Moorabool
Shire Council

ATTACHMENTS

Development Assessment Committee Meeting

Under Separate Cover

Wednesday, 21 May 2025

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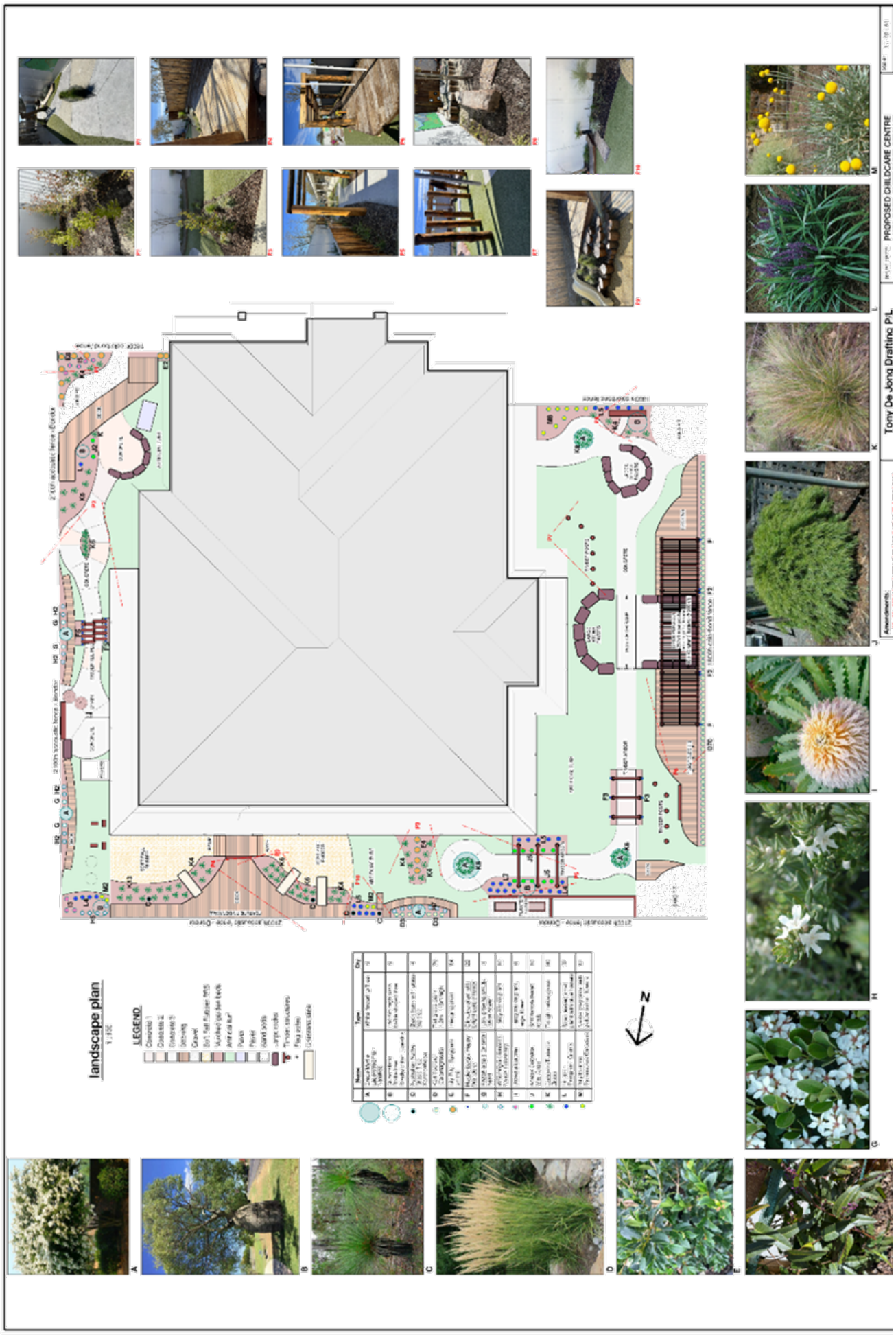

landscape plan
LEGEND
Tony De Jong Drafting P/L
PROPOSED CHILDCARE CENTRE

Farm Management Plan: Rationale

Troy & Rachael Peterken own and operate Inglenook Dairy, which is a milk processing facility located at 265 Ti Tree Road, Dunnstown. They started building their plant in 2010 and commence process 12 years ago. Their impetus for doing this was the excessive market uncertainty that using larger, established processors was having on their extended family's dairy business, which operates across Dunnstown. A full description of the Inglenook Dairy's move from being a dairy producer, to become a process can be seen at Our Story - Inglenook Dairy. An aerial photo of Troy and Rachael's house and processing plant at 265 Ti Tree Road, Dunnstown and a streetscape view of the crossover to their processing plant are provided below.

Being a small processor in a highly competitive industry, Troy and Rachael are constantly seeking ways of adding value for their customers in order to both guarantee their market share and improve the sustainability of their business. For example, they run guided tours of the processing plant for tourists and offer a home milk delivery service.

Inglenook Dairy milks 250 cows twice daily at their 144 hectare Scotts Creek farm and processes 40,000 litres of milk per week, with capacity in their plant to double production. They are a high end processor, that also produces boutique Cream, Yoghurt and Butter. In order to produce these high value products, they require milk from a breed that they are pioneering, i.e. equal part Friesian, Jersey & Australian Red. Calves of this breed cost $2,200-$2,500 to purchase. So, maintaining and/or building the Inglenook herd represents a significant component of their business' costs. Bearing all of that in mind, their next goals are to:

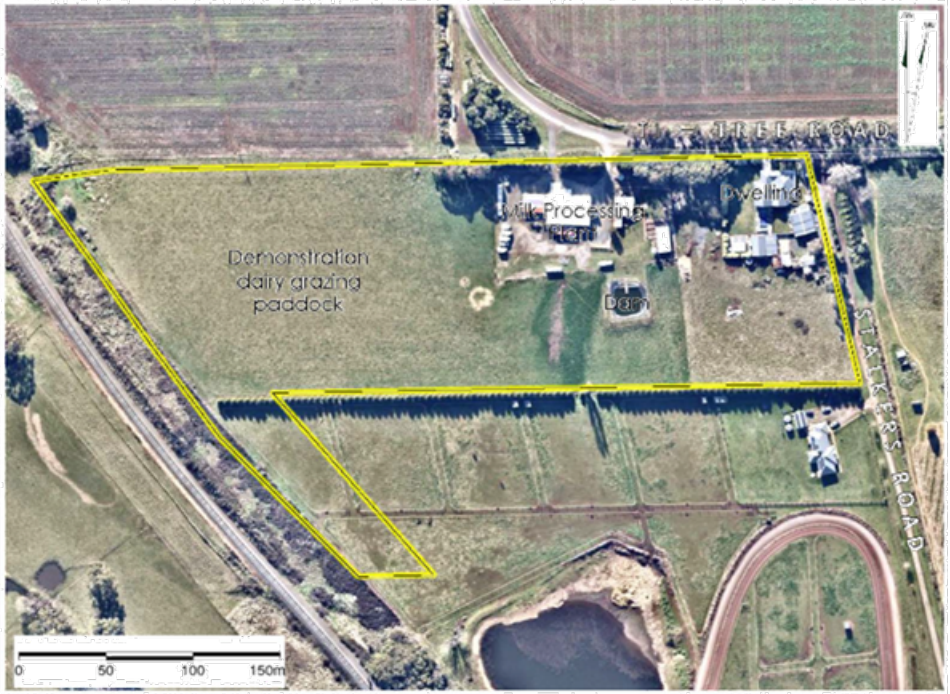
1. Double the amount of milk they process;
2. Build a herd of part Friesian, Jersey & Australian Red cows to improve the quality of their product; and,
3. Provide on-site housing at 265 Ti Tree Road for their production manager so they can cease paying $600 per week to rent their accommodation & retain a permanent presence at the plant.

To achieve the first goal, they have employed a full-time milk processing professional to run their plant and be present for night-time deliveries. Part of this role is also to make sure their plant stays up to date with industry advancements and can accommodate the projected growth in processing.

To achieve their second goal, they have purchased land at 88 Tierneys Road, which is located 1.38km to the east of their processing plant (see below), to set up a breeding operation.

To achieve their final goal, they aim to construct a new house at 88 Tierneys Road so they can manage calving while their new production manager lives in their house at 265 Ti Tree Road.

