Kelly Road, Donnybrook Structure Plan

(WAPC REF SPN 0855M-2)

PREPARED BY

LB PLANNING

TOWN PLANNING | URBAN DESIGN | LAND DEVELOPMENT CONSULTING

This structure plan is prepared under the provisions of the Shire of Donnybrook-Balingup Local Planning Scheme No. 7.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

7 March 2013

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Date of Expiry: 19 October 2025

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Amendment Table

Amendment No.	Summary of the Amendment	Amendment type	Date approved by Commission
Amendment 1	Increase the total area of the Lifestyle Village site by removing four R15 lots and the Public Open Space Area 5; Insert the modified Lifestyle Village lot into the Structure Plan area and remove reference to Option B; and Modify the Structure Plan report and map accordingly	Major	12 February 2019
Amendment 2	Increase the density within Lot 9500 in its northern residential cell from R10 to R17.5 and identified portions within its southern residential cell from R10 to R17.5 and R40.	Minor	6 March 2020

EXECUTIVE SUMMARY

The proposed amendment to the current endorsed Kelly Road Structure Plan specifically relates to the two residential cells contained within Lot 9500, located on the western side of Kelly Road.

Lot 9500 comprises approximately 4.8 hectares and is owned by Ridgeview Holdings (WA) Pty Ltd.

The proposal seeks to achieve the following changes to the Structure Plan:

1. Increase the density within the northern residential cell of Lot 9500 from R10 to R17.5 and identified portions of its southern residential cell from R10 to R17.5 and R40;
2. Introduce an additional subdivisional road, in the northern residential cell of Lot 9500, with a minimum road reserve width of 14.2 metres, except where abutting open space where the width can be reduced to 13.2 metres;
3. Modify uniform fencing requirement to only apply to those proposed lots within Lot 9500 directly abutting "POS" or the "Foreshore Reserve";
4. Change reference of "Detailed Area Plan" on the Structure Plan Map (Sheet 1) to "Local Development Plan" in the legend;
5. Remove the Local Development Plan requirement for the proposed lots in the northern residential cell of Lot 9500;
6. Update legend accordingly; and
7. Update the Summary Table to reflect the revised density allocation, estimated dwelling number, lot yield and POS Area.

T

SUMMARY TABLE

Item	Data	Structure Plan Ref (section no.)
Area covered by structure plan	• Lot 9500 - 4.3838ha • Lot 9501 - 6.7801ha • Lot 9502 - 5.6319ha • Lot 9503 - 6.3647ha • Lot 9504 - 3.9130ha • Closed road reserve – 0.7752ha	
Total area covered by the structure plan	28.3328ha	
Area of each land use proposed	Hectares / Lot Yield Residential: 26.1511ha / 139 Commercial: Nil / Nil Industrial: Nil / Nil Rural Residential: Nil / Nil	
Total estimated lot yield	139	
Estimated number of dwellings	271	
Estimated residential site density	9 dwellings per hectare	
Estimated population	693	
Number of high schools	Nil	
Number of primary schools	Nil	
Estimated commercial floor Space	Nil	
Estimated area and percentage of public open space given over to: - Regional Open Space - District Open Space - Neighbourhood Parks - Area 2 - Area 3 - Area 4 - Area 6 - Area 7	 Nil Nil 0.1449 0.4489 0.5931 0.3855 1.6505	

Item	Data		Structure Plan Ref (section no.)
Estimated area and percentage of POS given over to drainage	0.4233	1.5%	
Estimated percentage of natural area (foreshore)	2.1817ha	7.7%	

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Appendix B: Updated Bushfire Management Plan for Lot 9500 (Version D)
Appendix C: Updated Foreshore Management Plan
Appendix D: Endorsed Local Water Management Strategy

PART ONE

IMPLEMENTATION

1 STRUCTURE PLAN AREA

The Structure Plan applies to the original land parcel being Lot 108 Kelly Road, Donnybrook of which has now been subdivided into 5 super lots, being Lots 9500 to 9504.

The Structure Plan Area is the land contained within the inner edge of the broken black line shown on the Structure Plan Map – **(Plan 1)**.

2 DEFINITIONS

Unless otherwise provided for words and expressions used have the same meaning as they have in the Scheme and specifically:

"Planning Consent" Means an approval of the local government under Clause 8.1 of the Scheme.

"Proponent" Means the occupier of any lot within the structure plan area.

"Scheme" Means Town Planning Scheme No 4.

"Structure Plan Map" Means the figure designated as the "Structure Plan Map" and contained in this report.

3 OBJECTIVES

The objectives for the development of the structure plan area are:

- To facilitate mixed-use urban development which provides for a wide range of living, employment and leisure opportunities; capable of adapting over time as the community changes and which reflects appropriate community standards of health, safety and amenity.
- To provide a variety of lot sizes and housing types to cater for the diverse housing needs of the community at a density that can ultimately support the provision of local services.
- To maximise land efficiency wherever possible.

4 OPERATION

This Structure Plan will expire on 19 October 2025.

5 LAND USE

Residential lots shall be developed in accordance with the requirements of the 'Residential " zone.

The Lifestyle Village Site shall be developed in accordance with Additional Use A4 requirements of the Scheme.

6 STAGING

Staging of subdivision of the Structure Plan Area and within each superlot shall be undertaken consistent with:

- State Planning Policy 3.7 'Planning in Bushfire Prone Areas' and associated guidelines, in regard to the provision of suitable vehicular access roads leading to two different destinations and the management of vegetated areas;
- The ability to provide reticulated services;
- The orderly provision for the drainage of stormwater from one superlot to another;
- Provision of public open space in the early stages of subdivision; and
- Road connectivity between superlots in the early stages of subdivision.

7 SUBDIVSION AND DEVELOPMENT

Subdivision

7.1 Subdivision of the land shall generally be in accordance with the Structure Plan Map and the assigned R Codes.

7.2 Prior to the subdivision of land, the following management plans shall be submitted and approved by the local government:

- Landscaping Management Plans for the public open space reserves;
- A Sustainability Implementation Strategy;
- Transport Impact Assessment for the whole Structure Plan Area to address:
  - i) The road classification of Kelly Road, other connecting roads and subdivisional roads;
  - ii) Any road upgrading requirements of roads connecting the Structure Plan Area with Bridge Road;
  - iii) Road intersection treatments and advice on spacing between road junctions;
  - iv) Design of road upgrading requirements;
  - v) Cost of works and the apportionment of costs relative to each superlot.
- Update the Foreshore Management Plan to include pest control management in the Implementation Schedule as part of the annual monitoring and reporting of results for revegetation success to the responsible authority.

7.3 Prior to the subdivision of land, the proponent is to demonstrate that land for an off-site wastewater pump station has been secured or make arrangements for alternative land to be ceded to the Crown free of any cost or compensation.

Residential Design Codes

7.4 The R-Codes assigned on the Structure Plan applies, however, due regard is required to be given to the following variations:

- 20m setback as identified on the Structure Plan;
- Setback lines to align with BAL-29 or lesser ratings, as identified on Bushfire Management Plans.

Requirements for Dwellings

7.5 There are three categories of residential lots within the Structure Plan area as follows:

- "Valley Lots" – These are to be filled between 0 - 2 metres with minimal retaining walls between lots.
- "Lower Slopes" – These are to have between 2 and 4 metres of fill / earthworks and will incorporate retaining walls generally up to 2 metres but in some cases larger walls may be required.
- "Hill Side" - Earthworks are to be minimised by the use of larger lots. Development is to be in accordance with the approved design guidelines.

7.6 The development of dwellings shall be setback from the boundaries of the adjoining land as shown on the Structure Plan Map.

7.7 Each dwelling shall:

- Utilise waterwise fittings;
- Have a 3kl minimum tank to be plumbed into laundry toilet and garden.
- Have a 5 star energy efficiency rating.
- Are to be set back off northern and southern property boundaries to achieve winterasolar gain (e.g. not being covered in shadow by neighbouring houses or fences.

7.8 Front gardens are to incorporate Waterwise provisions.

7.9 The Developer is to provide incentives to lot purchasers to:

- Install rainwater tanks;
- Incorporate Waterwise landscaping; and
- Encourage the use of native species in front gardens.

Public Open Space

7.10 Each application and stage of subdivision is required to ensure that sufficient public open space (POS) is provided consistent with WAPC policy, i.e. not less than 10 percent of the gross subdividable area.

7.11 A Foreshore Management Plan is to be prepared and approved prior to development commencing. This is to include a 5 year maintenance period.

7.12 The landscaping of public open space areas is to promote the use of suitable native species, the construction of living streams and waterwise initiatives.

7.13 The landscaping plans for the public open space areas are to address nutrient and sediment management.

7.14 The developer is responsible for the maintenance of the areas of public open space for 5 years.

7.15 A Special Area Rate will be applied to maintain and upkeep the POS area, with the developer required to contribute the balance as part of the 5 year maintenance period. Once this period finishes the Shire will continue the maintenance of the POS areas and any additional monies required.

Design Guidelines

7.16 Design guidelines shall be prepared for the following:

- Hill Side lots, to minimise the extent of any earthworks on any lot;
- To ensure that housing cannot significantly impact on views of other lots;
- To promote state energy efficiency guidelines to a 5 Star rating (Item 8 above);
- To promote Waterwise gardens and household fittings (Item 8 above);
- To promote 'work from home' opportunities.

7.17 The design guidelines shall be prepared as a Local Planning Policy and adopted by Council pursuant to Division 2 of Part 2 of the Deemed Provisions, prior to the sale of any lots.

7.18 Where a landowner seeks a variation from the approved design guidelines, Council's Planning Consent is required.

Water Conservation Measures

7.19 Encourage householders to install rainwater tanks for non-potable uses both inside and outside the dwellings.

7.20 Encourage the use of Waterwise fittings at construction.

7.21 Promote Waterwise landscaping packages for new dwellings that include low water use gardens and soil amendments to minimise water and nutrient loss.

7.22 Water use in Public Open Space areas is to be minimised through the use of low water use landscaping treatments, suitable vegetation, soil amendments and water efficient irrigation systems.

7.23 Harvest onsite stormwater to naturally irrigate landscaping features such as bio-retention gardens and living stream vegetation.

Stormwater Management Measures

7.24 Implementing a drainage design that limits the peak outflow from the development to close to the pre-development levels through storage and infiltration on site.

7.25 Designing swale systems that where possible mimic living streams, to clean and transport water through the development, while providing a link for the community to water within their local environment.

7.26 Including swales and bio-retention units in the road reserve and POS areas that store, treat and infiltrate the 1 in 1 year event.

7.27 Implementing a stormwater treatment train system that improves water quality to Department of Water targets for nitrogen, phosphorus and total suspended solids reduction through the use of soil amendments, infiltration swales, infiltration ponds and bioretention systems.

Groundwater Management Measures

7.28 Filling the site where necessary so that a 1.2m clearance is maintained between AAMGL and surface level on residential lots.

7.29 Monitoring of groundwater levels on the site for at least 2 winters to determine AAMGL.

7.30 Installation of sub-surface drainage at the current AAMGL to stop groundwater rising above this level.

7.31 Use of soil amelioration products and treatment of water prior to infiltration, to ensure surface water entering the groundwater is of a good quality.

7.32 Roof runoff water will be piped to detention areas which will allow for some infiltration.

7.33 Soakwells will only be used in areas where the fill is to be at least 1.5m.

7.34 Groundwater quality will be improved through the use of bioretention gardens.

Foreshore Reserve

7.35 The Preston River foreshore reserve shall be ceded to the Crown at the time of subdivision of Lot 9500, preferably with the first Deposited Plan.

7.36 The subdivider shall implement the Foreshore Management Plan (Ref SW229 Kelly Road FMP 18/9/2019), and any subsequent modifications, at the time of subdivision of Lot 9500.

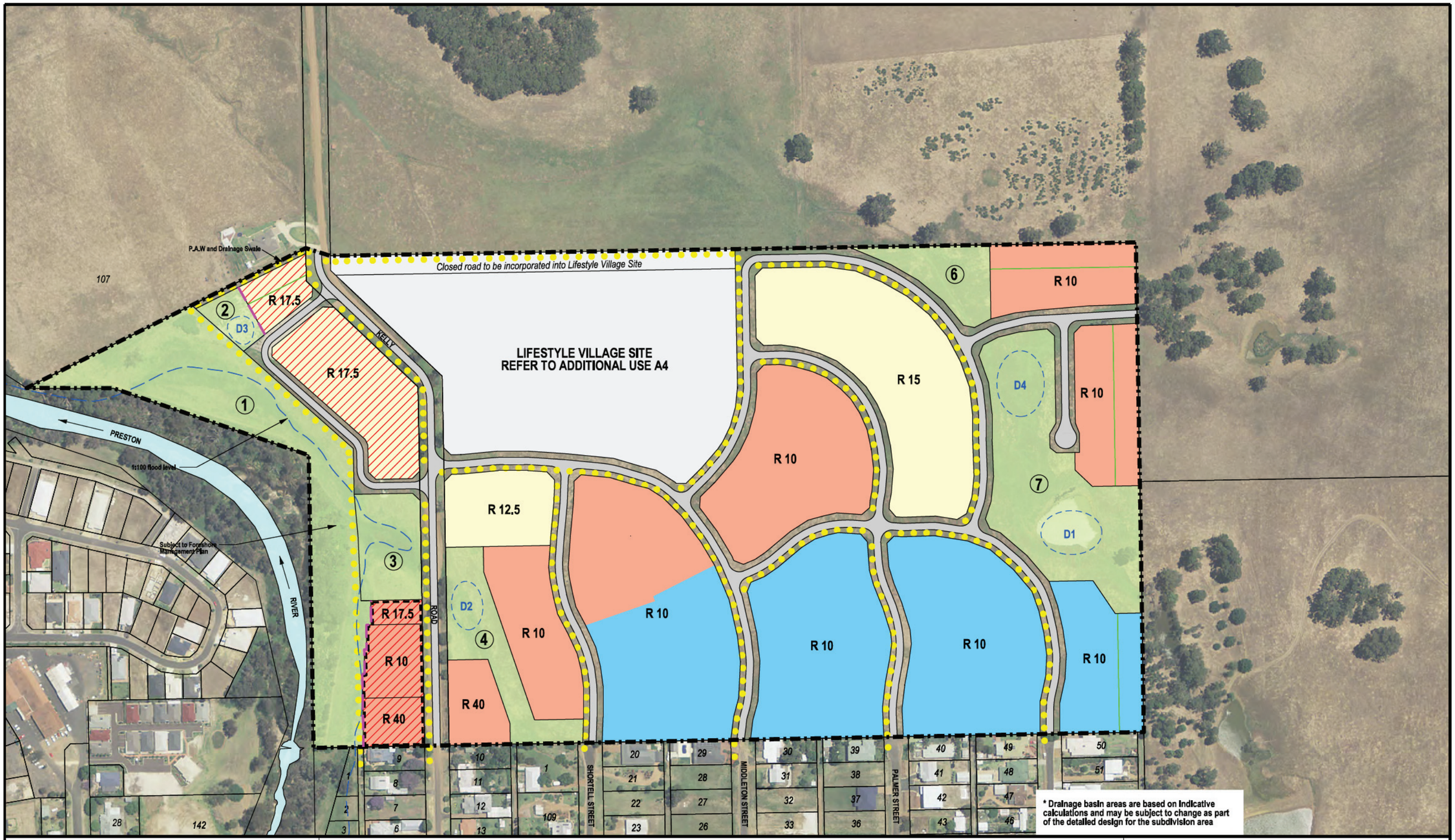
8 LOCAL DEVELOPMENT PLANS

8.1 Local Development Plans are to be prepared for the areas shown on the structure plan map.

8.2 Each Local Development Plan should contain details as prescribed by Council including (but not limited to) the following:-

- Lot layout and dimensions;
- Finished surface levels;
- Building floor plans, orientation; dimensions and setbacks;
- Building materials and colours;
- Vehicular access, parking;
- Landscaping and private open space;
- Site drainage;
- Fencing;
- Pedestrian access.

8.3 Local Development Plans are to be adopted by Council as part of this Structure Plan, prior to the development of any of the individual LDP areas as shown on the Structure Plan Map.



NOTES

Base data supplied by Landgate

Aerial Photography Date - 10th December 2013

Areas and dimensions shown are subject to final survey calculations.

All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.

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These concepts presented in this plan are based on the original design prepared by TME 24/2/2011

0 30 60 90 120 metres

LEGEND

- VALLEY LOTS
- LOWER SLOPES LOTS
- HILL SIDE LOTS
- LIFESTYLE VILLAGE SITE
- RIVER SIDE LOTS
- ② POS AREA & NUMBER
- D1 DRAINAGE BASIN

- UNIFORM FENCING
- AREA SUBJECT TO LOCAL DEVELOPMENT PLAN
- DUAL USE PATH (D.U.P.)
- 20m DWELLING SETBACK
- LIFESTYLE VILLAGE SITE - OPTION B

KELLY ROAD - 20m RESERVE
SUBDIVISION ROADS - 14.2m & 15m RESERVES

PLAN 1

CLIENT	:	*Ridgeview Holdings (WA) Pty Ltd*
SCALE	:	*1:3,000@ A3*
DATE	:	*19 February 2020*
PLAN No	:	*1046-2-001*
REVISION	:	*C*
PLANNER	:	*SLB*
DRAWN	:	*BL*

STRUCTURE PLAN MAP

Kelly Road, Donnybrook

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Part Two

EXPLANATORY SECTION

1 PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

The current Structure Plan was endorsed by the Western Australian Planning Commission (WAPC) on 12 February 2019 and is the guiding document for future subdivision and development of the land.

A copy of the current endorsed Structure Plan Map is contained at the rear of this of this section.

The proposed amendment to the Structure Plan Map, specifically relates to the area contained within Lot 9500, located in the western portion of the Structure Plan Area, on the western side of Kelly Road **(refer Plan 2)**.

The amendment is primarily sought to increase the density within the northern residential cell of Lot 9500 from R10 to R17.5 and identified portions of its southern residential cell from R10 to 17.5 and R40. Various updates and changes to references (including the legend) on Structure Plan Map – Sheet 1, as a consequence to the proposed density changes, are also proposed.

Further details regarding the proposed changes to the Structure Plan are outlined in Section 4 of this report.

2 LAND DESCRIPTION

2.1 LAND PARTICULARS

The proposed amendment to the Structure Plan relates to Lot 9500 (the site).

The land particulars are as follows:

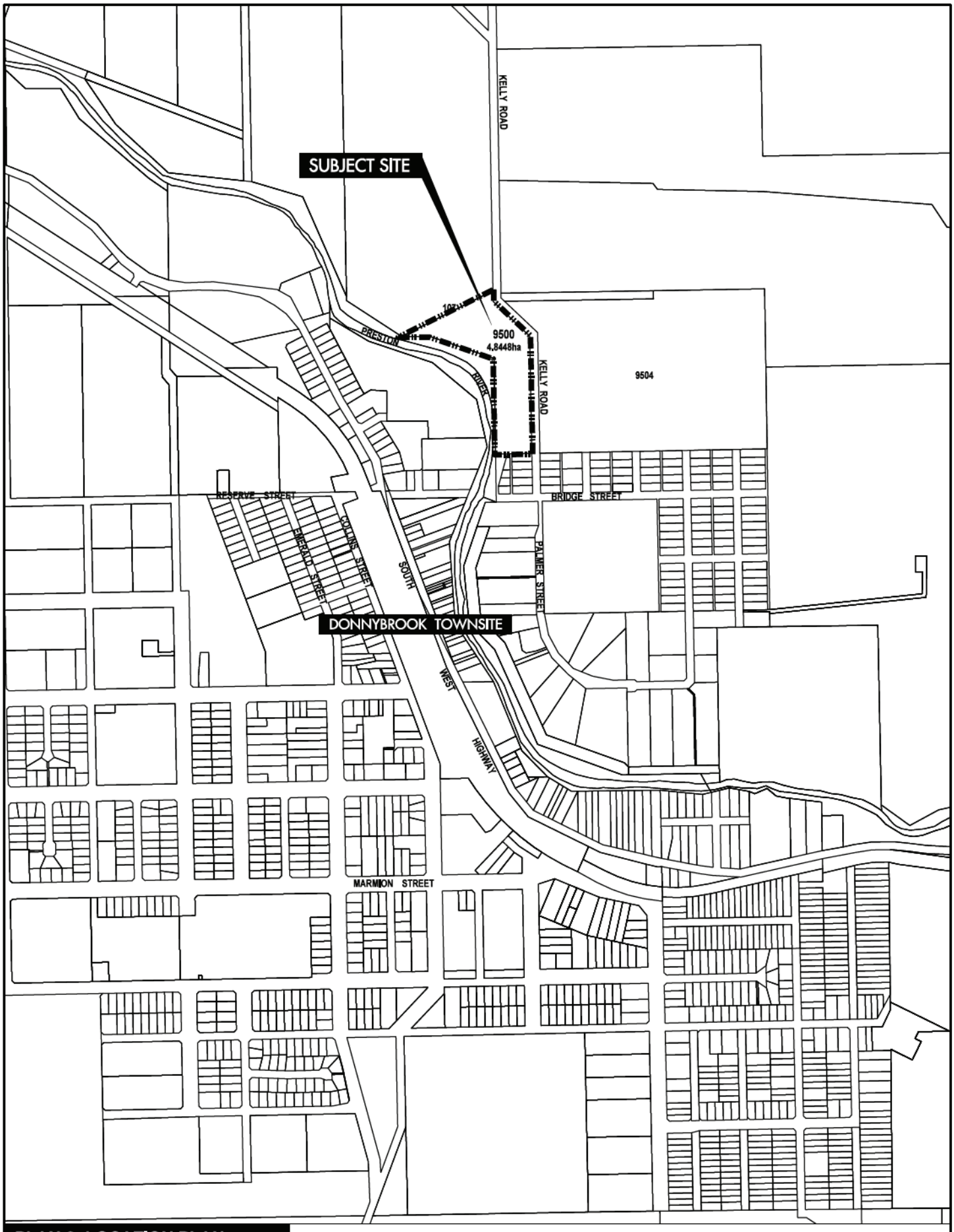
Lot / Plan No	Proprietor
Lot 9500 on Plan 76897	Ridgeview Holdings (WA) Pty Ltd.

2.2 LOCATION

The site is a single green title lot parcel which is approximately 4.83 hectares and located in the western portion of the Structure Plan Area **(Plan 2)**.

2.3 SITE DESRIPTION AND LANDUSE

While the site is identified by the Structure Plan for "residential" and "public open space" land uses, it is currently undeveloped and generally comprises pasture grasses, apart from a small section of the Preston River which crosses over its western boundary and contains a mix of both native and weed vegetation species along the existing river bank. The site's topography gently slopes from east to west towards the river from approximately 60m to 55m AHD.



PLAN 2: LOCATION PLAN

Lots 9500 - 9504 Kelly Road, Donnybrook

CLIENT	:	-
SCALE	:	*1:12,500*
DATE	:	*16 July 2018*
PLAN No	:	*1046-5-001.dgn*
REVISION	:	*A*
PLANNER	:	*SLB*
DRAWN	:	*BL*

LEGEND

SUBJECT SITE

0 125 250 375 500
metres

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3 PLANNING FRAMEWORK

3.1 SHIRE OF DONNYBROOK – BALLINGUP TOWN PLANNING SCHEME NO 7

The site is zoned 'residential' pursuant to the Shire of Donnybrook-Balingup Town Planning Scheme No 7 and is also contained in a 'special control area' (SCA8) which requires the preparation and endorsement of a Structure Plan prior to recommending subdivision or approving development within the relevant structure plan area. Subdivision and development of the subject land is required to generally be in accordance with the approved Structure Plan and any associated provisions contained in Schedule 11 of the Scheme text.

In this regard, Schedule 11 identifies the site within SPA 16 as follows:

Area No (SPA)	***Description of Land Area***	***Land Use Expectations***	***Matters to be addressed in Structure Plans (in addition to clause 6.9.4.4)***	***Associated Provisions***
SPA 16	*Lots 9500 — 9504 Kelly Road, Donnybrook*	*Residential, Parks and Recreation*	*Subdivision and development shall be in accordance with the endorsed Structure Plan.*	*Residential density is to be in accordance with the R Codes as indicated on the endorsed Structure Plan.*

3.2 CURRENT STRUCTURE PLAN

As previously mentioned, the current structure plan was endorsed by the Western Australian Planning Commission (WAPC) on 12 February 2019.

The current structure plan forms Amendment 1 to the original version (dated 7 March 2013) which was originally prepared by TME.

The structure plan guides transformation of the land from cleared farmland, into an established residential area that combines a variety of lot sizes, POS/Drainage areas and a legible and interconnecting street network that corresponds to the existing residential area to the south and future development areas to the north and east.

In summary, the Structure Plan Map demonstrates in a comprehensive manner, how the land shall be developed, including allocation of residential land uses (including a Lifestyle Village), the residential codes applying to typical lot sizes and the proposed traffic/pedestrian movement network.

The amended Structure Plan (**Plan1**) supersedes the version contained at the rear of this section.

3.3 STATEMENT OF PLANNING POLICY (WAPC)

Development of land must generally be consistent with any relevant Statements of Planning Policy (SPPs) introduced by the WAPC and due regard to the provisions of SPPs shall be given when preparing or amending structure plans.

Details of the SPPs relevant to this proposal are outlined below:

3.3.1 SPP No 3 Urban Growth and Settlement (2006)

The overall intent of the 'Urban Growth and Settlement' SPP is to facilitate a sustainable pattern of urban development. A key element in achieving this, is the promotion of a sustainable and liveable neighbourhood form which reduces energy; water and travel demand while ensuring safe and convenient access to employment and services by all modes, providing choice and affordability of housing and creating an identifiable sense of place for each community.

All of these factors have been considered as part of this proposal and upheld by the proposed increase in density coupled with appropriate designated movement networks and in close proximity to existing/future public facilities and employment opportunities associated with the town centre and potential lifestyle village.

3.3.2 Liveable Neighbourhoods (Western Australian Planning Commission, 2009)

Liveable Neighbourhoods (LN) was prepared by the WAPC to implement the objectives of the State Planning Strategy and is a compulsory design code and an operational policy of the WAPC which guides the design and assessment of structure plans (regional, district and local), subdivision and development for new urban areas. Its aims include promoting the design of walkable neighbourhoods; places that offer community and a sense of place; mixed uses and active streets; accessible and sustainable parks; energy efficient design; and a variety of lot sizes and housing types.

The implementation of applicable elements and the fulfilment of the overall principles of LN will ensure the development of site occurs in an appropriate and sustainable manner.

Application of LN principles is relevant to all levels of planning for the site, from structure planning through to detailed lot and building design.

Changes to the Structure Plan proposed by this amendment are consistent with LN principles, with particular emphasis placed on the provision of varying lot sizes and efficient use of land.

3.3.3 - SPP3.7 - Planning in Bushfire Prone Areas (WAPC 2015).

This policy provides the foundation for land use planning to address bushfire risk management in Western Australia. It is to be used to inform and guide decision-makers, referral agencies and landowners/ proponents to help achieve acceptable bushfire protection outcomes. It applies to all higher order strategic planning documents, strategic planning proposals, subdivision and development applications located in designated bushfire prone areas.

In this regard, the majority of Lot 9500 is within a designated Bushfire Prone Area and accordingly a Bushfire Management Plan (BMP) has been prepared in respect of the site by 'Lushfire and Planning' to address the policy requirements.

In summary the BMP reduces the likelihood and consequences of a bushfire within the proposed demonstrates the following:

- How the hazard level will be reduced and maintained for the life of the development; and
- That compliance with the Bushfire Protection Criteria in the Guidelines can be achieved.

A full copy of the report is contained at the rear of this document **(Appendix B)**.

4 PROPOSED STRUCTURE PLAN AMENDMENT

4.1 THE PROPOSAL

The proposed amendments to the Structure Plan specifically relate to Lot 9500, located on the western side of Kelly Road, within the Structure Plan Area.

Each of the proposed changes to the Structure Plan are described below:

1. **Increase the density within the northern residential cell of Lot 9500 from R10 to R17.5 and identified portions of its southern residential cell from R10 to R17.5 and R40;**
2. **Introduce an additional subdivisional road, in the northern residential cell of Lot 9500, with a minimum road reserve width of 14.2 metres, except where abutting open space where the width can be reduced to 13.2 metres;**
3. **Modify uniform fencing requirement to only apply to those proposed lots within Lot 9500 directly abutting "POS" or the "Foreshore Reserve";**
4. **Change reference of "Detailed Area Plan" on the Structure Plan Map (Sheet 1) to "Local Development Plan" in the legend;**
5. **Remove the Local Development Plan requirement for the proposed lots in the northern residential cell of Lot 9500;**
6. **Update legend accordingly; and**
7. **Update the Summary Table to reflect** the revised density allocation, estimated dwelling number, lot yield and POS Area.

Further detail regarding the proposed density change is provided below.

4.2 RESIDENTIAL DENSITY CHANGE

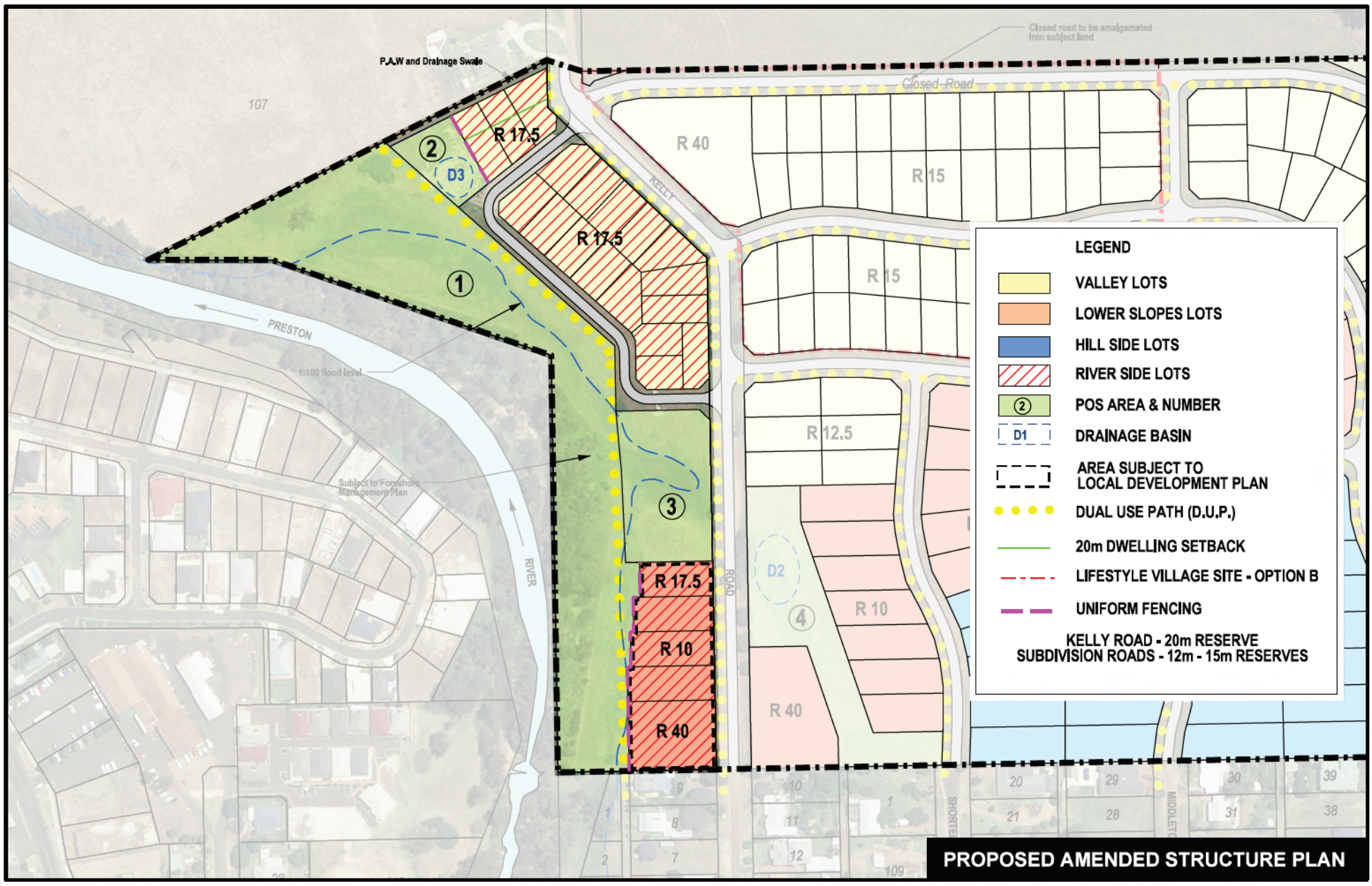
The proposed amendment to the Structure Plan primarily involves change to the current residential density codes within the two development cells identified on Lot 9500, from R10 to R17.5 in the northern cell and R10 to 17.5 and R10 to R40 in the upper and the lower portions of the southern residential cell. The remainder of the southern cell shall remain as R10.

