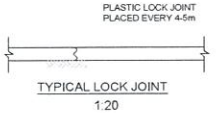


PARKWAY SEAT
TYPICAL DETAIL SCALE 1:20

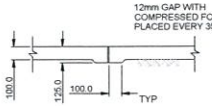




TYPICAL PATH JOINT LAYOUT
NTS



TYPICAL LOCK JOINT
1:20



TYPICAL EXPANSION JOIN
1:20

NOTES:

1. INTERNAL SWINGING AND LOCKING POST TO BE 90mm DIAMETER, 1600mm LONG WITH 900mm CONCRETED 50mm BELOW GROUND LEVEL.
2. THE BOOM IS TO BE 4200mm LONG, 35mm WIDE AND 70mm HIGH AND BE ABLE TO SWING FREELY AND WELDED TO THE INTERNAL POST.
3. THE SUPPORT BAR IS TO BE 3600mm LONG, 35mm WIDE AND 70mm HIGH AND WELDED TO THE BOOM AT ONE END AND TO THE SWINGING POST.
4. 25mm FLAT BAR TO BE CHAINED TO LOCKING POST WITH A 14mm x 22mm HOLE LOCATED AT THE END OF THE FLAT BAR AND TO HAVE A CoG G&M PADLOCK.
5. ALL POSTS AND BOOM ARE TO BE GALVANISED AND POWDERCOATED HERITAGE GREEN UNLESS AGREED OTHERWISE.

NOTES:

1. FOUNDATION TO BE COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
2. ALL CONCRETE FOR PATH CONSTRUCTION TO BE A MINIMUM OF 20MPa, 20mm AGGREGATE AND MAXIMUM SLUMP OF 65mm.
3. BEDDING - SAND (100mm MINIMUM).
4. FINISH - BROOMED TO NON-SKID FINISH.

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS
PRELIMINARY
NOT FOR CONSTRUCTION

SCALE

CLIENT
CLAYMONT

DISCLAIMER
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Oversby Consulting

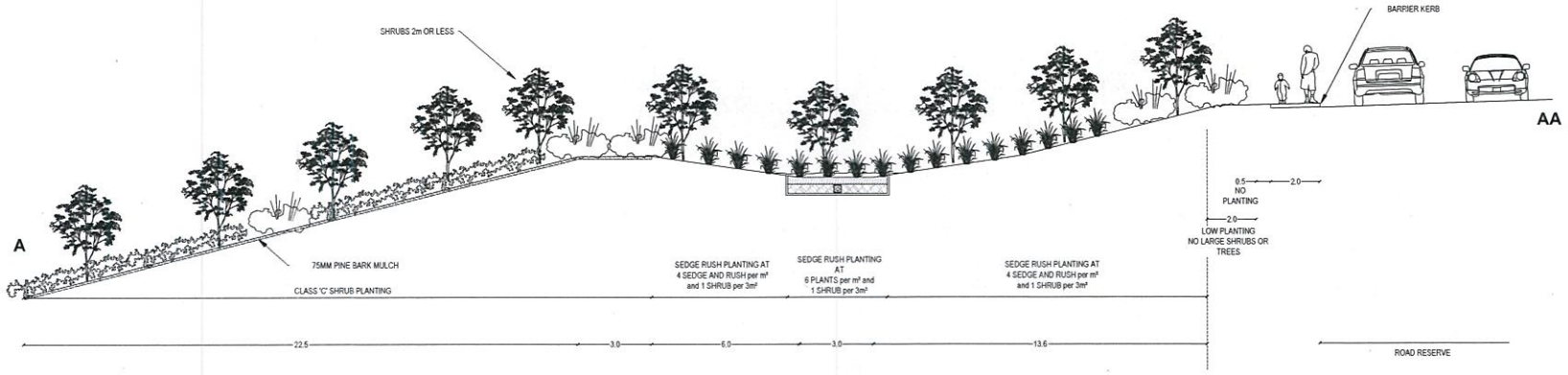
PROJECT
CANNING RISE MADDINGTON

WETLAND & LANDSCAPE PLAN

DRAWING TITLE
DETAIL DRAWINGS
SHEET 1

PROJECT No.	DRAWING No.	REVISION
B21015	L007	6

BASIN 'D' 1 PLAN VIEW
1:750



BASIN TYPICAL SECTION
1:750

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS
PRELIMINARY
NOT FOR CONSTRUCTION

SCALE

CLIENT
CLAYMONT

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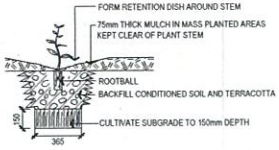
Oversby Consulting