AERIAL PHOTOGRAPH OF INGLENOOK DAIRY'S EXISTING MILK PROCESSING PLANT AT 256 TI-TREE ROAD



AERIAL PHOTOGRAPH SHOWING THE LOCATIONS OF 256 TI-TREE ROAD AND 88 TIERNEYS ROAD

VIEW OF THE CROSSOVER TO THE INGLENOOK DAIRY PROCESSING PLANT AT 256 TI-TREE ROAD

Site Description: 88 Tierneys Road, Dunnstown

Troy & Rachael Peterken chose 88 Tierneys Road for their new breeding facility because it:

- Is located less than 5 minutes drive from the processing plant at 256 Ti-Tree Road, with access via a high quality, bitumen-sealed roadway, i.e. Ti-Tree Road;
- Is located in the Farming Zone, which is the appropriate zone for a cattle breeding operation;
- Is located only 8km from the regional centre of Ballarat's central activity district;
- Provides adequate pasture across 8.557ha for 15 breeding dairy cows and one bull, which is a herd size that they feel they can comfortably manage, while still devoting a good portion of their time to running their business;
- Has a reliable water supply from an on-site dam (see opposite);
- Was found by Provincial Geotechnics Pty. Ltd. to have clay loam topsoils overlying light clay, with no 'rocky outcrops', a water table depth of more than 1.4m, and average rainfall of 848.2mm (Source: Climate Station No. 087014). These aspects will ensure consistent pasture growth and stormwater harvesting capacity, which makes the site appropriate for livestock grazing;
- Is surrounded by small-scale farming uses that will not suffer an unreasonable amenity impact through the creation of a calf breeding enterprise thereon; and,
- Is located more than 500m from the nearest Work Authority approval, i.e. WA82, which is 1.5km from the southeast corner of the land – see below; and,
- Is located more than 500m from the nearest Windfarm, i.e. the Lal Lal (Yendon & Elaine) Wind Farm, which is 4.12km from the southeast corner of the land – see below.

AERIAL PHOTOGRAPH SHOWING THE SETBACK BETWEEN THE SUBJECT SITE AND THE NEAREST WORK AUTHORITY AND WINDFARM SITES

ZONING MAP WITH THE SUBJECT SITE OUTLINED WITH A RED DASHED LINE

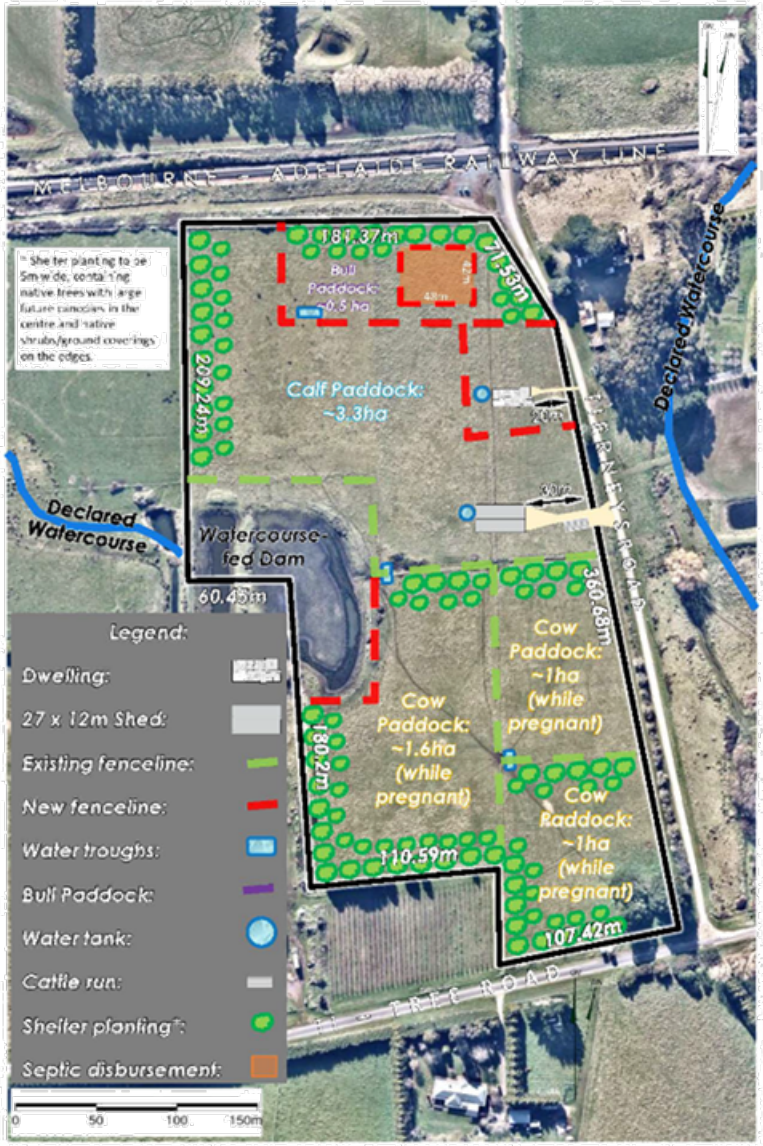
DIMENSIONED AERIAL PHOTOGRAPH OF 88 TIERNEYS ROAD WITH RELEVANT SITE FEATURES LABELLED

Farm Management Plan: Operational Aspects

Troy & Rachael Peterken aim to:

- Utilise existing fencing to establish 6 paddocks, i.e. a 1ha at the north end, a house paddock, a 3.3ha paddock near the house, a 1.6 hectare paddock in the southwest portion and two 1ha paddocks along the southern half of the eastern boundary;
- Build their house 20 metres from the east boundary in the northern portion of the land. It will be fenced off from the balance off the farm and gain access via a new crossover to Tierneys Road. It's water supply will come from a pump with a filter that is fed by a 100,000 litre tank that will be plumbed to collect stormwater runoff from the rooftop;
- Build the farm shed in the 3.3ha paddock, 30 metres from the east boundary and to the south of the dwelling. It will be used to store their farm machinery. Stormwater runoff from the roof will be collected in a 100,000 litre tank. Water in this tank will provide a backup supply for the house. Access to it will available via a new double crossover to Tierneys Road;
- Install a cattle run will in the 3.3ha paddock. It will be available via the same crossover to Tierneys Road as the shed;
- Install water troughs along fencelines as shown opposite;
- Plant canopy trees around the northern and western site boundaries to provide shelter and shade from prevailing winds for the dairy cows, calves and the bull
- Keep their bull in the 1ha northern paddock. It will be used to impregnate some of the Inglenook herd, while artificial insemination will be used while perfecting the Friesian, Jersey & Australian Red breed;
- Bring pregnant cows to the farm 2 months prior to calving. This pregnant herd will be rotated around the 3 southern paddocks so as to ensure adequate pasture can be kept up. They will be moved into the 3.3ha paddock near the end of their third trimester so as to be as close as possible to the house during calving;
- Milk pregnant cows on a twice daily basis using a portable single milking machine to collect colostrum for bottle feeding calves during their early lives;
- Run two x 15 cow calving cycles per annum, i.e. one in February and one in August, until the entire Inglenook herd is the new breed. This program will continue indefinitely to provide Inglenook with its replacement stock. Inglenook require up to 30 replacement stock per year;
- Once calves have been born they will stay with the Mum's for a week. Then the Mums will be transported to the farm and the calves will stay at 88 Tierneys Road to be hand reared by Rachael and Troy up until they are 3 months old to ensure their health and well-being;
- Sell any bull calves that are born;
- Sell members of the current herd where it becomes feasible/appropriate to replace them with calves from the new breed; and,
- Calves will be moved from the Tierneys Road breeding program at 3 months to the Farm at Scotts Creek to graze until they reach breeding age at around 18 months. They will then enter the breeding program back at Tierneys Road. Once the calves have been moved to the farm, another 15 cows will join the August breeding program.

FARM PLAN



Farm Management Plan: Costs

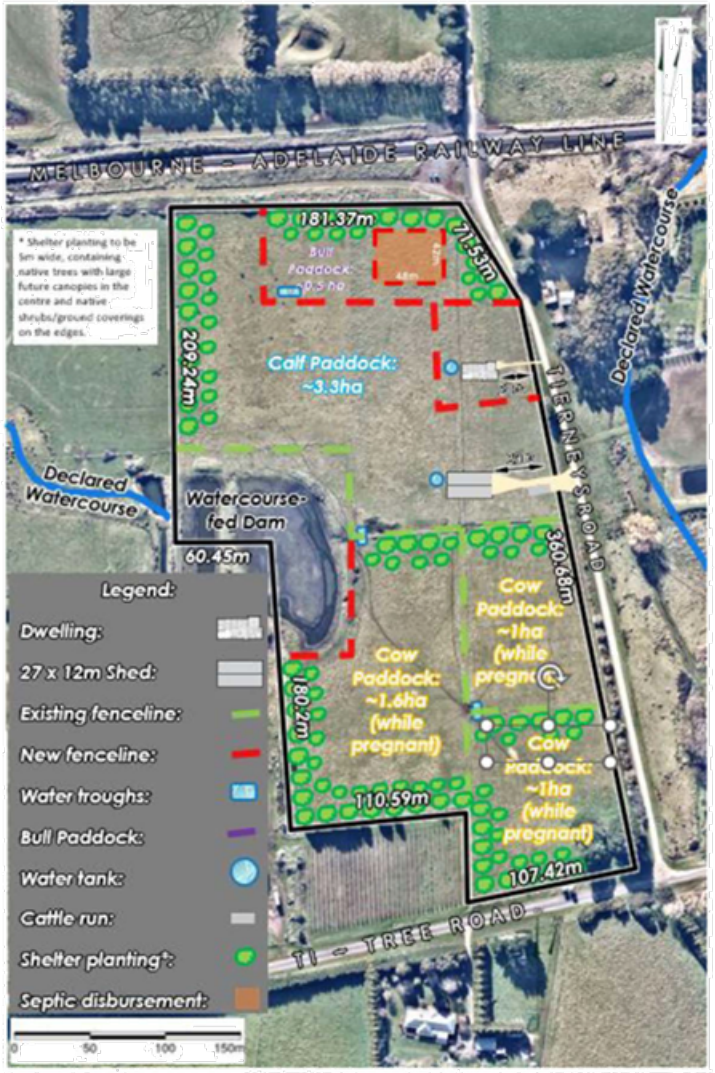
Establishment costs:

Element	Cost
Dwelling, concrete slab, driveway, water tank & pump:	$ 550,000
Shed, tank, pump & concrete pad	$ 80,000
Cattle run & crossover:	$ 15,000
New fencing, including electric wires:	$ 15,000
New water troughs & plumbing:	$ 10,000
Tube Stock, stakes, guards & feed (x60) for shade trees:	$ 1,000
Total:	$ 671,000

Ongoing Annual Costs:

Element	Cost (per annum)
Artificial Insemination:	$ 500
Supplementary feed during winter months:	$ 10,000
Fertiliser for pasture:	$ 5,000
Electricity for fences:	$ 1,000
Veterinarian:	$ 5,000
Total (per annum):	$ 21,500

FARM PLAN



Farm Management Plan: Revenue & Profit

Annual Revenue:

Element	Revenue (per annum)
15 dairy calves ($2,500 per calf if purchased on the open market):	$ 37,500
Sale of 15 bull calves ($300 per calf if sold on the open market):	$ 4,500
Money saved on rental accommodation for production manager ($600/week):	$ 31,200
Leasing of bull for servicing:	$ 10,000
Total annual revenue:	$ 83,200

Annual Profit once fully established:

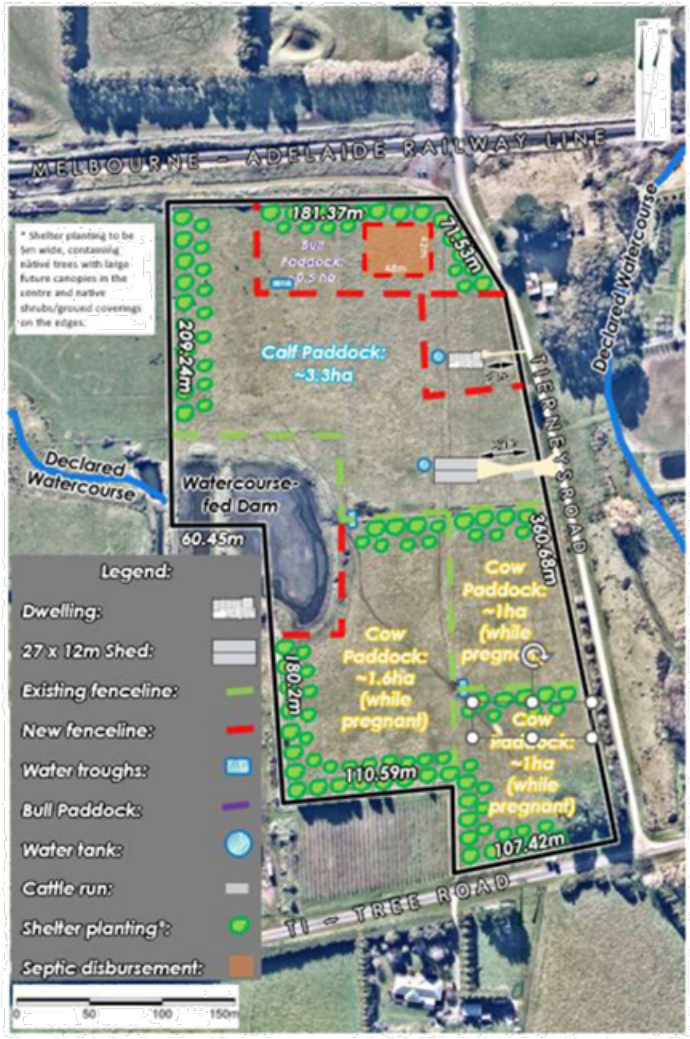
Element	Amount
Annual Revenue:	$ 83,200
Annual Costs:	$ 21,500
Total (per annum):	$ 61,700*

Time until venture pays for itself:

Element	Amount
Establishment Cost:	$ 671,000
Annual Profit:	$ 61,700
Time to pay off Establishment Costs (assuming 6% interest):	17 years & 7 months

** Upon maturation, the female calves born as part of the breeding program will yield 30 litres of improved quality milk per day. Given Inglenook processes it's own milk and produces value added products, i.e. cream, cheese and yoghurt, that are sold directly to its customers/suppliers under their own brand. So, the business will enjoy the full benefit from this additional, improved quality milk, rather than passing a large percentage on to an external processor. This additional profit is not included in the annual revenue so as to allow a straight cost/profit analysis for the subject site.*

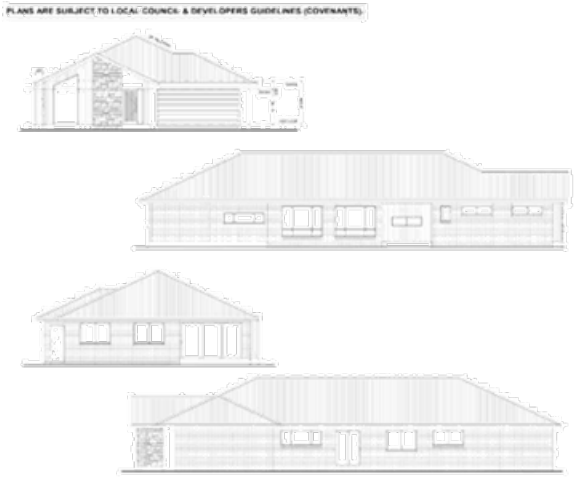
FARM PLAN



CONCEPT ELEVATION OF THE PROPOSED DWELLING (PREPARED BY G J GARDINER HOMES) & CROSSOVER DRIVEWAY SUPERIMPOSED OVER A STREETSCAPE VIEW OOKING WEST FROM TIERNEYS ROAD

MAGNIFIED AERIAL VIEW OF THE DWELLING SITE SHOWING THE NEW CROSSOVER AND FLOORPLAN (PREPARED BY G J GARDINER HOMES) ORIENTATION

PROPOSED ELEVATIONS (PREPARED BY G J GARDINER HOMES)



PROPOSED FLOORPLAN (PREPARED BY G J GARDINER HOMES)

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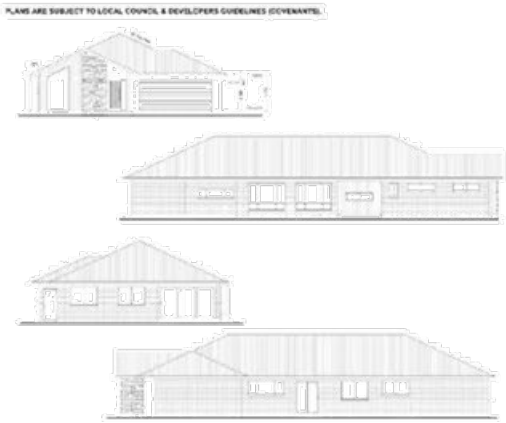

PROPOSED FLOORPLAN (PREPARED BY G J GARDINER HOMES)

Farm Plan Additional Information

The species and number of trees, or shrubs, or a mix of both, that will be planted as wind breaks, and the width of these plantations.

A mix of native gum trees (Eucalyptus Rubida, Eucalyptus Sideroxylon Rosea, Lophostemon Suaveolens and Corymbia Citriodora) will be included in the 5m wide strips of shelter planting around the property as indicated in the Farm Plan to provide shelter and shade for the animals. Large trees will be planted in the centre and native shrubs and ground covers along the edges.

Details of how and where the calves will be raised. Assuming the calf rearing will occur in the new shed, an internal layout of the shed is required. Are only female calves raised under this system?

The calves will be raised in the shed with access to outside pens (see Figures 1 & 2).

Only female calves will be raised at this proposed site. There will be a total of 5 pens. We will have 5 calves per pen, fed from a 5 teat feeder which will leave 2 spare pens if calves need separating for any reason.

We would like the pens to be aesthetically pleasing as once established we are hoping to restart the Inglenook Dairy Education farm tours at this location. This was a fantastic way to educate children on where their products come from and a great promotion for our local business and tourism in the region. The factory in Ti Tree Road is where we held these previously, but the business is too busy with traffic now.

The shed is proposed to be 18m long by 12m wide. The dashed lines indicate the area of the pens that are not under the 3m wide skillion roof.

How will calf health be maintained during the first three months? Will fresh milk or milk replacement be used?

Calf health will be maintained by feeding the calves twice daily fresh raw milk obtained from the farm via the factory in Ti Tree Road. The milk will be warmed in a temperature-controlled bath like operation (we have used this before and it is very accurate and controlled).

The calves will remain on the cows for the first few days to ensure they have received colostrum which is imperative to the health of the calves. Once the calves arrive at the shed they will be in pens with mulch bedding and access to an outdoor pen (see Figure 2) to provide fresh air and sunshine. They will have access to lucerne and pellets. They will also be injected with Vitamin B12 and Vitamin C. This helps maintain a high level of health in the calves. We are very experienced in calve rearing and have been doing it for a long time.

The Farm Management Plan states that there would be two rotations of 15 pregnant cows each year (February and August) and that Inglenook requires 30 replacement stock (cows) per annum. Once bull calves are sold, the target of 30 replacement females for the dairy from the calf enterprise as proposed doesn't add up. How will the target of 30 replacement calves per annum be achieved?