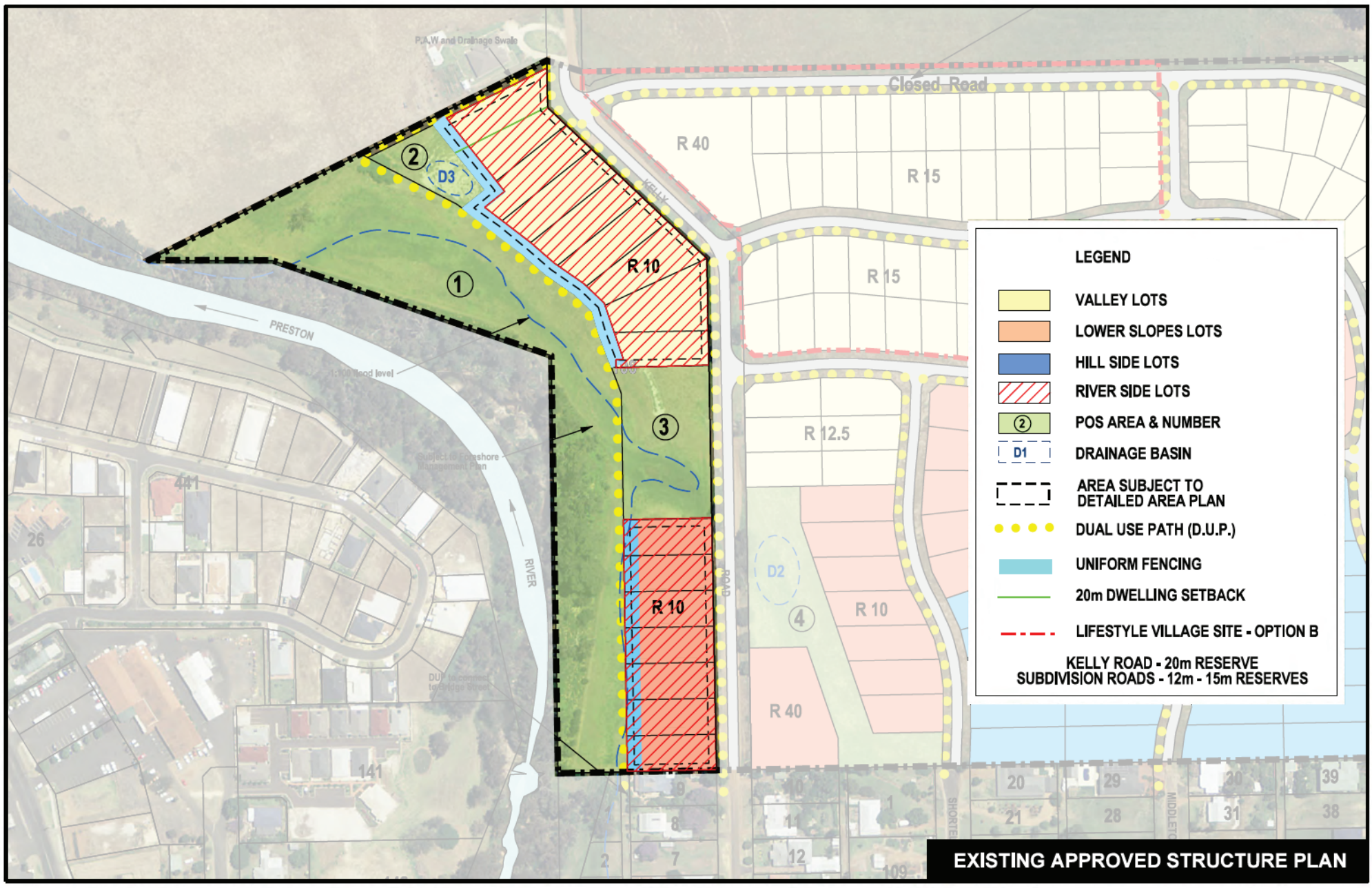
For ease of reference **Plan 3** illustrates current and proposed residential densities on the Structure Plan Map, as it relates to the site.

The proposed density increase in the northern cell from R10 to R17.5 will deliver greater lot yield potential in a location that is close to the proposed foreshore reserve and with frontage to Kelly Road, which provides a direct link to the Donnybrook Town Centre, approximately 400m south west of the site.

Similarly the increase in density from R10 to R40 in the southern cell is also supported by these locational attributes, coupled with an existing R40 cell on the opposite side of Kelly Road, as shown on the current endorsed Structure Plan.

A small area in the upper portion of the southern cell is also proposed at R17.5 in order that the future lot in this location will comply with the minimum lot size requirements as set out in the R-Codes. The smaller area of residential land is necessary in this location in order to comply with fire setback requirements to the foreshore area, as detailed in the attached BMP **(Appendix B).**





0 35 70 105 140
metres

NOTES

Base data supplied by TME

Areas and dimensions shown are subject to final survey calculations.
All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.

CLIENT	:	-
SCALE	:	*1:2,500 @ A3*
DATE	:	*5 September 2018*
PLAN No	:	*1046-5-002.dgn*
REVISION	:	*B*
PLANNER	:	*SLB*
DRAWN	:	*BL*

PLAN 3

EXISTING AND PROPOSED STRUCTURE PLAN

Lots 9500 - 9504 Kelly Road, Donnybrook

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An indicative subdivision layout, based on the proposed density change, is presented by a subdivision concept plan **(Plan 4).** The plan has been prepared to inform the amended structure plan proposal and validate the proposed density change with an envisaged subdivision outcome.

The concept plan also identifies the introduction of an additional internal road in the northern cell to support smaller lots with appropriate road frontage, combined with providing a suitable edge as part of the residential interface to the adjoining foreshore and public open space areas.

Given the road will only account for low traffic volumes and generally service lots on one side, the proposed minimum road reserve width in this location has been reduced from 15 metres to 12 metres. This is consistent with Liveable Neighbourhoods and its guidelines for both "Access Streets D" and "Special Purpose Streets" which have smaller road reserve widths and account for low volume and low parking demand streets, often associated with servicing larger lots and one sided streets, opposite a rural edge and/or parkland.

A recent engineering servicing review of the proposal, undertaken by Wood and Grieve Engineers, confirms that the proposed 12m wide road reserve can adequately contain the necessary servicing infrastructure and that proposed new intersections to Kelly Road, will also provide sufficient sight line distances for associated vehicle movement.

Further details regarding servicing and infrastructure is contained within Section 6 and a full copy of the Engineering Servicing Report is contained in **Appendix A** of this report

It should be noted that the concept plan design is subject to further planning, detailed design and analysis as part of future development and subdivision staging. Therefore it should not be construed as the actual or final proposed development and subdivision layout and may be subject to variation at the subdivision stage.

SUBDIVISION LAYOUT IS INDICATIVE ONLY

DUP & DRAINAGE RESERVE

20m DWELLING SETBACK

107

1001 721m²

1002 663m²

1003 724m²

POS & DRAINAGE 1450m²

12m ROAD RESERVE

1004 605m²

1005 589m²

1006 589m²

1007 590m²

1008 605m²

1009 618m²

1010 611m²

1011 552m²

1012 506m²

1013 503m²

1014 615m²

1015 602m²

1016 604m²

1017 617m²

1018 613m²

FORESHORE RESERVE 2.21ha

PRESTON RIVER

9504

KELLY ROAD

POS & DRAINAGE 4489m²

1019 841m²

1020 922m²

1021 963m²

1022 1004m²

1023 2009m²

150

1

123

9

LEGEND

- SUBJECT LAND
- POS & DRAINAGE
- FORESHORE RESERVE
- R10 LOTS (3)
- R17.5 LOTS (19)
- R40 LOT (1)

0 15 30 45 60 metres

NOTES

Base data supplied by Landgate
Aerial Photography Date - 10th December 2013
Areas and dimensions shown are subject to final survey calculations.
All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.

PLAN 4

SCALE	:	*1:1,500 @ A3*
DATE	:	*3 September 2018*
PLAN No	:	*1046-b-002*
REVISION	:	*C*
PLANNER	:	*SLB*
DRAWN	:	*BL*

SUBDIVISION CONCEPT PLAN

Lots 9500 Kelly Road, Donnybrook

LB PLANNING
TOWN PLANNING | URBAN DESIGN | LAND DEVELOPMENT CONSULTING

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E admin@lbplanning.com.au
ABN 55 115 374 128

5 PUBLIC OPEN SPACE

Despite the removal Public Open Space Area 5 via the previous amendment to the Structure Plan (i.e. Amendment 1) in order to make way for the proposed Lifestyle Village on Lot 9504, the total provision of public open space, inclusive of the foreshore and drainage reserves was maintained at 20% of the total (gross) Structure Plan Area. This was achievable due to the total area of Lot 9504 (inclusive of the closed road) being 4.6893ha.

Under Clause 18 of Division 5 of the Caravan Parks and Camping Grounds Regulations 1997, a Lifestyle Village is required to provide at least 10% of the site area for recreational space, two thirds of which must be in one area. Therefore, a total of 4,689m² is required to be set aside for recreational space within the Lifestyle Village. Given Public Open Space Area 5 had an area of 4,217m² and therefore the total open space provision per square metre of land across the Structure Plan Area would increase as a result of the proposed modification. Accordingly, the broader Structure Plan Area maintained its surplus of unrestricted public open space relative to the 10% open space requirement.

In the context of this proposal the provision of Public Open Space is generally unaffected.

6 SERVICES AND INFRASTRUCTURE

Wood and Grieve Engineers carried out an investigation into the serviceability of the site and a full copy of the Engineering Servicing Report is attached at **Appendix A.**

The report provides details regarding roads, stormwater/groundwater management, earthworks and services (i.e. sewer, water, power etc).

In summary, the investigation concludes that no constraints were identified that would be considered critical to the servicing and development of the proposed site, at this early stage of the planning process.

7 FORESHORE MANAGEMENT

Thompson McRobert Edgeloe Group (TME) prepared an Interim Foreshore Management Plan (FMP) in 2011 for the Preston River foreshore that was associated with the original Lot 108 Kelly Road, Donnybrook Structure Plan proposal.

In response to this proposed amendment to the structure plan, the Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Water and Environmental Regulation (DWER) provided updated comments. Accordingly, a Revised Interim FMP was prepared to incorporate these comments. The Interim FMP has been prepared by SW Environmental in consultation with the relevant government agencies and the landowners involved.

A copy of the updated document is contained in **Appendix C** at the rear of this report.

8 LOCAL WATER MANAGEMENT STRATEGY

The Kelly Rd Donnybrook Local Water Management Strategy (LWMS) was approved by the Department of Water on 14 February 2012. The LWMS was prepared to inform the Scheme amendment to rezone the land from 'General Farming' to 'Structure Plan Area' zone and its associated structure plan.

In summary the LWMS articulates the range of management practices that are being considered for the proposed structure plan area. The objective of the LWMS is to detail how the development manages 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 throughout the LWMS a copy of which is attached at **Appendix D** at the rear of this report.

9 CONCLUSION

The proposed amendment to the current endorsed Structure Plan has been prepared in accordance with the WAPC's "Structure Plan Framework" pursuant to *The Planning and Development (Local Planning Scheme) Regulations 2015.*

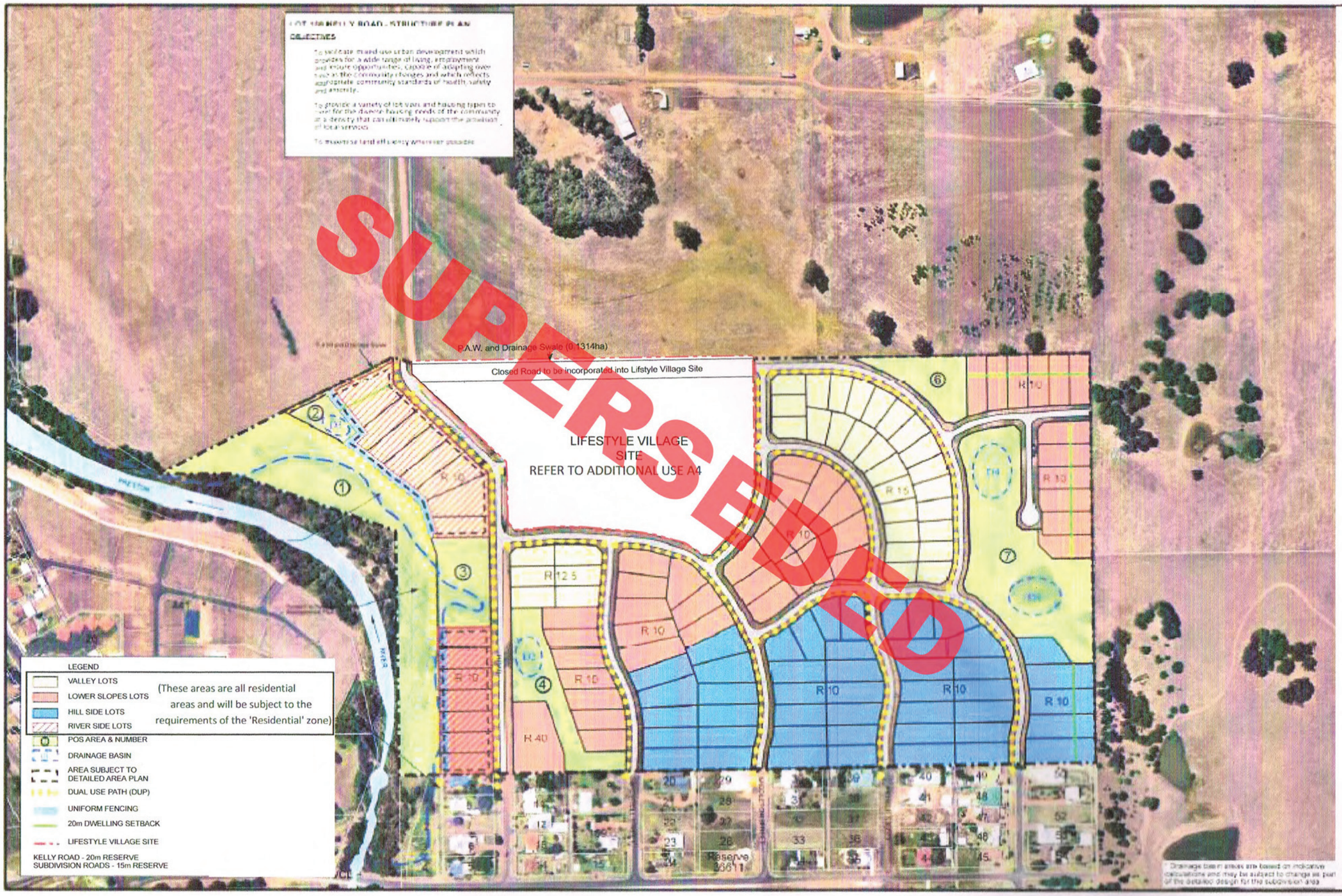
The proposed amendment specifically relates to the western portion of the Structure Plan Area (i.e. Lot 9500) and provides an opportunity to maximise efficient use of the subject land for housing in a location which is well suited to support residential development and will provide appropriate guidance to future subdivision and development assessment.

The proposed amendment to the Structure Plan does necessitate review of all technical reports, except for the Engineering, Foreshore Management and Bushfire Management assessments. Accordingly, updated reports for these assessments has been prepared and are contained at the rear of this document, as appendices. All other technical information remains as per that contained in the original endorsed Structure Plan Report.

The Structure Plan maintains its original design philosophy and outlines the planned urban layout for the site. It also identifies specific land use, residential density codes and other development provisions to guide and control future planning and design.

The proposed amendment to the Structure Plan is considered 'minor' as it does not represent a departure from the original endorsed version in relation to its purpose and intent, nor does it alter the indicative lot yield estimate by more than 10%.

Figure 1: Structure Plan Amendment Map



LOT ANALYSIS

Land Area	Hectares
Lot 108	27.5576
Closed Road Reserve	0.7752
Total Area of Structure Plan (Gross)	28.3328
Foreshore Reserve	2.1817
Net Developable Land	**26.1511**
10% P.O.S. Requirement	2.6151
Lots	
R10	101
R12.5	6
R15	22
R40	1
Lifestyle Village Site (equivalent residential density of R40)	1
Total Lots	131
Total Estimated Dwellings	255
Net Density - dwellings per hectare	9.00
Estimated Population (Occupancy reate of 3 persons per dwelling for standard residential and 2 persons per dwelling for lifestyle village)	645
P.O.S. / Drainage Reserves	
Area 1 - Foreshore Reserve	2.1817
Area 2	0.1449
Area 3	0.4505
Area 4	0.5931
Area 6	0.3855
Area 7	1.6505
Total	**5.4062**
Drainage	
D1	0.1417
D2	0.0799
D3	0.0367
D4	0.1650
Total	**0.4233**

STRUCTURE PLAN MAP

LOT 108 KELLY ROAD DONNYBROOK

- SUBJECT LAND
- EXISTING CADASTRE
- PROPOSED CADASTRE
- CONTOURS

1:3000 @ A1 or 1:4000 @ A3
ALL DISTANCES ARE IN METRES

REVISION	DESCRIPTION	DRAFTER	DATE
J			
I			
H			
G			
F			
E			
D			
C			
B			
A			

ORIGINAL PLANNER	G.L
ORIGINAL DRAFTER	M.S.
CREATED DATE	24.02.2011
AERIAL DATA	
CADASTRAL DATA	MGA
TOPOGRAPHIC DATA	

THIS PLAN HAS BEEN PREPARED FOR PLANNING PURPOSES ONLY. AREAS, DIMENSIONS AND BOUNDARIES SHOWN ARE SUBJECT TO SURVEY.

APPENDICES INDEX

Appendix A: Engineering Servicing Report
Appendix B: Updated Bushfire Management Plan for Lot 9500 (Version D)
Appendix C: Updated Foreshore Management Plan
Appendix D: Endorsed Local Water Management Strategy

Appendix A

Engineering and Servicing Report

WOOD & GRIEVE ENGINEERS

Lot 108 Kelly Street, Donnybrook

Engineering Servicing Report

Prepared for:

Mr Kelvin Rising
Ridgeview Holdings (WA) Pty Ltd

Date:
September 2018

Prepared by:

Dean Kelly BEng MIEAust
28893-BUS-C

PO Box 1276, 10 / 44-48 Queen Street, Busselton WA 6280
T: (08) 9754 4244 **F:** (08) 9754 4132 **E:** busselton@wge.com.au
W: www.wge.com.au

Revision

REVISION	DATE	COMMENT	APPROVED BY
0	13/07/18	Final	**D.Kelly**
1	5-9-2018	Final – Revised Road Layout	**D.Kelly**

Contents

1. Introduction

Wood & Grieve Engineers (WGE) has been engaged by Ridgeview Holdings (WA) Pty Ltd to:

- conduct investigations of existing infrastructure through the Local Authority and Utility Providers,
- review existing infrastructure and identify additional infrastructure required for the proposed development, and
- provide a "high level" report (this report) indicating WGE's understanding of the engineering infrastructure required to service the proposed development, including:
    - Earthworks
    - Stormwater Drainage
    - Roads
    - Sewer Reticulation
    - Water Reticulation
    - Gas Reticulation
    - Power Supply
    - Communications Supply
    - Stormwater Management
    - Groundwater Management

The proposed Development Plan is included in Section 3.

2. Basis of Report

2.1 Information Provided to WGE

2.1.1 Geotechnical Investigation

Within the Foreshore Management Plan (section 2.5 Soil and Land capability) dated 9-8-2011 produced by TME, soil profile is indicated as topsoil over sandy clay or clayey sand over bedrock with rock outcrops.

2.1.2 Environmental Investigation

An Interim Foreshore Management Plan was produced by TME in June 2011.

2.1.3 Conceptual Planning Information

Refer to the Concept Layout in Section 3.

2.1.4 Traffic Planning Information

Traffic and Pedestrian Management is indicated in the TME Structure Plan Report Dated August 2011

2.1.5 Survey Information

Survey was provided to WGE in the form of:

- Planning Layouts with 5m contour intervals.
- Dwg file with 2m contour intervals.

2.1.6 Existing Services Information

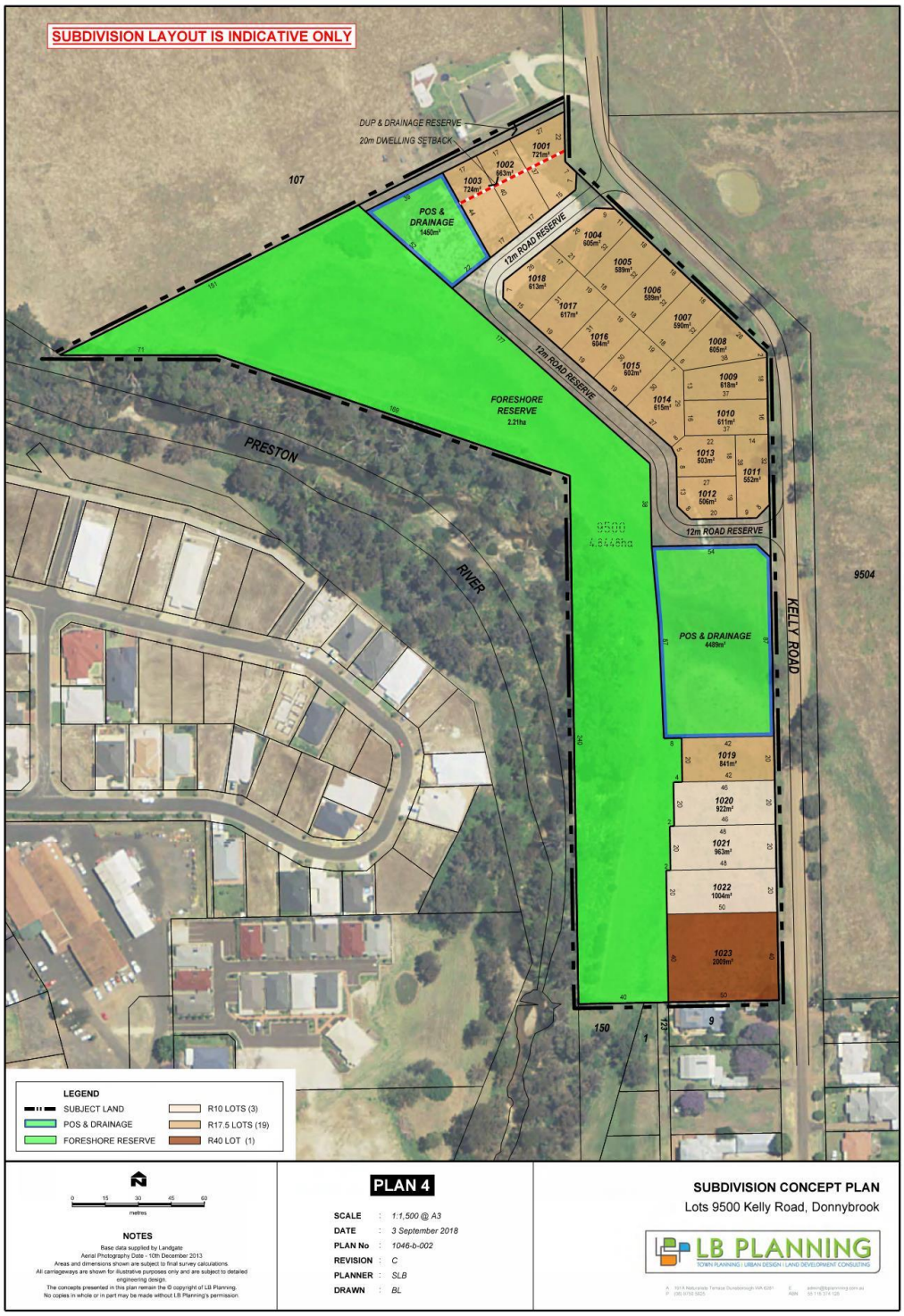
Information about existing infrastructure has been sourced from the “Dial Before You Dig” system, and the following information was received from the Utility Providers:

- Existing Water Reticulation Plan from the Water Corporation
- Existing Overhead and Underground Power Plan from Western Power
- Existing Communications Plan from Telstra

2.1.7 Existing Planning Information

Sewer planning information was requested from the Water Corporation, and WGE were advised that planning for the area was outdated. The Water Corporation subsequently updated their planning for the area and provided WGE with Sewer Planning Scheme SD205.

3. Concept Layout



4. Infrastructure Investigations

4.1 Earthworks

Taking into account the size of the lots (approx. 600m2 to 1000m2 and one lot at approx. 2000m2) earthworks could be considered in order to raise the lots such that they are slightly higher than Kelly Road and thus avoid overland flow from storm water entering the lots from upstream catchments.

As a lower cost alternative to earth working all of the lot areas (i.e. more affordable for lot purchaser due to reduced cost of lot development by the land sub-divider), each resident can at the time of building their house, take into account surface water flows/water management and design their house and lot to manage storm water flows. E.g. partial earth working under the house area when the house location and design is determined.

Given the close proximity to the river foreshore earth working should be given careful consideration due to the resulting sediment transport which is virtually impossible to contain during winter if grass and vegetation stabilization has not been achieved. i.e. if disturbance can be limited to road reserves and treatment basins, sediment management is significantly easier and a better outcome for the community and environment is achieved.

The ground conditions and ground water level do not indicate any need for earth working and appropriate water management within the foreshore and lots which front the river, may reduce Local Authority infrastructure and thus future maintenance costs.

No issues are foreseen which would prevent land subdivision and development.

4.2 Storm Water Drainage

Storm water management will need to take into account:

- The Foreshore Management Plan. i.e. integration of environmental management of the foreshore.
- Pre-Development = Post Development Flows. i.e. compensation basin requirements.
- Upstream Flows. i.e. what are upstream developments doing with their discharge
- Costs associated with managing upstream storm water flows.
- Storm water quality and treatment prior to discharge into the river. i.e. detention times, treatment requirements and what are upstream catchments doing to manage water quality.
- Culvert structure to transfer water from the upstream catchment, under Kelly Street and through the proposed Development to the river.
- Erosion control.

During Detailed Design, an Urban Water Management Plan will need to be prepared to show how the above issues are dealt with. E.g. what level of upstream compensation is required to avoid excessive areas being required for compensation in the proposed development.

The section of Kelly Street south of the proposed development currently consists of a 6m wide sealed road with swale drains each side. Upgrade of the existing storm water system to accommodate future development may require contribution to the Local Authority.

4.3 Roads & Footpaths

4.3.1 Kelly Street

Adjacent the proposed development, Kelly Street is currently unsealed gravel with ”vee” drains each side, culverts to allow upstream flows to cross the road and reach the River.

The section of Kelly Street south of the proposed development currently consists of a 6m wide sealed road with swale drains each side. Upgrade of the existing road to accommodate future development may require contribution to the Local Authority.

Infrastructure Investigations

Based on the Structure Plan Report and "Livable Neighborhoods" it is anticipated that Kelly Street will be considered a neighborhood connector and have:

- Some realignment at bends (to place the road closer to the middle of the road reserve).
- a width between kerb faces of 7.4m plus on street parking if relevant.
- kerbing each side.
- a pit and pipe drainage system which redirects flows to POS/Drainage areas for compensation and treatment.

Kelly Street Road Reserve appears to be 20m wide currently and is considered sufficient from an Engineering perspective to accommodate road pavements and associated development infrastructure.

No issues are foreseen with provision of road infrastructure in this area which would prevent land subdivision and development.

4.3.2 Proposed Road Reserve

Reserve Width

Within the northern portion of the proposed development, a loop road is planned with 12m wide wide reserve widths.

These widths are in accordance with "Livable Neighborhoods" and a concept infrastructure layout has been prepared to show potential alignment and configuration of sewer, and common trench services (i.e. power, communications, gas, water).

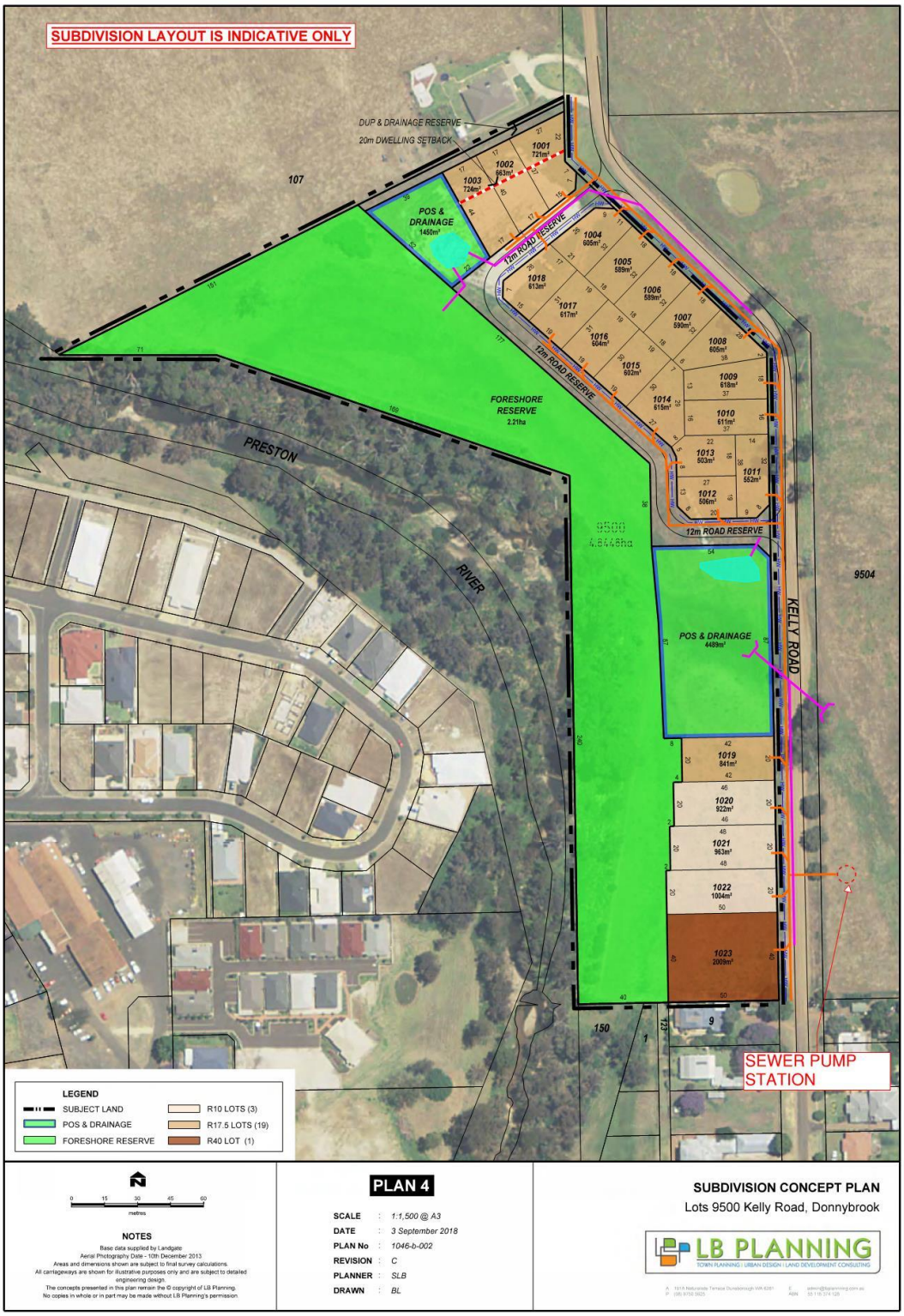
No adverse engineering issues are foreseen with the road reserve widths.

Road Configuration and Sight Distance Requirements

In relation to the proposed road sight distance, the minimum required sight distance (SISD allowing for the existing road constraints) for a posted speed zone (i.e. typical urban speed limit) with a 60km/hr design speed (allow for expectations), is 97m.

The proposed intersections onto Kelly Street have sufficient sight distance to comply with Austroads and MRWA design guidelines.

4.4 Infrastructure Reticulation Concept



Infrastructure Investigations

4.5 Sewer Reticulation

Sewer reticulation will need to be installed in accordance with Water Corporation requirements.

No issues are foreseen with the provision of sewer reticulation to accommodate land subdivision and development.

4.6 Waste Water Pump Station and Pressure Main

Sewer reticulation will need to be directed into a waste water pump station and pressure main (WWPS & PM) in accordance with Water Corporation requirements.

The Sewer Planning scheme shows waste water from the pump station needs to be directed to a discharge on the west side of the river.

Without sufficient progress being made in relation to installation of the sewer pump station, Water Corporation is unlikely to provide approvals for sewer reticulation or clearances for the lot development.

If the WWPS & PM is included in the 5year Capital Investment Program, reimbursement to the developer will occur for the costs of design and construction. Inclusion is dependent on a business case and request by the developer to the Water Corporation.

The opinion of potential costs for the WWPS & PM is $1.5M to $2.5M. Without detailed design it is not possible to determine a more accurate estimate.

Apart from financial viability, no issues are foreseen in relation to provision of a WWPS & PM which would prevent land subdivision and development.

4.7 Water Reticulation

Water reticulation will need to be installed in accordance with Water Corporation requirements.

Fire hydrants (located within streets) will need to be included within the reticulation design.

No issues are foreseen with the provision of potable water reticulation to accommodate land subdivision and development.

4.8 Gas Reticulation

Based on ATCO Gas maps, gas reticulation is not available within Donnybrook.

4.9 Power Supply and Street Lighting

Electricity reticulation will need to be installed in accordance with Western Power requirements.

Street Lighting in accordance with “pedestrian level” requirements is anticipated to be most appropriate in this area to avoid disruption to resident amenity. i.e. excessive light intensity results in numerous complaints to Local Authorities in residential areas.

No issues are foreseen with the provision of electricity reticulation and street lighting to accommodate land subdivision and development.

4.10 Communications Supply

Communications reticulation will need to be installed in accordance with Telstra or NBN requirements depending on which service provider is most appropriate for this area.

No issues are foreseen with the provision of communications reticulation to accommodate land subdivision and development.

4.11 Storm Water Management

Storm Water should be managed in accordance with Water Sensitive Design Principals.

Storm Water Management for the proposed development area in isolation will be relatively simple.

Storm Water Management complexity is introduced when the upstream catchments are taken into consideration. i.e. the down stream management needs to integrate with the upstream catchment management in order for both catchments to manage water successfully.

If both down stream and upstream catchments:

- adopt the water management strategy noted in the Local Water Management Strategy (TME dated September 2009),
- coordinate their individual Urban Water Management Plans,
- coordinate their detailed design (i.e. upstream catchment needs to ensure excessive water is not discharged into the downstream catchment without appropriate compensation or treatment,

then WGE foresee no issues which would prevent land subdivision or development.

To minimize Local Authority infrastructure and associated maintenance, the proposed subdivision road profile is anticipated to consist of one way cross fall to allow sheet flow into the foreshore reserve.

4.12 Groundwater Management

Due to permeable soils overlying impermeable soils/bed rock, the potential for perched ground water exists. To ensure ground water does not adversely affect residential development or infrastructure, the following issues need to be addressed:

- What is the AAMGL for the proposed development area?
- If ground water is with reach of residential buildings (e.g. footings) or utilities infrastructure (e.g. road pavements), can the ground water be lowered using sub-soil drainage pipes?
- If lowering ground water causes acid sulphate soil issues, filling above the natural ground will need to be considered as an alternative.

Based on the TME ground water investigations between 2009 and 2011 (refer TME Water Management Plan Figure 8), ground water is not anticipated to be within 1.2m of the surface. As such no issues are foreseen in relation to ground water impact on the proposed land subdivision and development.

In relation to additional storm water concentration resulting from roof runoff, disposal to ground/vegetation is considered more appropriate than use of soak wells for the proposed development area. i.e. lower permeability will not likely allow sufficient infiltration and as such overland flow with exposure to vegetation is considered to produce improved social and environmental outcomes as per water sensitive design principals and intent.