PROJECT
LOT 808, 809 ALBANY HIGHWAY
MADDINGTON

WETLAND & LANDSCAPE PLAN

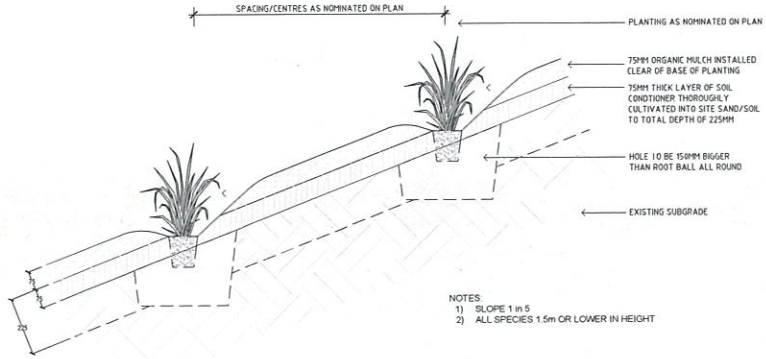
DRAWING TITLE
DETAIL DRAWINGS
SHEET 2

PROJECT No.	DRAWING No.	REVISION
B21015	L008	6



TUBESTOCK PLANTING IN LANDSCAPING AREA

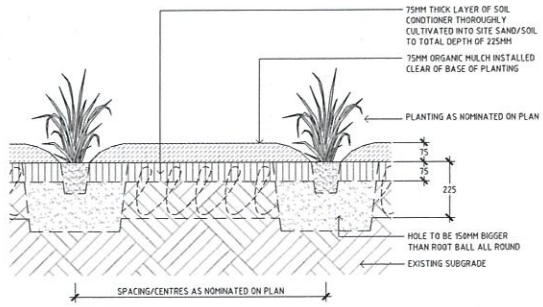
1:10



NOTES:
1) SLOPE 1 in 5
2) ALL SPECIES 1.5m OR LOWER IN HEIGHT

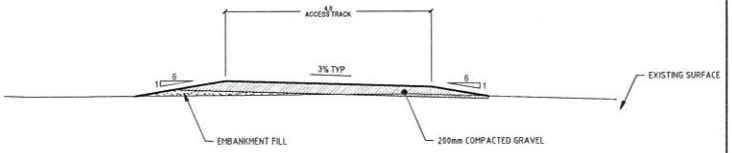
LANDSCAPE MASS PLANTING (CROSSING BANK)

SECTION SCALE 1:10 @ A1



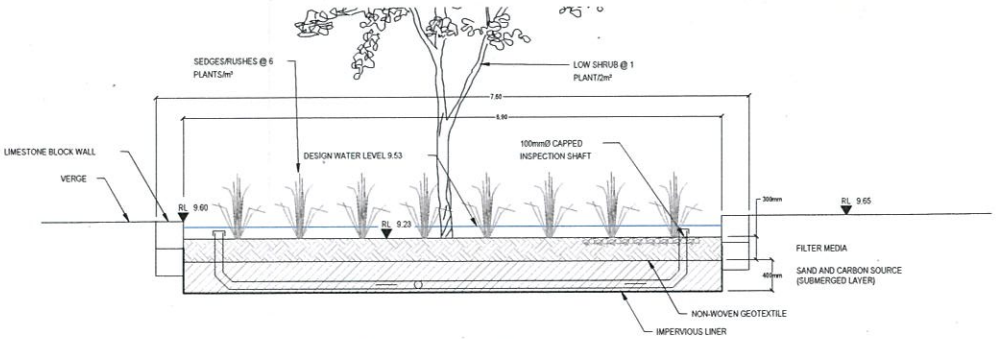
LANDSCAPE MASS PLANTING

SECTION SCALE 1:10 @ A1



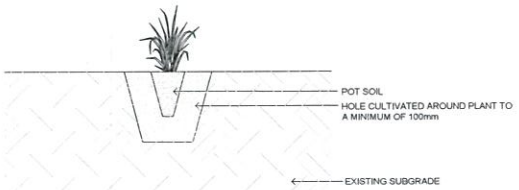
WATERCORP ACCESS TRACK - TYPICAL SECTION

1:50



RAIN GARDEN SECTION - TYPICAL

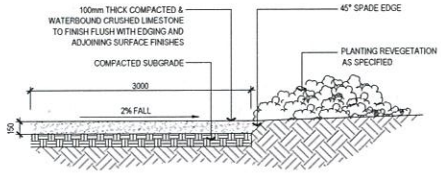
NTS



NOTES:
1) DISPOSE OF ANY SURPLUS SOIL AND STONES TO ENSURE THAT WATER IS NOT DEFLECTED FROM PLANTING POINT.
2) PLANTS IN REHABILITATION AREAS SHALL NOT RECEIVE SOIL PREPARATION.