We have put 15 cows but are hoping we can increase this to 20. We will use Sex Semen to increase chances of female calves but are aware that the mop up bull has a 50% chance of throwing a bull. These bulls will be sold to our neighbour to hand rear. We will work with the number of females we get per year. If the target is not met it isn't a problem as will not cull as many from the current herd.

Figure 1 – Indicative layout of calf raising shed

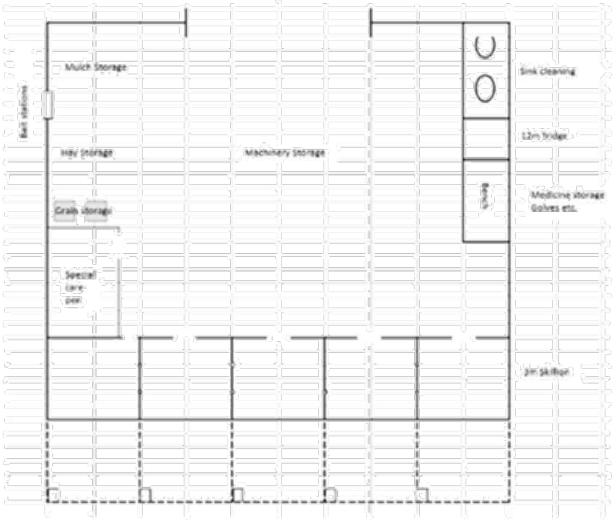

Figure 2 – Example photo of calf pens

PACIFIC 270 EXPRESS

Alpine Streetscape

FLOOR AREAS

LIVING	199.3 m²
GARAGE	37.5 m²
ALFRESCO	29.7 m²
PORCH	3.3 m²
TOTAL	269.8 m²

14m+ Lot Width

Proposed Display Home

Lot 111
Barwon Avenue
"Alluvium Estate"
Winter Valley

CONCEPT

DATE:

7/10/2022

PRESENTATION PLAN

G.J. Gardner. HOMES

PLANS ARE SUBJECT TO LOCAL COUNCIL & DEVELOPERS GUIDELINES (COVENANTS).

ARTISTS IMPRESSION - for illustrative purposes only

PACIFIC 270 EXPRESS

Alpine Streetscape

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"Alluvium Estate"
Winter Valley

CONCEPT

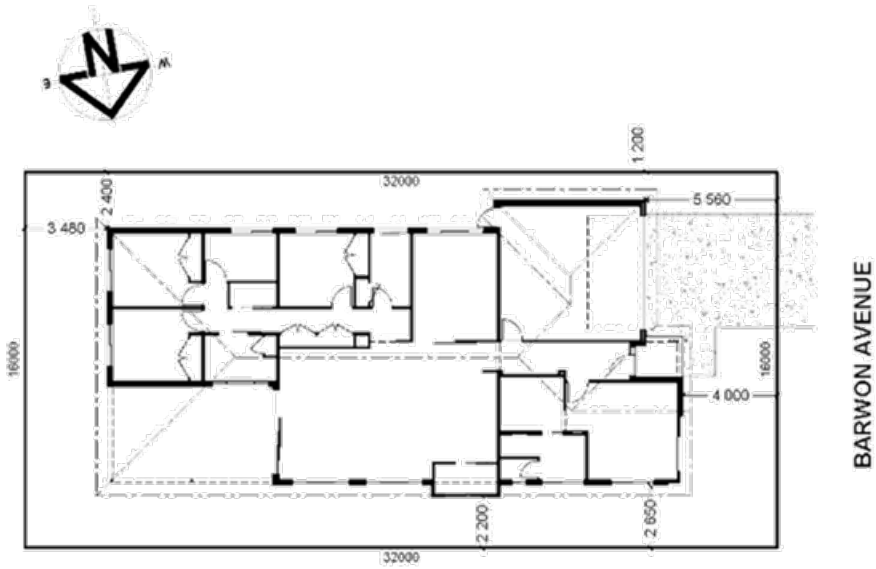
DATE:

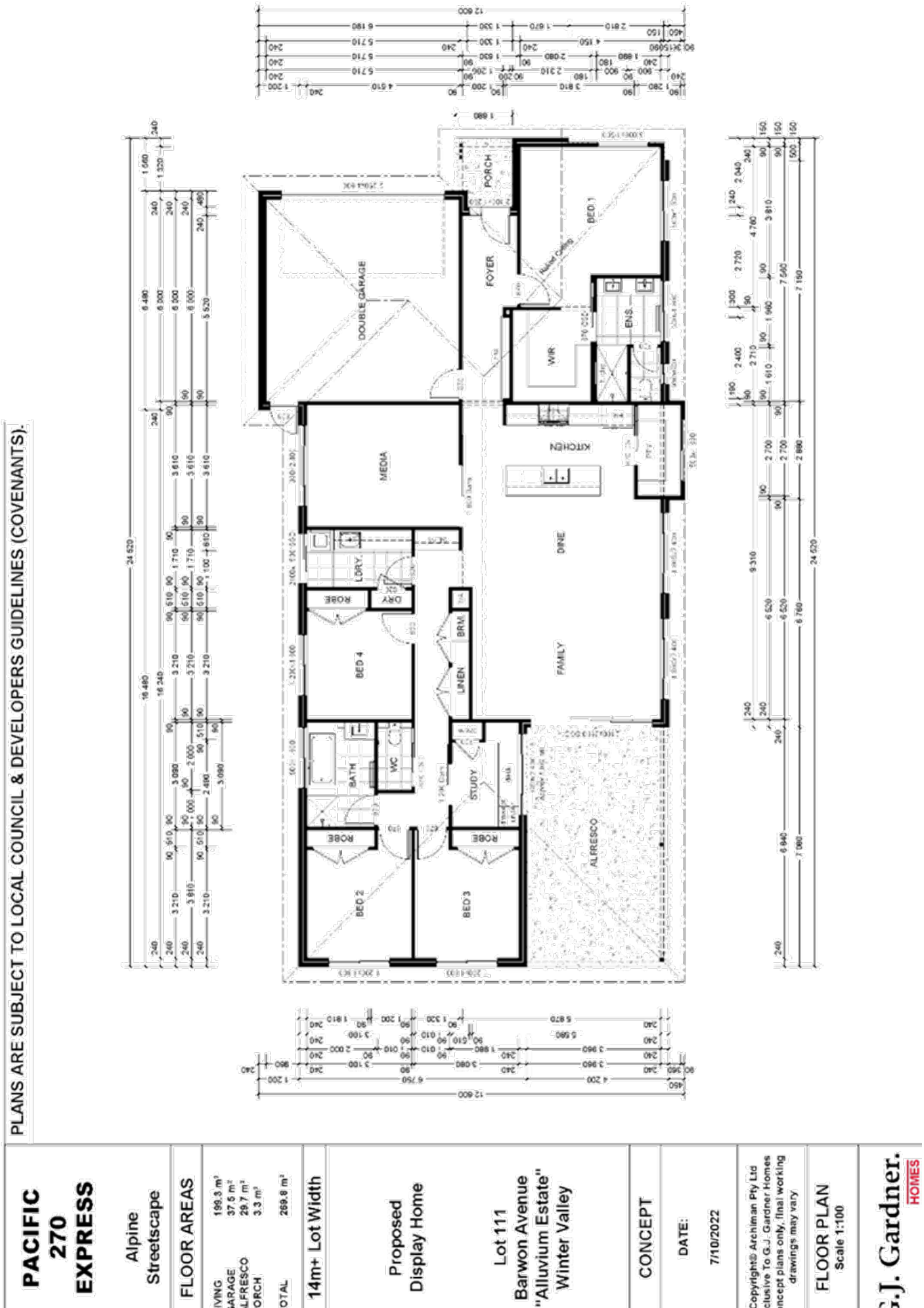
7/10/2022

SITE PLAN
Scale 1:200

G.J. Gardner. HOMES

PLANS ARE SUBJECT TO LOCAL COUNCIL & DEVELOPERS GUIDELINES (COVENANTS).




PLANS ARE SUBJECT TO LOCAL COUNCIL & DEVELOPERS GUIDELINES (COVENANTS).
PACIFIC 270 EXPRESS
Alpine Streetscape
FLOOR AREAS
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TOTAL 269.8 m²
14m+ Lot Width
Proposed Display Home
Lot 111 Barwon Avenue "Alluvium Estate" Winter Valley
CONCEPT
DATE: 7/10/2022
Copyright© Archiman Pty Ltd exclusive To G.J. Gardner Homes Concept plans only, final working drawings may vary
FLOOR PLAN
Scale 1:100
G.J. Gardner. HOMES
DOUBLE GARAGE
PORCH
FOYER
BED 1
ENS
WIR
KITCHEN
MEDIA
DINE
FAMILY
LDRY
DRY
ROBE
BED 4
BRM
LINEN
BATH
WC
STUDY
ROBE
ROBE
BED 2
BED 3
ALFRESCO

PACIFIC 270 EXPRESS

Alpine Streetscape

FLOOR AREAS

LIVING	199.3 m²
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ALFRESCO	29.7 m²
PORCH	3.3 m²
TOTAL	269.8 m²

14m+ Lot Width

Proposed Display Home

Lot 111
Barwon Avenue
"Alluvium Estate"
Winter Valley

CONCEPT

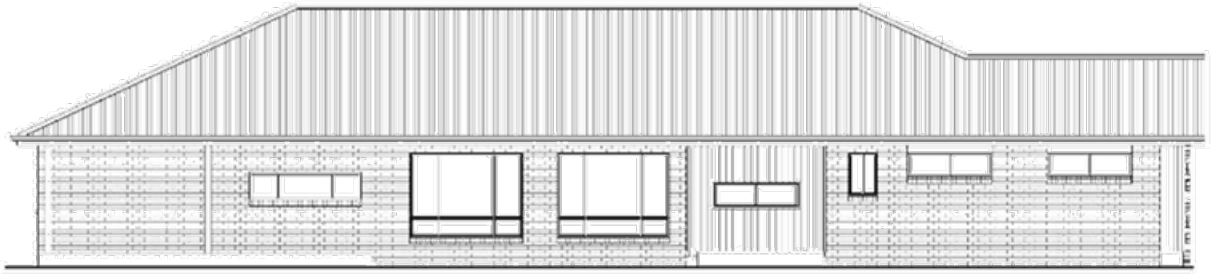
DATE:

7/10/2022

ELEVATIONS
Scale 1:100

G.J. Gardner. HOMES

PLANS ARE SUBJECT TO LOCAL COUNCIL & DEVELOPERS GUIDELINES (COVENANTS).