Appendices

Appendix 1

TME Local Water Management Strategy - September 2009

Appendices

Appendix 2

TME Interim Foreshore Management Plan - June 2011

Appendices

Appendix 3

TME Structure Plan Report - August 2011

Appendices

Appendix 4

DBYD Information

Appendix B

Updated Bushfire Management Plan for Lot 9500 (VersionD)

Lot 9500 Kelly Road
Donnybrook
Bushfire Management Plan
(Structure Plan - Subdivision Application

BPAD
Bushfire
Planning & Design
Accredited Practitioner
Level 2

LUSH FIRE & PLANNING
3 Paterson Rd
Pinjarra WA 6208
0418 954 873
ABN 74 232 678 543

Ref 17-068
Ver D
October 2019

Bushfire Management Plan Coversheet

This Coversheet and accompanying Bushfire Management Plan has been prepared and issued by a person accredited by Fire Protection Association Australia under the Bushfire Planning and Design (BPAD) Accreditation Scheme.

Bushfire Management Plan and Site Details

Site Address / Plan Reference:	Lot 9500 Kelly Road				
Suburb:	Donnybrook	**State:**	WA	**P/code:**	6239
Local government area:	Donnybrook Balingup				
Description of the planning proposal:	Residential subdivision				
BMP Plan / Reference Number:	17-068	**Version:**	D	**Date of Issue:**	8/10/2019
Client / Business Name:	Ridgeview Holdings WA Pty Ltd				

Reason for referral to DFES	**Yes**	**No**
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	☐	☒
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	☐	☒

Is the proposal any of the following special development types (see SPP 3.7 for definitions)?

Unavoidable development (in BAL-40 or BAL-FZ)	☐	☒
Strategic planning proposal (including rezoning applications)	☒	☐
Minor development (in BAL-40 or BAL-FZ)	☐	☒
High risk land-use	☐	☒
Vulnerable land-use	☐	☒

If the development is a special development as listed above, explain why the proposal is considered to be one of the above listed classifications (E.g. considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

Modifications to an existing approved structure plan

Note: The decision maker (e.g. the local government or the WAPC) should only refer the proposal to DFES for comment if one (or more) of the above answers are ticked "Yes".

BPAD Accredited Practitioner Details and Declaration

Name	**Accreditation Level**	**Accreditation No.**	**Accreditation Expiry**
Geoffrey Lush	Level 2	BPAD 27682	28/02/2019
Company		**Contact No.**	
Lush Fire & Planning		0418 954 873	

I declare that the information provided in this bushfire management plan is to the best of my knowledge true and correct.

Signature of Practitioner  **Date** 8/10/2019

Document Reference

Property Details

Street No	Lot No's	Plan	Street Name	
	9500	76897	Kelly Road	
Locality	Donnybrook		**State** WA	**Postcode** 6239
Local Government Area	Donnybrook Balingup			
Description of the building or works	Modification to structure plan Residential subdivision			

Report Details

Revision	Date	Job No 18-068
A	13/09/2018	Preliminary
B	01/08/2019	Foreshore management plan
C	15/08/2019	Foreshore management plan update
D	08/10/2019	Foreshore management plan update

Practitioner Details

BPAD	Level 2 Practitioner	Accreditation No	27682

Disclaimer

The measures contained in this report do not guarantee that a building will not be damaged in a bushfire. The ultimate level of protection will be dependent upon the design and construction of the dwelling and the level of fire preparedness and maintenance under taken by the landowner. The severity of a bushfire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.

Geoffrey Lush
8 October 2019
geoffrey@lushfire.com.au

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

CONTENTS

FIGURES

TABLES

1.0 PROPOSAL DETAILS

1.1 Introduction

This bushfire management plan is prepared for the proposed subdivision of Lot 9500 Kelly Road Donnybrook. The subject land is located approximately 500m north east of the Donnybrook CBD as shown in Figure 1 and the property details are shown in Table 1.

The aim of this Report is to reduce the likelihood and consequences of a bushfire within the proposed development. The Report also demonstrates:

1) How the hazard level will be reduced and maintained for the life of the development; and
2) That compliance with the Bushfire Protection Criteria in the Guidelines can be achieved.

Table 1 Land Details

Lot	Plan	Volume	Folio	Proprietor	Area (ha)
9500	76897	2818	386	Ridgeview Holdings WA Pty Ltd	4.8448

1.2 Existing Conditions

The existing conditions are shown in Figure 2.

The subject land is situated between Kelly Road and the Preston River, having a frontage of approximately 400m to Kelly Road and an average depth of 100m. The land is generally cleared grazing land with some remnant vegetation along the western boundary in association with the Preston River corridor.

It has slight slopes with an elevation of 60m AHD and a minor drainage line crossing the middle of the land. The land on the eastern side of Kelly Road then slopes up to a major ridge line with an elevation of 130m AHD.

To the south and west of the subject land is existing residential development. To the north is broad acre farming land which is generally cleared. The land on the eastern side of Kelly Road is vacant but has an approved structure plan which provides for approximately 200 residential dwellings as shown in Figure 3.

The principal access to the site is from Kelly Road and Bridge Street. Kelly Road is an unsealed formed gravel road adjacent to the site and then from the southern boundary it is sealed. Bridge Street provides access across the Preston River to the South Western Highway and town centre.

The river foreshore area is Unallocated Crown Land.

The residential lots to the south of the site have reticulated water and fire hydrants.

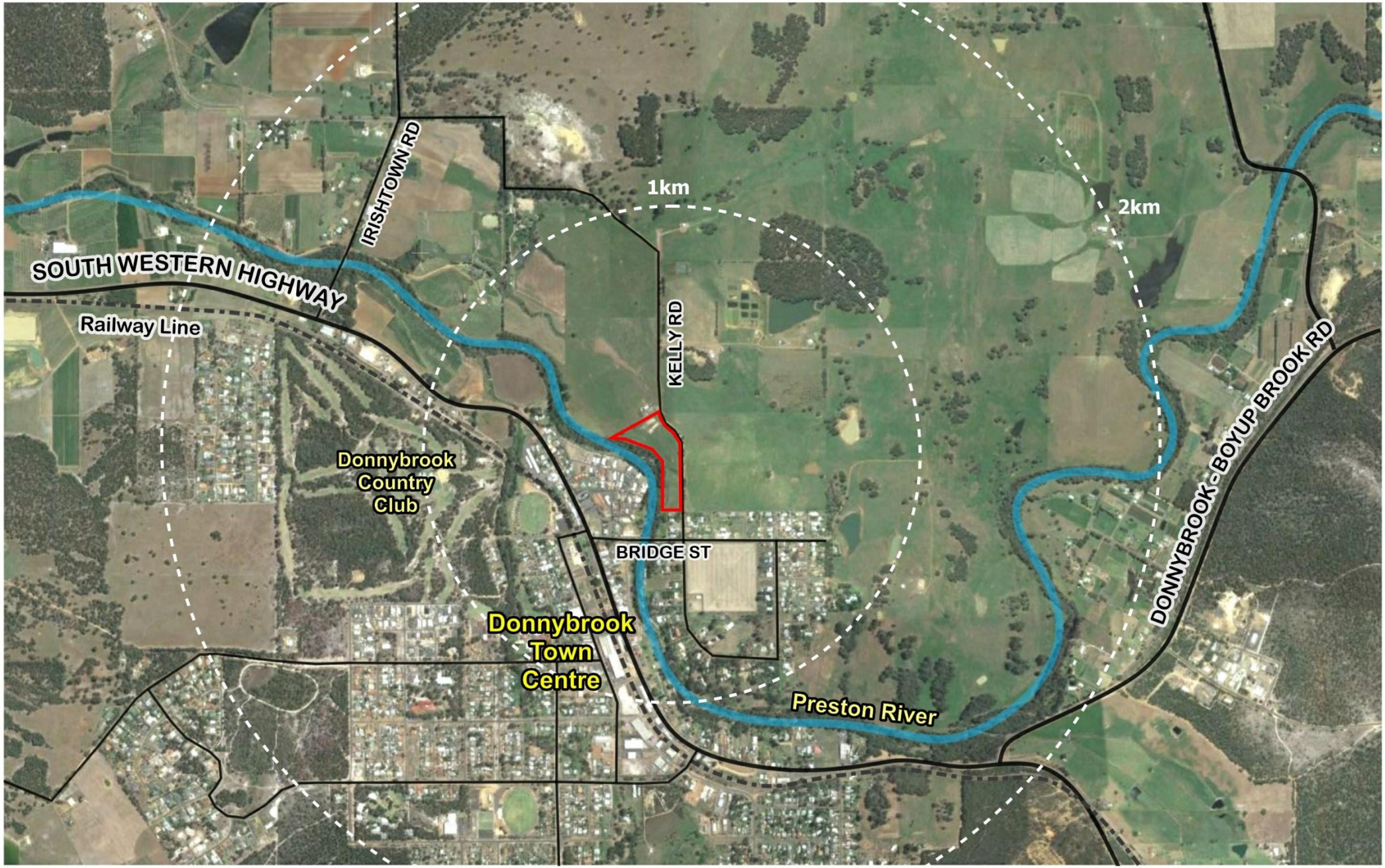


FIGURE 1
LOCATION AND CONTEXT

SUBJECT LAND

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018

LUSHfire and planning
geoffrey@lushfire.com.au
0418 954873

LEGEND

SUBJECT LAND

150m ASSESSMENT AREA

2m CONTOURS

FIGURE 2
EXISTING CONDITIONS

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018

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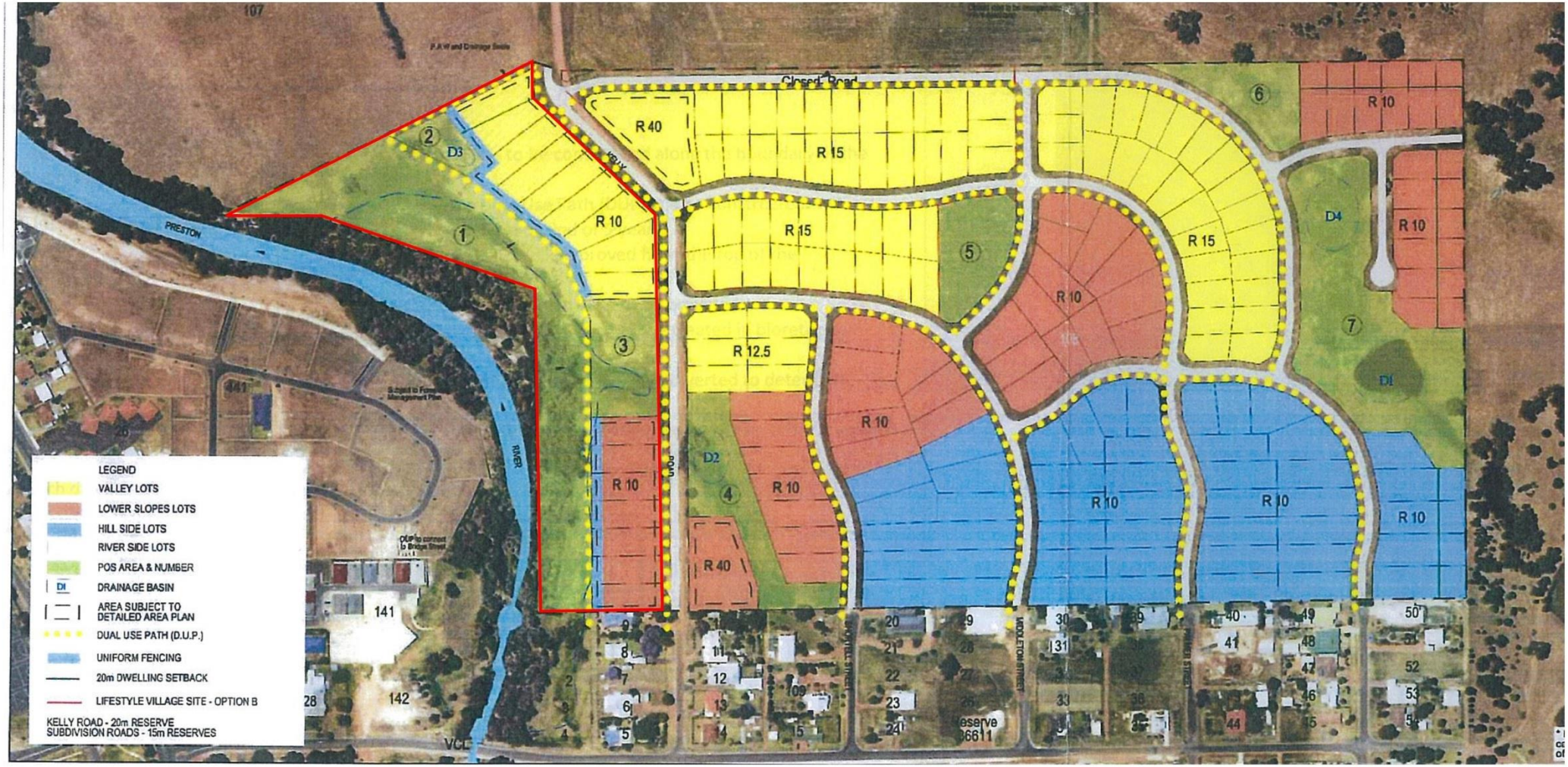
0418 954873



LEGEND

SUBJECT LAND

FIGURE 3
APPROVED STRUCTURE PLAN

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018

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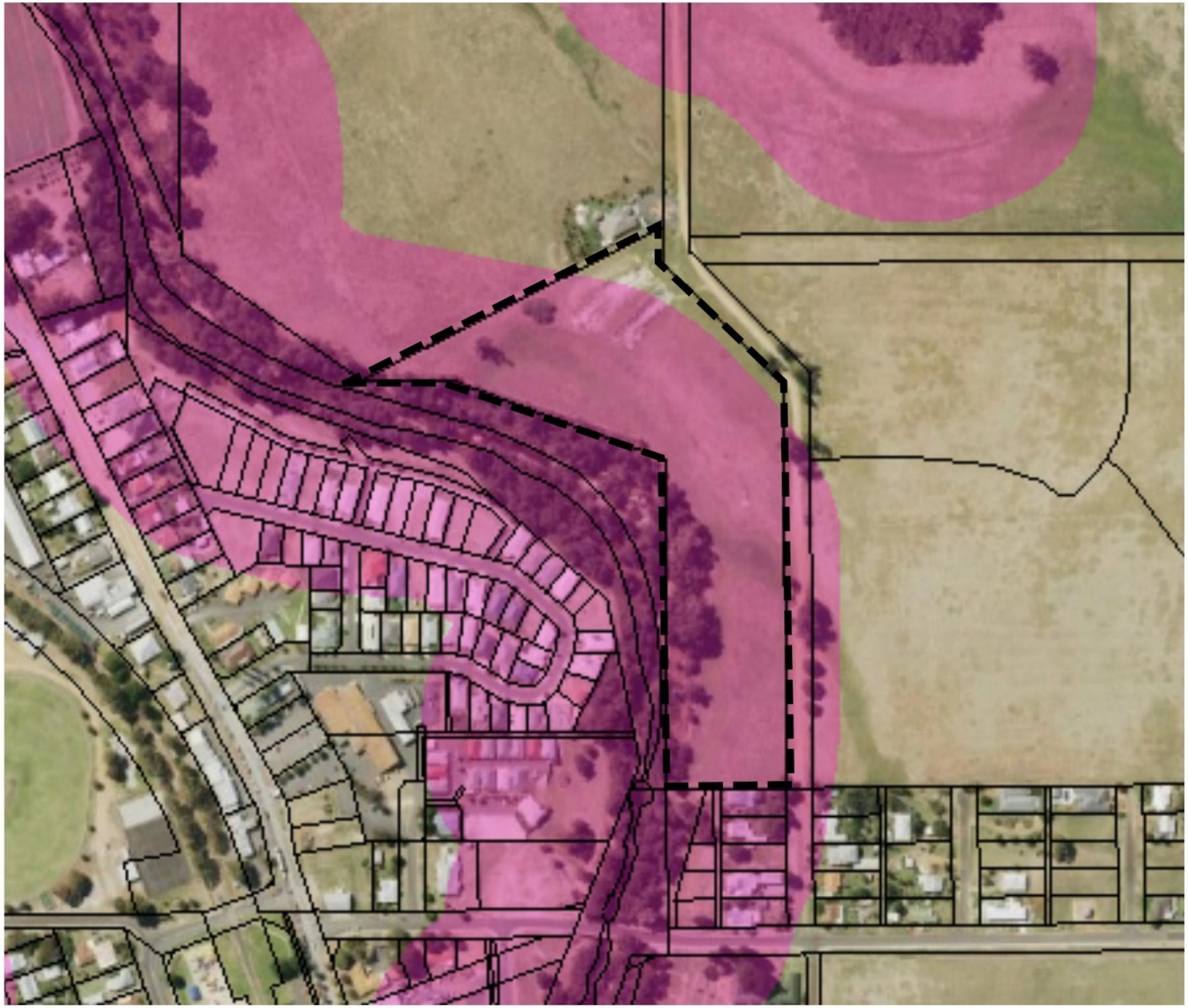
0418 954873



LEGEND

SUBJECT LAND

150m ASSESSMENT AREA

BUSHFIRE PRONE LAND

FIGURE 4
BUSHFIRE PRONE LAND

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018

LUSHfire and planning
geoffrey@lushfire.com.au
0418 954873

1.3 Bushfire Prone Land

Portions of the subject land are shown on the Map of Bush Fire Prone Areas as being bushfire prone (see Figure 4). Bushfire prone areas are comprised of (1):

- Bushfire prone vegetation; and
- A 100m wide bushfire prone buffer.

The designation of bushfire prone areas triggers:

- The application of Australian Standard AS3959 Construction of Buildings in Bushfire Prone Areas under the Building Code of Australia;
- The provisions of the Planning and Development (Local Planning Schemes) Amendment Regulations 2015; and
- The application of SPP3.7 Planning in Bushfire Prone Areas.

1.4 Local Planning Scheme

The subject land is included in the Residential zone; Special Control Area 8 and Structure Plan Area 16. Special Control Area 8 requires the preparation of a structure plan.

Section 4.42 of the Scheme relates to bush fire hazard and fire management plans. These provisions generally reflect SPP3.7 Planning in Bushfire Prone Areas and the Guidelines.

Clause 4.42.10 states that where a Fire Management Plan has been endorsed by the Department of Fire and Emergency Services and/or the local government, through the planning process, the affected landowners will be responsible for the ongoing implementation of the 'landowners' responsibilities' section as specified in that Fire Management Plan.

1.5 Firebreak Order

The Shire's 2018/2018 Firebreak Order stipulates that residential land within a townsite shall:

(a) Where the area of land is 2024m^2 (approx. 1/2 acre) or less, remove all flammable material on the land except living trees, shrubs and plants from the whole land, and;

(b) Where the land exceeds 2024m^2 (approx. 1/2 acre) clear firebreaks not less than two (2) metres wide, unless otherwise specified in the Local Planning Scheme, immediately inside all external boundaries of the land, and also immediately surrounding all buildings situated on the land. Grass on the remaining area of the land must be either grazed, cut for fodder, or totally removed from the land.

All works must be carried out by the 1st December and maintained until the 31st March.

1 DFES (2015) Mapping Standard for Bush Fore Prone Areas.

1.6 Proposed Development

The proposed subdivision plan is shown in Figure 6 and it is proposed to create twenty-three residential lots as follows:

- 19 lots between 503 and 841sqm (R17.5);
- 3 lots between 922 and 1,004sqm (R10); and
- 1 group house lot of 2,023sqm (R40).

There will be two POS & Drainage Reserves being 1,450 and 4,489sqm. A foreshore reserve being 2.21 hectares will be provided along the river corridor.

The internal subdivision road will have a width of 12m.

2.0 ENVIRONMENTAL CONSIDERATIONS

2.1 Native Vegetation Modification and Clearing

There is no proposed general clearing of native vegetation.

2.2 Re-vegetation / Landscape Plans

There will be revegetation of the river foreshore and landscaping of the POS areas. The foreshore management plan is shown in Figure 6 and addresses:

- Foreshore rehabilitation/maintenance;
- Control of public access;
- Dumping of rubbish;
- Weed Control;
- Fire Control;
- Protection of native fauna;
- Drainage;
- Public involvement/management; and
- Creation of Reserve.

It proposes to have intensive revegetation in a 30m wide band from the top of the Preston River bank. Planting is to be done predominately by seedlings at an average density of 5000 stems/hectare where native vegetation is absent. A mixture of trees, shrub and, groundcovers will be used.

FIGURE 5
PROPOSED SUBDIVISION

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018

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7.0 MANAGEMENT PLAN RECOMMENDATIONS AND COMMITMENTS
Adapted from TME 09203-MP-01 (Figure 2, 2009).

The following are the recommendations to manage the foreshore area identified as Foreshore Reserve. It includes land owner commitments to implement various components of the management plan as well as a number of recommendations that relate to long-term actions to be progressed by the agencies responsible for the management of the reserve and any community group/landowner associations that may be established in the future. Following each recommendation is the person/agency responsible for implementation. The symbols are as follows: Developer (D), Shire of Donnybrook-Balingup (S)

Each of the recommendations and actions are shown on the management plan summary. An implementation schedule is also attached showing more detail. **Refer to Appendix 2, Sections 6.1 and 6.2 of the Revised Interim FMP for the Schedule of weed management and revegetation.**

7.1 Land Use Management

R1. Uniform open style fencing is to be constructed along the boundary of the private lots that abut the Foreshore Reserve. This is to assist with lot demarcation between private and public areas. Where necessary retaining walls will be constructed with open style fencing on top (D).

R2. A 2 meter wide limestone Dual Use Path (DUP) with 1 meter shoulders will be constructed and maintained in the reserve along the boundary between the private lots and the foreshore reserve. This DUP will connect to other paths in the POS areas and road reserve. It will also finish next to the existing road reserve in the far south west corner and the northern foreshore reserve boundary to facilitate future extension of the pathway along the river when desired. There will be no paths constructed to the edge of the main river channel to limit public access to these areas. The pathway will have a 2% slope across its width to facilitate drainage and will sit outside the 1:100 ARI flood area except for where it crosses the gully and southern section. Across the gully area, the pathway will be concrete to minimise erosion of the path. Culverts may be added, if needed, once engineering design for the site is finalised. (D for 5 years.)

R3. Maintenance of foreshore reserve path system after 5 years. (S)

R4. All other existing paths to be ripped and revegetated.(D)

R5. All sections not revegetated as part of the path system will be left as gassed areas. There will be no formal lawn areas and no fertiliser will be applied. These grass areas will be slashed as necessary.(D 5 years. S ongoing)

R6. All vehicles, other than those needed for maintenance or fire control will be excluded from the reserve using appropriate fencing, bollards or other similar barriers.(D)

R7. Any Infrastructure in the reserve such as unnecessary fencing to be removed.(D)

7.2 Environmental

R8. Initial weed control programme for a period of 5 years (less than 10% weed cover in 5 seasons). All weed species to be controlled outside of the main river channel. Due to the quick recolonization of the actual channel by introduced grasses such as kikuyu and couch, and that these grasses are performing an excellent sediment control function, weed control in the channel will not focus on grass removal. Refer to Appendix 2 for weed management schedule (D)

R9. Initial intensive revegetation in a 30m wide band from the top or the Preston River bank or until the low fuel zone is reached, whichever is the lesser. Planting is to be done predominately by seedings at an average density of 5000 stems/hectare where native vegetation is absent. A mixture of trees, shrubs and groundcovers will be used. The species will be predominately taken from the species list in the appendix. Revegetation will begin once adequate weed control is achieved. Target completion density is 80% vegetation cover, at the end of the five year period. In the area of dense vegetation along the river spot planting will be undertaken in areas where weeds are removed. Refer to Appendix 2 for revegetation schedule (D).

7.3 Fire Control

The interface between the residential development and the river revegetation has been designed to consider fire management measures and principles as contained in Planning for Bushfire Protection.

R10. Areas not revegetated or containing native vegetation will be slashed in spring and on an as needs basis. (D first 5 years, S ongoing).

R11. A 2m wide limestone path (with one metre shoulders) will be constructed along the boundary between the private lots and the foreshore reserve. This path will connect to the road reserve and existing path network at the northern end. This path will be constructed to allow for access by a fast attack fire appliance i.e. a utility 4WD with a 900L slip on fire unit. (D)

R12. A low fuel zone of at least 20m from the lot boundary will be constructed. This will be planted with trees at spacing of no denser then 1 tree / 20m2. The understorey will be the pasture species currently present on site. The understorey is to be slashed annually in spring before the commencement of the fire season. (D first 5 years, S ongoing).

R13. All residential lots will be required to be maintained in a low fuel state in accordance with Council's Firebreak Order.(D)

R14. Fire hydrants will be installed as per the Bushfire Management Plan, Planning for Bushfire Protection, AS3.5.1 and 3.5.2 (D).

R15. Access points to the reserve/DUP for fire emergency vehicles will be installed from both Kelly Road and the northern road that abuts the Foreshore Reserve. The DUP can also potentially link through to Bridge Street. (D)

7.4 Drainage Control

R16. All stormwater less than the 1:1 ARI event will be treated in bioretention gardens and swales to remove nutrients, sediments and other contaminants prior to entering the foreshore reserve.

R17. All stormwater less than the 1:5 ARI event that is generated on the site will be diverted to retention basins to slow the water to pre development flows. No stormwater infrastructure will be located in the foreshore reserve.(D)

R18. Ongoing maintenance of the stormwater treatment systems will be undertaken to continue management of flows into the reserve. (D during construction and negotiated maintenance period, S after this period)

7.5 Reserve Creation

R19. A foreshore reserve is to be ceded free of cost as part of the subdivision (D)

R20. The Shire of Donnybrook - Balingup is to take vesting of the reserve after the 5 year maintenance, period (S)

8.0 IMPLEMENTATION

8.1 Funding and Management Responsibilities

The land owner will commit to a 5 year (5 season) rehabilitation / maintenance and monitoring agreement to be effective from the Time of creation of foreshore reserve. Maintenance by the land owner will be limited to weed control, erosion control, grass slashing, path development, fence construction and revegetation. This does not include standard maintenance arrangements that may be negotiated for other engineering works beyond the scope and influence of the management plan.

Ongoing maintenance, rehabilitation and replanting will be the responsibility of the Shire following the initial maintenance and Monitoring period. The Shire has identified that it will take vesting of the Foreshore Reserve .

Community Input is desirable to complete implementation of the plan. Community involvement will also assist in establishing a degree community pride and support for the management of natural assets within their neighbourhood. The Shire is encouraged to engage the community in the ongoing management of the reserve,

8.2 Implementation Schedule

The recommendations developed in the management plan will be implemented in two stages. Stage one will involve construction and implementation works at the time of subdivision of land adjoining the foreshore areas. It will include activities such as weed control and planting. Once vesting of the reserves has occurred and Stage 1 works are completed, Stage 2 will begin. Stage 2 is the monitoring and necessary maintenance by the responsible authority. The responsible authority will mainly be the land owner for the first 5 years and the Shire after this time. The pathway and fencing will be created at the time of residential lot creation on the boundary of the reserve. The timing of foreshore works will also be dependent on seasonal requirements, particularly in regard to staging of subdivision, path construction, spraying and planting.

FIGURE 6
FORESHORE MANAGEMENT PLAN
Sheet 1 of 2

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019
C	Foreshore MP	08/10/2019

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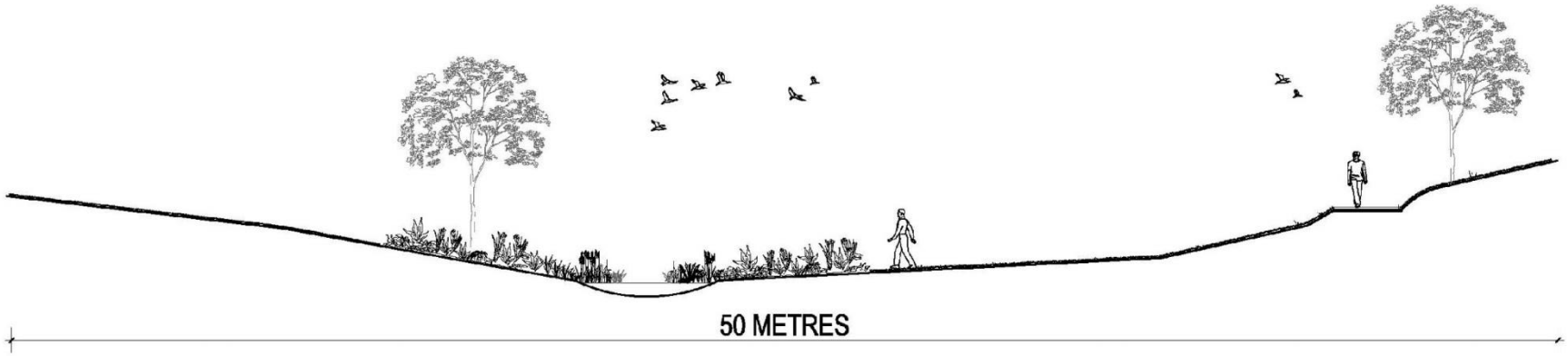

FIGURE 6
FORESHORE MANAGEMENT PLAN
Sheet 2 of 2

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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3.0 BUSHFIRE ASSESSMENT RESULTS

3.1 Assessment Inputs

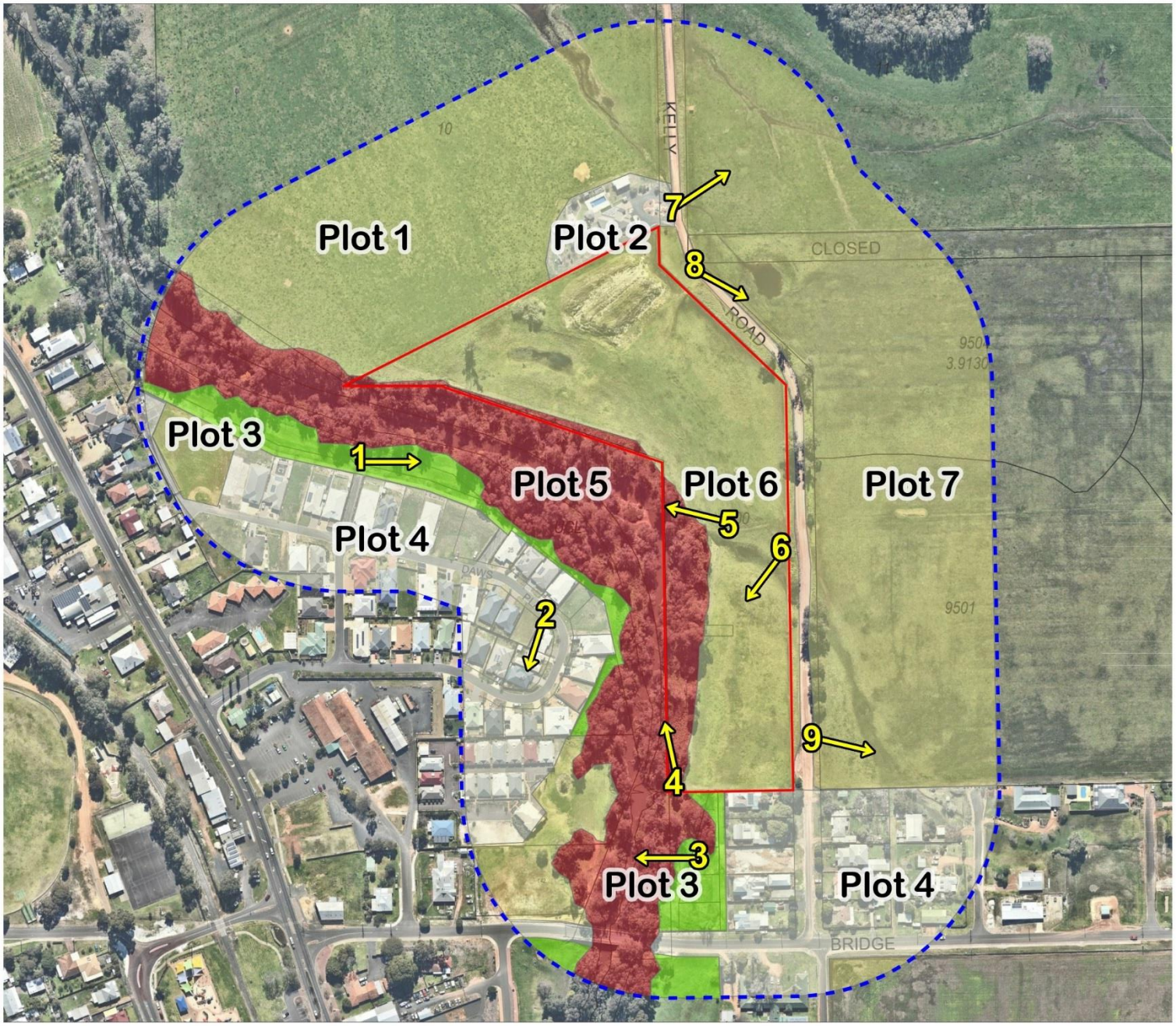
3.1.1 Existing Vegetation Classifications

The classification of the vegetation adjacent to the site is shown in Figure 6 and the photographs on the following pages.

The classification is based upon AS3959 and also considers The Visual Guide for Bushfire Risk Assessment in Western Australia (WAPC 2016). The details of the vegetation plots are summarised in Table 2.

Table 2 Existing Vegetation Classifications

Plot No	Applied Vegetation Classification	Comment
1	G Grassland	Cleared pasture, grazing land.
2	Managed land	Domestic garden, lawn etc being low threat vegetation around the existing dwelling in Lot 107. Approximately 4,000sqm.
3	Managed land	Managed POS adjacent to the river including dual use path.
4	Managed land	Existing residential development including the Salvarosa Estate.
5	A Forest	Vegetation along the river corridor with mixed understorey and significant weed invasion. The river bank has narrow steep slopes in both directions away from this the slopes are generally very low to flat. The vegetation corridor varies from 50 - 100m width. The eastern side adjacent to the subject land is generally 25m wide. Generally damp or waterlogged and will only be a hazard following a long dry period where curing can occur. Elevated fine fuel increases the hazard.
6	G Grassland	Cleared pasture, grazing land on the subject land.
7	G Grassland	Cleared pasture, grazing land on the eastern side of Kelly Road with the upslope increasing further away from the subject land.



LEGEND

SUBJECT LAND

VEGETATION ASSESSMENT AREA (150m from the external boundary of the subject land)

UPSLOPE

PHOTO POINT 3

VEGETATION CLASS

- A FOREST
- G GRASSLAND
- EXCLUDED 2.2.3.2 (e) Managed Land
- POS - EXCLUDED 2.2.3.2 (f) Low Threat Vegetation

Location Details:	Lot 9500 Kelly Road Donnybrook
Assessment Date:	15/08/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2020

FIGURE 7
VEGETATION CLASSIFICATION

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Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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Photo No 1 **Plot No 3**

Vegetation Classification

Excludable - 2.2.3.2(f) Low Threat Vegetation

Description

Maintained POS area adjacent to the river with Plot 5 vegetation in the background.