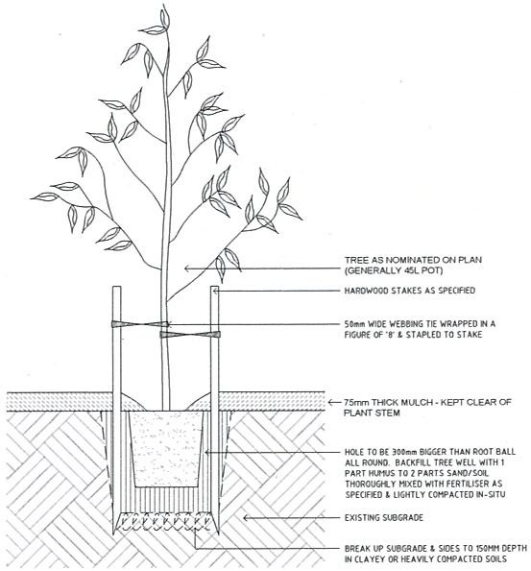
TUBESTOCK REHABILITATION - REVEGETATION AREA

1:20



THICK CRUSHED LIMESTONE PATH

1:20



FEATURE TREE NEAR PLAYGROUND

TYPICAL SECTION SCALE 1:20 @ A1

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS: **PRELIMINARY** NOT FOR CONSTRUCTION

SCALE

CLIENT: CLAYMONT

DISCLAIMER
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Oversby Consulting

PROJECT: LOT 808, 809 ALBANY HIGHWAY MADDINGTON

WETLAND & LANDSCAPE PLAN

DRAWING TITLE: DETAIL DRAWINGS SHEET 3

PROJECT No.	DRAWING No.	REVISION
B21015	L009	6

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
B	30/11/22	DCA AND PARKS & REC RESERVE BOUNDARY ADDED	KJB	BO	BO
A	3/10/22	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

SCALE

0 10 20 30 40 50

SCALE 1:1000 @ A1

CLIENT

CLAYMONT

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Oversby Consulting

PROJECT

CANNING RISE MADDINGTON

STORMWATER & LANDSCAPE MANAGEMENT

DRAWING TITLE

POST DEVELOPMENT CATCHMENTS

PROJECT No.	DRAWING No.	REVISION
B21015	L010	B

Appendix B Implementation Schedule and Monitoring

Implementation Schedule for Landscaping/Foreshore Management Actions

Note; The dates are associated with Stage 1 works and may need to be reviewed for future stages.