Stormwater Management Plan

58 Ingliston Rd Ballan

JANUARY 13, 2025

PREPARED FOR MRM FAMILY TRUST

DRYSIDE ENGINEERING

DRYSIDE ENGINEERING (AUST) PTY LTD

DSE24012REP01

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Appendices

Contact Information

Dryside Engineering (Aust) Pty Ltd

www.dryside.com.au

Melbourne, Adelaide & Ararat

ed@dryside.com.au

Project Information

Client: MRM Family Trust

Project Name: 58 Ingliston Rd Stormwater Management Plan

Report Number: DSE24012REP01

Version: V03

Date: 13th January 2025

Document Control

Date	Version	Author	Comments	Approved
17/5/24	V01	Ed Henty	For Submission	17/5/24
30/7/24	V02	Ed Henty	Updated to remove formalised flow path and culverts	30/7/24
13/1/25	V03	Ed Henty	Updated to confirm detention tank arrangements	13/1/25

1. Introduction

This report has been prepared by Dryside Engineering (DSE) on behalf of MRM Family Trust to assess stormwater management requirements for the proposed development of 58 Ingliston Rd Ballan. The report will form part of a development application to the Moorabool Council and Permit response to Melbourne Water.

The assessment has been conducted by experienced engineers from DSE with consideration to the existing conditions, proposed site usage and layout, surrounding drainage scheme and relevant feedback/advice from catchment management authorities.

The report considers the following elements of stormwater management relevant to development of the site:

- Stormwater Catchments and Hydrology
- Stormwater Quantity & Quality Management
- Proposed Drainage Network and Hydraulics

Version 2 July 2024 Update

SWMP was updated to remove the formalised overland flow path and culverts as Melbourne Water had issues with this arrangement and the solution was to maintain the existing flow path due to the flood hazard being low.

Version 3 January 2025 Update

SWMP was updated to confirm that the detention tanks will be located within the road and the road will be owned/managed by an owner's corporation. This is at the request of Council who would only accept detention as follows:

- Detention Basin in drainage reserve
- Detention tanks under the road if the road will be owned/managed by an owner's corporation

2. Site and Surrounds

The existing site at 58 Ingliston Rd is approximately 2.07ha in size. It is currently a rural residential block.

The site generally grades north with a flow path located in the eastern section of the land defined by a Land Subject to Inundation (LSIO) overlay.

The site is bound by smaller residential lots to the south & west, rural residential to the north and Ingliston Rd to the east.

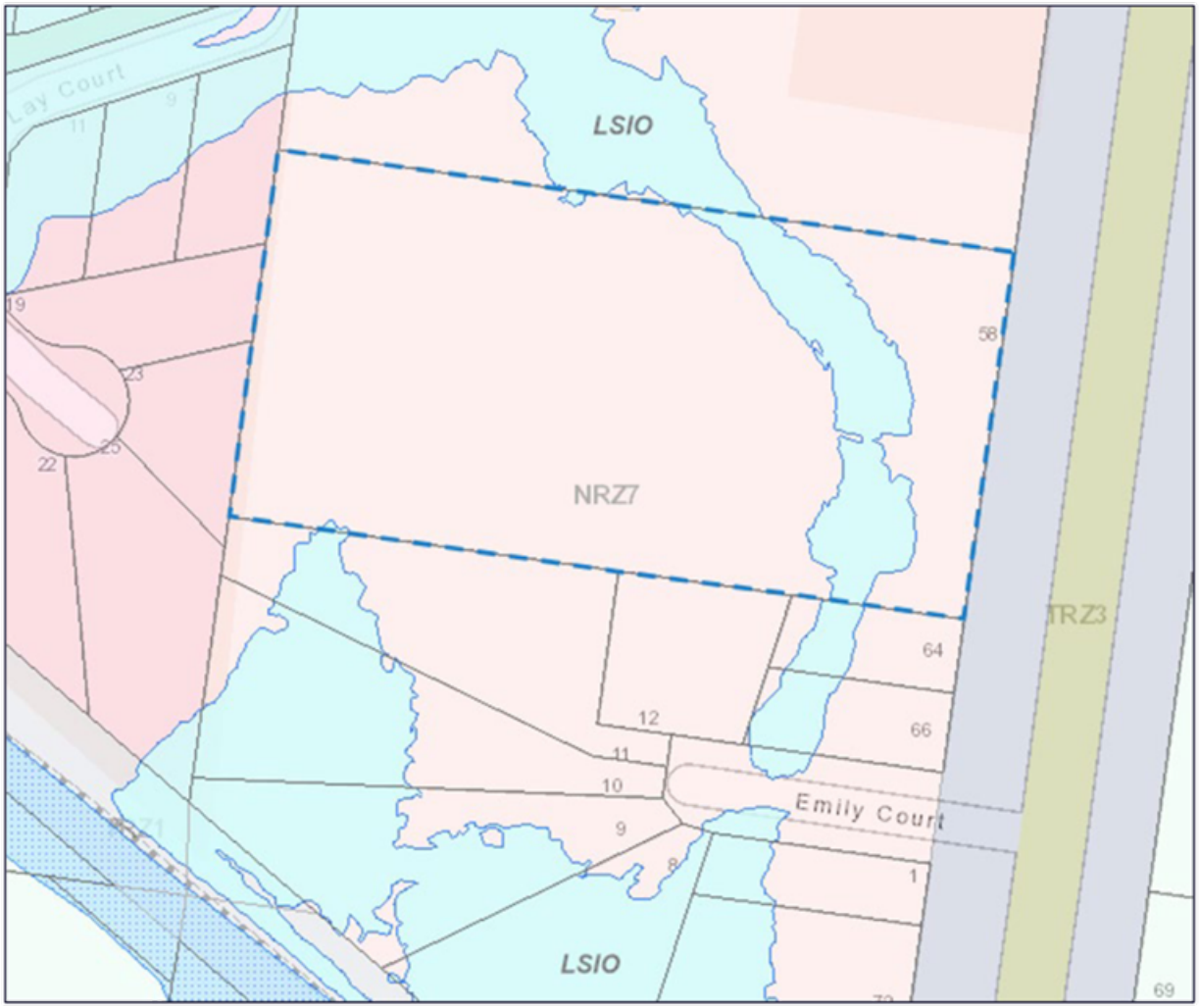


Figure 2-1 Site Location

Figure 2-2 Site Aerial View

3. Proposed Development

The proposal for the site is for a 18 Lot medium density residential subdivision as per the zoning for the area.

Figure 3-1 shows the proposed used and development of the site. Appendix A contains full layout plans.