Photo No 2 **Plot No 4**

Vegetation Classification

Excludable - 2.2.3.2(f) Low Threat Vegetation

Description

Existing residential development.

Photo No 3 **Plot No 5**

Vegetation Classification

Class A Forest - Open forest A-03

Description

River corridor vegetation with Flooded Gum, mixed middle and understorey. Heavy weed, bracken, watsonia understorey and very high fuel loads.

Photo No 4 **Plot No 5**

Vegetation Classification

Class A Forest - Open forest A-03

Description

River corridor vegetation with Flooded Gum, mixed middle and understorey. Heavy weed, bracken, watsonia understorey and very high fuel loads.

Photo No 5 **Plot No 5**

Vegetation Classification

Class A Forest - Open forest A-03

Description

River corridor vegetation with Flooded Gum, mixed middle and understorey. Heavy weed, bracken, watsonia understorey and very high fuel loads.

Photo No 6 **Plot No 6**

Vegetation Classification

Class G Grassland – Sown pasture G-26

Description

Pasture, grazing within the subject land.

Photo No 7 **Plot No 7**

Vegetation Classification

Class G Grassland – Sown pasture G-26

Description

Pasture, grazing land east of Kelly Road.

Photo No 8 **Plot No 7**

Vegetation Classification

Class G Grassland – Sown pasture G-26

Description

Pasture, grazing land east of Kelly Road.

Photo No 9 **Plot No 7**

Vegetation Classification

Class G Grassland – Sown pasture G-26

Description

Pasture, grazing land east of Kelly Road, with Plot 4 residential development in the background.

3.2 Assessment Outputs

3.2.1 BAL Contour Map

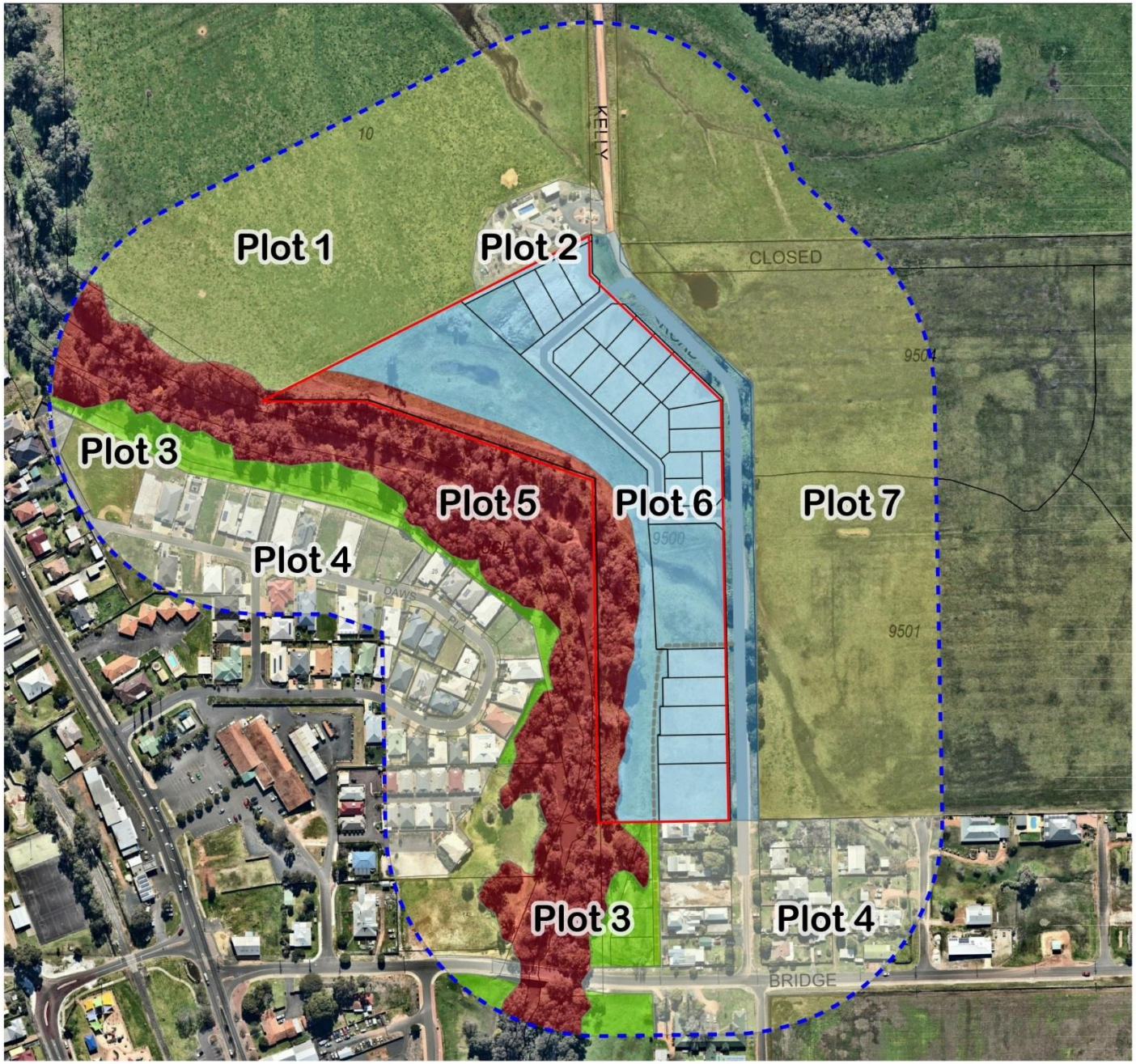
The revised vegetation classification plan is shown in Figure 8. This recognises:

- The foreshore revegetation; and
- That the local open space within the subject land will become managed land / low threat vegetation.

A BAL Contour Map is shown in Figure 9 and this is a plan of the subject lot/s illustrating the potential radiant heat impacts and associated indicative BAL ratings in reference to any classified vegetation remaining within 100 metres of the assessment area after the development is completed.

Table 3 BAL Classifications

Lot Number	Vegetation Plot (1)	Vegetation Classification	Effective Slope (degrees)	Separation Distance (2)	BAL Rating
1001	7	G Grassland	Upslope	18m	BAL-12.5
1002	1	G Grassland	Flat	44m	BAL-12.5
1003	1	G Grassland	Flat	30m	BAL-12.5
1004	7	G Grassland	Upslope	20m	BAL-12.5
1005	7	G Grassland	Upslope	20m	BAL-12.5
1006	7	G Grassland	Upslope	20m	BAL-12.5
1007	7	G Grassland	Upslope	20m	BAL-12.5
1008	7	G Grassland	Upslope	20m	BAL-12.5
1009	7	G Grassland	Upslope	20m	BAL-12.5
1010	7	G Grassland	Upslope	20m	BAL-12.5
1011	7	G Grassland	Upslope	20m	BAL-12.5
1012	5	A Forest	Flat	38m	BAL-19
1013	5	A Forest	Flat	34m	BAL-19
1014	5	A Forest	Flat	36m	BAL-19
1015	5	A Forest	Flat	38m	BAL-19
1016	5	A Forest	Flat	38m	BAL-19
1017	5	A Forest	Flat	55m	BAL-12.5
1018	5	A Forest	Flat	55m	BAL-12.5
1019	5	A Forest	Flat	21m	BAL-29
1020	5	A Forest	Flat	21m	BAL-29
1021	5	A Forest	Flat	21m	BAL-29
1022	5	A Forest	Flat	21m	BAL-29
1023	5	A Forest	Flat	24m	BAL-19
Notes (1) (2)	The selected vegetation plot is the plot with the highest BAL rating. The separation distance is measured to the nearest point on the boundary of the lot.				



LEGEND

SUBJECT LAND

VEGETATION ASSESSMENT AREA (150m from the external boundary of the subject land)

UPSLOPE

PHOTO POINT 3

VEGETATION CLASS

- A FOREST
- G GRASSLAND
- AREA TO BE MODIFIED TO LOW THREAT STATE
- EXCLUDED 2.2.3.2 (e) Managed Land
- POS - EXCLUDED 2.2.3.2 (f) Low Threat Vegetation Public Open Space

Location Details:	Lot 9500 Kelly Road Donnybrook
Assessment Date:	15/08/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2020

FIGURE 8
MODIFIED VEGETATION

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Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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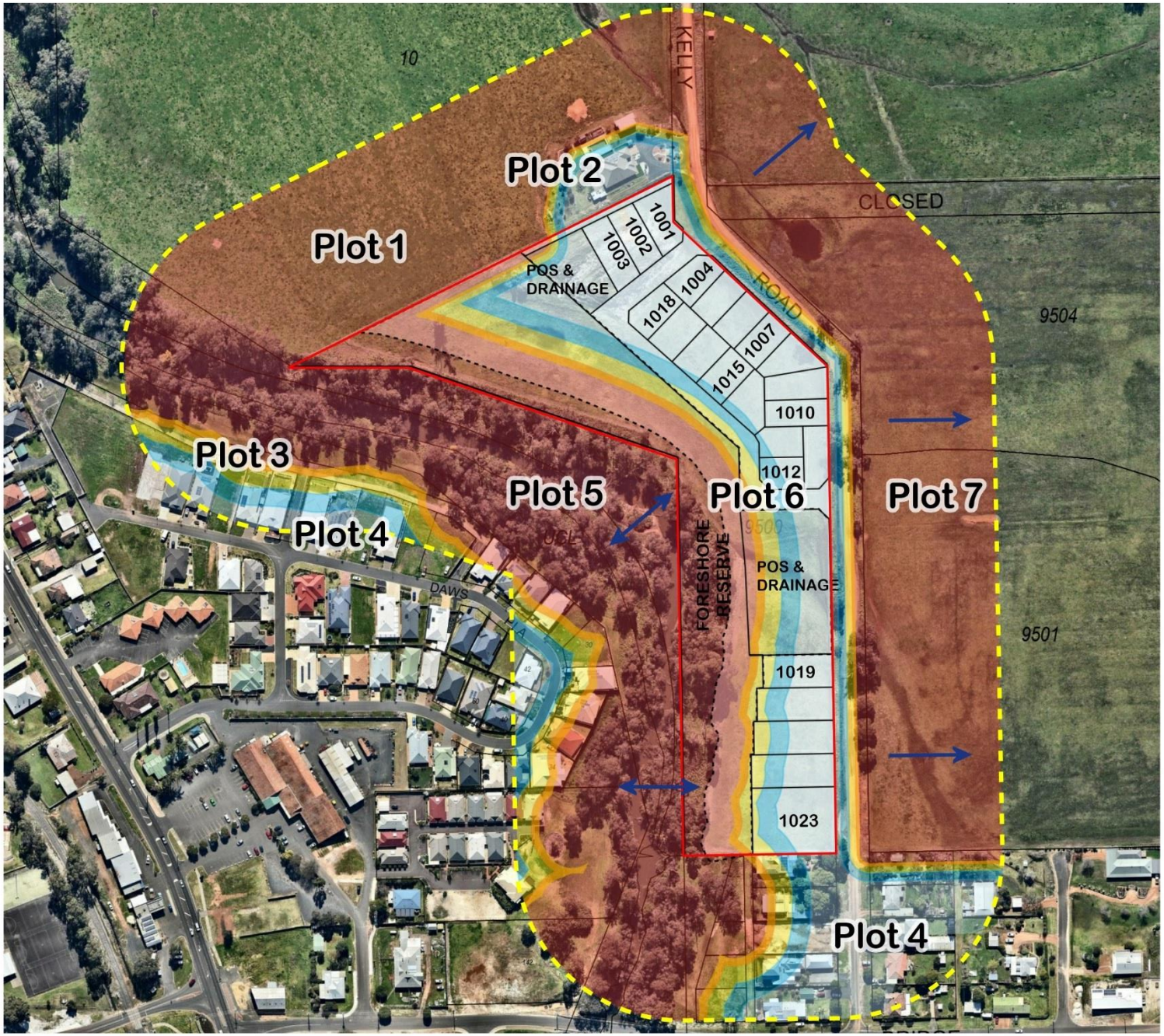

LEGEND

SUBJECT LAND

BAL CONTOUR ASSESSMENT AREA (100m from the external boundary of the development area)

VEGETATION PLOTS

UPSLOPE

EFFECTIVE FLAT SLOPE

INDICATIVE BUSH FIRE ATTACK LEVELS

- BAL - FZ
- BAL - 40
- BAL - 29
- BAL - 19
- BAL - 12.5
- BAL - Low

Location Details:	Lot 9500 Kelly Road Donnybrook
Assessment Date:	15/08/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2020

FIGURE 9
BAL CONTOUR MAP

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A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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4.0 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

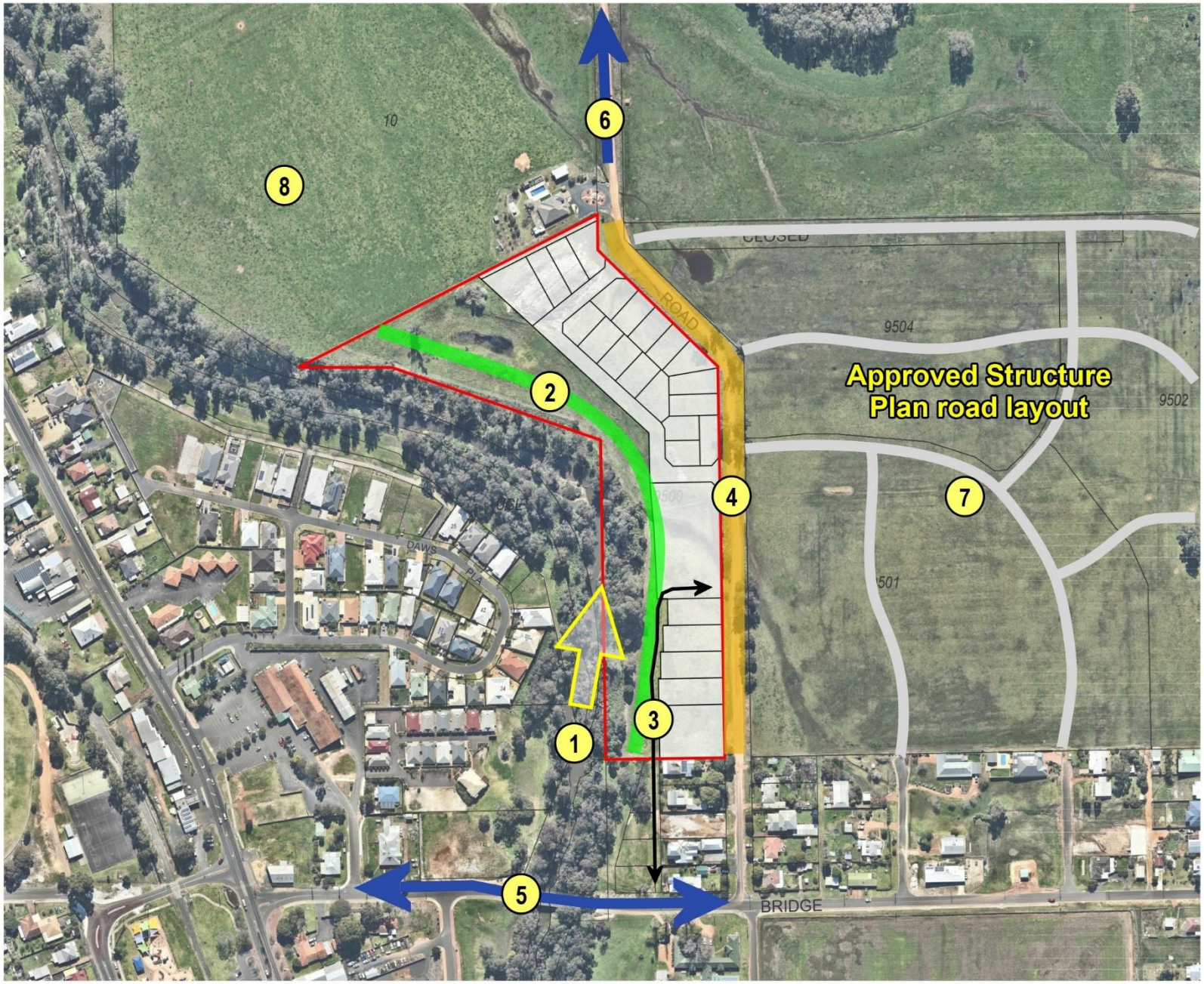
Figure 1 shows the existing conditions for the locality around the subject land. The local spatial issues are shown in Figure 10.

The most significant bushfire hazard is the vegetation along the river corridor. This is linear corridor and being a permanent waterbody, the soil is generally damp throughout the year. Development is only like to be impacted by a flanking fire rather than a head fire. A Method 2 BAL Assessment may result in a reduction of the BAL setbacks shown in Table 3.

It is critical that there be a suitable development setback between the river and the subdivision. Parts of the proposed foreshore reserve are flood prone and not suitable for the development. The subdivision has been designed to provide for a BAL-29 classification of the lots which means that the foreshore area has to be maintained as low threat vegetation.

The subject land is located on the edge of the townsite with additional residential development planned for the eastern side of Kelly Road. The land to the north is rural farm land which is generally semi cleared grazing land.

There is only a single access to the eastern side of town via Bridge Street. Kelly Road extends to the north of the site connecting into Hamilton Road and then Irishtown Road but it is only passable in summer.



LEGEND

SUBJECT LAND

ISSUES

1) River corridor has linear vegetation which is generally damp throughout the year. Development is only like to be impacted by a flanking fire rather than a head fire. A Method 2 BAL Assessment may result in a reduction of the BAL setbacks shown in Table 3.
2) Foreshore reserve will be a hazard separation zone and/or asset protection zone and must be managed as low threat vegetation.
3) Access required along the rear of the southern lots potentially being a dual use pathway.
4) Kelly Road reserve to be upgraded and the verge vegetation is to be maintained as low threat vegetation.
5) Bridge Street provides the main access to the eastern side of town.
6) Kelly Road continues to the north eventually connecting to Irishtown Road but this is only accessible in summer months.
7) Land on the eastern side of Kelly Road has an approved structure plan which allows for residential development. The road layout will connect into the existing road network to the south.
8) The land to the north is zoned Agriculture being outside of the townsite boundary.

FIGURE 10
SPATIAL ISSUES

N

Job No 17-068

Rev	Description	Date
A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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5.0 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA

5.1 Compliance Table

In formulating the proposed mitigation measures regard has been given to the objectives, general principles, guidance statements and performance criteria contained in the Guidelines for Planning in Bushfire Prone Areas and specifically the Bushfire Protection Criteria. The requirements in the Bushfire Protection Criteria and the proposed mitigation strategies are summarised in Table 4.

The spatial representation of the fire mitigation measures are shown in Figure 10.

Table 4 Bushfire Protection Criteria

Bushfire protection criteria	Method of Compliance Acceptable solutions / Performance based solution	Compliance	Proposed bushfire management strategies
Element 1: Location	A1.1 Development location	Yes	The existing proposed lots will have a maximum BAL-29 rating. This is at the boundary of the lot and the actual development sites may have a lower rating.
Element 2: Siting and design	A2.1 Asset protection zone (APZ)	Yes	Council's Firebreak Order requires the whole of the lots to be maintained as low threat vegetation. The APZ will extend across the subdivision road and portions of the adjacent reserves. This complies with the Guidelines which state on page 63 of the BPC that the APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context.
Element 3: Vehicular access	A3.1 Two access routes	Yes	Kelly Road provides access in two different directions.
	A3.2 Public road	Yes	The proposed subdivision roads have a 12m wide road reserve with a minimum 6m pavement. They will be constructed in accordance with the Local Government Guidelines for Subdivisional Development which meet required specifications for bushfire access. The internal roads meet the requirements of Table 6 as follows: • Min 6m trafficable surface • Min 6m horizontal clearance • 4.5m vertical clearance to vegetation • Maximum grade <50m of 1:10

Bushfire protection criteria	Method of Compliance Acceptable solutions / Performance based solution	Compliance	Proposed bushfire management strategies
			• Min weight capacity 15 tons • Min cross fall 1:33 • 8.5m inner curve radius
	A3.3 Cul-de-sac (including a dead-end-road)	N/A	There are no proposed cul-de-sacs.
	A3.4 Battle-axe	N/A	There are no proposed battle axe legs.
	A3.5 Private driveway longer than 50m is to meet detailed requirements contained within the Guidelines.	N/A	No driveways will be longer than 50m.
	A3.6 Emergency access way (EAW)	N/A	There is no proposed EAW.
	A3.7 Fire service access routes (FSAR)	N/A	There are no proposed FSARs
	A3.8 Firebreak width	N/A	No lots exceed 0.5ha and boundary firebreaks are not required.
Element 4: Water	A4.1 Reticulated areas	Yes	The reticulated water supply will be extended to service the subject land with hydrants.
	A4.2 Non-reticulated areas	N/A	Not applicable
	A4.3 Individual lots within non-reticulated areas.	N/A	Not applicable

5.2 Additional Management Strategies

5.2.1 Purchaser Advice

All prospective purchasers must be made aware of the fire management issues, measures and responsibilities associated with the subdivision. This can be a notification placed upon the Certificate of Title of all lots pursuant to Section 70A of the Transfer of Land Act advising landowners of this Bushfire Management Plan and BAL requirements.

LEGEND

- SUBJECT LAND
- DEVELOPMENT AREA
- HAZARD VEGETATION CLASS A FOREST
- BAL - 29 SETBACK
- ASSET PROTECTION ZONE (Low Threat Vegetation)
- SUBDIVISION ROAD
- UPGRADING OF KELLY ROAD
- DUAL USE PATHWAY

FIGURE 11
SPATIAL MITIGATION MEASURES

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A	Preliminary	17/08/2018
B	Foreshore MP	22/07/2019

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6.0 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF THE BUSHFIRE MEASURES

The management of the risk posed by bushfires is a shared responsibility between landowners, government and industry. These responsibilities are summarised in Table 5.

Table 5 Implementation

No	MANAGEMENT ACTION	TIMING
1.0 Developer Prior to Issue of Titles		
1.1	Construction of subdivision roads to standards outlined in the BMP to ensure safe access and egress.	Subdivision
1.2	Upgrading of Kelly Road to the requires standard.	Subdivision
1.3	A plan demonstrating the location and capacity of fire the fire hydrants shall be submitted to the Shire of Donnybrook Balingup and DFES	Subdivision
1.4	Preparation and approval of the landscape and maintenance plans by Council for the areas of Local Open Space. These are to address the proposed vegetation modification, separation areas, fuel loads and weed management and specifications contained in Schedule 1 Standards for Asset Protection Zones.	Subdivision
1.5	Provision of a dual use pathway along the rear of proposed lots 1019 to 1023.	Subdivision
1.6	Preparing a notification be included on the certificate of titles for the lost within the subdivision.	Subdivision
2.0 Developer Prior to Sale		
2.1	Providing prospective residents with a summary of this BMP	Sale
3.0 Landowner Prior to Occupancy		
3.1	Ensuring that any application for a building permit for a dwelling is to include an individual BAL assessment to confirm that sufficient land has been cleared to provide for BAL-29 setbacks.	Development
4.0 Landowners Ongoing		
4.1	Undertaking regular maintenance of their property in preparation for the annual fire season.	Ongoing
4.2	Ensuring that all fire mitigation measures shall be completed by the date prescribed in Council's Firebreak Order.	Ongoing
5.0 Local Government Ongoing Management		
5.1	Ensuring Building Permit Applications and Development Applications are compliant with the building and land use planning provisions	Ongoing
5.2	Maintenance of the designated areas of Local Open Space as low threat vegetation in accordance with the approved management plans.	Ongoing
5.3	Enforce compliance with its annual firebreak notice.	Ongoing

Appendix C

Updated Foreshore Management Plan

Revised Interim Foreshore Management Plan

Lot 108 Kelly Road, Donnybrook

OCTOBER 2019

Version control

Project number:	SW229
Project file path:	Interim Foreshore MP 20190918
Client:	Client
Revision	v20191011
Date	11/10/19
Prepared by	Shane Priddle
Reviewed by	Shane Priddle
Approved by	Shane Priddle
Status	Final

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Acknowledgements:

This document has been prepared based on the Interim Foreshore Management Plan Lot 108 Kelly Road, Donnybrook (Thompson McRobert Edgeloe Group, 2011) with minor updates in response to an updates to the Structure Plan, updated Bushfire Management Plan (Lush Fire and Planning, 2019) and comments from the Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Water and Environmental Regulation (DWER).

Contents

1 Introduction

Thompson McRobert Edgeloe Group (TME) prepared an Interim Foreshore Management Plan (FMP) in 2011 for the Preston River foreshore that was associated with the Lot 108 Kelly Road, Donnybrook Structure Plan application. The Interim FMP was required to comply with the Shire of Donnybrook-Balingup (the Shire) conditions for the Structure Plan application.

Minor updates were proposed to the original Structure Plan layout in 2019. The Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Water and Environmental Regulation (DWER) provided updated comments on the Plan. A Revised Interim FMP was prepared to incorporate these comments.

The Interim FMP has been prepared in consultation with the relevant government agencies and the landowners involved.

The need to prepare a Revised Interim Foreshore Management Plan (FMP) for the Preston River and associated floodplain was instigated by the proposed residential Structure Plan of Lot 108 Kelly Road, Donnybrook. The Lot's western boundary is adjacent to the Preston River and the southern boundary abuts the existing townsite of Donnybrook. The location is visually represented in Figure 1.

To assist in the preparation and implementation of the Interim FMP, the existing and post development conditions of the Preston River foreshore area has been overlain on an aerial photography. Figure 2 clearly delineates areas of remnant vegetation along the Preston River; the Foreshore Reserve; Public Open Space (POS); and the proposed Structure Plan zoning.

The Revised Interim FMP is considered an Interim Plan as particular planning details are not available to delineate the final alignment of the Foreshore Reserve at the Structure Plan stage. Thus, the preparation and implementation of a finalised FMP will be a condition of subdivision approval.

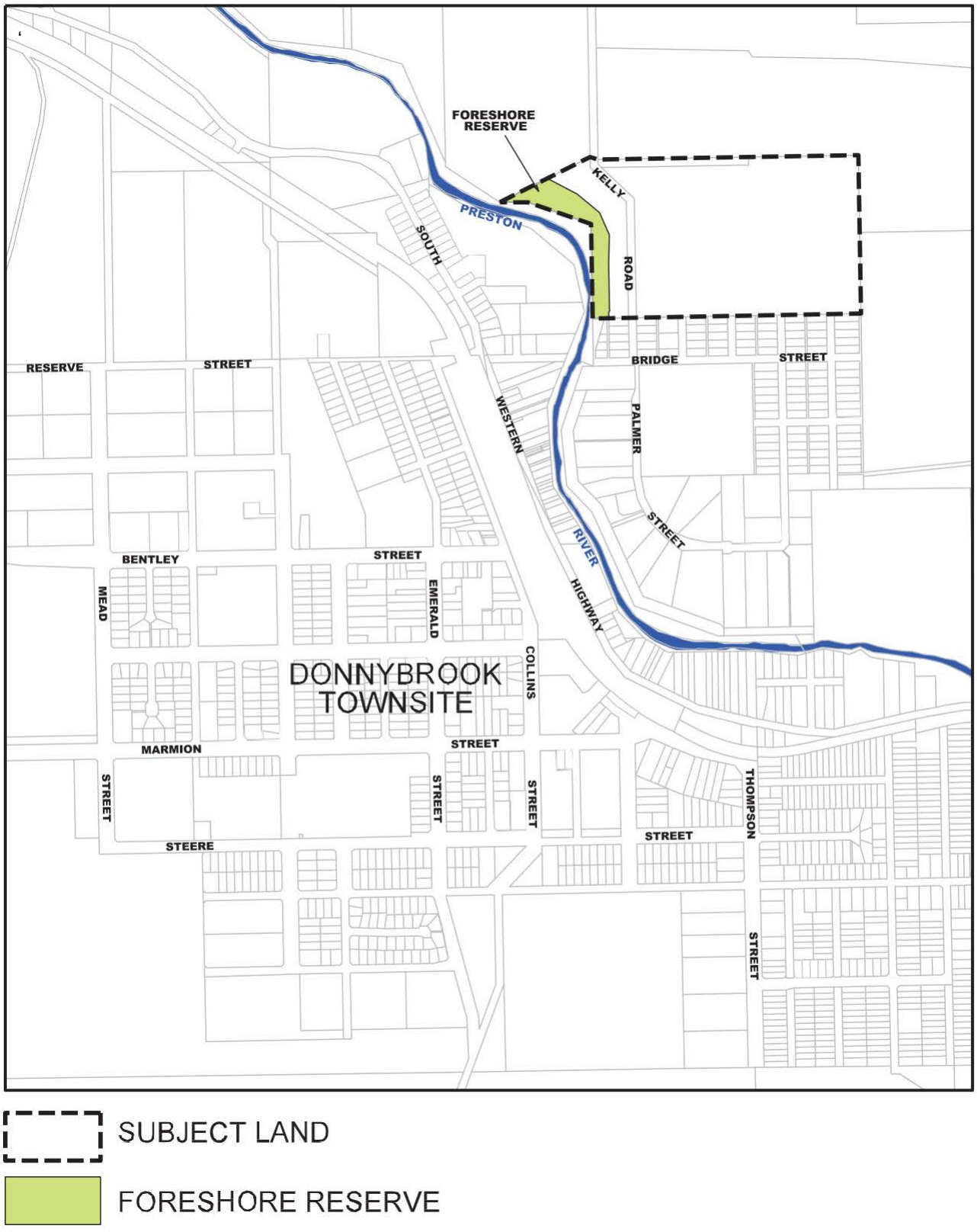


Figure 1 Location Plan (from TME 2011)

7.0 MANAGEMENT PLAN RECOMMENDATIONS AND COMMITMENTS
Adapted from TME 09203-MP-01 (Figure 2, 2009).

The following are the recommendations to manage the foreshore area identified as Foreshore Reserve. It includes land owner commitments to implement various components of the management plan as well as a number of recommendations that relate to long-term actions to be progressed by the agencies responsible for the management of the reserve and any community group/landowner associations that may be established in the future. Following each recommendation is the person/agency responsible for implementation. The symbols are as follows: Developer (D), Shire of Donnybrook-Balingup (S)

Each of the recommendations and actions are shown on the management plan summary. An implementation schedule is also attached showing more detail. **Refer to Appendix 2, Sections 6.1 and 6.2 of the Revised Interim FMP for the Schedule of weed management and revegetation.**

7.1 Land Use Management

R1. Uniform open style fencing is to be constructed along the boundary of the private lots that abut the Foreshore Reserve. This is to assist with lot demarcation between private and public areas. Where necessary retaining walls will be constructed with open style fencing on top (D).

R2. A 2 meter wide limestone Dual Use Path (DUP) with 1 meter shoulders will be constructed and maintained in the reserve along the boundary between the private lots and the foreshore reserve. This DUP will connect to other paths in the POS areas and road reserve. It will also finish next to the existing road reserve in the far south west corner and the northern foreshore reserve boundary to facilitate future extension of the pathway along the river when desired. There will be no paths constructed to the edge of the main river channel to limit public access to these areas. The pathway will have a 2% slope across its width to facilitate drainage and will sit outside the 1:100 ARI flood area except for where it crosses the gully and southern section. Across the gully area, the pathway will be concrete to minimise erosion of the path. Culverts may be added, if needed, once engineering design for the site is finalised. (D for 5 years.)

R3. Maintenance of foreshore reserve path system after 5 years. (S)

R4. All other existing paths to be ripped and revegetated.(D)

R5. All sections not revegetated as part of the path system will be left as gassed areas. There will be no formal lawn areas and no fertiliser will be applied. These grass areas will be slashed as necessary.(D 5 years. S ongoing)

R6. All vehicles, other than those needed for maintenance or fire control will be excluded from the reserve using appropriate fencing, bollards or other similar barriers.(D)

R7. Any Infrastructure in the reserve such as unnecessary fencing to be removed.(D)

7.2 Environmental

R8. Initial weed control programme for a period of 5 years (less than 10% weed cover in 5 seasons). All weed species to be controlled outside of the main river channel. Due to the quick recolonization of the actual channel by introduced grasses such as kikuyu and couch, and that these grasses are performing an excellent sediment control function, weed control in the channel will not focus on grass removal. Refer to Appendix 2 for weed management schedule (D)

R9. Initial intensive revegetation in a 30m wide band from the top or the Preston River bank or until the low fuel zone is reached, whichever is the lesser. Planting is to be done predominately by seedings at an average density of 5000 stems/hectare where native vegetation is absent. A mixture of trees, shrubs and groundcovers will be used. The species will be predominately taken from the species list in the appendix. Revegetation will begin once adequate weed control is achieved. Target completion density is 80% vegetation cover, at the end of the five year period. In the area of dense vegetation along the river spot planting will be undertaken in areas where weeds are removed. Refer to Appendix 2 for revegetation schedule (D).

7.3 Fire Control

The interface between the residential development and the river revegetation has been designed to consider fire management measures and principles as contained in Planning for Bushfire Protection.

R10. Areas not revegetated or containing native vegetation will be slashed in spring and on an as needs basis. (D first 5 years, S ongoing).

R11. A 2m wide limestone path (with one metre shoulders) will be constructed along the boundary between the private lots and the foreshore reserve. This path will connect to the road reserve and existing path network at the northern end. This path will be constructed to allow for access by a fast attack fire appliance i.e. a utility 4WD with a 900L slip on fire unit. (D)

R12. A low fuel zone of at least 20m from the lot boundary will be constructed. This will be planted with trees at spacing of no denser then 1 tree / 20m2. The understorey will be the pasture species currently present on site. The understorey is to be slashed annually in spring before the commencement of the fire season. (D first 5 years, S ongoing).

R13. All residential lots will be required to be maintained in a low fuel state in accordance with Council's Firebreak Order.(D)

R14. Fire hydrants will be installed as per the Bushfire Management Plan, Planning for Bushfire Protection, AS3.5.1 and 3.5.2 (D).

R15. Access points to the reserve/DUP for fire emergency vehicles will be installed from both Kelly Road and the northern road that abuts the Foreshore Reserve. The DUP can also potentially link through to Bridge Street. (D)

7.4 Drainage Control

R16. All stormwater less than the 1:1 ARI event will be treated in bioretention gardens and swales to remove nutrients, sediments and other contaminants prior to entering the foreshore reserve.