Phase	Approximate Date	Basin	Revegetation Area	Landscaping	Lawn	Playground	Pathways/Edging/Seats
Before Construction		Implement sediment/erosion protection measures prior to any works starting	Mark all woody weeds to be removed by machinery. Mark all trees to be retained and inform Civil Contractors of the need to avoid these trees. Mark out wetland boundary to reduce chance of soil entering. Implement sediment/erosion protection measures prior to any works starting.	Mark all woody weeds to be removed by machinery. Mark all trees to be retained and inform Civil Contractors of the need to avoid these trees. Implement sediment/erosion protection measures prior to any works starting	Mark any woody weeds to be removed by machinery.Implement sediment/erosion protection measures prior to any works starting	Implement sediment/erosion protection measures prior to any works starting	Implement sediment/erosion protection measures prior to any works starting
Work implementation as part of Civil Construction	**Spring 2023**	All basin construction and flow control structures to be finalised prior to planting.	Spray winter active species with herbicides in open areas, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	Spray winter active species with herbicides in open areas, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	Remove any woody weeds and spray other weeds	Topsoil removed and lay down 200mm of clean playground sand. Install playground equipment. Install feature trees.	Install concrete pathways and edging. Instal relevant seats.
Work Implementation at Completion of Civil Construction	**Spring/ Summer 2023**	Plant out basin and surrounding banks. Install temporary irrigation.	Undertake pre planting weed control.	Undertake soil improvement works. Install temporary irrigation. Spread mulch 75mm thick to suppress weed germination. Plant out landscaping area	Install permanent irrigation. Prepare subsurface soil with conditioner, Lay 100mm clean sand. Lay turf.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Install compacted limestone pathway.
	Summer 2023/24	Check for any erosion/sedimentation/ compaction,repair as required. Remove weeds as required. Inspect irrigation system and repair as required.	Undertake pre planting weed control.	Undertake pre planting weed control.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging and seats and repair as required.
	Autumn 2024	Check for any erosion/sedimentation/compaction and repair as required. Remove weeds as required. Inspect irrigation system and repair as required.	Undertake pre planting weed control.	Undertake pre planting weed control.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging and seats and repair as required.
	Winter 2024	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Inspect irrigation system and repair as required.	Plant out areas with native species. Mark out 5 monitoring quadrants (or proportional number depending on area revegetated).	Plant out landscaping area	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging and seats and repair as required.
Maintenance and Monitoring: Period 1	**September 2024 - December 2024**	Check for any erosion/sedimentation/ compaction, as required. Remove weeds as required. Inspect irrigation system and repair as required.	Control weeds with selective herbicides eg Fusillade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required. Monitor quadrants to determine plant survival and weed burdens.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control. Order plants for replanting to replace lost plants if needed. Inspect irrigation system and repair as required. Check for any erosion on slopes and rectify.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging and seats and repair as required.
Period 2	**January 2025 - April 2025**	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Order plants for replanting to replace lost plants if needed. Inspect irrigation system and repair as required.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control. Order plants for replanting to replace lost plants if needed.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control. Order plants for replanting to replace lost plants if needed. Inspect irrigation system and repair as required.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.
Period 3	**May 2025 - August 2025**	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Infill replanting as required. Remove temporary irrigation if plants are well established	Replant into areas where necessary. Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required.	Replant into areas where necessary. Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required. Remove temporary irrigation if plants are well established. Check for any erosion on slopes and rectify.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.
Period 4	**September 2025 - December 2025**	Check for any erosion/sedimentation/ compaction and repair as required. Remove weeds as required,	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees and check stakes.	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.
Period 5	**January 2026 - April 2026**	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Order plants for replanting to replace lost plants if needed.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control. Order plants for replanting to replace lost plants if needed.	Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control. Order plants for replanting to replace lost plants if needed.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees. Remove stakes.	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.
Period 6	**May 2026 - August 2026**	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Infill replanting as required.	Replant into areas where necessary. Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required.	Replant into areas where necessary. Control weeds with selective herbicides eg Fusilade or utilise spot spraying with Roundup Biactive and/or and manually remove weeds. Inspect site for signs of excessive grazing and undertake rabbit control as required. Trim plants if required to keep areas meeting the bushfire category. Check for any erosion on slopes and rectify.	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees .	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.
Works by City after completion of 2 year monitoring and maintenance period	**Ongoing**	Check for any erosion/sedimentation/ compaction, repair as required. Remove weeds as required. Infill replanting as required.	Weed Control and Revegetate as deemed necessary	Weed Control and Replant as deemed necessary	Monitor lawn growth and mow as required. Inspect irrigation and repair as required. Undertake weed control as required.	Undertake necessary maintenance of equipment. Control any weed encroachment. Check on health of trees a.	Monitor pathways, edging seats and repair as required. Trim any plants growing out onto pathway corridor.

Weed control is considered adequate if the weeds are in numbers low enough that they are currently not affecting the success of the revegetation/ existing native vegetation growth and it can be reasonably expected that they won't in the foreseeable future. For this to be the case it is assumed that weeds will cover less than 10% of the area on average in revegetation areas and 5% in landscape areas and no weeds in the basin or playground area.