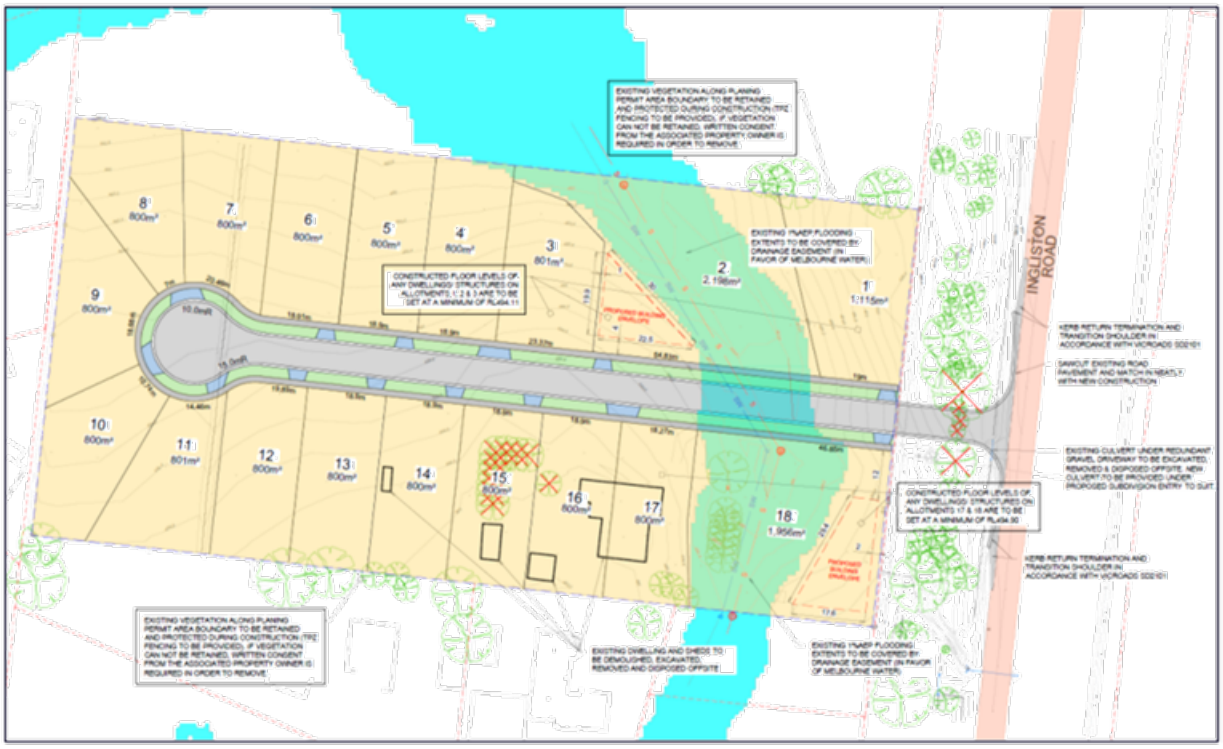


Figure 3-1 Proposed Layout

4. Legal Point of Discharge

The Legal Point of Discharge for the subdivision will be the Melbourne Water 600mm dia RCP that runs along the western side of the overland flow path. A Stormwater Connection Application will be submitted to Melbourne Water for this.

Each Lot will connect to drainage in the Street. The street drainage will connect to the existing pit shown in Figure 4-1.

Table 4-1 shows the estimated 20% AEP flows for the site.

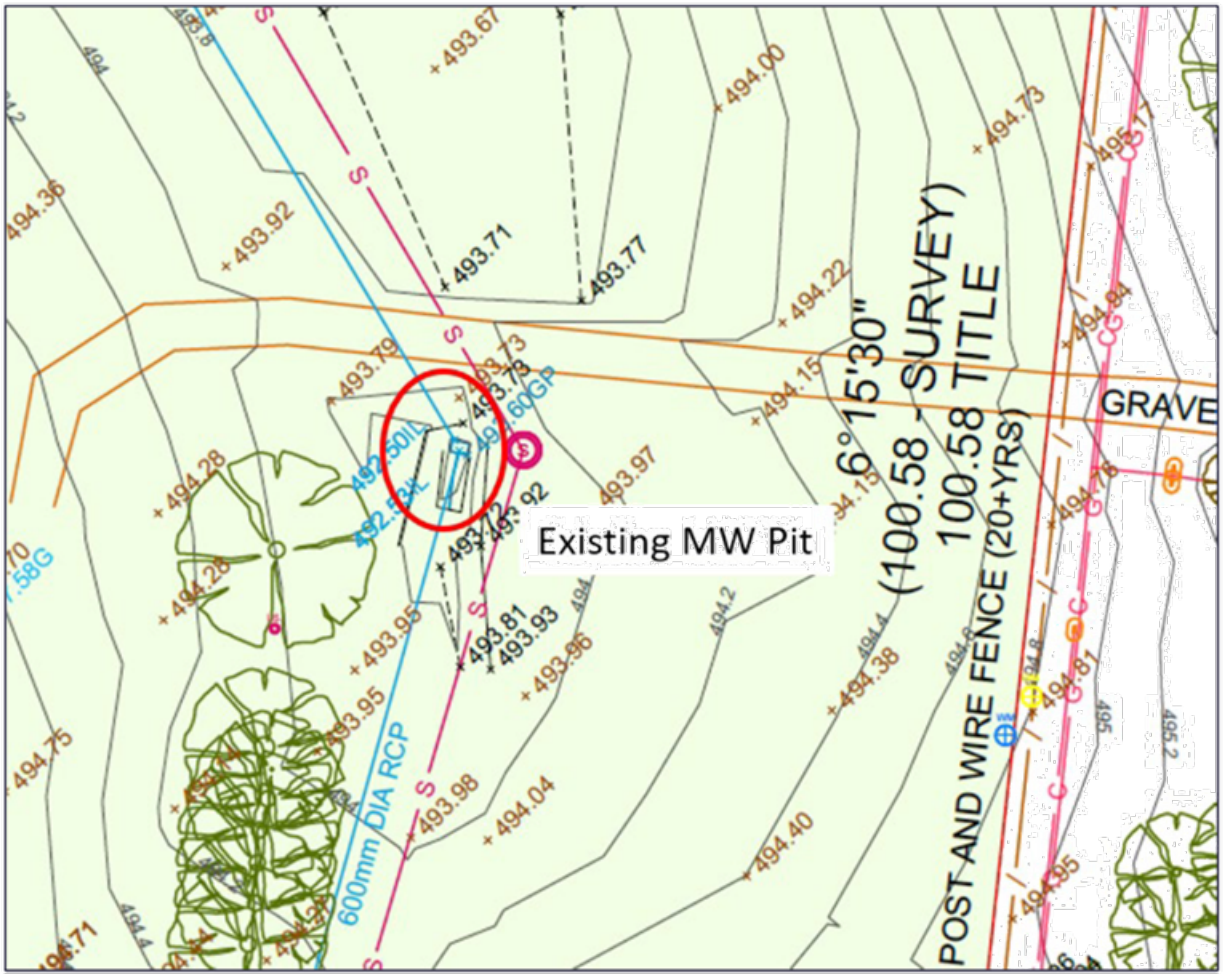


Figure 4-1 Legal Point of Discharge

Table 4-1 Adopted design events and peak flow 20% AEP

Event	Location	Scenario	Critical Duration	Adopted Temporal Pattern	Peak Flow (m^3/s)
20% AEP	Eastern Catchment	Pre-developed Post-developed	90 minutes 20 minutes	4 10	0.007 0.047
20% AEP	Western Catchment	Pre-developed Post-developed	270 minutes 20 minutes	2 4	0.022 0.157
20% AEP	**Combined Catchment Flows**	**Pre-developed** **Post-developed** **Post-developed (Undetained)**	**270 minutes** **60 minutes** **25 minutes**	**2** **6** **8**	**0.025** **0.053** **0.192**

5. Water Quality Treatment

5.1. MUSIC Model Set UP

5.1.1. Treatment

The proposed treatment is a 5Kl rainwater tanks for each house with 12 tree pits spread throughout the road reserve (Figure 5-1).

This treatment train results in the development meeting the Best Practice Management Targets.

5.1.2. Model Set Up

A MUSIC model was set up to assess the impacts of the RWTs & Raingardens on the Water Quality using the following parameters:

- Total development Area– 1.61ha
  - Roof Area – 0.57ha 100% Impervious
  - Lots & Road – 1.291ha 35% Impervious
- Rainfall – Melbourne City (as per Melbourne Water MUSIC Guidelines)
- Set Up – Refer to Figure 5-1
- Results – Refer Table 5-1

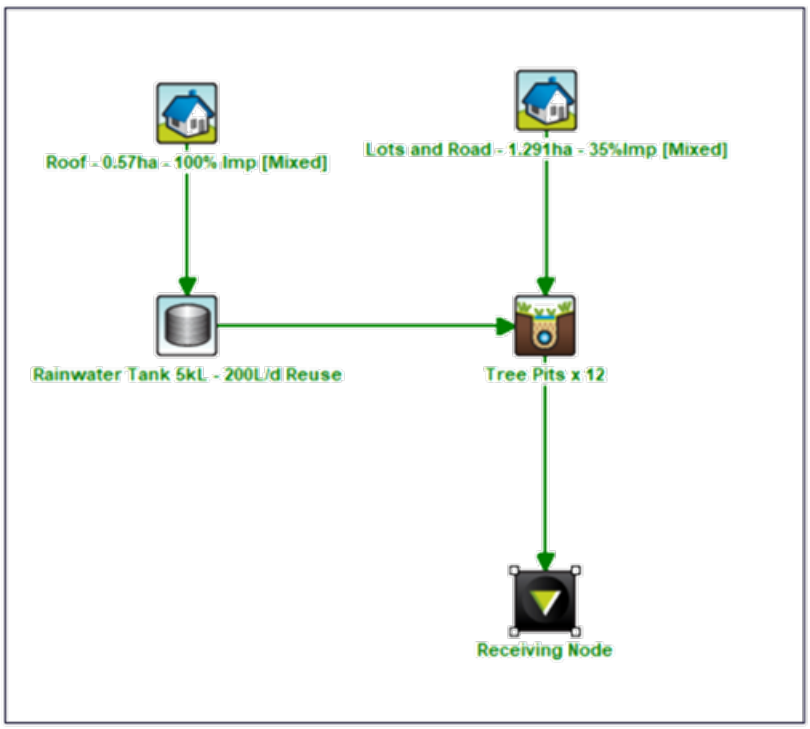


Figure 5-1 MUSIC Model Set Up

Table 5-1 MUSIC Modelling Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.05	5.7	19.1
Total Suspended Solids (kg/yr)	1270	266	79
Total Phosphorus (kg/yr)	2.69	1.23	54.1
Total Nitrogen (kg/yr)	19.5	8.81	54.8
Gross Pollutants (kg/yr)	248	0.317	99.9

6. External and Internal Overland Flows

6.1. External Catchments

External catchments in relation to the site are the overland flow path associated with the Melbourne Water 600mm RCP that runs through the site.