R17. All stormwater less than the 1:5 ARI event that is generated on the site will be diverted to retention basins to slow the water to pre development flows. No stormwater infrastructure will be located in the foreshore reserve.(D)

R18. Ongoing maintenance of the stormwater treatment systems will be undertaken to continue management of flows into the reserve. (D during construction and negotiated maintenance period, S after this period)

7.5 Reserve Creation

R19. A foreshore reserve is to be ceded free of cost as part of the subdivision (D)

R20. The Shire of Donnybrook - Balingup is to take vesting of the reserve after the 5 year maintenance, period (S)

8.0 IMPLEMENTATION

8.1 Funding and Management Responsibilities

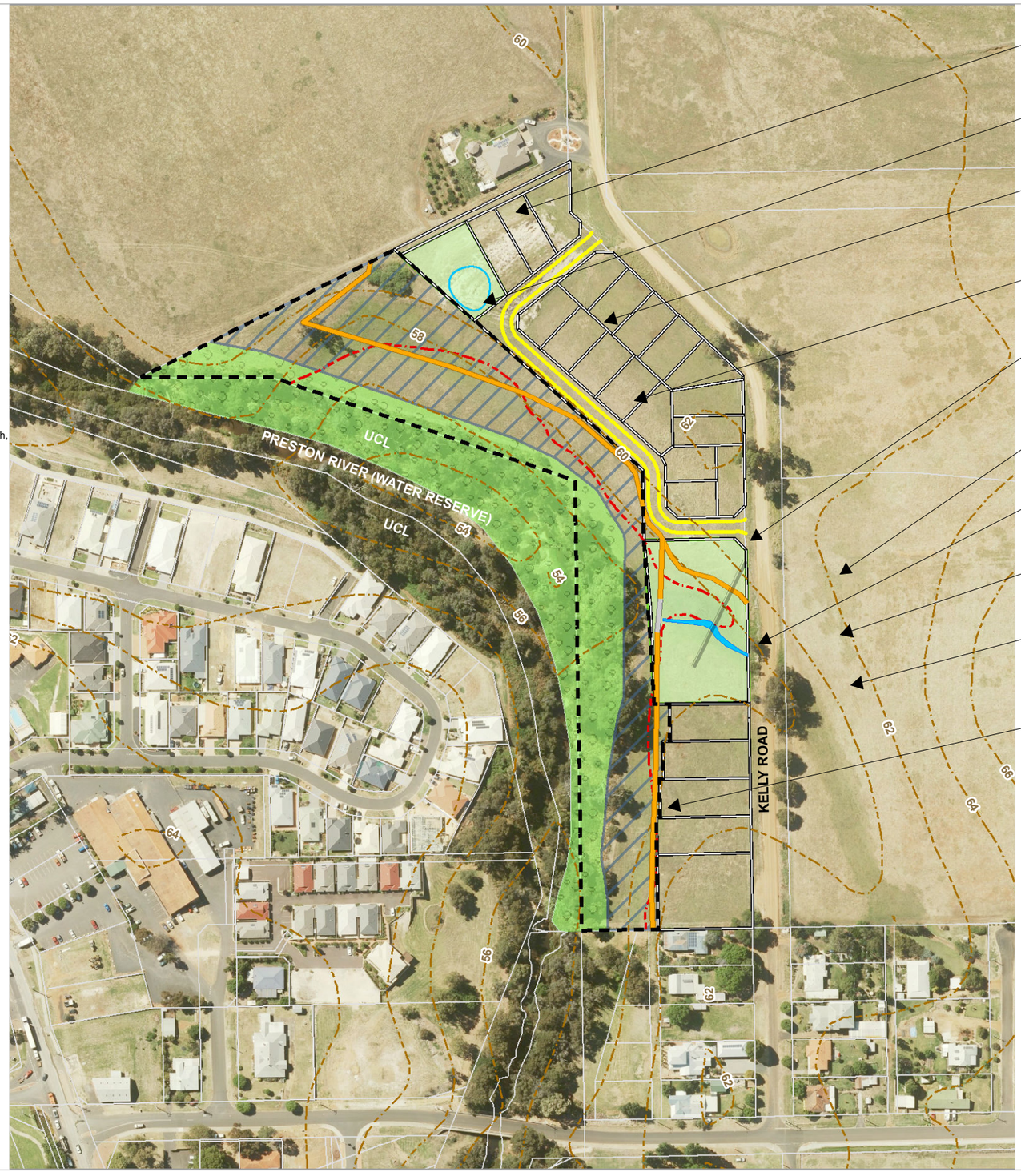
The land owner will commit to a 5 year (5 season) rehabilitation / maintenance and monitoring agreement to be effective from the Time of creation of foreshore reserve. Maintenance by the land owner will be limited to weed control, erosion control, grass slashing, path development, fence construction and revegetation. This does not include standard maintenance arrangements that may be negotiated for other engineering works beyond the scope and influence of the management plan.

Ongoing maintenance, rehabilitation and replanting will be the responsibility of the Shire following the initial maintenance and Monitoring period. The Shire has identified that it will take vesting of the Foreshore Reserve .

Community Input is desirable to complete implementation of the plan. Community involvement will also assist in establishing a degree community pride and support for the management of natural assets within their neighbourhood. The Shire is encouraged to engage the community in the ongoing management of the reserve,

8.2 Implementation Schedule

The recommendations developed in the management plan will be implemented in two stages. Stage one will involve construction and implementation works at the time of subdivision of land adjoining the foreshore areas. It will include activities such as weed control and planting. Once vesting of the reserves has occurred and Stage 1 works are completed, Stage 2 will begin. Stage 2 is the monitoring and necessary maintenance by the responsible authority. The responsible authority will mainly be the land owner for the first 5 years and the Shire after this time. The pathway and fencing will be created at the time of residential lot creation on the boundary of the reserve. The timing of foreshore works will also be dependent on seasonal requirements, particularly in regard to staging of subdivision, path construction, spraying and planting.



1:5 ARI Drainage basin

1:100 ARI flood level

Road pavement

20m minimum low fuel zone - parkland planting with slashed grass

Indicative 2 m wide cement stabilised limestone pathway

Public Open Space / drainage

Cement crossover over living stream for pathway

Cross section: Artists impression

Living stream (see cross section) to edge of foreshore reserve

Infill and revegetation area within 30m of top of riverbank

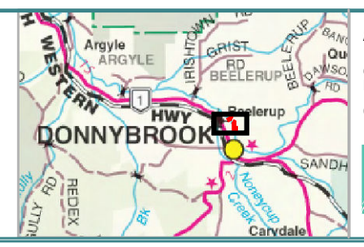
FORESHORE MANAGEMENT PLAN FIGURE 2 AMENDED

LOT 108 KELLY ROAD, DONNYBROOK

Ref: SW229 Kelly Rd FMP
Date: 18/09/2019 Author: SP

- Foreshore Reserve application area
- Living stream (see cross section) to edge of foreshore reserve
- Indicative 2 m wide cement stabilised limestone pathway
- Cement crossover over living stream for pathway
- 1:100 ARI flood level
- 1:5 ARI Drainage basin
- Revised structure plan lots
- Road pavement
- 20m minimum low fuel zone - parkland planting with slashed grass
- Infill and revegetation area within 30m of top of riverbank
- Public Open Space / drainage
- Existing cadastre
- Contour (2m)
- Cross section: Artists impression

Source:
This Management Plan has been adapted from TME 09203-MP-01 (Fuigure 2, 2009).
It has been prepared for planning purposes and is subject to survey.
Base map © Esri and its data suppliers. SLIP Landgate (2019)



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GRID: GDA zone 50

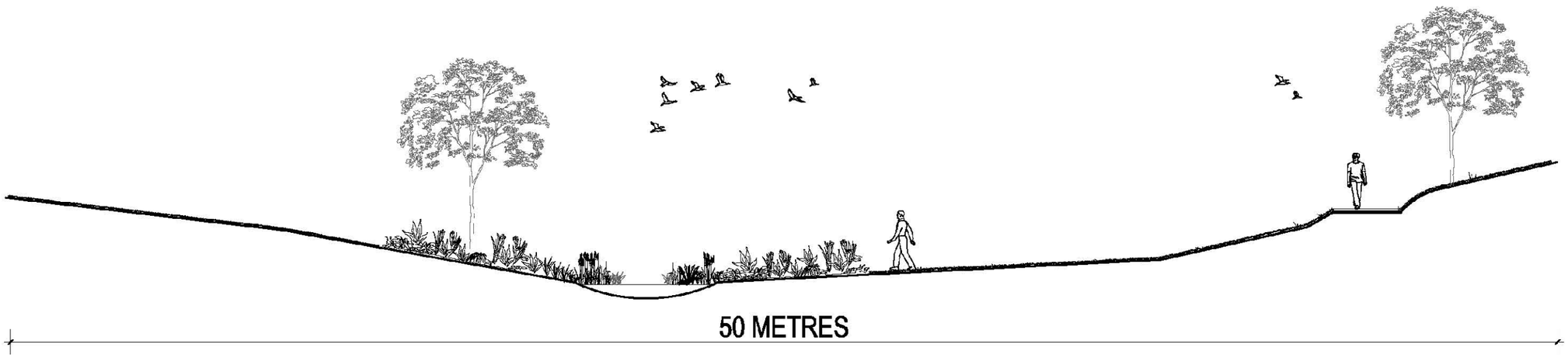
N

SW environmental
www.swenvironmental.com.au

LOW FURL ZONE - MAINTAINED
GRASSLAND <100MM HEIGHT

MAX 15 METRES LIVING STREAM

LOW FURL ZONE - MAINTAINED
GRASSLAND <100MM HEIGHT



50 METRES

FORESHORE MANAGEMENT PLAN
CROSS SECTION: ARTISTS IMPRESSION

LOT 108 KELLY ROAD, DONNYBROOK

Ref: SW229 Kelly Rd FMP cross section
Date: 14/08/2019 Author: SP

Source:
This artist impression has been prepared for planning purposes and is subject to survey.

SW environmental
www.swenvironmental.com.au

2 PLANNING SUMMARY

2.1 Lot Description

The subject land for the Revised Interim FMP is described as Lot 108 Deposited Plan 45176 Kelly Road, Donnybrook. The subject land's western boundary is adjacent to the Preston River and the southern boundary abuts the existing townsite of Donnybrook. The location is shown in Figure 1.

2.2 Land Zoning

The subject land's Structure Plan proposes to rezone the land to 'Residential', including land zoned 'POS', 'Drainage Reserve' and 'Foreshore Reserve'.

The specific focus of the Interim FMP is the land identified within the Structure Plan as the Foreshore Reserve, referred to as the 'study area' within this document. The Foreshore Reserve is for the Preston River (see Figure 1). It occupies an area of approximately 2.3 hectares. It borders 'Unallocated Crown Land' (UCL) and a 'Water Reserve' for the Preston River.

2.3 Structure Plan Approval

The Structure Plan is presently proposed, and the Revised Interim FMP will support the Structure Plan application. This condition was requested by the Shire of Donnybrook-Balingup in a letter titled Proposed Scheme Amendment – Lot 108 Kelly Road, Donnybrook dated 11th May 2009. The relevant requests by the Shire in the letter stated:

(v.) The following documentation to be provided with the Structure Plan, which shall be to the satisfaction of the Shire and relevant government agencies:

– *A Foreshore Management Plan.*

(vi.) The following design issues shall be addressed in respect to both proposed SGP options:

– *DAP's for rear laneways proposed group dwellings sites and lots adjoining POS/ Foreshore reserves;*

Initial review of the FMP from the Department of Water (DoW) altered the preparation of the FMP at the Structure Plan stage. There is a need the Foreshore Reserve boundary to be investigated and finalised at the Subdivision approval stage, because of the further details required to:

- ascertain final boundary alignment based on final subdivisional plans;
- clarify DoW flood level modelling;
- appropriately revegetate a 30m, or to the low fuel zone buffer, whichever is the lesser; and
- determine land requirements to assist in the management of stormwater flows from the Structure Plan development, including the protection of the natural ecological functions of the Preston River and surrounding natural environment.

DoW advised that the FMP is to read Interim FMP for the Structure Plan application and that there will be a subdivisional condition requirement for a finalised FMP to be prepared and implemented.

3 DEVELOPMENT OF THE PLAN

3.1 Preparation of the Plan

All major stakeholders were consulted in the preparation of the original Interim FMP (TME 2011). The following is a summary of the stakeholders and their comments:

Department of Water (DoW)

Liaisons with the Department indicated that the points listed below should be considered in the preparation of the interim FMP:

- Foreshore protection reserve is ceded free of cost;
- 1:100 ARI flood levels are identified;
- Identification of any wetlands associated with Preston River;
- Acid sulphate soil (ASS) management, if applicable;
- Restoration and/or revegetation of foreshore;
- Weed management of foreshore;
- Bank stability and erosion control, where relevant;
- Fencing and retaining walls, if applicable;
- Parking, where relevant;
- Sign posting;
- Crossovers, if applicable;
- Pedestrian access located and constructed to complement the natural landforms and environment of the area.The construction and utilisation of the paths will not be detrimental to the susceptibility of erosion;
- Community recreational infrastructure;
- Fire protection measures;
- Stormwater management, especially the interface with Foreshore Reserve;
- Foreshore Reserve maintenance and monitoring schedule; and
- Ownership and responsibilities of the Foreshore Reserve determined.

Department of Environment and Conservation (DEC)

DoW liaised with DEC on TME's behalf. DoW reported that DEC had no requirement for consultation in the preparation of the Interim FMP because the subject area currently has only a small area of existing significant environmental values other than the Preston River ecosystem, which DoW will advise upon. During the preparation and approval of the Interim FMP DoW will consult DEC on any relevant issues, if applicable.

Shire of Donnybrook-Balingup (the Shire)

The Shire provided the following advice:

- Revegetation of relevant areas to be undertaken as per Department of Water and Fire and Emergency Service Authority (FESA) recommendations;
- FESA should be contacted for advice on fire management planning;
- DEC and DoW should be contacted for advice on rehabilitation programme;
- Drainage infrastructure to be outside of the Foreshore Reserve;
- Treatment of all stormwater runoff and discharges to the Foreshore Reserve to meet agreed volumes, flow rates and quality;
- All private lots abutting the Foreshore Reserve are to be fenced with open style fencing to facilitate passive surveillance;
- If retaining walls are necessary, the engineering details are to be provided to the Shire prior to Construction;
- No barbeques can be installed, however benches are acceptable;
- There should be connectivity of the path network to the north, south and Kelly Road, linking to other established and proposed paths in the vicinity;
- Paths are to be cement stabilised limestone;
- The concrete pathway over the gully floor is not to be grey, i.e. the use of cream cement or another colour approved by the Shire; and
- The Shire will seek vesting of the Foreshore Reserve.

Fire and Emergency Service Authority (FESA)

FESA provided the following advice:

- There is no requirement for a fire management plan to be prepared;
- Access to the Foreshore Reserve and proposed Structure Plan development will need to comply with Planning for Bushfire Protection (AS3.4.3); and
- The Structure Plan development area will need to be serviced with reticulated water supplies and fire hydrants in accordance with Planning for Bushfire Protection (AS3.5.1 and 3.5.2).

Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Water and Environmental Regulation (DWER) (2019)

As additional minor updates were proposed to the original Structure Plan layout in 2019 comment was sought from DBCA and DWER in the Interim FMP. Advise received from DBCA and DWER was related to revegetation and weed management. A Revised Interim FMP was prepared to incorporate these comments.

4 INTERIM AIM AND OBJECTIVES

4.1 Aim

The aim of the Revised Interim FMP is:

To prepare recommendations for the development and implementation of an Interim Foreshore Management Plan to ensure the protection and long-term conservation of the Preston River's water quality and foreshore area, including riparian vegetation and ecological functions. Further provide recommendations on controlled public access and interaction with the Preston River and associated foreshore area.

4.2 Objectives

The objectives for the Interim FMP were derived from the consultations with key stakeholders and from the detailed site investigations. The objectives for the Foreshore Reserve and Interim FMP are:

General

- Provide mechanisms and strategies to ensure that control of weeds, mosquitoes and fire that are consistent with Interim FMP's aim and objectives;
- Provide clear demarcation of the Foreshore Reserve where it abuts private lots;
- Incorporate sensitive fire management controls within the Foreshore Reserve areas; and
- Through raising awareness of the Foreshore Reserve's values within the Structure Plan development and Shire residents, encourage their participation in the long-term management.

Conservation

- Maintain and enhance the native flora extent and condition;
- Enhance and protect the native fauna habitat values within the Foreshore Reserve;
- Minimise any development disturbances; and
- Provide mechanisms and strategies for the effective and timely rehabilitation of the Preston River foreshore within the subject land.

Drainage

- Incorporate best management practices to treat and manage stormwater and runoff generated within the Foreshore Reserve, and land abutting;
- Provide best management practices to treat and manage stormwater that is generated within the Structure Plan area that discharges and/or runs off into the Foreshore Reserve; and
- Treat all minor stormwater runoff for sediments, nutrients and other contaminants prior to entering the Foreshore Reserve.

Recreation and Public Access

- Provide recreational and public access opportunities that are compatible and complement the aforementioned general and conservation objectives;
- Enhance the recreational, aesthetic and social values of the development and Donnybrook through all the objectives listed and locality where necessary; and

- POS abutting the Foreshore Reserve and within the Structure Plan development area to complement the recreational, aesthetic, social and environmental values that are objectives of the Foreshore Reserve

5 BIOPHYSICAL FEATURES OF THE STUDY AREA

5.1 Physical Description

The five dominant landforms within the foreshore study area are the:

1. Riverside Upland;
2. Floodplain, including the river bank;
3. Steep Embankment;
4. Gully; and
5. Structure Plan Development Area (outside of the Foreshore Reserve).

The **RIVERSIDE UPLAND** area is described as the land west of Kelly Road to the point where the land slopes down to the river. The soil is generally a sandy clay or clayey loam. The land is predominately cleared and the dominant vegetation is pasture grasses, with the occasional Eucalyptus along the road reserve. There is a small stand of *Chamaecytisus palmensis* (Tagasaste) in a pile of rocks in the north-west corner. There is currently little ecological value present in this landform.

Numerous introduced and pasture grasses were observed, however the weed species identified include:

- *Arundo donax* (False Bamboo);
- *Rosa spp.* (Wild Rose);
- *Ficus spp.* (Fig);
- *Lonicera japonica* (Japanese Honeysuckle);
- *Pennisetum clandestinum* (Kikuyu);
- *Cynodon dactylon* (Couch);
- *Rumex spp.* (Dock);
- *Avena fatua* (Wild Oat);
- *Salix spp.* (Willow);
- *Solanum nigrum* (Black Berry Nightshade); and
- *Watsonia spp.*

The **STEEP EMBANKMENT** is described as the steep slopes (up to 20%) that connect the two aforementioned landforms. The soil is generally a clayey loamy with alluvial deposits. The area is covered in a dense vegetative cover of pasture grasses. No signs of erosion were observed across the embankment.

The **GULLY** intersects the previous embankment landform. The gully transports water from the south western portion of the Structure Plan area and existing residential lots outside of the development area. The gully is densely covered with pasture grasses, and no signs of erosion were identified. The gully does not have a defined channel at the base. The gully discharges flows onto the river's floodplain and has a confluence with the Preston River's main channel.

The **STRUCTURE PLAN DEVELOPMENT AREA** is described as that subject land outside of the Foreshore Reserve. Predominantly this land has surface flows that are directed towards the Preston River. Predominately the land is covered by pasture grasses with a scattering of mature Eucalypt trees. The north western part of the land is relatively flat, and then rises up to approximately 5% slopes in the south western corner. Two gullies intersect the eastern part and there are constructed dams along their courses. Agricultural and rural land surface water flows from outside of the subject land enter the subject land gullies in the west.

5.2 Wetlands

No wetlands or associated vegetation types were identified within the subject land.

5.3 Drainage

The majority of water generated on the adjoining Structure Plan development land currently infiltrates into the soil or flows along natural and constructed gullies. There is ground and surface water movement from the subject land to the Preston River floodplain.

The Preston River is adjacent to the western boundary of the subject land. The river flows in a northern direction along the length of the subject land.

6 MANAGEMENT ISSUES

The consultation with key stakeholders, detailed site inspections and Foreshore Reserve objectives the follow issues have been identified as the key management issues that require addressing in the preparation and implementation of the Revised Interim FMP.

1. Foreshore rehabilitation and maintenance
2. Weed Control
3. Protection of native fauna habitat values
4. Control of public access
5. Dumping of rubbish
6. Fire control
7. Drainage
8. Public involvement and management
9. Creation of a Foreshore Reserve

A summary of the issues follow. The management recommendations for each of these issues are detailed in Section 7.

6.1 Foreshore rehabilitation and maintenance

The Preston River's foreshore has significantly been impacted upon by previous agricultural practices, weeds and vehicle tracks. This has led to the complete removal of native vegetation over the majority of the study area, except for a narrow vegetated strip along the river. The river's banks are relatively stable due to the native vegetation cover and density; however, weeds are present.

The embankment down to the foreshore present limits on the machinery type and their uses.

The management issues discussed in the following sections, and the success in managing the issue, will largely determine the rehabilitation and long-term maintenance success.

Revegetation should be carried out by infill planting to a success criteria of 80% vegetation cover, at the end of the five year period. Completion when no more than 10% weed cover has been achieved.

Refer to Appendix 2 for a schedule of weed management and revegetation.

Pest control, such as preventing browsing by kangaroos and/or rabbits, is likely to be required to achieve successful revegetation and should be included in the preparation, monitoring and additional controls, as necessary. Pest control management is to be included in the annual monitoring and reporting of results for vegetation success, to the responsible authority.

6.2 Weed control

Within the foreshore area there are no native plant communities that have not been invaded by introduced weeds. The weed burden over most of the area is heavy and will take considerable effort to control. While the remnant native vegetation is showing some signs of resilience currently

to weed invasion, any type of disturbance is likely to greatly increase the risk of weed infestations in this area. In the foreshore area the removal or control of weeds must be completed with great care, and that erosion control function of the weeds is considered in any weed management strategies. Outlined below are recommended management control practices for the major weeds present within the study area.

Weed control should be carried out over a 5 year period with targets of no more than 10% weed coverage within vegetated areas (see Appendix 2). Weed control within the proposed revegetation area must be undertaken before any planting works begin. This would involve a more thorough weed control program in spring and autumn prior to first planting efforts in the following planting season.

Soursob (*Oxalis pes-carpe*)

Soursob is difficult to eradicate unless control methods are well timed and persistent over several years. The plant must be attacked at a critical stage in its life cycle called the old bulb exhaustion stage. This is when the food material of the old bulb is exhausted, and the new bulb is not sufficiently developed to survive. Unfortunately, this stage cannot be determined by looking at the aerial growth, only by digging up plants and inspecting the bulbs. Manual removal of the plants is not recommended, as it will most likely lead to spreading of the weed. Chemical control of Soursob is often the most practical option available for dense infestations in bushland.

False Bamboo (*Arundo donax*)

False Bamboo is an aggressive species with rapid growth rates. Growth can be suppressed by repeated mowing or tillage and removal of material from site; however the key to eradicating infestations is killing the root and rhizome mass. Small infestations can be physically controlled ensuring all rhizomes are removed. In larger infestations, use foliar or cut-stump applications of aquatic approved herbicide (Round- up Biactive). Chemical control is most effective in late summer/early autumn. Careful timing of mechanical control and treatment of cut material can minimise or inhibit sprouting. A single 3% to 5% glyphosate foliar application late in the season has been effective at killing stems and stopping production of new stems the following spring. As spread tends to occur downstream, the best control approach is to start upstream and work downwards.

Wild Oat (*Avena fatua*)

A highly competitive species that matures rapidly and starts to sheds prolific seeds early in their life. Spray at 3-5 leaf stage with Fusilade Forte at 16 ml/10 L + wetting agent. Repeat treatment over following 2 years. Prevent seed production and seed bank inputs each year. In small infestations hand removal may be feasible.

Exotic Grasses (Kikuyu, Winter Grass and Couch)

Kikuyu, winter and couch grass has spread from surrounding gardens and pasture, and have replaced, in areas, the majority of understorey vegetation. Management of these grasses will be ongoing. Options to manage these grasses include spraying, slashing and burning. Due to the lay of the land the most applicable method will be a combination of spraying and slashing. Replanting the controlled areas with native vegetation should assist in controlling the re-establishment of the grasses after treatments. Following initial treatment, a range of other options may need to be investigated by the Shire and DBCA.

6.3 Protection of native fauna habitat values

The current study area potentially hosts a range of fauna species. Protection and where possible, enhancement of the different habitats within the Foreshore Reserve is necessary for the continued support of current native fauna and provide habitat colonisation for surrounding native fauna.

6.4 Control of public access

The public is currently denied access to the foreshore area as it is a fenced and on a working farm. The proposed Structure Plan development will increase access to the foreshore during construction and post establishment.

Dumping of rubbish

Dumping of rubbish is currently limited because it is on private property. However, as noted above, once public access is increased the potential for rubbish dumping, including garden refuse, will become an issue that will require managing.

6.5 Fire control

The Preston River foreshore is at considerable risk from fires that start within the study area and subject land because of the high fuel loads present and areas of remnant vegetation presently on the land. There are some tracks that currently double as effective firebreaks, however permanent and regularly maintained dedicated tracks will be required to protect the Foreshore Reserve and Structure Plan development area. The location of residential houses at the top of the embankment will require careful consideration in regard to appropriate species selection to the risks of fire impacts and ignition.

6.6 Drainage

Drainage from new proposed residential areas will need to be managed to protect ecological functions and values of the Preston River foreshore. The Local Water Management Strategy for the subject land has stated that the objectives for the 1:1 ARI stormwater event best management practices is to treat all impervious surface water runoff from the development and protect ecological functions of nearby ecosystems.

6.7 Public involvement and management

Currently there is no community based management group that is specifically established to assist in the management of the Preston River foreshore on the subject land. Such groups can be instrumental in implementing local projects and assisting government agencies in the management of environmentally sensitive areas. There is active river management in the greater catchment, which can provide a model of cooperative assistance.

The developer would be encouraged to liaise and be involved in catchment wide management activities to ensure that any work carried out within the Foreshore Reserve complemented the

aims and objectives for the surrounding Preston River area. The proximity of the development to the existing townsite of Donnybrook should provide great opportunities for the developer to involve the public in any management strategies.

6.8 Creation of a Foreshore Reserve

A reserve needs to be created and ceded for the foreshore land to afford it long-term protection. A vesting authority is also needed to maintain the Foreshore Reserve after the developer's maintenance period is complete.

7 INTERIM RECOMMENDATIONS AND COMMITMENTS

The following are the recommendations to manage the area identified as the Foreshore Reserve within the Lot 108 Kelly Road Structure Plan development area. It includes developer commitments to implement various components of the Revised Interim FMP and a number of recommendations that relate to long-term actions to be progressed by the agencies responsible for management of the Foreshore Reserve, and any relevant community groups/landowners. Following each recommendation, in bold brackets, is the responsible authority for implementation. Each of the recommendations and actions are depicted within the Figure 2 map. The symbols used are listed as follows:

- **Developer (D)**
- **Shire of Donnybrook-Balingup (S)**

7.1 Land Use Management

R1. Uniform open style fencing to be constructed along the boundary of the private lots that abut the Foreshore Reserve. This will assist with lot demarcation between private and public areas. Where necessary retaining walls will be constructed with an open style fence on top. **(D)**

R2. Any non-essential infrastructure in the Foreshore Reserve to be removed, e.g. unnecessary fencing. **(D)**

R3. All existing paths to be ripped and revegetated. **(D)**

R4. Construction of a 2 metre wide limestone Dual Use Path (DUP) along the boundary between the private residential lots and the Foreshore Reserve. The DUP is to have 1 metre shoulders. The path will connect to other paths within POS areas and road reserves that are part of the Structure Plan. The path alignment and extent will facilitate future extensions to the north and south of the Structure Plan area. Public access to the main river channel will be limited with no paths constructed to its edge. The path will have a 2% slope across its width to facilitate drainage and will sit outside the 1:100 ARI flood area, except for where it crosses the gully.

R5. Construction of the path across the gully will be in concrete and it will not be grey in colour. The colour will be approved by the Shire. Culverts may be added, if needed, once engineering design for the site is finalised. **(D for 5 years)**

R6. Maintenance of Foreshore Reserve path system after 5 years. **(S)**

R7. All sections not revegetated or part of the path system will be left as grassed areas. There will be no formal lawn areas and no fertiliser will be applied. These grassed areas will be slashed as necessary. **(D first 5 years. S ongoing)**

R8. All vehicles, other than those needed for maintenance or fire control will be excluded from the Foreshore Reserve using appropriate fencing, bollards or other similar barriers. **(D)**

7.2 Environmental

R9. Initial weed control programme for a period of 5 years to achieve less than 10% weed cover in vegetated areas. All weed species to be controlled outside of the main river channel. Introduced grasses along the main river channel will require a control programme that ensures that their functions to stabilise banks are replaced prior to their removal. Refer to Appendix 2 for weed management schedule (D)

R10. Initial intensive revegetation along a 30m wide band from the top of the Preston River bank, or until the low fuel zone is reached, whichever is the lesser. Planting is to be done predominately by seedlings at an average density of 5000 stems per hectare, where native vegetation is absent. Target completion density is 80% vegetation cover, at the end of the five year period. A mixture of trees, shrubs and groundcovers will be used. The species will be predominately taken from the list provided in Appendix 1. Revegetation will begin once adequate weed control is achieved. In the area of dense vegetation along the river, spot planting will be undertaken in areas where weeds are removed. Refer to Appendix 2 for revegetation schedule (D)

7.3 Fire Control

The interface between the residential development and the riparian revegetation has been designed to account for fire management measures and principles as contained in Planning for Bushfire Protection. A Bushfire Management Plan has been prepared (Lush Fire and Planning 2019).

R11. Areas not revegetated or containing native vegetation will be slashed in spring and/or on a need basis. **(D first 5 years, S ongoing)**

R12. The Dual Use Path (DUP) will be constructed to allow for access by a “fast attack” fire vehicle, i.e. a utility 4WD with a 900L slip on fire unit. **(D)**

R13. Access points to the Foreshore Reserve via the DUP will be installed off Kelly Road for fire and other emergency vehicles. The DUP can also potentially link through to Bridge Street. **(D)**

R14. A low fuel zone of at least 20m from residential lot boundaries will be constructed. This will be planted with trees at spacing of no denser than 1 tree per 20m^2. The understorey will compromise of the current pasture species. The understorey is to be slashed annually in spring before the commencement of the fire season. **(D first 5 years, S ongoing)**

R15. All residential lots will be required to be maintained in a low fuel state in accordance with Council’s Firebreak Order. **(D)**

R16. Fire hydrants will be installed along Kelly Road as per Planning for Bushfire Protection AS3.5.1 and 3.5.2. **(D)**

7.4 Drainage Control

R17. All stormwater runoff up to and including the 1:1 ARI events from the Structure Plan development will be treated in biofiltration systems to remove nutrients, sediments and other contaminants prior to discharging into the Foreshore Reserve. **(D)**

R18. All stormwater runoff up to and including the 1:5 ARI events from the Structure Plan development will be diverted to detention basins to slow water discharges to pre-

development flows. No stormwater infrastructure will be located within the Foreshore Reserve. **(D)**

R19. Ongoing maintenance of the stormwater treatment systems will be undertaken to continue management of flows into the Foreshore Reserve. **(D during construction and negotiated maintenance period, S after this period)**

7.5 Reserve Creation

R20. A Foreshore Reserve is to be ceded free of cost as part of the subdivision. **(D)**

R21. The Shire of Donnybrook – Balingup is to take vesting of the Foreshore Reserve after the 5 year maintenance period. **(S)**

8 INTERIM IMPLEMENTATION

8.1 Funding and Management Responsibilities

The developer is committed to a 5 year rehabilitation, maintenance and monitoring programme agreement for the Foreshore Reserve. The developer's commitment to the programme will commence at the formal creation of the Foreshore Reserve at the subdivision subject to approval stage. The Revised Interim FMP recommendations and commitments (Section 7) outlines the responsibilities and limitations for the developer in regard to the Foreshore Reserve.

The developer's maintenance responsibilities do not any include standard maintenance arrangements that may be negotiated as part of other engineering works that are beyond the scope and influence of the Revised Interim FMP.

After the 5 year developer responsibility period lapses, the Shire will assume responsibility for the Foreshore Reserve's ongoing maintenance, rehabilitation and replanting. The Shire has identified they will take vesting of this Foreshore Reserve and be the management authority.

Community input is desirable to complete the preparation and implementation of the finalised Foreshore Management Plan. The involvement of the community would assist to establish a sense of responsibility and achievement for the local community in the management of the Preston River Foreshore Reserve. The community participation at the preparation and implementation stages of the FMP will determine any recommendations to the Shire in regard to engaging the community in the ongoing management of the Foreshore Reserve.

8.2 Interim Implementation Schedule

Upon finalised delineation of the Foreshore Reserve boundary the recommendations developed in the Revised Interim FMP will be implemented in two stages.

Stage One will involve all the construction and implementation works required at the time of land subdivision, which adjoins the Foreshore Reserve. These works will also include weed control and planting.

Stage Two involves the monitoring and maintenance of the Foreshore Reserve. The developer will be the predominant responsible authority for the first 5 years of the Foreshore Reserve. The Shire will be the responsible authority after this 5 year period.

The Dual Use Path and fencing will be constructed in conjunction with the creation of the residential lots that border the Foreshore Reserve.

The schedule of the establishment, maintenance and monitoring programme is dependent on seasonal requirements, particularly in regard to; the staging of the subdivision; the path construction; weed spraying; and revegetation planting. Appendix 2 provides an interim implementation schedule for the Foreshore Reserve.

9 REVIEW OF INTERIM FMP

This Revised Interim FMP has been prepared to satisfy the Shire request for a FMP to support the scheme amendment's rezoning of Lot 108 Kelly Road, Donnybrook. Liaison with the Department of Water concluded that at the Structure Plan stage particular aspects of the FMP, including the alignment and extent of the Foreshore Reserve, could not be finalised until more detailed planning designs are produced at the subdivision stages. Therefore, this FMP will only be classified as interim. There will be a requirement to finalise the FMP as a condition of subdivision.

At the subdivision stage further investigations of the Foreshore Reserve management may include:

- A detailed assessment to improve the accuracy of the 1:100 flood lines and to subsequently ensure that the Foreshore Reserve protects the residential development from any possible flood damage arising from the Preston River.
- Ensuring that a 30m vegetated strip (or up to the low fuel zone, whichever is lesser) from the banks of the Preston River are incorporated into the Foreshore Reserve.
- Further details of the water sensitive urban designs within the development to ensure protection of the water resources and environment within the Foreshore Reserve.
- Finalise the alignment and extent of the Foreshore Reserve, and boundary with the adjoining residential and POS lots.
- Any management guidelines, e.g. particular weed control methods, and infrastructure placement to be defined.