MONITORING COMPLIANCE TABLE

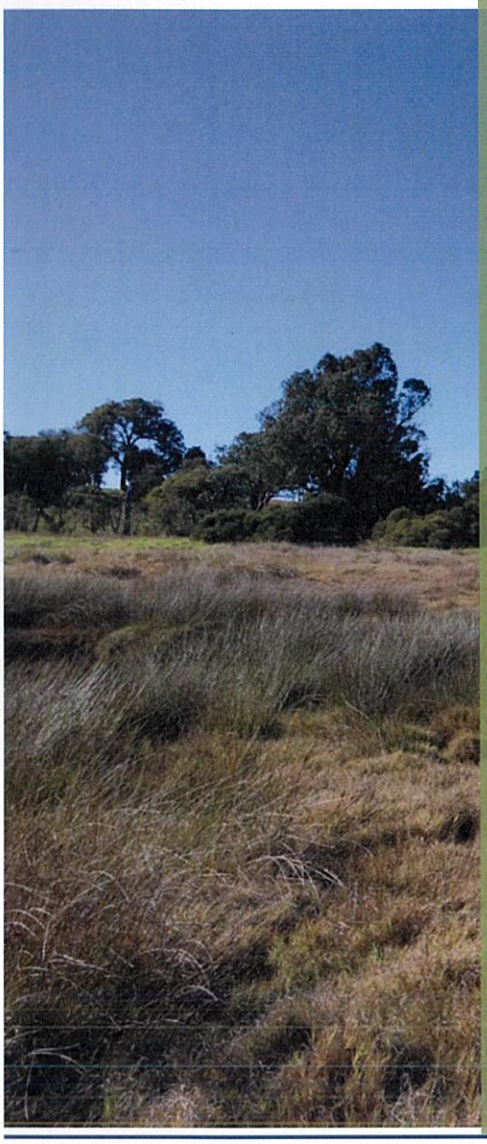
Item	Compliance criteria	Review period
Revegetation Area		
Weed control	No declared weeds present	Quarterly and at PC and Handover
	All woody weeds removed	Quarterly and at PC and Handover
	All other weeds below 5% cover	Quarterly and at PC and Handover
Native Plant establishment	Understorey plants at 80% of initial planting density	
	Understorey plants at 70% of initial planting diversity/	Quarterly and at PC and Handover
	Mid and overstorey plants at 80% of initial planting density	Quarterly and at PC and Handover
	Mid and overstorey plants at 70% of initial planting diversity	Quarterly and at PC and Handover
	All rubbish removed	Quarterly and at PC and Handover
	All trees and areas of native vegetation are marked around the drip line prior to construction beginning and kept in place until PC	Prior to construction and weekly through construction
	Note: Total plant density is to be as per Policy 6.2.2 – Retention, Rehabilitation and Revegetation of Natural Areas	At PC and Handover
Landscaping Area, Including basins		
Weed control	No declared weeds present	Quarterly and at PC and Handover
	All woody weeds removed	Quarterly and at PC and Handover
	All other weeds below 5% cover	Quarterly and at PC and Handover
Native Plant establishment:- Fire Risk Planting areas	Understorey plants at 80% of initial planting density	Quarterly and at PC and Handover
	Understorey plants at 70% of initial planting diversity	Quarterly and at PC and Handover
	Mid and overstorey plants at 80% of initial planting density	Quarterly and at PC and Handover
	Mid and overstorey plants at 70% of initial planting diversity	Quarterly and at PC and Handover
	Dead plants removed	Quarterly and at PC and Handover
	All rubbish removed	Quarterly and at PC and Handover
	All trees and areas of native vegetation are marked around the drip line prior to construction beginning and kept in place until PC	Prior to construction and weekly through construction
Bushfire Management	All vegetation in areas being managed for bushfire are to be kept to agreed heights through pruning.	Prior to bushfire season and at PC and Handover
	Any extra plants self seeding in bushfire management areas are to be managed as per the approved bushfire Management Plan, including potential pruning or removal.	Prior to bushfire season and at PC and Handover
	The low fuel zones on the north and south portions of the site are to be managed to maintain groundcovers only.	Prior to bushfire season and at PC and Handover
Path network	All plants trimmed a minimum of 200mm from path edges and no plants blocking sight lines on curves.	Quarterly and at PC and Handover
	All footpaths to be in working order with no excessive cracking.	Quarterly and at PC and Handover
	All limestone tracks to be maintained so that they are free of vegetation	Quarterly and at PC and Handover
	Any erosion of the track is to be repaired.	Quarterly and at PC and Handover
Lawn	Reticulation system to be in full working order	Monthly over spring to autumn period and at PC and Handover
	Grass to be mowed and in a neat state	Weekly -monthly over spring to autumn period and at PC and Handover
	Weeds to be <1%	Quarterly and at PC and Handover
	Any lawn that has invaded surrounding revegetation/landscaping areas is to be removed.	Quarterly and at PC and Handover
Drainage		
(UWMP contains more detailed information in relation to drainage)	Any drainage outfalls are stable and not eroding	Quarterly and at PC and Handover
	Plants within flow dissipation areas are growing and at 80% or original density.	Quarterly and at PC and Handover
	Sediment is removed from dissipation areas	Quarterly and at PC and Handover
	Dissipation rocks are stable	Quarterly and at PC and Handover