The 1% AEP Overland flow is 3.6m³/s.

Cumulus Engineering have undertaken a Flood Impact Assessment (16 May 2024) which looks at the flow path in detail. Figure 6-1 shows the flood depths for the proposed development.

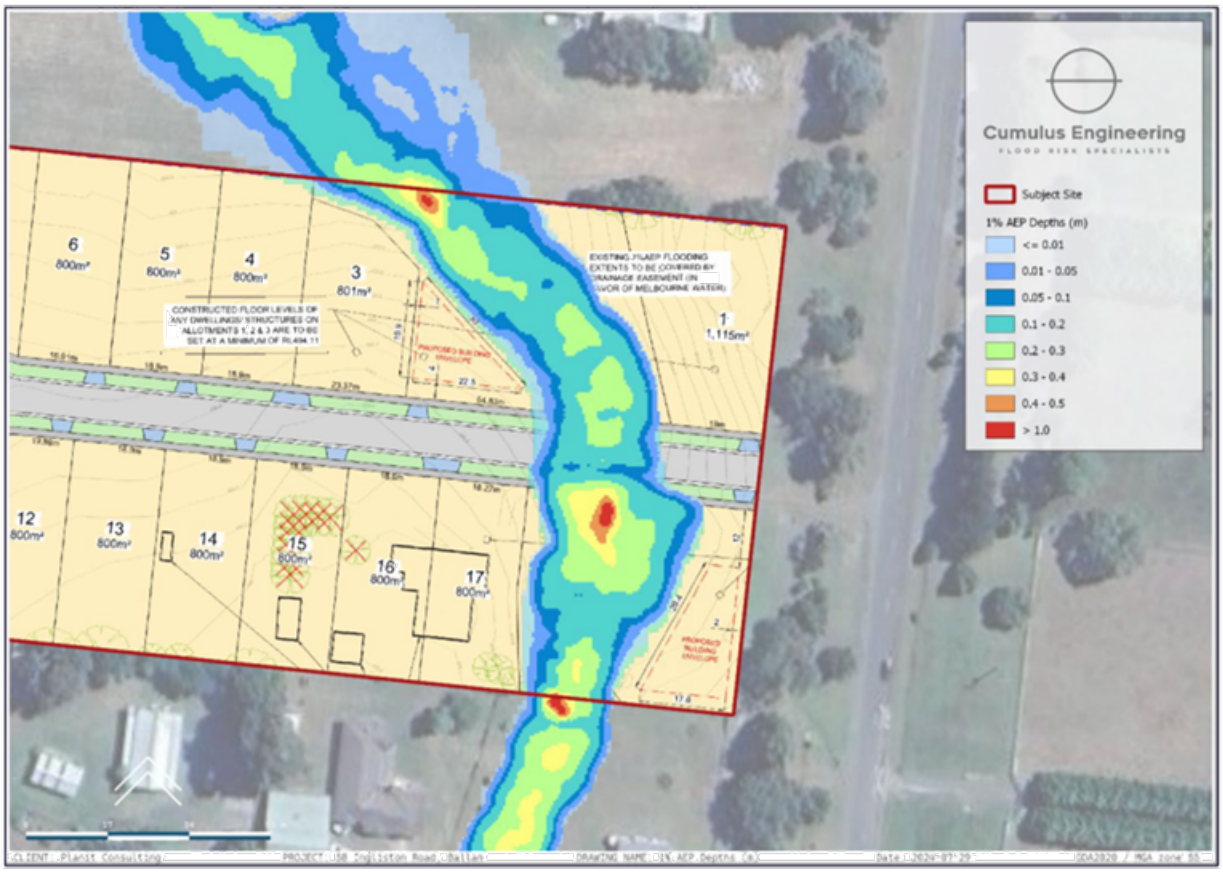


Figure 6-1 Overland Flow Path (Cumulus Engineering 2024)

6.2. Overland Flow Path in Subdivision

The overland flow path in the subdivision will maintain the existing condition (i.e. no works to be undertaken) with the area being set aside as a drainage reserve in favour of Melbourne Water and Floor Levels set to 300mm above the 1% AEP level.

Lots 1,2 and 3 FLs will be set to a minimum of 494.11m AHD and Lots 17 and 18 to 494.9m AHD.

Figure 6-2 shows the Hazard Mapping for the flow path (same as existing) which has a DxV of less than 0.3 for the access/egress to the lots.

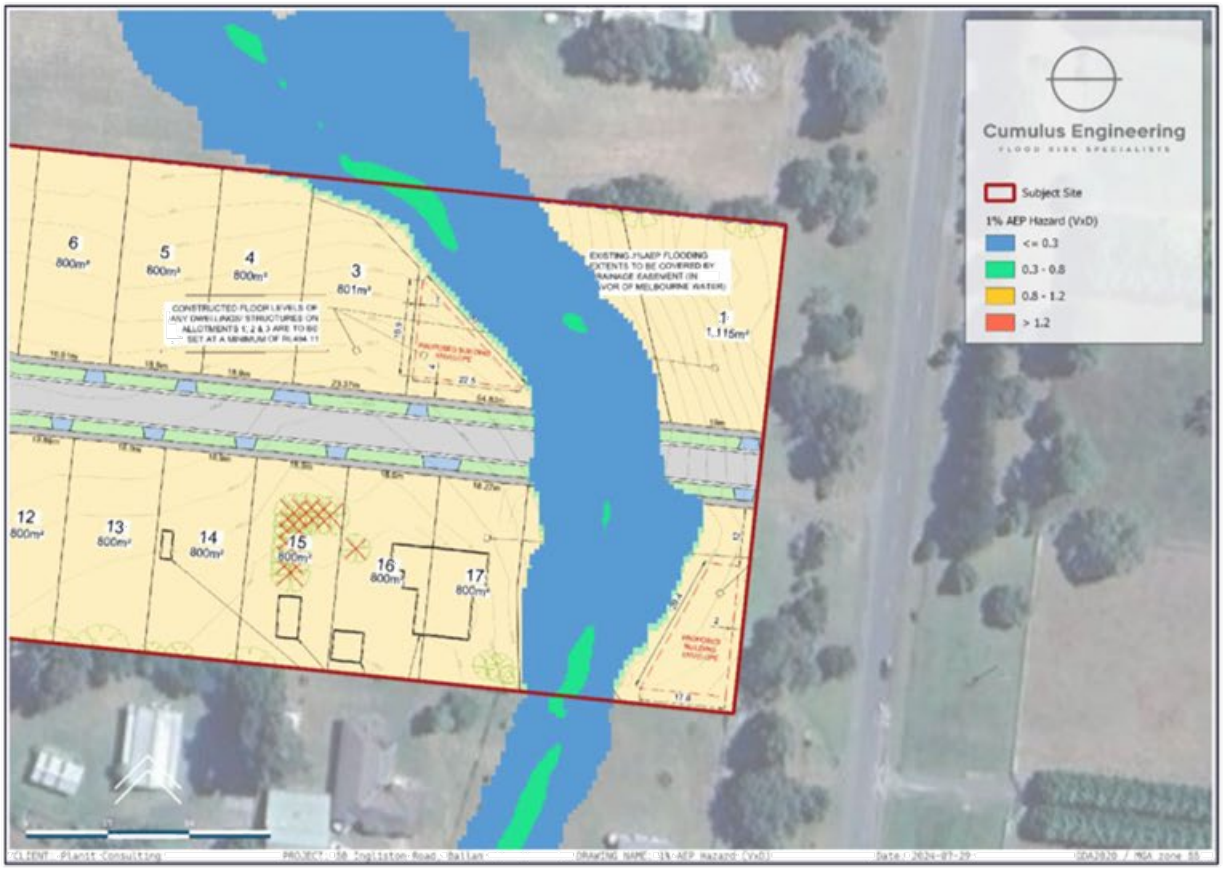


Figure 6-2 Proposed Overland Flow Path Hazard Mapping (Cumulus Engineering 2024)

7. Detention

The RORB hydrological model Version 6.51 (Laurenson, Mein and Nathan, 2010) was used for this analysis. RORB calculates flood hydrographs from storm rainfall hyetographs and can be used for modelling natural, part urban and fully urban catchments. RORB is an industry standard modelling package that is used widely in hydrological studies in Australia.

Critical duration and associated peak mean temporal pattern for the 1% AEP storm event (in accordance with ARR2019) was determined through an Ensemble approach where results informed the critical duration for the 1% AEP event.

The total area of the eastern catchment is 0.35 Ha, while the total area of the western catchment is 1.56 Ha. The total area of the development is 1.91 Ha.

Sub-catchment delineation of the site and surrounding areas was determined through tools in QGIS using publicly available LiDAR obtained online (Geoscience, 2021) in combination with the proposed development layout as illustrated in Figure 7-1.

Figure 7-1 Developed Conditions Catchment Delineation

7.1. Storage Design

The aim of the RORB modelling was first to establish critical peak flows under existing conditions and then model post-developed conditions and test detention basin requirements within the model to ensure no net increase in combined peak flow from the site.

RORB was used to size the storage at the proposed tank (storage) locations. The developed conditions have been modelled under the conditions that 19 lots across the site.