Aspects of the finalised Foreshore Management Plan are likely to require periodical review upon the completion of the subdivision construction within the study area after five years. Modification to the finalised FMP shall be the responsibility of the responsible authority in which the Foreshore Reserve is vested. Upon any review, consultation with the landowners within the study area and adjacent developments is recommended.

10 REFERENCES

Chester E.T. and Klemm V.V. (1990). Draft Integrated Mosquito Control Strategy for the Leschenault Estuary Region, Western Australia. Waterways Commission, Perth WA

Lush Fire and Planning (2019). Lot 9500 Kelly Road Donnybrook, Bushfire Management Plan, (Structure Plan - Subdivision Application).

Pen L.J. (1993). Fringing Vegetation of the Lower Collie and Brunswick Rivers 1992. Waterways Commission, Perth WA.

Thompson McRobert Edgeloe. (2000). Treendale Foreshore Management Plan Report.

Water and Rivers Commission and Leschenault Inlet management Authority. (1997). Northern Leschenault Estuary Foreshore Management Plan. Water and Rivers Commission and Leschenault Inlet management Authority, Water Resources Management Series Report WRM 2.

Appendix 1: Recommended Plant Species List Along Study Area of Preston River

RIVER CHANNEL AND FLOODWAY		
HABIT	**SPECIES**	**COMMON NAME**
TREE	*Eucalyptus rudis*	Flooded Gum
TREE	*Eucalyptus patens*	Blackbutt
TREE	*Melaleuca rhaphiophylla*	Swamp Paperbark
TREE/SHRUB	*Taxandria linearifolia*	
SHRUB/TREE	*Melaleuca incana*	Golden Honeymyrtle
SHRUB	*Astartea fascicularis*	
SHRUB	*Viminaria juncea*	Swishbush
SHRUB	*Callistachys lanceolata*	Native Willow
SHRUB	*Grevillea diversifolia*	Variable-leaved Grevillea
RUSH	*Ficinia nodosa*	Knotted Club Rush
RUSH	*Juncus kraussii*	Sea Rush
RUSH	*Juncus pallidus*	Pale Rush
RUSH	*Juncus pauciflorus*	Loose Flower Rush
RUSH	*Juncus subsecundus*	Finger Rush
SEDGE	*Carex appressa*	Tall Sedge
SEDGE	*Lepidosperma tetraquetrum*	Sedge

FLOODPLAIN		
HABIT	**SPECIES**	**COMMON NAME**
TREE	*Agonis flexuosa var.*	Peppermint
TREE	*Banksia littoralis*	Swamp Banksia
TREE	*Corymbia calophylla*	Marri
TREE	*Eucalyptus rudis*	Flooded Gum
TREE	*Eucalyptus patens*	Blackbutt
TREE	*Melaleuca preissiana*	Moonah
TREE	*Melaleuca rhaphiophylla*	Swamp Paperbark
TREE/SHRUB	*Taxandria linearifolia*	
SHRUB/TREE	*Banksia seminuda*	River Banksia
SHRUB/TREE	*Melaleuca incana*	Golden Honeymyrtle
SHRUB	*Astartea fascicularis*	
SHRUB	*Chorizema ilicifolium*	Holly Flame Pea
SHRUB	*Hakea varia*	Variable-leaved Hakea
SHRUB	*Viminaria juncea*	Swishbush

FLOODPLAIN		
RUSH	*Juncus pallidus*	Pale Rush
RUSH	*Juncus pauciflorus*	Loose Flower Rush
RUSH	*Juncus subsecundus*	Finger Rush
SEDGE	*Lepidospermum effusum*	Spreading Sword-sedge
SEDGE	*Baumea riparia*	
SEDGE	*Baumea vaginalis*	Sheath Twigrush
CREEPER	*Hardenbergia comptoniana*	Native Wisteria

UPLAND AND EMBANKMENT		
HABIT	**SPECIES**	**COMMON NAME**
TREE	*Agonis flexuosa var. flexuosa*	Peppermint
TREE	*Corymbia calophylla*	Marri
TREE	*Eucalyptus marginata*	Jarrah
TREE	*Banksia attenuata*	Slender Banksia (NOTE: only suitable if soils are sandy)
TREE	*Banksia grandis*	Bull Banksia
TREE-LIKE	*Xanthorrhoea preissii*	Grass Tree
TREE (CYCAD)	*Macrozamia riedlei*	Zamia
SHRUB	*Acacia pulchella*	Prickly Moses
SHRUB	*Boronia megastigma*	Scented Boronia
SHRUB	*Bossiaea aquifolium*	Water Bush
SHRUB	*Hakea varia*	Variable-leaved Hakea
SHRUB	*Hemiandra pungens*	Snakebush
SHRUB	*Hibbertia stellaris*	Orange Stars
SHRUB	*Hovea trisperma*	Common Hovea
SHRUB	*Hypocalymma robustum*	Swan River Myrtle
SHRUB	*Kennedia prostrata*	Scarlet Runner
SHRUB	*Pultenaea skinneri*	Skinner's Pea
CREEPER	*Hardenbergia comptoniana*	Native Wisteria

Additional species that may be planted in the UPLAND AND EMBANKMENT section:

Acacia extensa, Allocasuarina fraseriana, Acacia pulchella, Bossiaea linophylla, Bossiaea ornate, Calothamnus sanguines, Eucalyptus marginata, Grevillea trifida, Hakea amplexicaulis, Hakea lissocarpha, Hibbertia hypericoides, Hovea elliptica, Hakea ruscifolia, Lepidosperma squamata, Mesomelaena tetragona, Orthrozanthus laxus, Patersonia umbrosa, Taxandria parviceps, Tetraria capillaris, Xanthorrhoea gracilis, Xylomelum occidentale

Appendix 2: Implementation Schedule for the Preston River Foreshore Reserve

Period	Weed Control		Planting	Monitoring		Retaining wall / Fencing / stock removal	Infrastructure / Rubbish removal	Slashing	Pathways
	Control of summer active weed species	**Control of winter active weed species**		**Monitoring of weed control**	**Monitoring of vegetation success**				
Period 1 (Year 1: Jan - Apr)	Spray summer active species with herbicides, focusing on periods of active growth after rainfall.			Monitor success of summer active species weed control. Utilise information to improve spray program if necessary.			Removal of stock loading ramp and old fences if necessary and any rubbish throughout reserve.		Installation of limestone paths
Period 2 (Year 1: May - Aug)		Spray winter active species with herbicides, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	Phase 1 Planting: Plant into areas that have achieved adequate weed control once winter rains have raised soil moisture levels to sufficient levels. (Limited planting in first year)	Monitor success of winter active species weed control. Utilise information to improve spray program if necessary.		Removal of stock from reserve area prior to planting			
Period 3 (Year 1: Sep - Dec)	Spray summer active species with herbicides, focusing on periods of active growth after rainfall.	Spray winter active species with appropriate herbicide prior to spring weed species seed set.		Monitor success of winter active species weed control. Utilise information to improve spray program if necessary.	Monitor success of stage 1 planting program. Utilise information to improve planting program if necessary.			Slash all areas not covered by native vegetation , current revegetation or future revegetation	
Period 4 (Year 2: Jan - Apr)	Spray summer active species with herbicides, focusing on periods of active growth after rainfall.			Monitor success of summer active species weed control. Utilise information to improve spray program if necessary.	Monitor success of stage 1 planting program. Utilise information to improve planting program if necessary.				
Period 5 (Year 2: May - Aug)		Spray winter active species with herbicides, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	Phase 2 Planting: Plant into areas that have achieved adequate weed control once winter rains have raised soil moisture levels to sufficient levels.	Monitor success of winter active species weed control. Utilise information to improve spray program if necessary.	Monitor success of stage 1 planting program. Utilise information to improve planting program if necessary.				
Period 6 (Year 2: Sep - Dec)	Spray summer active species with herbicides, focusing on periods of active growth after rainfall.	Spray winter active species with appropriate herbicide prior to spring weed species seed set.		Monitor success of winter active species weed control. Utilise information to improve spray program if necessary.	Monitor success of stage 1 and 2 planting program.		Monitor to determine if new rubbish has been dumped and remove any waste.	Slash all areas not covered by native vegetation , current revegetation or future revegetation	Monitoring of path condition and repair as necessary
Period 7 (Year 3: Jan - Apr)	Spray summer active species with herbicides, focusing on periods of active growth after rainfall.				Monitor success of stage 1 and 2 planting program.				
Period 8 (Year 3: May-Aug)		Spray winter active species with herbicides, focusing on periods of active growth after winter	Phase 3 Planting: Plant into areas that had the heaviest original weed burden and have now	Monitor success of winter active species weed	Monitor success of stage 1 and 2 planting program.				

Period	Weed Control		Planting	Monitoring		Retaining wall / Fencing / stock removal	Infrastructure / Rubbish removal	Slashing	Pathways
	Control of summer active weed species	**Control of winter active weed species**		**Monitoring of weed control**	**Monitoring of vegetation success**				
		rainfall has encouraged adequate germination.	achieved adequate weed control, once winter rains have raised soil moisture levels to sufficient levels.	control. Respray if necessary	Replant if necessary.				
Period 9 (Year 3: Sep - Dec)	If monitoring shows it is necessary, spray summer active species with herbicides, focusing on periods of active growth after rainfall.	Spray winter active species with appropriate herbicide prior to spring weed species seed set.		Monitor success of winter active species weed control. Respray if necessary	Monitor success of stage 1 and 2 planting program.			Ongoing slashing by RA	
Period 10 (Year 4: Jan - Apr)	If monitoring shows it is necessary, spray summer active species with herbicides, focusing on periods of active growth after rainfall.				Monitor success of stage 1 and 2 planting program.				
Period 11 (Year 4: May-Aug)		If monitoring show it is necessary, spray winter active species with herbicides, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	If monitoring shows it to be necessary, plant into areas that have lower than desired survival, once winter rains have raised soil moisture levels to sufficient levels.	Monitor success of winter active species weed control. Respray if necessary	Monitor success of stage 1 and 2 planting program. Replant if necessary.				
Period 12 (Year 4: Sep - Dec)	If monitoring shows it is necessary, spray summer active species with herbicides, focusing on periods of active growth after rainfall.	If monitoring shows it is necessary, spray winter active species with appropriate herbicide prior to spring weed species seed set.		Monitor success of winter active species weed control. Respray if necessary	Monitor success of stage 1 and 2 planting program.			Ongoing slashing by RA	
Period 13 (Year5: Jan - Apr)	If monitoring shows it is necessary, spray summer active species with herbicides, focusing on periods of active growth after rainfall.				Monitor success of stage 1 and 2 planting program.				
Period 14 (Year 5: May-Aug)		If monitoring show it is necessary, spray winter active species with herbicides, focusing on periods of active growth after winter rainfall has encouraged adequate germination.	If monitoring shows it to be necessary, plant into areas that have lower than desired survival, once winter rains have raised soil moisture levels to sufficient levels.	Monitor success of winter active species weed control. Respray if necessary	Monitor success of stage 1 and 2 planting program. Replant if necessary.				
Period 15 (Year 5: Sep - Dec)	If monitoring shows it is necessary, spray summer active species with herbicides, focusing on periods of active growth after rainfall.	If monitoring shows it is necessary, spray winter active species with appropriate herbicide prior to spring weed species seed set.		Monitor success of winter active species weed control. Respray if necessary	Monitor success of stage 1 and 2 planting program.	Retaining wall and associated fence to be installed before sale of effected lots. This may be during or after the 5 year period of the management plan but to be undertaken by developer.	Monitor to determine if new rubbish has been dumped and remove any waste.	Ongoing slashing by RA	Monitoring of path condition and repair as necessary

Period	Weed Control		Planting	Monitoring		Retaining wall / Fencing / stock removal	Infrastructure / Rubbish removal	Slashing	Pathways
	Control of summer active weed species	Control of winter active weed species		Monitoring of weed control	Monitoring of vegetation success				
Ongoing by Responsible Authority	Weed control as deemed necessary		Revegetate as deemed necessary	Revegetate as deemed necessary		Repair fencing as necessary	Remove rubbish as necessary	Ongoing slashing by RA	Ongoing monitoring and repair of path system (RA)

Appropriate herbicides will be used in all instances, eg Roundup Biactive and other approved chemicals will only be used next to waterways and wetlands. 2,2DPA (propon) will be used to control Watsonia.

Weed control is considered adequate if the weeds are in numbers low enough that they are currently not affecting the success of the revegetation and it can be reasonably expected that they won't in the foreseeable future. This is generally when no more than 10% weed cover has been achieved.

Monitoring to use a 'quadrant' method and include both a 'best' and 'worst' site. A quadrant of 4 meters squared must include an adequate density of healthy understorey and overstorey plants.(at least one overstorey and 2 understorey plants per quadrant)

Revegetation success criteria is 80% vegetation cover.

Pest control management is to be included in the annual monitoring and reporting of results for vegetation success, to the responsible authority.

Appendix D

The Endorsed Local Water Management Strategy

Thompson McRobert Edgeloe

Kelly Road, Donnybrook

Local Water Management Strategy

08287
September 2009

Town Planning Management Engineering

DOCUMENT QUALITY CONTROL

AUTHOR	DATE
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REVISION TABLE

No.	PURPOSE	DATE

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CONTENTS

FIGURES

EXECUTIVE SUMMARY

The Kelly Rd Donnybrook Local Water Management Strategy (LWMS) articulates the range of management practices that are being considered for the proposed structure plan area. The objective of this LWMS is to detail how the development manages 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.

This strategy has been prepared to support a Town Planning Scheme Amendment in the Shire of Donnybrook Balingup for the land located on the north eastern edge of the existing Donnybrook townsite. It includes land east of the Preston River and both sides of Kelly Rd. The site is approximately 22.687ha in size and is owned by N Riising as described on Certificate of Title vol 1355 Fol 190. It is composed of Lot 108 Kelly Rd and the closed road reserve along the northern boundary of the site.

Since European settlement, much of the site has been extensively cleared and used for agricultural purposes. There are some areas of bushland remaining along the river itself and a scattering of remnant eucalyptus trees. There are no existing buildings on the site. A small gully dam has been constructed and is used as stock drinking water source.

The objective is to rezone the land from 'General Farming - Scenic' to 'Residential' with areas of the site reserved as 'Parks and Recreation' and a 'Foreshore Reserve' associated with the Preston River. There is also the possibility of a 3.76ha Lifestyle Village (Option A). Option B replaces the Lifestyle village with R20 lots.

The residential areas will mainly be at a R20 density with some R40 sites with lots. Option A would yield 184 lots and Option B 221 lots. There are large areas of public open space reflecting current drainage lines and as well as adequate buffers to the Preston River. These POS and Reserve areas maximise protection and enhancement of the river and existing ecological systems as well as a providing excellent opportunities for natural drainage passage and filtration. A Foreshore Management Plans is being developed for the Preston River which further articulates the management of this area.

This document has been compiled from the following reports. These reports should be referred to where more detail is sort.

- Kelly Rd Donnybrook Structure Plan.TME
- Lot 108 Kelly Rd Donnybrook Geotechnical Investigation. BGE
- Foreshore Management Plan for the Preston River, Kelly Rd Donnybrook. TME
- Drainage Management Strategy. TME

View from North West corner - looking back over site

Preston River

Gully leading to Preston River

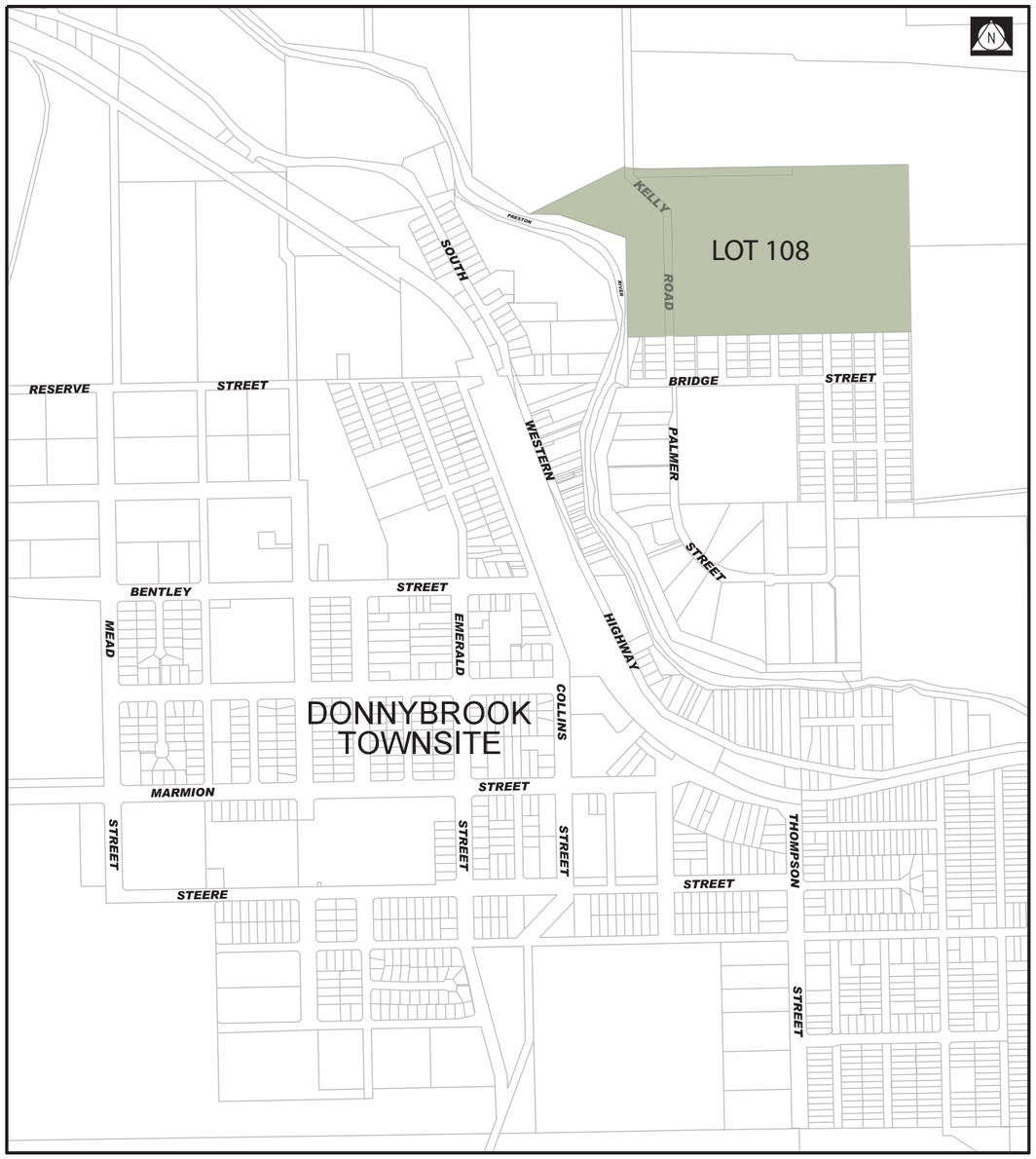


Figure 1 - Locality Plan

Bioretention Garden

Swale

Landscaping with native species

1. KEY ELEMENTS PLAN

Water management for the proposed Lot 108 Kelly Rd Donnybrook subdivision is based on best practice water sensitive urban design. This is achieved through maximising the sustainable use of water resources, working with and enhancing the existing ecological systems and managing stormwater to Department of Water guidelines.

The Kelly Rd structure plan area is located on the banks of the Preston River. It is also part of the Greater Leschenault catchment which flows into Leschenault Estuary and Koombana Bay. This LWMS details actions that will assist with protecting and enhancing these ecosystems through utilising best water management practices.

These management practices will be linked with community awareness raising programs to assist households to implement their own best practice at a lot scale.

Initiative Summary

Water Conservation

- Encouraging householders to install rainwater tanks for non-potable uses both inside and outside the dwellings;
- Encouraging the use of Waterwise fittings at construction;
- Option of Waterwise landscaping packages for new dwellings that include low water use gardens and soil amendments to minimise water and nutrient loss
- Minimising water use in Public Open Space through the use of low water use landscaping treatments, suitable vegetation, soil amendments and water efficient irrigation systems.
- Harvesting onsite stormwater to naturally irrigate landscaping features such as bioretention gardens and living stream vegetation.

Stormwater Management

- Implementing a drainage design that limits the peak outflow from the development to close to the pre-development levels through storage and infiltration on site, including utilising the existing dam and drainage lines;
- Designing swale systems that where possible mimic living streams, to clean and transport water through the development, while providing a link for the community to water within their local environment;
- Including swales and bioretention units in the road reserve and POS areas that store, treat and infiltrate the 1 in 1 year event
- Implementing a stormwater treatment train system that improves water quality to Department of Water targets for nitrogen, phosphorus and total suspended solids reduction through the use of soil amendments, infiltration swales, infiltration ponds and bioretention systems. This is backed by MUSIC modelling.

Groundwater Management

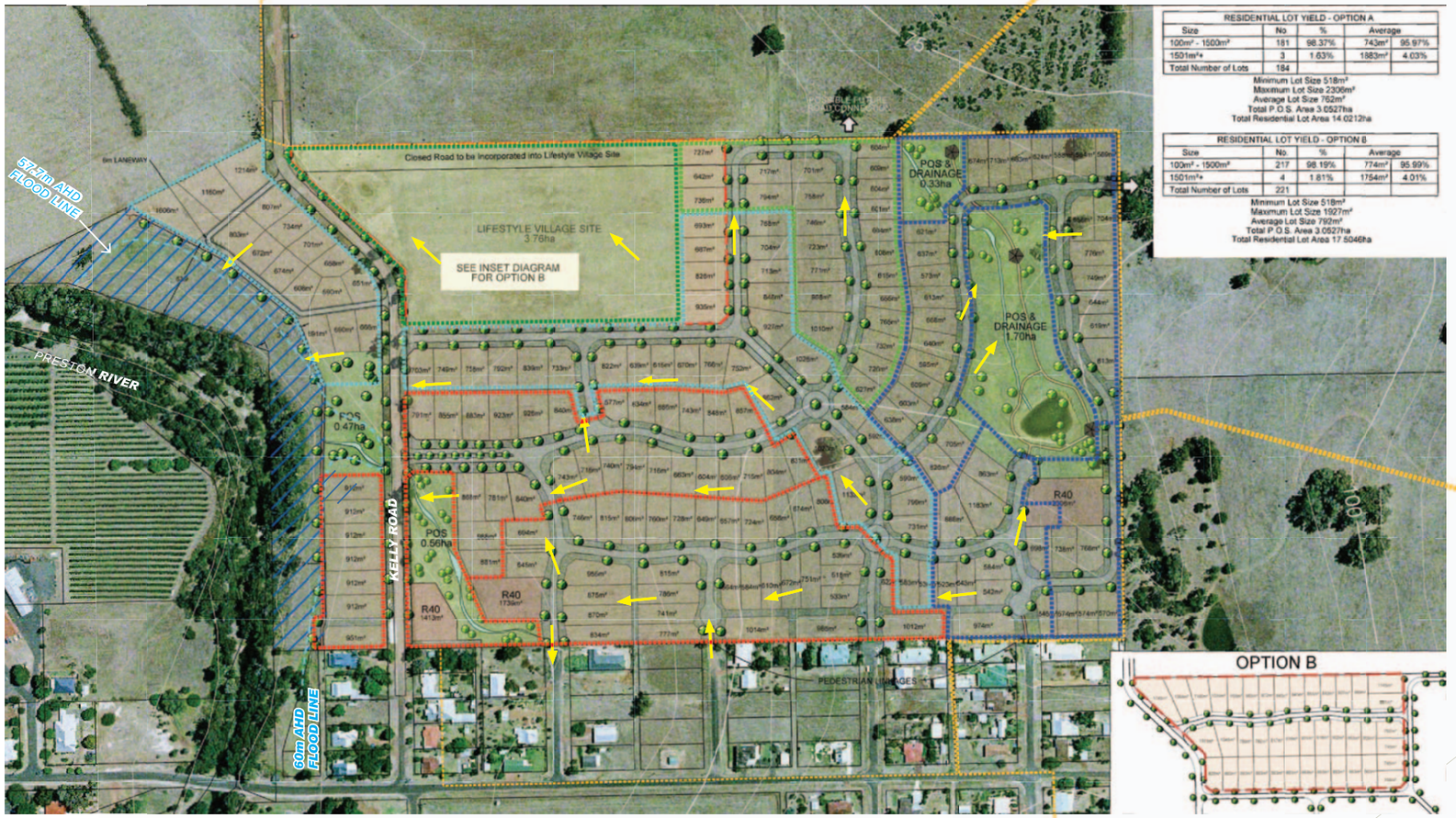
- Filling the site where necessary so that a 1.2m clearance is maintained between AAMGL and surface level on residential and commercial lots; and
- Monitoring of groundwater levels on the site for at least 2 winters to determine AAMGL.
- Installation of sub-surface drainage at the current AAMGL to stop groundwater rise above this level.
- Use of soil amelioration products and treatment of water prior to infiltration, to ensure surface water entering the groundwater is of a good quality.

River Management

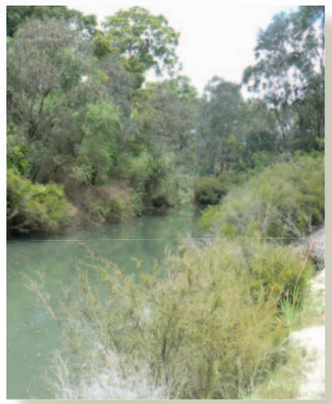
- Maintaining pre-development levels of flow into the Preston River and associated floodplain with good quality pre-treated water.
- Foreshore reserve along the river is to be created. A Foreshore Management Plan for this land will be developed and submitted as part of the Structure Planning process.

Living Stream

Rainwater tanks



Detention Basin in POS



Revegetation of Foreshore

Living Stream

Figure 2 - Key Elements Plan

2. ENVIRONMENTAL PLAN

Due to the absence of native vegetation over the majority of the site, an environmental report has not been undertaken at this time. Other than the Preston River, the only native vegetation is a scattering of mature eucalyptus trees. The rest of the site is cleared agricultural pasture.

The Preston River borders the site on the western edge, with a small section of the river actually passing through Lot 108. It has a relatively dense layer of vegetation along its immediate banks which has been fenced off from the rest of the property. The vegetation between the fence on the main channel of the river is a dense mix of both native and weedy species.

The native species include; *Eucalyptus rudis* (Flooded Gum), *Melaleuca rhaphiophylla* (Swamp Paperbark) *Corymbia callophylla* (Marri) *Lepidosperma sp*, *Pteridium esculentum* (Bracken fern), *Viminaria juncea* (Swish bush), *Acacia pullchella* (Prickly moses) and *Astartea sp*.

The weed species include; *Arundo donax* (False bamboo), *Rosa sp* (Wild rose), *Ficus sp* (Fig), *Honeysuckle*, *Pennisetum clandestinium* (Kikuyu), *Cynodon dactylon* (Couch), *Rumex sp* (Dock), *Avena spp* (Wild oats) (and other grass species), *Salix sp* (Willow), *Solanum nigrum* (Black berry nightshade)

The dense nature of the river vegetation and its permanent water supply make it an effective habitat area and corridor for a range of fauna. No detailed fauna studies have been undertaken as this vegetation is predominately outside of the lot area.

The farm dam also provides limited habitat for some generalist waterbirds adapted to an agricultural landscape.

Preston River upstream of Bridge Street

Gully down to Preston River

Preston River downstream of Bridge Street

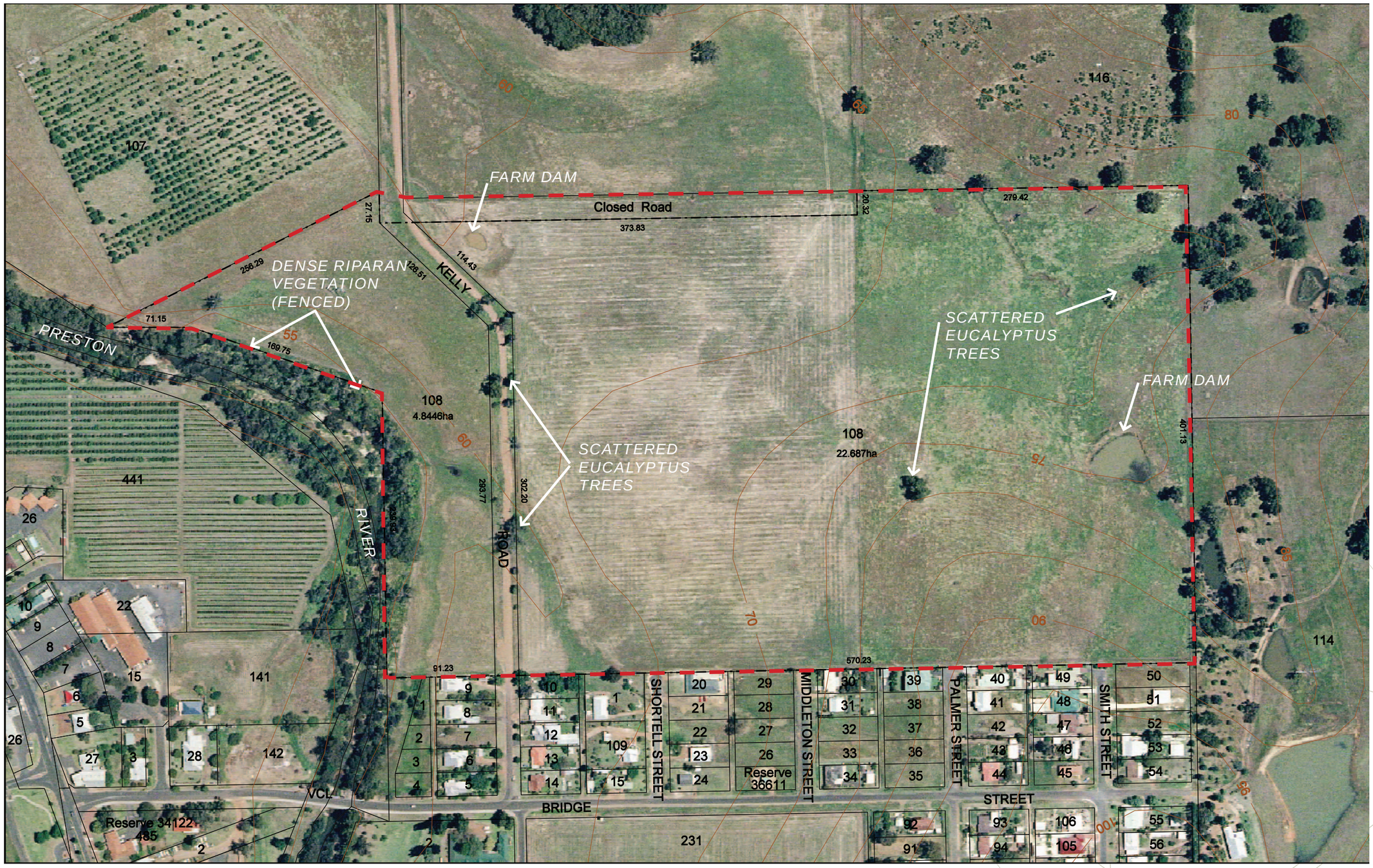


Figure 3 - Environmental Plan

3. GEOTECHNICAL PLAN

Geotechnical investigations for Lot 108 Kelly Rd were undertaken by Brown Geotechnical and Environmental. 29 test pits were dug. See Figure 4 for locations.

Top soil overlays the whole site except for the rocky outcrops. This is generally underlayed by a medium dense to dense clayey sand or sandy clay that is 0.4 to 2m deep. Bedrock and boulders were encountered across the majority of the site within the depth of the pit holes

Between Kelly Rd and the Preston River and in the base of the south western gully there are alluvial river deposits. These consists of silty sand, sandy gravels and clayey sands.

The report states that the site is not suitable to the installation of soakwells if construction is at the natural level of the site. This is due to the low permeability and insufficient thickness of the subsurface soils.

No Acid Sulphate Soil testing was undertaken. There is no ASS information on Department of Environment and Conservations Geomorphic Data Atlas for this area. Testing may be undertaken along proposed excavation routes (eg sewer lines) if it is deemed necessary. The most likely site for ASS would be along old drainage lines which showed higher levels of organics. This detail will be outlined as part of Urban Water Management Strategy.

Due to the Class 'H' site classifications of the subject land, sand fill will be required over most of the site where buildings and other infrastructure is required. To obtain a Class 'M' or Class 'S' for the site 0.8m and 1m respectively of clean sand is needed.

The Phosphorus retention index (PRI) for the site has not been tested. Based on the clayey sands and sandy clay soils present, it is likely that the soils will have a medium to high PRI.

If necessary the PRI can be measured and factored into decision making in the UWMP.

Typical test pit

Figure 4 - Geotechnical Plan

4. LANDFORM PLAN

The Kelly Rd Structure Plan area is composed of number of distinct land forms.

Just outside the western boundary of the structure plan area flows the Preston River. This is ultimately the current drainage point for the site. The river flows in a northward direction. It is approximately 55m AHD where it borders the site. (There is a small gully that cuts directly back from the river into the site near the south west corner.) The river sits in a narrow floodplain that ends abruptly in a terrace that climbs to approximately 60mAHD.

Moving east from the river through the northern part of the subject area there is a relatively flat winter wet, sandy clay plain. This plain slopes gently upwards to the east from 60m to 65m AHD. Land in the southern part of the site rises more rapidly from the gully that cuts back from the river. There is no distinct plain area as the land rises to the 65m contour. From the 65m AHD contour the whole site rises steeply to approximately 92mAHD in the south east corner.

A number of gullies intercept this steep slope, one heading upwards in a north easterly direction and one towards the south east. Both intercept the eastern boundary. These gullies fill a number of dams, before join in the north east quadrant of the site, filling one more dam before flowing into a constructed drain.

Slopes on the site vary between 0% to over 20%. These can be seen graphically in Figure 5. The large expanse of steep slopes and low permeability of the soils results in relatively high run off rates for the site. This is detailed in the Surface Water Plan (Section 5).