Appendix C Comparison of 2013 and 2021 tree area

Comparison of 2013 and 2021 aerials to note changes since 2013 tree survey

2013

2021



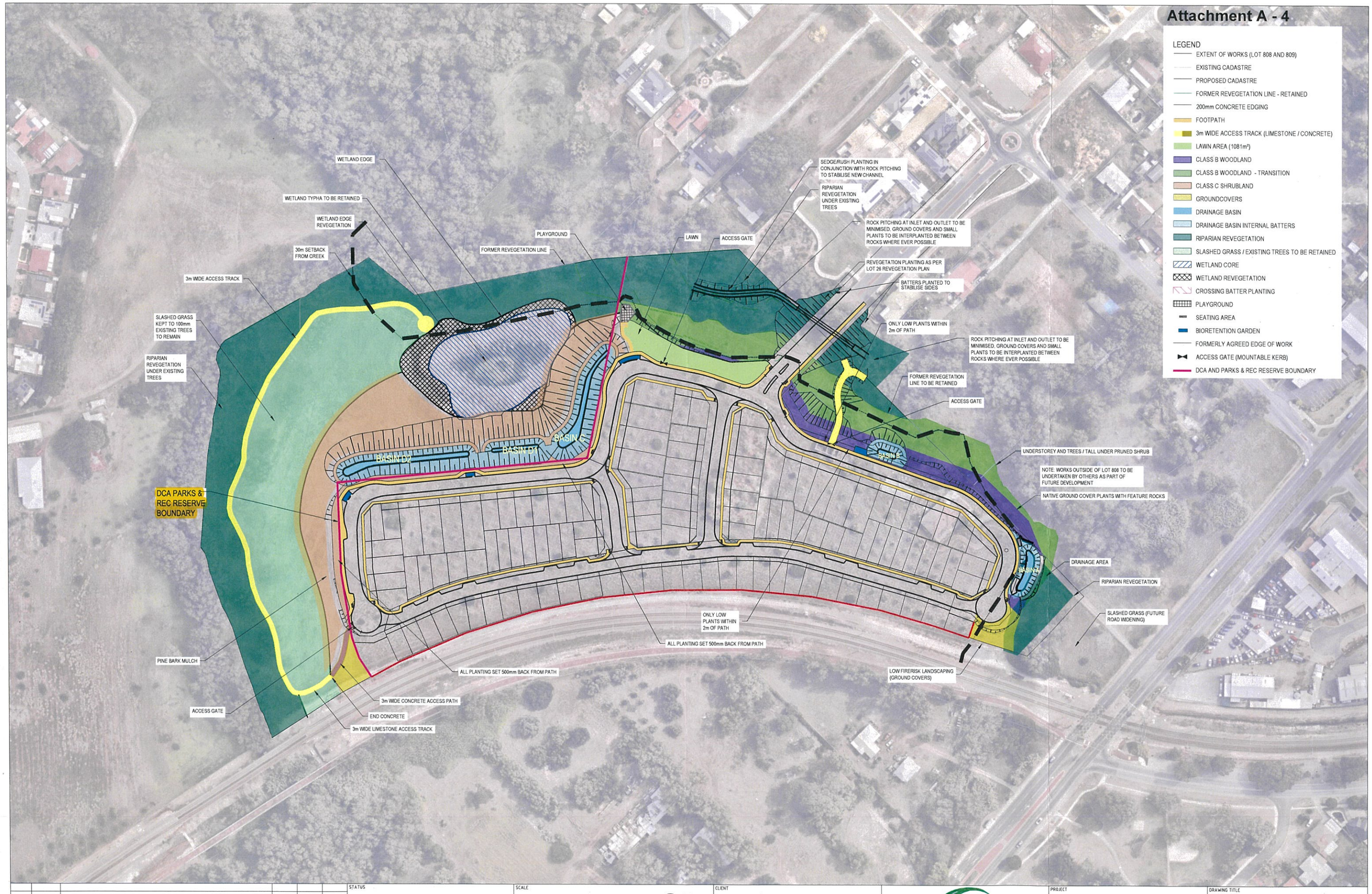
Contact Details

OVERSBY CONSULTING PTY LTD

PO Box 369
Dardanup WA 6236

Phone 044 761 4411

Attachment A - 4



LEGEND

- EXTENT OF WORKS (LOT 808 AND 809)
- EXISTING CADASTRE
- PROPOSED CADASTRE
- FORMER REVEGETATION LINE - RETAINED
- 200mm CONCRETE EDGING
- FOOTPATH
- 3m WIDE ACCESS TRACK (LIMESTONE / CONCRETE)
- LAWN AREA (1081m²)
- CLASS B WOODLAND
- CLASS B WOODLAND - TRANSITION
- CLASS C SHRUBLAND
- GROUNDCOVERS
- DRAINAGE BASIN
- DRAINAGE BASIN INTERNAL BATTERS
- RIPARIAN REVEGETATION
- SLASHED GRASS / EXISTING TREES TO BE RETAINED
- WETLAND CORE
- WETLAND REVEGETATION
- CROSSING BATTER PLANTING
- PLAYGROUND
- SEATING AREA
- BIORETENTION GARDEN
- FORMERLY AGREED EDGE OF WORK
- ACCESS GATE (MOUNTABLE KERB)
- DCA AND PARKS & REC RESERVE BOUNDARY

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
7	30/11/22	DCA AND PARKS & REC RESERVE BOUNDARY ADDED	KJB	BO	BO
6	4/10/22	ISSUED FOR FINAL APPROVAL	KJB	BO	BO
5	11/11/21	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS

PRELIMINARY

NOT FOR CONSTRUCTION

SCALE

0 10 20 30 40 50

SCALE 1:2000

NORTH

CLIENT

CLAYMONT

DISCLAIMER

ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

Oversby Consulting

PROJECT

CANNING RISE MADDINGTON

STORMWATER AND LANDSCAPE MANAGEMENT

DRAWING TITLE

OVERALL LANDSCAPING AND REVEGETATION PLAN

PROJECT No.	DRAWING No.	REVISION
B21015	L001	7

From: Patricia Dames
To: John Riley
Subject: RE: FW: (ECM:7311222) Referral for Comment - Part 5 - Lot 809 & 808 (1993) Albany Highway, Maddington - Drainage basins and stormwater outlet within Parks & Recreation Reserve and Canning River Development Control Area
Date: Tuesday, 8 November 2022 11:41:34 AM
Attachments: image007.png
image001.png

[External Email] This email was sent from outside the department – be cautious, particularly with links and attachments.

Hi John,

My apologies, it looks like the City hasn't provided a response to the Part 5 referral. I've had a look through our records system and can't see anything.

I do remember speaking to Mandy about this, but looks like I didn't follow up with an email.

There have been years of discussion around this subbie. The as the plan was approved with a bushfire management plan that meant we have ultimately been committed to a bushfire management regime that the City wouldn't normally support. The area to the south and south-west of the development (shown as slashed grass with existing trees to be retained) is within the DCA and the area relevant to the Part 5 referral. The City has been involved in discussions with DBCA and the proponent and has agreed to the treatment of the area as shown in the plans attached to the referral. This includes, slashing, path construction and revegetation. To this, the City has no objection to the Part 5 application being approved.

Kind regards,
Trish

Patricia Dames
Environmental Officer

CITY OF GOSNELLS

2120 Albany Highway Gosnells WA 6110
PO Box 662 Gosnells WA 6990
T 08 9397 3205 | **M** 0476 824 730
gosnells.wa.gov.au

From: John Riley <john.riley@dbca.wa.gov.au>
Sent: Friday, 28 October 2022 1:28 PM
To: Patricia Dames <PDames@gosnells.wa.gov.au>
Subject: RE: FW: (ECM:7311222) Referral for Comment - Part 5 - Lot 809 & 808 (1993) Albany Highway, Maddington - Drainage basins and stormwater outlet within Parks & Recreation Reserve and Canning River Development Control Area

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Hi Patricia,

I cant find if the City has responded to our Part 5 referral. Can you check for please?

From: Mandy Sherring
To: Rivers Planning
Subject: FW: Lot 808 and 809 Albany Highway, Maddington
Date: Wednesday, 2 March 2022 5:04:20 PM
Attachments: image001.png
PA Request - 023453 - Subdivisions - WAPC - 1036-18 - LOT 808 ALBANY HIGHWAY MADDINGTON.pdf
RE Query in City of Gosnells.msg
RE Query in City of Gosnells.msg

HI Caz

See response from DWER, I will save in Part 5 folder

Regards
Mandy

From: Diana Nussey <Diana.Nussey@dwer.wa.gov.au>
Sent: Wednesday, 2 March 2022 4:04 PM
To: Mandy Sherring <Mandy.Sherring@dbca.wa.gov.au>
Cc: Jim MacKintosh <jim.mackintosh@dwer.wa.gov.au>
Subject: RE: Lot 808 and 809 Albany Highway, Maddington

Hi Mandy,

Thank you for your email and apologies for the delay in response.

I have attached advice provided for subdivision application 1036-18 on Lots 808 and 809. I have also attached a response to Suzanna Chan's query regarding the drainage basins. It is noted that the UWMP dated November 2021 appears to be the same as the report dated March 2020.

As per our previous advice, DWER does not object to the proposed drainage basins provided that the UWMP includes mapping to show the drainage basins are located outside of the floodplain (as proposed) and that post development modelling demonstrates there will be no upstream impacts.

DWER has not done an engineering assessment of the Urban Water Management Plan (UWMP) as we do not have the technical expertise at the region. DWER is also unaware if the City of Gosnells has assessed the UWMP.

Let me know if you have any queries.