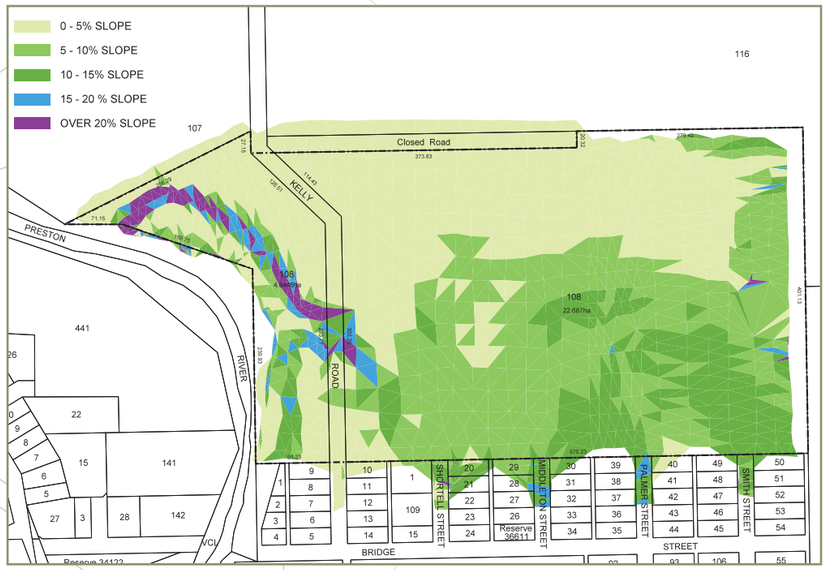


Figure 5 - Slope Analysis Plan

Lower gully in southwest corner of site

Gully Dam

Hills on site

Figure 6 - Landform Plan

5. SURFACE WATER PLAN (PRE DEVELOPMENT)

The Kelly Rd Structure Plan area is located in the Preston River Catchment.

On the site itself, surface water is generated on four main catchments, of which 3 begin upstream of the subject land. Water either flows directly from the subject area to the Preston River or flows to farm land to the north before entering the river.

The accompanying plan shows the sites individual catchments with pre development flows. It also details the flow paths from the catchments. Runoff is rapid in eastern and southern portions of the site during heavy rainfall events due to the sites slope.

Catchment A

Catchment A is 22ha in area and covers the south eastern portion of the site plus an extensive upstream catchment. It has a string of dams along its main gully flow line. The last gully dam is in the subject land and is the discharge point for this catchment. This dam can be seen in Figure 7. The 1:1, 1:5 and 1:100 ARI flow rates are 0.450kl/s, 0.714kl/s and 1.270kl/s respectively.

Catchment B

Catchment B covers the north eastern portion of the structure plan area plus a significant upstream catchment. Most of the upstream flow enters the site through an east wets gully. It is the largest catchment at 25.5 ha. The catchment has a small gully dam upstream of the site. Catchment B receives flow from Catchment A once it has filled the dam. Flows travel along a natural depression below the dam and from the gully to a shallow constructed dam before they leave the site to the north. The flow then enters agricultural land, which has been identified as Catchment E. The 1:1, 1:5 and 1:100 ARI flow rates are 0.540kl/s, 0.858kl/s and 1.535kl/s respectively.

Catchment C

Catchment C begins to the south of the structure plan area in the existing urban area. The urban area contains a small gully that directs water onto the south western corner of the structure plan area. This water continues its flow within the gully through the structure plan area and under Kelly Road before spreading out on the Preston River floodplain. The point where the gully enters the Preston River floodplain can be seen in Figure 7.

Catchment C also contains around a quarter of the structure plan area to the east of Kelly Rd and the south eastern quarter of the area to the west of Kelly Rd. This catchment is relatively steep with surface flow moving in a westerly direction to the gully mentioned above.

The 1:1, 1:5 and 1:100 ARI flow rates are 0.216kl/s, 0.342kl/s and 0.609kl/s respectively.

The catchment is 10.4ha in total.

Bridge street and its associated swale drain acts as a diverter for any overland flow to the south. The swale drain can be seen in Figure 7. This water is directed down Bridge street directly to the Preston River and doesn't enter the structure plan area.

Catchment D

Catchment D is located completely within the structure plan area. It covers the middle of the site and extends to the northern and western boundaries. Water flows of the eastern steep hill side in a westerly direction across the relatively flat plain to exit in the north western corner of the structure plan area. It It flows into the bottom of Catchment E. The 1:1, 1:5 and 1:100 ARI flow rates are 0.269kl/s, 0.424kl/s and 0.748kl/s respectively.

Catchment E

Catchment E covers the farmland to the north of the structure plan area. It has a steep slope to the north and east that empties onto a broad, relatively flat plain. None of the water from Catchment E enters the structure plan area. It has been included in the analysis of the surface water for the site due to the fact that much of the water for the structure plan area and its upstream catchments flow into Catchment E, including catchments A, B and D. The catchment is 12.8ha. The majority of Catchment E and the flow through from Catchment A and B exit through the northern 375mm culvert (E2). A small percentage of Catchment E and all of Catchment D exit via the southern 375mm culvert (E2) under Kelly Road. The 1:1, 1:5 and 1:100 ARI flow rates for Catchment E are 0.350kl/s, 0.570kl/s and 0.592kl/s respectively.

The flow rates for Catchments A,B and E combined are 1.341kl/s, 2.142kl/s and 3.398kl/s respectively.

Catchment F

Catchment F is situated directly to the west of Kelly Road and extends to the edge of the foreshore reserve and the gully to the south. It is 1.43 ha in size and sheets water directly onto the foreshore area. The flow rates for the 1:1, 1:5 and 1:100 ARI events are 0.023kl/s, 0.039kl/s and 0.165 kl/s respectively.

Foreshore area

The 1:100 ARI flood line for the Preston River along the western boundary of the site is also shown on Fig X. The flood line drops from approximately 60m AHD at the southern entry to the site to approximately 57.7m AHD at the northern exit.

The floodplain area has not been included in pre development calculations as this part of the structure plan site will not be developed. It also has a minimal impact on the flow rates of the rest of the site.

Gully from catchment C

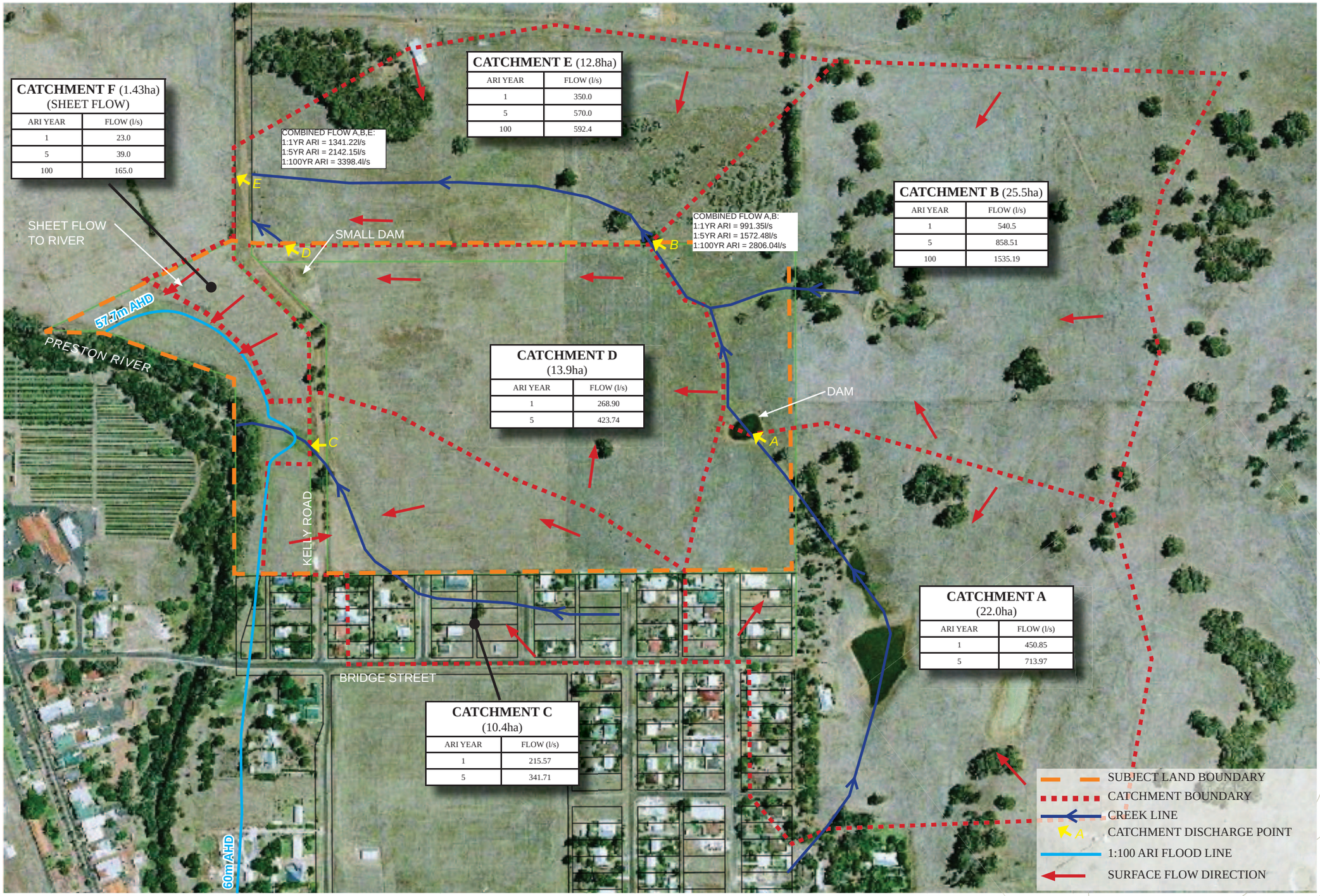


Figure 7 - Existing Drainage and Catchments

6. GROUNDWATER

Shallow Superficial Aquifer

A preliminary groundwater investigation was undertaken for the subject area as part of the Geotechnical Investigations by Brown Geotechnical and Environmental. The investigations were conducted in February 2008. No groundwater was encountered within any of the test pits which were dug to 2.7m of the surface or point of refusal due to rock. The test pit locations can be seen in the Geotechnical section. (Figure 4)

The report stated that it is possible that there may be perched groundwater over sections of the site in areas that exhibit sandy soils over deeper clayey soils.

There is also the possibility of groundwater in the winter wet flats in the north west corner of the site. Groundwater levels may also be elevated in areas close to the Preston River within the floodway and within the gullies that traverse the site.

Groundwater bores to 2.1m deep have been installed across the site and are being monitored over the 2009 and 2010 winters. The location of the bores can be seen in the Fig 8. Initial monitoring on the 1st July showed groundwater levels varied from greater than 2m from the surface to 100mm below the surface. The shallowest groundwater was seen on the eastern half of the site and seems to be associated with the hillier parts of the site as suggested by the geotechnical report. Shallow holes were also dug along side the monitoring bores to test the validity of the monitoring bore readings. The levels were found to be equal in the hole and monitoring bore.

If there is any significant lateral superficial groundwater movement at the site, it is likely to be towards the Preston River, unless obstructed by impervious material and rock. They clayey nature of the sites soils means that there is most likely limited infiltration of rainfall into a deeper groundwater aquifers.

The available Department of Water bore information within 5km of the site is of limited use in determining the current groundwater level on site due to the limited number of detailed bore logs. The information though did show that there is a general seasonal trend noted though in both the shallow and deep bores, with a steady decline in the deeper bore levels over time.

Other Aquifers

The subject land is within the Busselton-Capel Groundwater area - Donnybrook Sub area. There is no water available for the Leederville or Yarragadee at this location. The Blackwood Surficial has approximately 120ML currently available (pers cons. Department of Water), however, as this aquifer is discontinuous across its range it may be restricted beneath the subject land.

Test hole to check water depth

Typical water monitoring bore

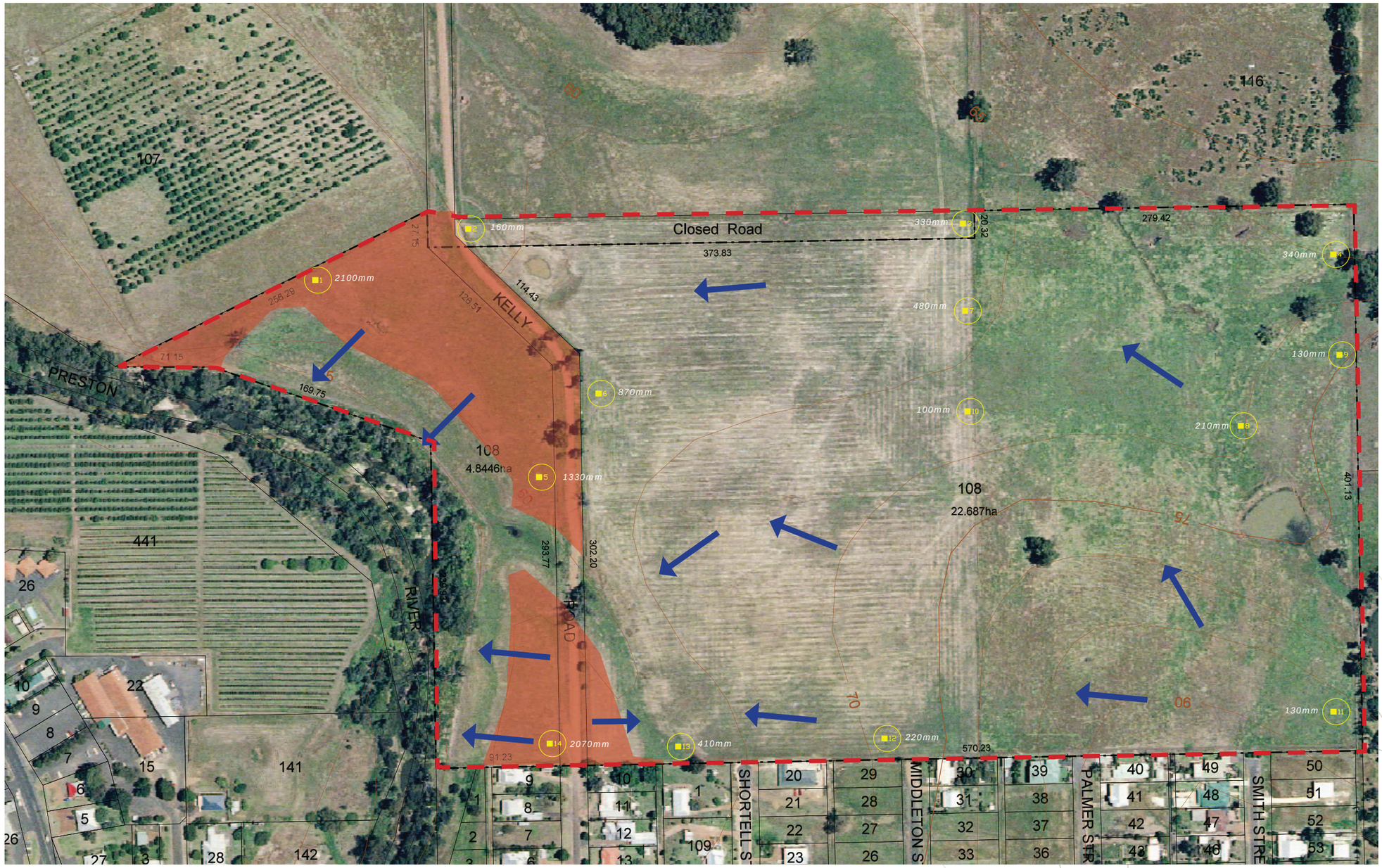


Figure 8 - Groundwater Plan

7. WATER DEPENDENT ECOSYSTEMS MANAGEMENT STRATEGY

The main Water Dependent Ecosystems that is influenced by the site is the Preston River. Stormwater will be managed so that the river receive hydro regimes comparable to pre development. Water quality will also be improved through treatment in bioretention units, soil amelioration and living streams prior to the water entering the rivers foreshore.

Water released into the Preston River will mimic pre development flows. This is detailed in the drainage management strategies and will be achieved through water sensitive urban design that include detention basins designed to slow flows up to the 1:5 ARI. This water will be treated to meet water quality guidelines set out by the Department of Water. These are 0.1 mg/L for total phosphorus, 1.0mg/L for total nitrogen.

A Foreshore Management Plan will also be produced. This will provide details on how the river will be protected and enhanced. It will include details on rehabilitation along its banks such as weed control and planting with native species as well as erosion control where necessary. The whole of the rivers riparian area will be contained within reserves. All lots will be at least 30m from the rivers main bank and outside of the floodplain.

The Preston River discharges into the Leschenault Estuary. This water body is known to experience poor water quality at certain times. The water sensitive urban design employed on site will help to reduce the amount and concentration of contaminants flowing into the Estuary.

The living streams to be developed on site will also act as ephemeral waterways, providing increased habitat for water dependent species. They will include rocked areas, shallow pools and planting with native riparian species.

The sites main dam will be landscaped to enhance its ecological function, helping it to replicate a natural wetland. This will be achieved through the battering back of the sides and planting with appropriate native species. The living streams and POS planted with native species that is to be constructed either side of the dam, will help provide an simple ecological corridor through the urban area.

Other detention basins being constructed will be designed to replicate ephemeral perched wetlands. This will be achieved through the use of appropriate edge slopes, variety of water depths and planting with appropriate native species.

Receiving body for the Preston River

Greater catchment and receiving water bodies

RESIDENTIAL LOT YIELD - OPTION A				
Size	No.	%	Average	
100m² - 1500m²	181	98.37%	743m²	95.97%
1501m²+	3	1.63%	1883m²	4.03%
Total Number of Lots	184			

Minimum Lot Size 518m²
Maximum Lot Size 2306m²
Average Lot Size 762m²
Total P.O.S. Area 3.0527ha
Total Residential Lot Area 14.0212ha

RESIDENTIAL LOT YIELD - OPTION E				
Size	No.	%	Average	
100m² - 1500m²	217	98.19%	774m²	95.99%
1501m²+	4	1.81%	1754m²	4.01%
Total Number of Lots	221			

Minimum Lot Size 518m²
Maximum Lot Size 1927m²
Average Lot Size 792m²
Total P.O.S. Area 3.0527ha
Total Residential Lot Area 17.5046ha

Figure 9 - Water Dependent Ecosystems Plan

8. GROUNDWATER MANAGEMENT STRATEGY

The focus of groundwater management for the Kelly Rd Structure Plan area is to maintain groundwater as close as possible to existing levels, while maintain separation from infrastructure. Furthermore groundwater will be managed to achieve a high water quality.

Maintaining a separation of 1.2m minimum between buildings and maximum groundwater level will be achieved through two main methods.

The first method proposed involves using porous clean fill over the entire site where infrastructure will be located. This will be at least 1m deep to allow for the site to receive a Class S classification. In areas shown to have groundwater at surface through two winters of groundwater monitoring, 1.2m of fill will be used.

Secondly, subsurface perforated pipes will be laid along road reserves. They will be set at or very close to the natural surface level. This will assist with stoping groundwater levels rising above the existing groundwater level. This will be complemented by not filling the POS areas with significant fill. This will allow the natural drainage lines located in the POS areas to continue to hold the groundwater at their current levels.

Seepage points will also be identified as part of this monitoring. If any are located, appropriate engineering will be used as necessary to alleviate any impacts on infrastructure

The plan opposite shows the most likely high groundwater areas in relation to the proposed layout of the subject area. The POS areas have been located in these areas to assist with maintaining natural groundwater expression areas.

Except in areas where fill is to be at least 1.5m, soakwells will not be the preferred method of dealing with excess surface water by infiltrating it. This is due to the low permeability of the soil. Roof runoff water will be piped to detention areas which will allow for some infiltration.

The sand fill proposed for the subject area does have a high permeability. As such it will allow water directly on it to infiltrate down to the original soil layer. Some of this water will then penetrate further into the natural soils below while the excess will move laterally to the subsurface perforated pipe drainage system.

Groundwater quality will be improved through the use of bioretention gardens. As water moves through these gardens and into the soil profile it is treated to remove nutrients, sediments and other contaminants. Amended soils may also be used in gardens and landscaped areas. This will allow for treatment of nutrients that are used in these soils.

By maintaining the groundwater at a level similar to the current level, this development will have minimal impact on the groundwater dependent ecosystems that rely on water from the site. The main ecosystem that may rely on groundwater flow is the Preston River.

Swale

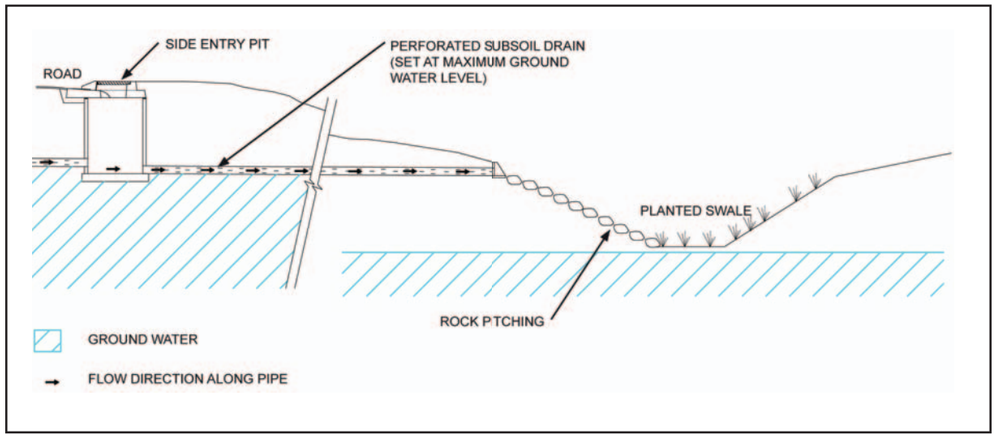


Figure 10 - Indicative design for groundwater level control

Figure 11 - Groundwater post development

9. DRAINAGE MANAGEMENT STRATEGY.

The aim of Drainage Management for the Kelly Road Structure Plan area will be to mimic pre development flows and treat all drainage water before it is discharged to receiving water bodies. All flows up to the 1:1 storm event are treated to reduce nutrients and sediments prior to discharge to natural systems. Above 1:1 year storm events, the main function is to control the flow of drainage water throughout the subdivision and its release from the subdivision. This is mainly achieved through the temporary storing and slowing of the water.

Further information can be found in the Kelly Road Structure Plan Drainage Study

The following three plans show how water is treated and conveyed in three different scenarios,

10. A – Up to and including the 1:1 Flood

10. B – The 1:5 Flood

10. C – The 1:100 Flood.

Bubble up pit in Bioretention Basin

End of street bioretention unit

Streetside bioretention garden

Linear bioretention swale in multiple use corridor

9A. DRAINAGE MANAGEMENT PLAN - 1 IN 1 STORM

The Drainage Management system is designed to treat 99% of all drainage water generated on the site for nutrient and sediment removal. This equates to all flows up to and including the 1:1 year storm event.

There are two main directions that drainage water will take in the proposed Kelly Road subdivision; infiltration to groundwater and surface run off. To deal with these different flow paths, two separate treatment trains have been designed.

Infiltration to groundwater:

The majority of water that fall on pervious surfaces in the subdivision will infiltrate through to the shallow groundwater. The high pervious nature of the surfaces will be due to the high hydraulic conductivity of the fill soil.

To treat this infiltrating water, various soil amelioration products will be used. Soil amelioration will help to greatly reduce the level of nutrients leaching through the soil profile. Soil amelioration for sandy soils is a relatively new technique to treat drainage water. The subdivision will employ cost effective products to reduce nutrient leaching from below gardens, ovals and other public open spaces where fertilisers will be applied. Any landscaping packages for house lots may also include soil amelioration across garden areas. This will be complimented with awareness raising material on how to be a nutrient and waterwise gardener for all household.

It is predicted that applying the soil amelioration treatments should give at least a 70% decrease in the nutrients leaching into the groundwater. It also has the added advantage of increasing water retention and plant growth.

Once the groundwater reaches a critical height, it will flow into sub surface mole drains running below the roads. This water will then flow into the swale system where it will infiltrate into the area below the swale or flow downstream to the Preston River. Groundwater contribution will have little effect on peak flow volumes during 1:1 storm events.

Rainwater tanks of a 2-3kl minimum per household will be installed throughout the development. These tanks will assist with reducing peak flood flows, especially during summer storm events. Overflow from the rainwater tanks will be piped into soakwells which will direct water to the groundwater system.

Surface flow:

For the majority of the site, water flowing off impervious surfaces such as roads, pathways, driveways etc and excess runoff from pervious areas will be directed to the edge of roads. Here it will flow into bioretention units sized at 2% of the impervious feeding catchment. The bioretention units will either be located part way along the edge of a road or at the end of a street or mini catchment. Pictures below and on the previous page show an bioretention examples similar to those that are proposed for the subject land. These bioretention units are designed to take all flows up to the 1:1 flood event.

Once water enters the bioretention units it infiltrates through a filter media designed to remove nutrients and suspended solids. Water then infiltrates to the groundwater or moves into the perforated pipe below the bioretention unit. This water is then directed to the swales through the processes outlined above.

Once water enters the swales, it will either infiltrate into the groundwater system or flow to the detention basins located on the edge of the site. The existing dam will also function partly as a detention basin. The dam will have minor modifications and landscaping to allow for this function. The detention basins will infiltrate some water with the excess treated water continuing to flow to the Preston River.

The swales and detention basins will contain soil amelioration products to further reduce nutrients moving into the groundwater.

It should be noted that the site will continue to receive flows from the surrounding rural and urban catchments. This water will receive treatment as it flows through the swales and detention basins of the site. The volumes generated from each catchment in the 1:1 ARI event are shown on Figure 16.

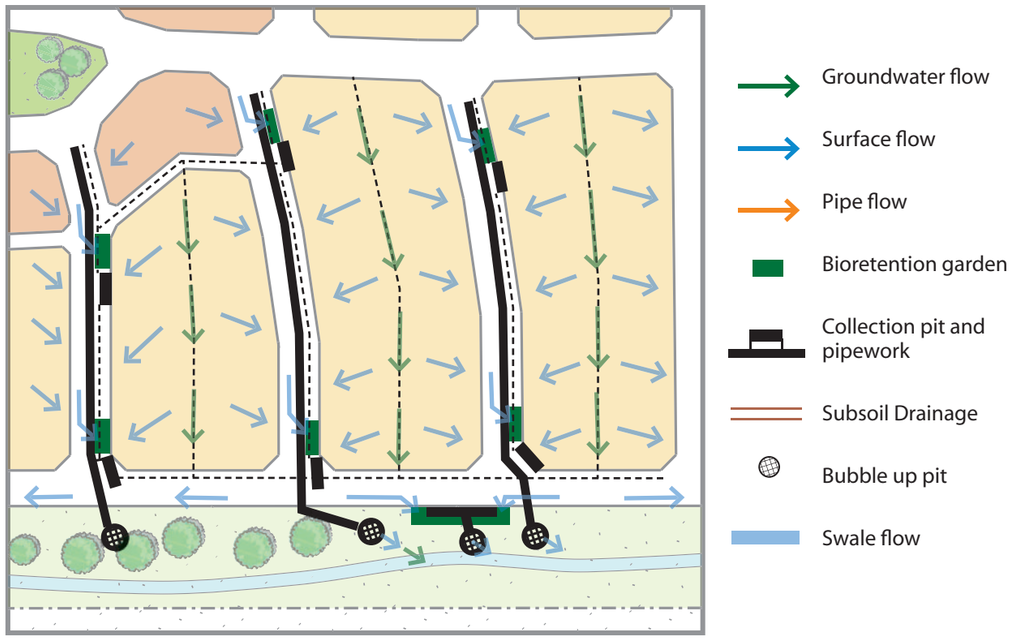


Figure 12 - Enlargement showing 1 :1 Stormwater Management

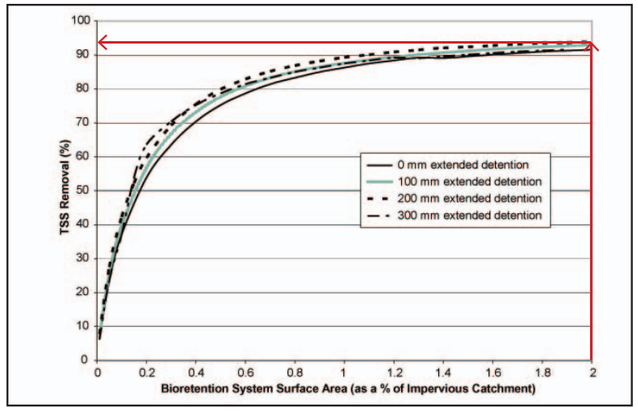
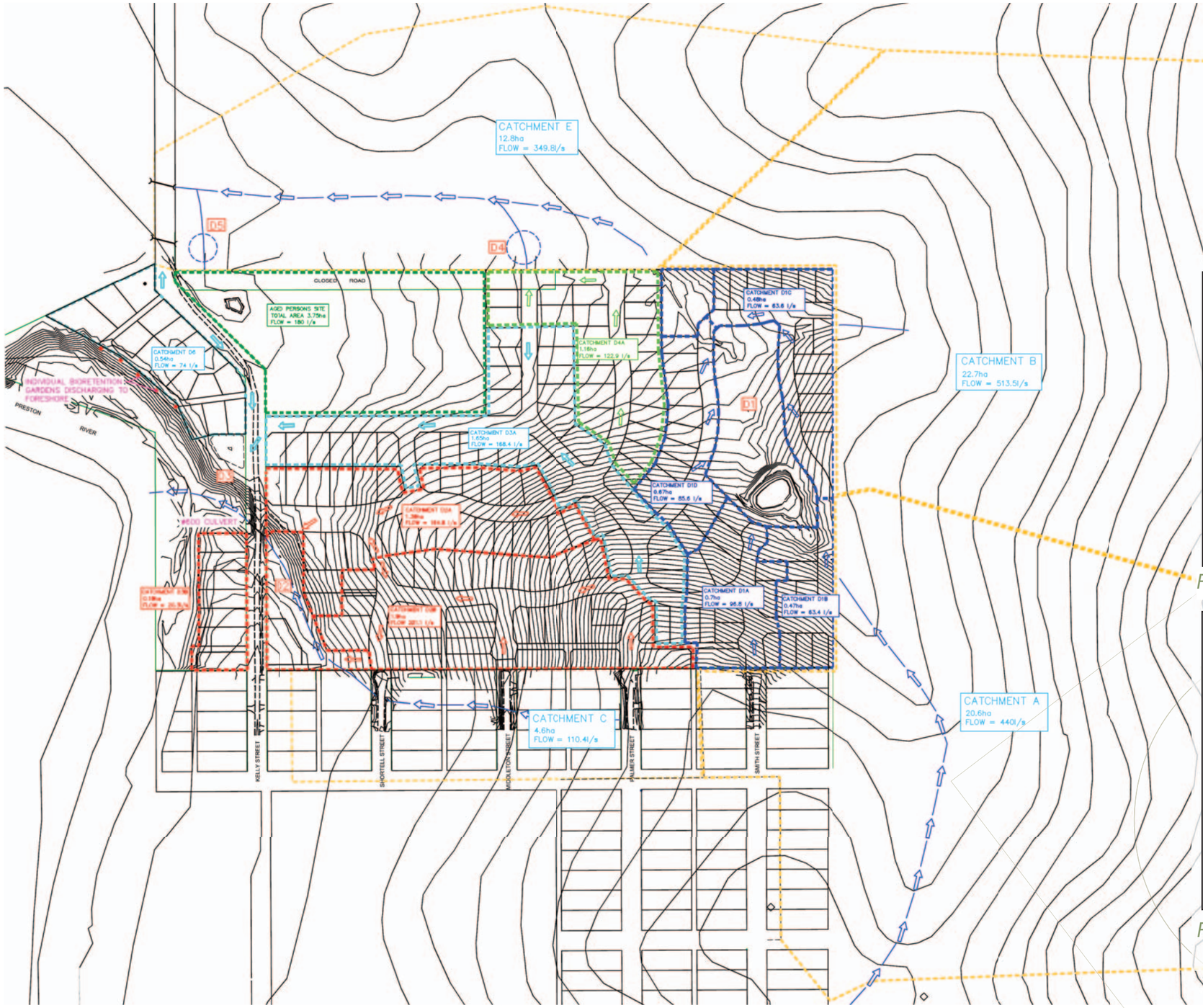


Figure 13 - Bioretention System TSS removal performance



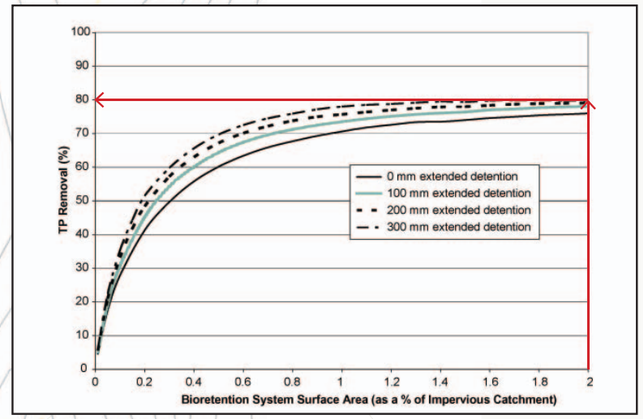


Figure 14 - Bioretention System TP removal performance

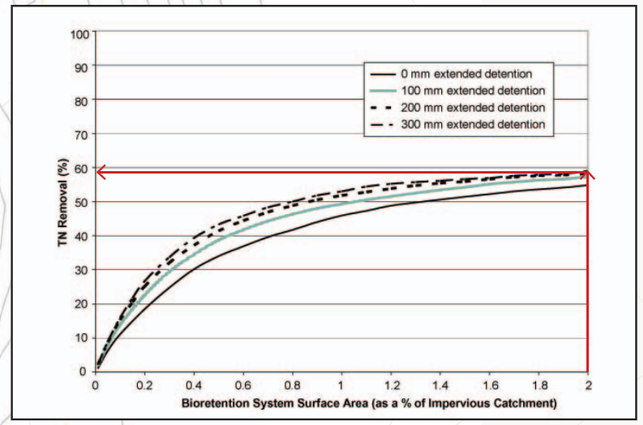


Figure 15 - Bioretention System TN removal performance

Figure 16 - 1 : 1 year storm event plan

9 B. DRAINAGE MANAGEMENT PLAN - 1 IN 5 FLOOD

The drainage system of subject land has been designed to manage a 1:5 flood event using a pipe, swale and detention basin network. The main function during the 1:5 flood event is to convey excess water off roads and house lots and into this network. Within this network the flow and peak of the flood is slowed down. The water is then discharged over an extended period to the Preston River as well as being infiltrated to the groundwater.

Flood waters will flow down the side of the road, flood out the bioretention units then flow into the collection pit situated immediately downstream. This water will then be transferred along the underground pipe system. Water will exit the pipe system into the swale system. The swale system will allow the flood waters to move slowly along their length, using check pipes under roads to control the rate of movement. By using the swales, with their high level of roughness and storage volume, the peak of the flood flows will be flattened in comparison to a complete pipe system. A portion of the floodwaters will infiltrate into the soil below the swale and possibly the groundwater.

The rest will flow through the full course of the swale to detention ponds. These will be sized to take the 1:5 ARI event then release this water in a controlled manner along further swales or to the foreshore areas of the Preston River. The rate at which water is released from these detention basins will match the pre development flow rate for each catchment. A portion of the water will also be infiltrated into the groundwater. The details for each basin can be found in Figure 17.

Figure 17 - Detention Basin Details

Detention basins	Storage required (m^3)	Depth (m)	Surface area (m^2)	Pipe outlet size (mm)
D1	1050	1.5	700	375
D2	280	1.5	186.7	375
D3	160	1.2	133.37	300
D4	150	1.5	100	150
D5	200	1.5	133.37	150

Groundwater that infiltrates during a 1:5 storm event will have minimal effect on the flood peak. However it will express itself later through seepage into the perforated subsoil pipe system. This will extend the period of time that water will move through the pipe system, though at a much reduced rate.

Although treating water to improve its quality is not the objective of managing 1:5 flood events, the initial water caught in the bioretention gardens, the vegetated swales and detention ponds will allow for some trapping and settling of suspended sediments, especially after the flood peak has pass. This is due to the slowing of water near the surfaces of the swale from the in-stream vegetation and residence time in the detention basins. All water infiltrating through the soil profile and bioretention units during the flood event will still be treated, so the groundwater that expresses itself later in the swales will be of a high quality.

The volume of water generated from each catchment during the 1:5ARI event is shown on Figure 19.

Swale Drain

Bioretention Unit

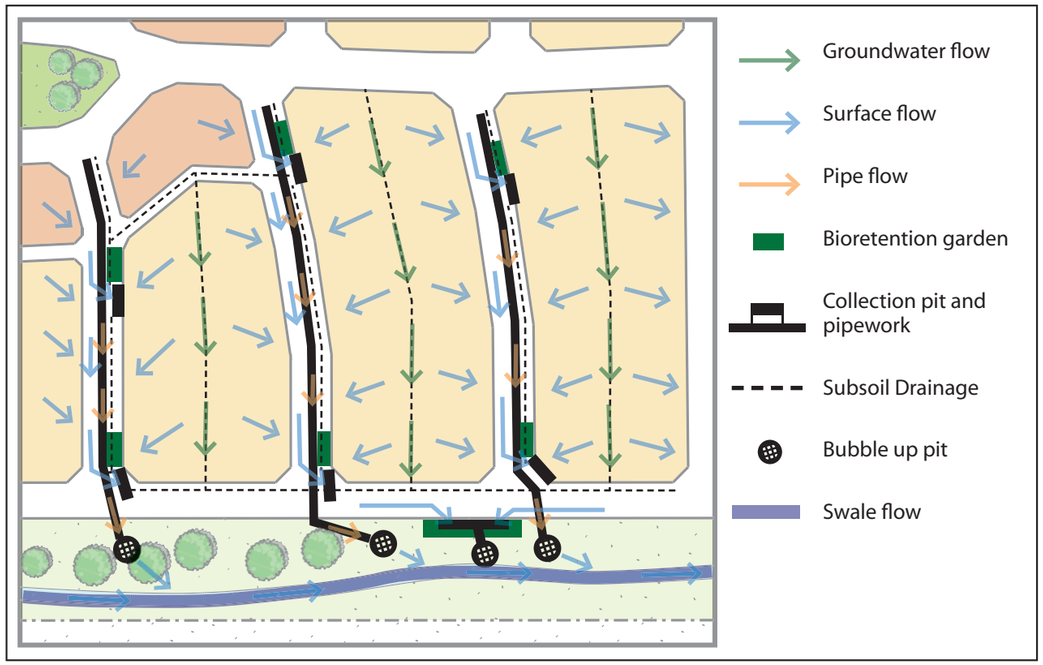


Figure 18 - Enlargement showing 1:5 stormwater

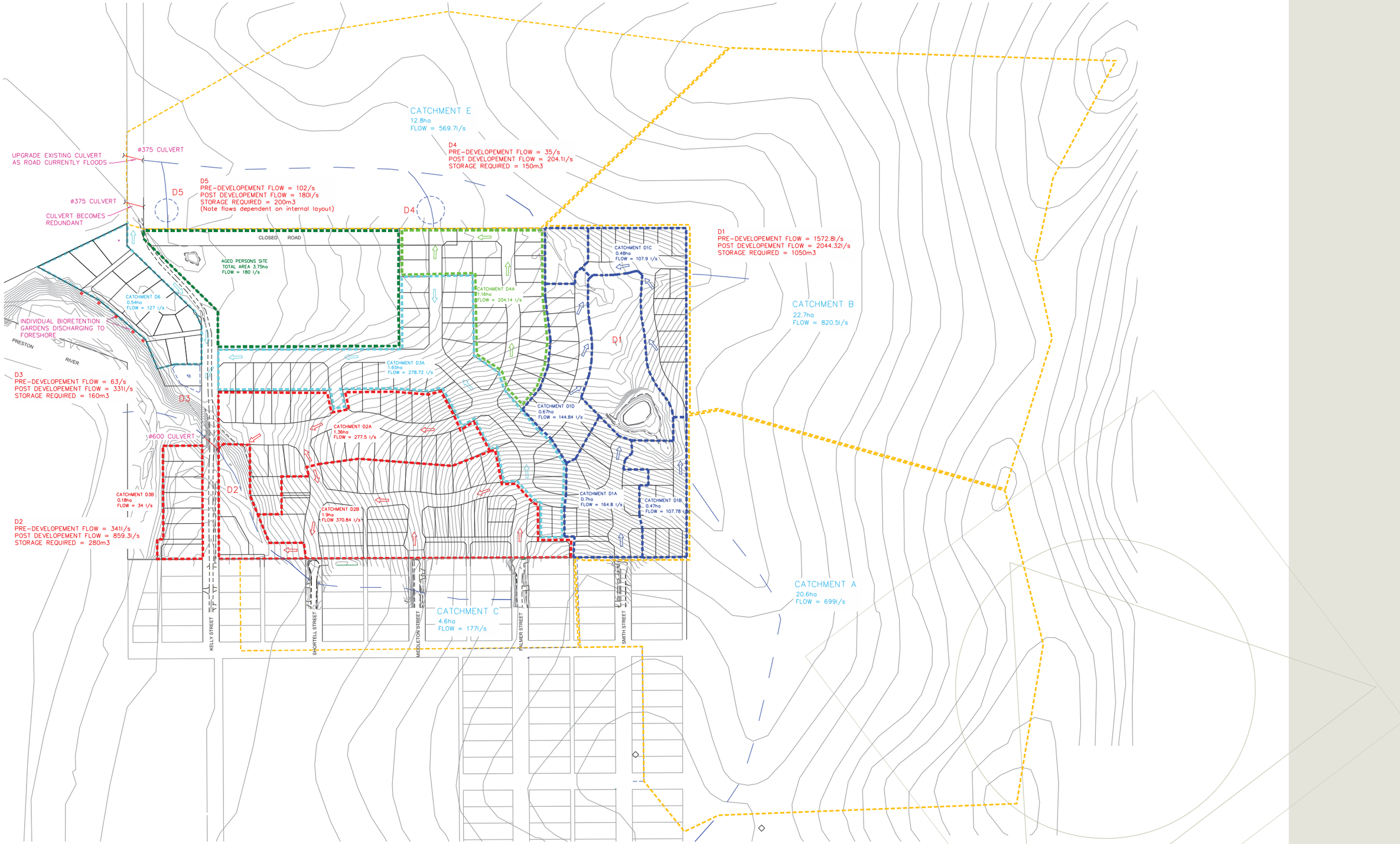


Figure 19 - 1 : 5 year flood event plan

9C. DRAINAGE MANAGEMENT PLAN - 1 IN 100 FLOOD

The Kelly Road subdivision has been designed to safely convey the 1:100 flood event.

The road, lot, MUC and POS levels are to be designed to allow a safe flood route and maintain a minimum clearance of 500mm between flood surface water levels and the habitable floor levels and important infrastructure. Some roads will be partially flooded but will remain serviceable for emergency vehicles

During a 1:100 flood event most of the road surface will convey flood waters. This water will spill over into the swale system and POS areas as a sheet flow. The swales will flow at capacity with extra water flooding into the adjoining road reserve and POS land. The road reserve will in effect be acting like the floodplain of a natural rive, and in doing so will lower the peak of the flood. At the same time the underground pipe system will be collecting water from the road and conveying it at capacity to the swale and detention basin system.The swales will transport water to the end of the swale system and onto the Preston River floodplain.

The infiltration and detention basins will sit at or above the 1:100 year flood line for the Preston River. It is likely that the 1:100 year high flows from the subject land will enter and disperse down the Preston River prior to the flood peak generated from waters higher in the catchment moving past the subdivision.

Designated flow paths have been determined to take the flow from the surround rural and urban catchments that cross the site. These are shown on Fig 20.

With all infrastructure above the Preston River's 1:100 flood line, the river will have no impact on site other than the designated floodplain.

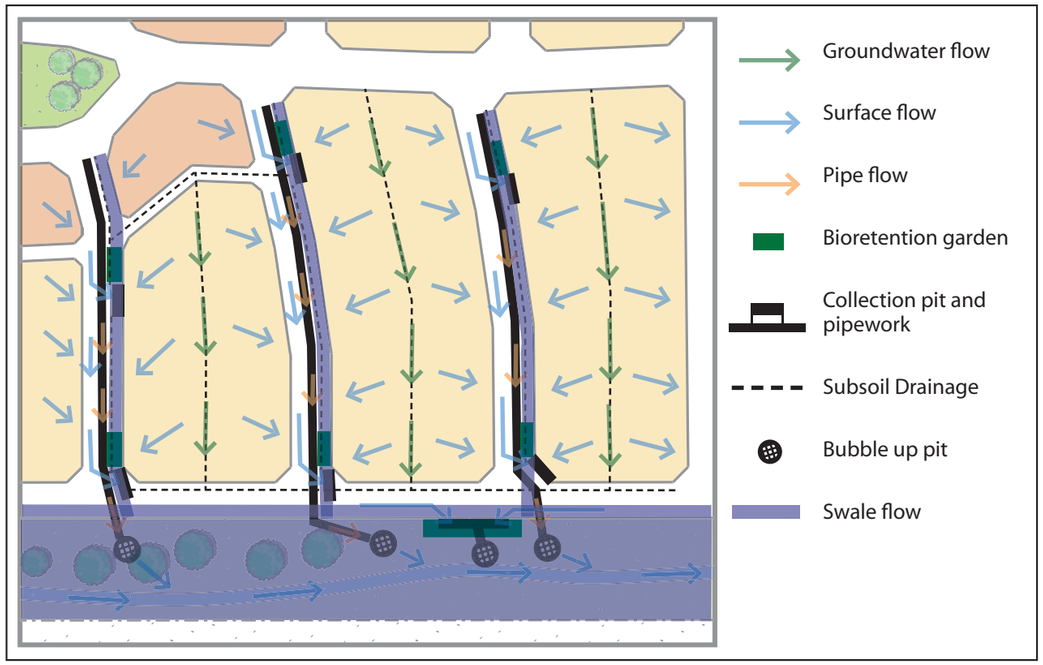


Figure 20- Enlargement showing 1:100 flood flow

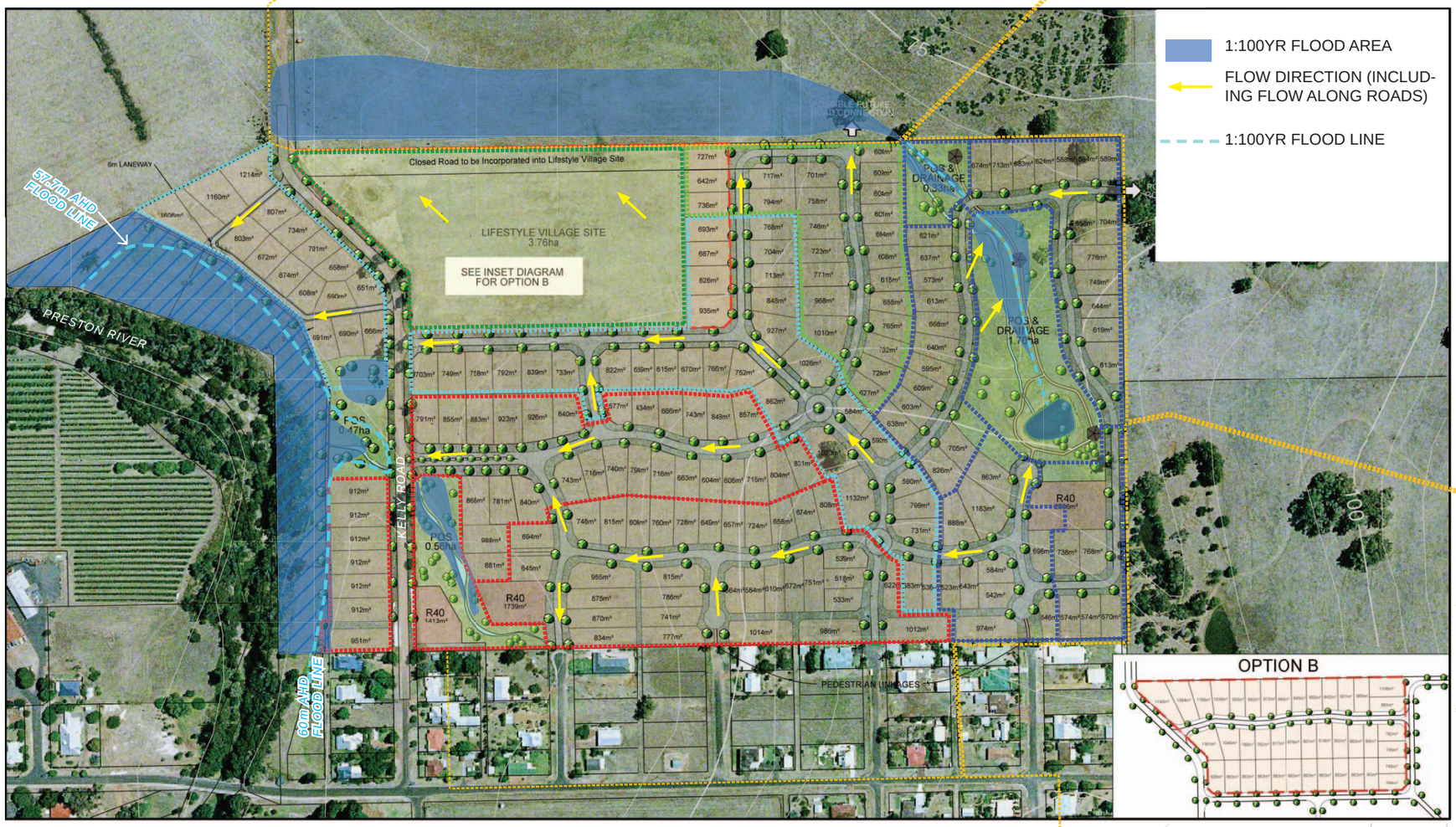


Figure 21 - 1 in 100 year flood event plan

10. WATER CONSERVATION STRATEGY

Western Australia has set a target of 100kl/person/year of water usage. This target has been adopted for the Boyanup East Structure Plan area.

The following Water Conservation Strategy assumes the following averages:

House roof catchment = 250m^2
Lot size = 550m^2
There will be 2.3 person/house

With these assumptions, the target water usage per house is averaged to 230kl/annum. This compares with the current Perth average of 274kl/annum since water restrictions have come into effect and 459kl/annum prior to restrictions (Water Corporation).

To achieve this reduction, a number of water conservation strategies will be incorporated. These measures will both reduce overall water usage as well as specifically reduce potable mains water.

The following table identifies where the savings will be made, based on known average water savings. Builders and house owners will be encouraged to install water efficient devices and undertake conservation methods to achieve the savings identified in Figure 22. This will be assisted with the provision of awareness raising information to lot purchasers.

Mains potable:

Mains potable water will make up the majority of water use both within and outside the house.

169kl of mains potable water will be used, of which 139kl will be used inside and 30kl for gardens and other outside uses.

Rainwater use

Houses will be encouraged to install rainwater tanks. An average 3000L tank has been used in the following calculations. Based on rainfall figures for Donnybrook from 2003 to 2006, an average house with a roof catchment of 250m2 will be able to collect and use 61kl of water per annum. This is on the provision that rainwater is used preferentially to mains potable water for washing machines and toilet flushing as well as 10kl being drawn for garden watering. This will be achieved through a water pump system that allows for efficient switching between mains and tank supplies.

Onsite infiltration and stormwater discharge

Excess roof runoff of 116kl/year will be directed to a property connection soakwell. Due to the low hydraulic conductivity of the site, it has been assumed there will be a low infiltration rate of around 100mm/hour, from the bottom of the soakwell. This will lead to approximately 93kl infiltrating and 23kl flowing to the stormwater system. Runoff from the gardens and hard surfaces around the house will be directed predominately to the road before entering the pipe system. This has been modelled at approximately 141kl/annum. The remainder will infiltrate into the soil and groundwater. The stormwater flows that leave the block will enter into the subdivisions bioretention and swale systems for treatment.

Sewage outflow

Sewage will be maintained by the Water Corporation and will be treated at their waste water treatment plant. There are no plans at this point to bring the treated wastewater back into the structure plan area. On average, 190kl/annum will be sent to the sewer from each house.

Waterwise garden and other outside usage

Figures for water savings due to implementation of waterwise gardens and other general smart outdoor water use can vary widely (see Figure 22). Water wise gardens should be able to maintain themselves almost on the natural rainfall alone. Some top up water for gardens and other outdoor use is factored into the Kelly Rd model . To achieve the necessary target of 230kl/house/annum, a target of 40kl/annum has been allocated to garden and other outside usage.

Waterwise gardens will be encouraged through various landscaping packages.

Awareness raising workshops and other educational material may also be offered to new residents.

Greywater use

Greywater use is a possibility for the Kelly Rd Structure Plan area. However, as it will not be mandated, it has not been shown in the water balance model. Greywater, if well managed could provide for most if not all of the waterwise garden's water needs. This would reduce the amount going to sewage by 80-120kl/annum as well as saving up to 30kl of mains potable water.

Groundwater/bore:

Bore water use has not been shown in the model as it is also not mandated in the subdivision. Bores into the superficial aquifers are a possibility, however the quality and quantity of the water is uncertain in many areas of the site making this an unlikely option. This means a small percentage of lots may have domestic bores installed. Licences to provide groundwater through a central reticulated system are unlikely to be provided.

Landscaping:

In the landscaping of POS areas there will be a strong focus on using and promoting locally native waterwise species. This will be reinforced through the use of suitable native species in streetscape plantings as well, including bioretention gardens. Grassed areas will be minimal with the most likely source of irrigation being stormwater harvesting on site and possibly scheme water. Other POS landscaped areas will only have limited watering during establishment.

Figure 22 - Water Efficient Devices /Conservation measures

Device/Measure	**Average amount saved in KL/household/ annum.** (Saving are based on average Perth water usage for 1998-2001)
Washing Machines (automatic front loader)	4-8
Shower head	2-5
Tap aerators	8-10
Toilets (dual flush)	7-11
Water wise gardening (includes drip irrigation and low water use plants)	50 -200
Total amount saved:	**71 - 234**

Figures extrapolated from Domestic Water use Study (Water Corporation)

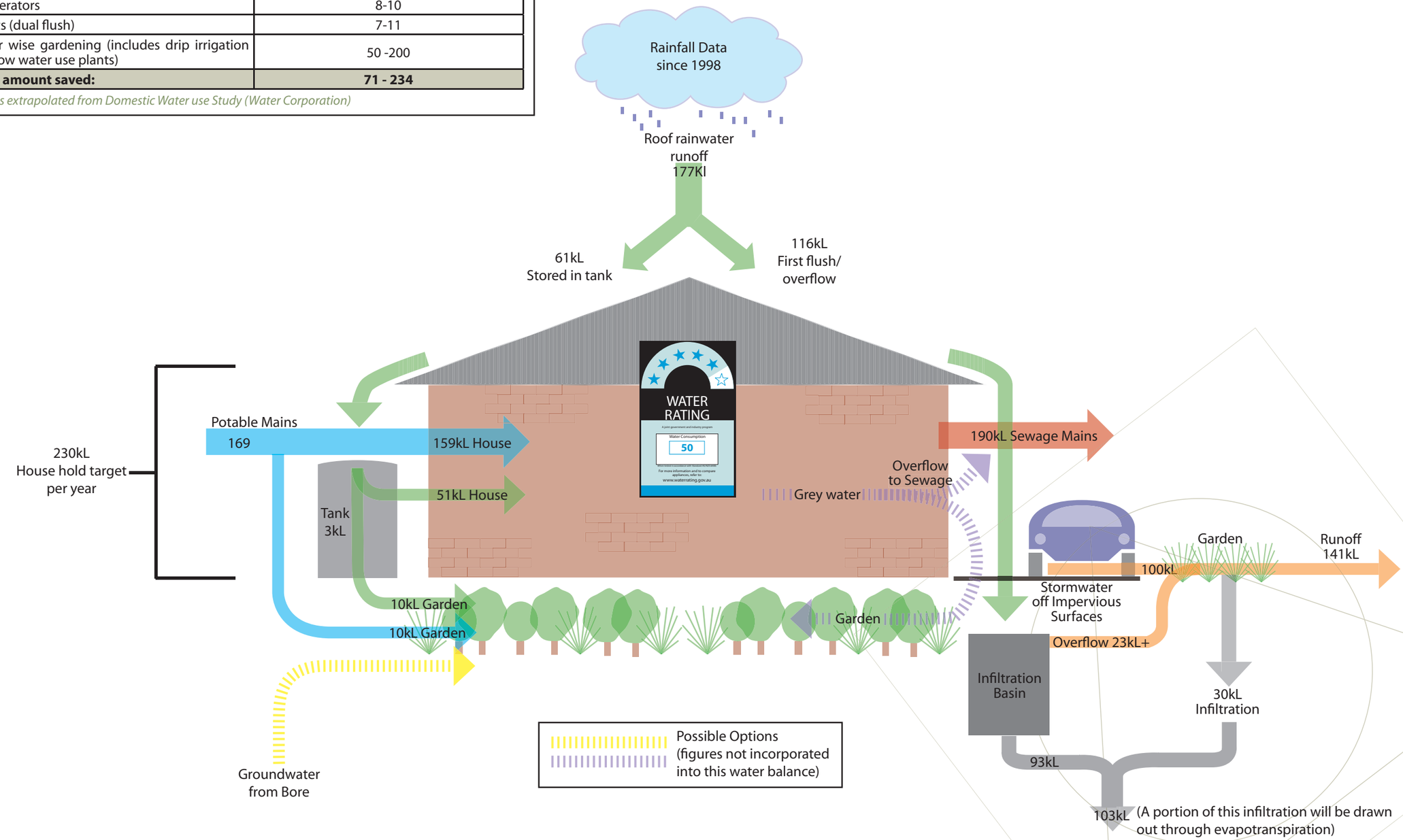


Figure 23 - Water Conservation Strategy

11. MUSIC MODEL

MUSIC is the Model for Urban Stormwater Improvement Conceptualisation. It provides the ability to simulate the quality of runoff from catchments using a wide range of water sensitive urban design treatment options.

The accompanying plan is a diagrammatic representation of the treatment train that will be employed in the Kelly Road Structure Plan area.

The model shows that the treatment train for the development will meet the water quality parameters recommended by the Department of Water of 0.1mg/L for Phosphorus and 1.0mg/L for Nitrogen. It is also very effective in reducing sediment and gross pollutant loads. The details can be seen in Figure 24.

Figure 24 - Detention Basin Details

Summary of Kelly Road MUSIC Model results

Inflow	mean	standard deviation	median	maximum	minimum	10 percentile	90 percentile
Flow (cubic metres/sec)	0.01	0.12	0.00	12.20	0.00	0.00	0.00
TSS Concentration (mg/L)	11.00	17.50	8.65	1210.00	5.44	7.49	10.90
TP Concentration (mg/L)	0.05	0.05	0.03	2.97	0.02	0.03	0.08
TN Concentration (mg/L)	0.90	0.47	0.79	29.80	0.51	0.68	1.04
TSS Load (kg/6 Minutes)	0.42	7.15	0.00	921.00	0.00	0.00	0.02
TP Load (kg/6 Minutes)	0.00	0.02	0.00	3.37	0.00	0.00	0.00
TN Load (kg/6 Minutes)	0.01	0.17	0.00	23.30	0.00	0.00	0.00
Gross Pollutant Load (kg/6 Minutes)	0.02	0.26	0.00	23.10	0.00	0.00	0.00

Nodes:

The subdivision has been modelled with 14 distinct catchments nodes. These are 3 predominately 'Rural' catchments, 1 existing 'Urban' catchment and 10 new 'Urban' catchments. Each node incorporates data from Department of Water and the MUSIC Guidelines for Perth Interim Final Report, to represent the flow patterns of water through or across the soil and the level of nutrients and other pollutants normally found in each type of node.

Each catchment has been further divided into 3 'mini catchment nodes'. These nodes are:

A) Surface Water Node

B) Shallow Groundwater Node

C) Deep Groundwater Node

The Surface Water Node best represents the flow that is likely to mainly travel in an overland fashion to the nearest treatment node. It represents flow off roads, rooves, pavements and other impervious surfaces. The new urban catchment areas are all directed to bioretention gardens in the first instance. Water filters through to the bottom of these, into the subsurface pipe below and then to the swale system. Flows that are higher that the capacities of the garden are directed into the pipe system located adjacent to the garden. This water then flows either to a swale or directly to a detention basin (represented as a sedimentation basin). Water then makes its way into the Preston River.

The Shallow Groundwater node is shown usually entering the nearest swale. This is because much of this water will be picked up in the perforated subsurface pipe and delivered to the swales. Nearer to the River it is more likely that the groundwater will naturally flow directly to the river and so this is how the model has been configured.

Deep groundwater nodes area all shown flowing directly to the river, and not being intercepted by any drainage infrastructure. This is the most likely scenario for water that is below the height of the perforated subsoil drains and swales.

NB. Although the subdivision will encourage rainwater tanks, the model is currently unable to incorporate these into the previous groundwater nodes. Therefore rainwater tanks have not been included in the model. It is likely though that incorporating tanks will marginally reduce the total load of nutrients and entering the Preston River. Once parameters are available as to how Rainwater tanks can be incorporated into the model, they will be included to test this hypothesis.

Treatment details:

<u>Soil Amendment/ Nutrient wise actions:</u>

There is minimal opportunity for treatment of water once it has moved into the groundwater. As a large percentage of rainfall on the site will move through to the groundwater, treatment needs to take place prior to the water entering the groundwater.

To achieve this, soil amelioration products will be applied under public open space areas and encouraged as part of landscaping packages for households. There a range of products, currently being tested by CSIRO that will be available shortly. These can achieve reduction of 80 – 95% in certain nutrients. These and other potential other products maybe incorporated into the development to attempt to achieve at least an average 70% reduction in the nutrient concentration moving into the groundwater. A further reduction in nutrients may be seen through nutrient wise activities by households and in public open spaces. Native gardens that don't need fertiliser and low water soluble fertiliser application to other gardens will have a positive effect on the amount of nutrients entering the groundwater also. The reduction in fertiliser leaching will be achieved through community awareness raising activities and appropriate landscaping packages for households.

As the model is unable to effectively incorporated treatment of groundwater, it has not been shown in this model. Once effective ways of representing this treatment option is available it will be incorporated into the model.

<u>Bioretention units:</u>

The bioretention units have been sized to 2% of each impervious catchment. They will be planted with appropriate native species, which will assist with nutrient absorption due to the surface area provided by their roots for the formation of bio-films and direct nutrient uptake into the plant. The units will be composed of a filter media 1meter in depth and an average particle size of 1mm. Around 0.3m of extended detention will be provided to assist with storing heavy rainfall event. Water will be able to freely drain from the bottom of the unit; however the heavier local soils will slow the movement of this water from the bottom. A subsurface drainage pipe will be located directly below the units. The subsurface pipes flow directly to the swales. Overflow during storm events above the 1:1 will be directed into the adjacent pipe system which also flow to the swales.

Swales:

The swales have an average base width of 1m and a top width of 5m. They will be approximately 1.0m deep and be planted out with native riparian species that will have an average height of 0.25m. Although the swales will assist with improving water quality, their primary function is to transport flows throughout the catchment. They will be designed to mimic living streams and in doing so will provide valuable habitat to fauna through the subdivision.

Detention Basins:

The detention basins have been sized to store and release the 1:5 ARI flood event at pre-development rates. The sizing therefore is linked to each feeding catchment. The basins all have a restricting culvert to release water from the bottom of the detention basin. Details can be found in Figure 16 on the sizing of each basin and restricting culvert. A small amount of water may be retained in the very bottom of the basins so that they function as ephemeral wetlands. This is most likely in Basins D3, D4 and D5. Detention areas D1 and D2 are essentially POS areas with a restricting road culvert controlling the outgoing flow rate. They essentially flood out the swale system into the surrounding park areas. In smaller flows there will be no detention of water as it will move along the swale and directly into the road culvert.

These detention basins are mainly designed to slow the rate of water movement to pre-development flow, rather than being used to treat the urban runoff. However they will assist with some sedimentation due to the slowing of the rate of water flow.

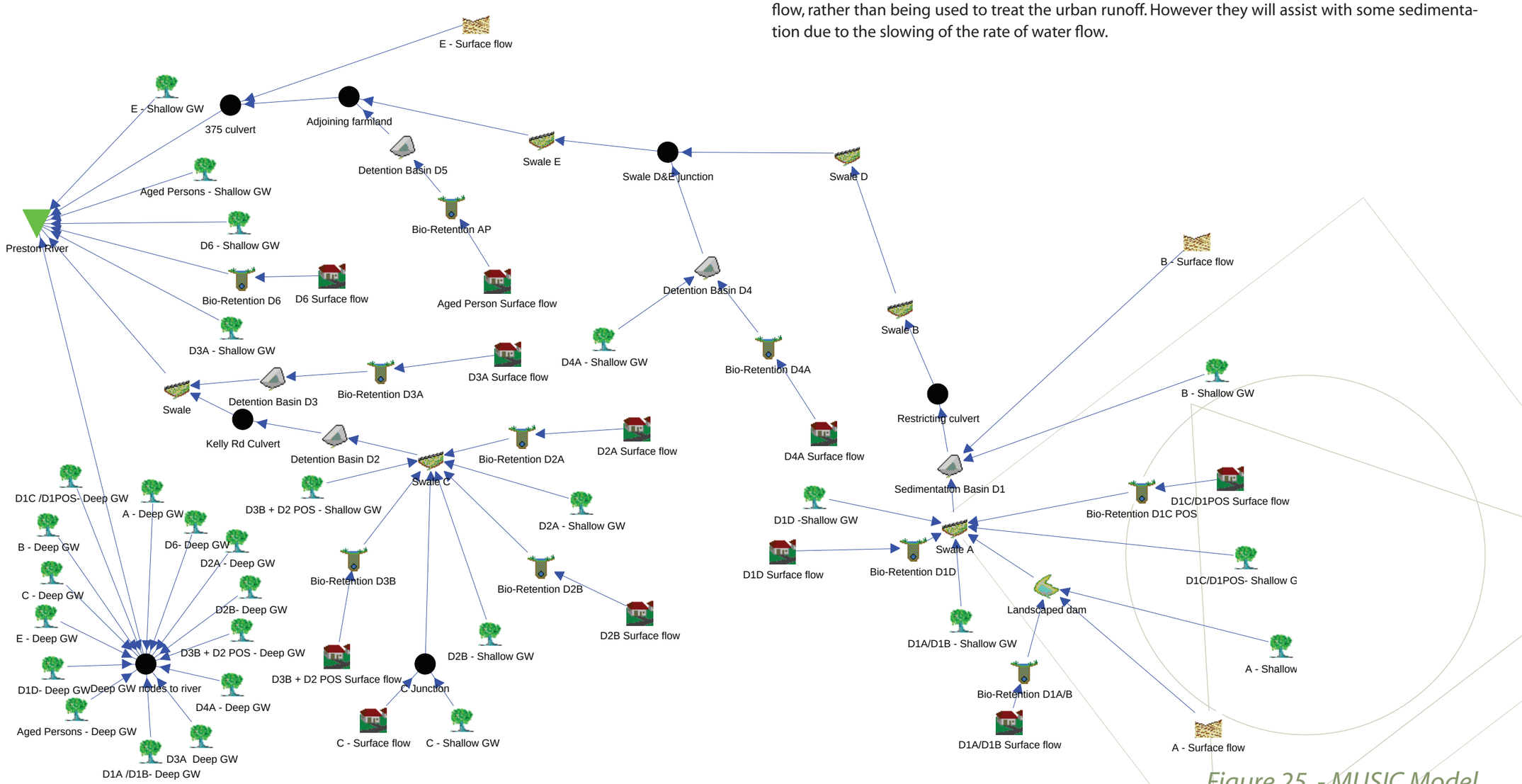


Figure 25 - MUSIC Model

12. MONITORING

Monitoring Requirements

Groundwater

Groundwater bores to monitor groundwater levels have been installed throughout the Site. The bores monitor the superficial groundwater level within 2m of the natural soil surface.

The bore field layout can be seen in Figure 26.

These will be monitored for at least two years prior to construction.

Monitoring will continue until construction is completed.

A Groundwater Monitoring Report will be produced after two winters of data collection

13. IMPLEMENTATION

Implementation of this Local Water Management Strategy will continue over an extended period of time. This is due to the size of the structure plan area and the rate of expansion predicted for Donnybrook.

It is likely that the structure plan area will be released in multiple subdivision stages moving generally from the south west in an eastern direction. The first stage is likely to be developed a minimum of 18 months to 2 years after the Structure Plan is approved.

Commitments by developers

- To assist with engineering design and protection of water and environmental resources, groundwater level monitoring will continue for at least the next two winters. The sampling program is detailed out in the Monitoring section. This will be undertaken by TME on behalf of the landowner. A Groundwater Level Monitoring Report will be produced after two winters of monitoring.
- A Foreshore Management Plan has been submitted with the Structure Plan for land adjoining the Preston River. The details of the ongoing management of this area and the interface of the residential and foreshore areas is outlined in this plan.
- Water sensitive landscaping of the POS areas will be undertaken as lots close to the POS are released.
- Appropriate landscaping packages for householder will also be further investigated by the developer prior to subdivision of each lot.
- Urban Water Management Plans will accompany all relevant subdivision developments covered by this LWMS as part of the subdivision conditions. These will provide higher levels of detail relevant to water management for that portion of the land being developed.
- 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.

Figure 26 - Implementation plan