Kind regards,

Diana Nussey
A/Senior Natural Resource Management Officer
Planning Advice Section

Department of Water and Environmental Regulation
Swan Avon Region
7 Ellam St, Victoria Park, WA 6100
T: (08) 6250 8014| F: (08) 6250 8050
E: diana.nussey@dwer.wa.gov.au | www.dwer.wa.gov.au

Twitter: @DWER_WA

From: Mandy Sherring <Mandy.Sherring@dbca.wa.gov.au>
Sent: Wednesday, 2 March 2022 2:07 PM
To: Jim MacKintosh <jim.mackintosh@dwer.wa.gov.au>
Subject: Lot 808 and 809 Albany Highway, Maddington

Dear Jim

In relation to the proposed subdivision at Albany Highway Maddington (WAPC Approval 155487). I'm in the process of preparing a report to go the Swan River Trust Board in relation to the detention basins in the DCA. I know it's a bit of a technicality as far as DWER are concerned given that the applicant has an approved subdivision, but can you please provide me with a comment in relation to DWER's assessment of the LWMP / UWMP and if DWER support or object to the proposed stormwater basin within the Regional Reserve. It only needs to be a few lines I just need to be able to report to the SRT board DWER's comments in relation to the proposal.

Regards

Mandy Sherring | Planning Officer |

Department of Biodiversity, Conservation and Attractions
Parks and Wildlife Service
Rivers and Estuaries Branch
17 Dick Perry Avenue, Kensington
Phone: 9278 0901 Email: mandy.sherring@dbca.wa.gov.au

Ngala kaaditj Noongar moort keyen kaadak nidja boodja.
We acknowledge the Noongar people as the original custodians of this land.

2120 Albany Highway Gosnells WA 6110
Mail to: PO Box 662 Gosnells WA 6990

T 08 9397 3000
F 08 9397 3333
E council@gosnells.wa.gov.au
W www.gosnells.wa.gov.au
ABN 18 374 412 891

26 May 2023

Department of Biodiversity, Conservation and Attractions

E: rivers.planning@dbca.wa.gov.au.

Reference: 2022/0237
Enquiries: Trish Dames 9397 3205

Attention: Kiara Smart

Dear Kiara

Draft Report - Part 5 - 2022/0237 - Lot 809 on Plan 31948, Albany Highway, Maddington - Proposed stormwater drainage basins, limestone maintenance access track/pedestrian footpath, rehabilitation and revegetation – City of Gosnells response

I refer to the draft report relating to an application under Part 5 for Lot 809 on Plan 31948, Albany Highway, Maddington. Proposed works within the Development Control Area (DCA) include stormwater drainage basins, limestone maintenance access track, pedestrian footpath, rehabilitation and revegetation.

This application has been submitted with approved documents relating to WAPC approval 155487 (approved 30/08/2018), including:

- Urban Water Management Plan
- Bushfire Management Plan
- Wetland and Landscape Development Plan

It should be noted that the City has received an altered subdivision application for adjoining Lot 808 Albany Highway which is currently under review. If approved, this will lead to a decrease in lot numbers by 2 (approved lot layout includes 62 lots while the proposed layout includes 60 lots). It is not expected that there will be substantial changes to drainage requirements as a result.

The City is supportive of the Part 5 application being approved for works including stormwater drainage basins, limestone maintenance access track, pedestrian footpath, rehabilitation and revegetation with the following conditions applied:

- A Construction Environmental Management Plan, especially relating to erosion and sedimentation, be approved and implemented prior to earthworks, and applied during both subdivisional and housing development works.

- Remnant trees identified to be worthy of protection should be protected in accordance with AS4970-2009 Protection of trees on development sites.

- Compaction of drainage areas during construction is to be minimised.

If you have any queries on this matter, please contact Patricia Dames, Environmental Officer, on 9397 3205.

Yours faithfully

Rachel Fitzgerald
Acting Coordinator Environmental Management

Attachment B

SWAN RIVER TRUST

Meeting No. 02/2022

Tuesday 21 March 2023

EXTRACT

ITEM 5.1

SWAN RIVER TRUST Extract of Minutes Swan River Trust

Meeting No:	02/2023
Date:	1/6/2023
Time:	11:29am
Signed:	C. Hombsch

5.1 Part 5 development application – proposed stormwater drainage basins, limestone maintenance access track/pedestrian footpath, rehabilitation and revegetation – Lot 809 on Plan 31948, Albany Highway, Maddington

DBCA received an application from Dynamic Planning and Developments, on behalf of landowners Dandenong Properties Pty Ltd, for the construction of stormwater detention basins, a limestone maintenance access/pedestrian footpath and rehabilitation and revegetation work on private property adjacent to the Canning River in Maddington.

The land, which is the subject of this application, Lot 809 is reserved under the Metropolitan Region Scheme for Parks and Recreation and is wholly contained within the Swan Canning Development Control Area (DCA).

RESOLUTION 10/2023

The Trust *RESOLVED* to advise the Director General of DBCA that it supports the report and recommendation of approval, with conditions.