The RORB model was run for:

- Pre-Developed Conditions
- Post-Developed Conditions

A summary of the design flows and critical durations under each scenario is shown in Table 7-3 below. The results show that the 1% AEP, detained flow is no higher than under existing conditions.

Table 7-1 Adopted design events and peak flow

Event	Location	Scenario	Critical Duration	Adopted Temporal Pattern	Peak Flow (m^3/s)
1% AEP	Eastern Catchment	Pre-developed Post-developed	45 minutes 45 minutes	24 26	0.050 0.048
1% AEP	Western Catchment	Pre-developed Post-developed	90 minutes 90 minutes	26 27	0.124 0.106
1% AEP	**Combined Catchment Flows**	**Pre-developed Post-developed**	**90 minutes 20 minutes**	**24 26**	**0.147 0.147**

Storage requirements are detailed in Table 7-2 below and is in the form of tanks under an owner's corporation owned/managed road

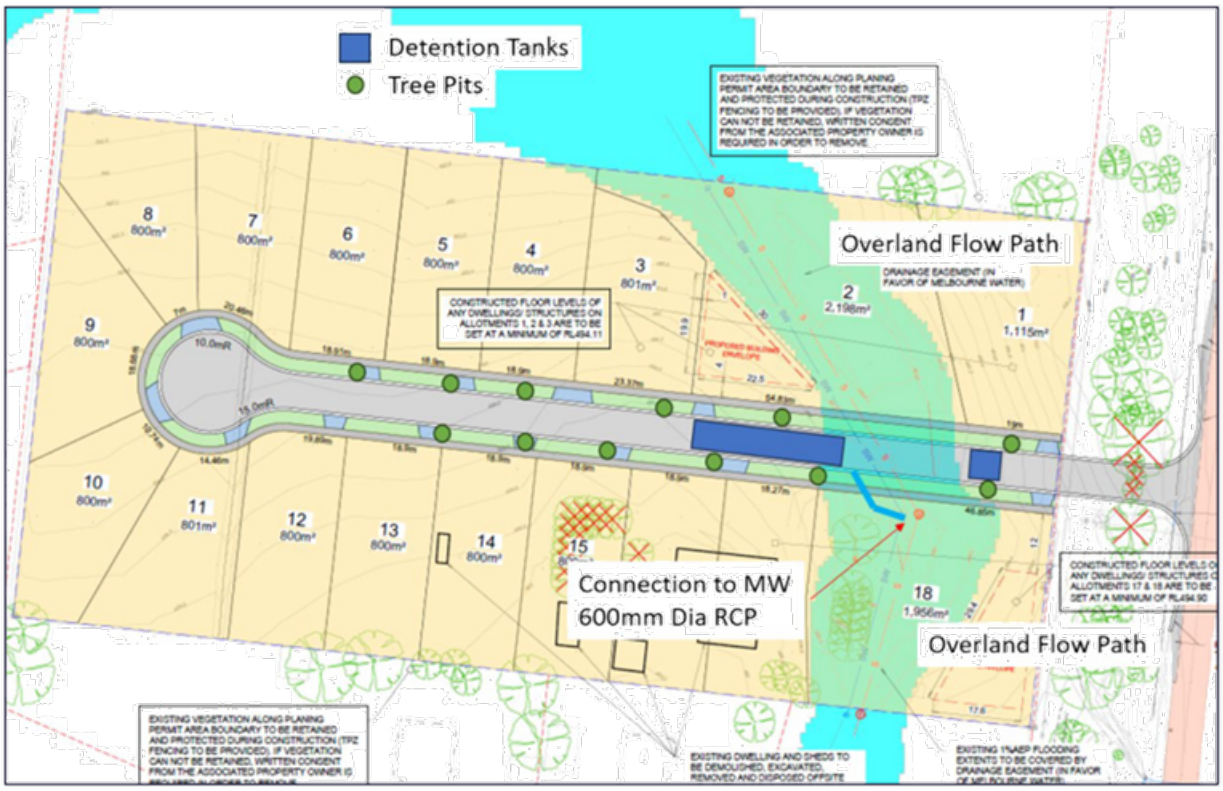
Table 7-2 Storage Requirements

Storage	Attributes	Values
Eastern Storage	Peak 1% AEP Outflow	$0.05m^3/s$
	Peak 1% AEP Storage	$50.9m^3$
	Peak Depth	0.37m
	Total Upstream Catchment Area	0.304Ha
	Outlet Configuration	1x 225mm pipe
Western Storage	Peak 1% AEP Outflow	$0.10m^3/s$
	Peak 1% AEP Storage	$366m^3$
	Peak Depth	0.65m
	Total Upstream Catchment	1.585Ha
	Outlet Configuration	1x 250mm pipe*

* Non-standard pipe size so a 250mm orifice plate on a 300mm pipe is recommended.

8. Stormwater Management Summary

This stormwater management plan outlines the measures that will be implemented by the proposed development at 58 Ingliston Rd. The measures are summarized below.



Legal Point of Discharge

The legal point of discharge for this site is the existing Melbourne Water 600mm Diameter RCP.

Water Quality

The proposed treatment is a 5Kl rainwater tanks for each house with 12 tree pits spread throughout the road reserve.

This treatment train results in the development meeting the Best Practice Management Targets.

Detention Requirements

The detention storage will be tanks under an owner's corporation owned/managed road and is split either side of the overland flow path/600mm RCP and is as follows:

- Eastern Catchment – 51m^3
- Western Catchment – 366m^3

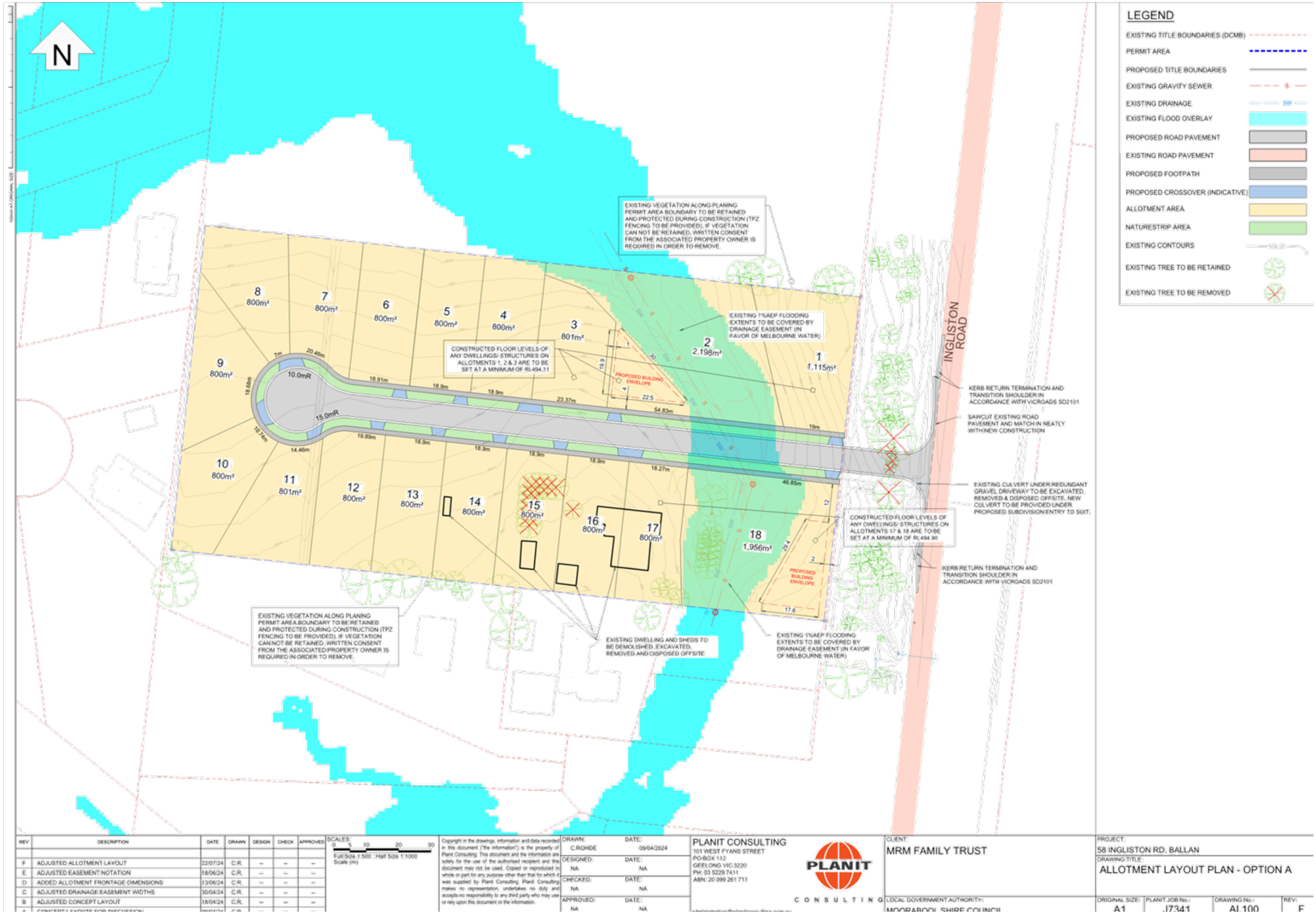
Overland Flow Path

The overland flow path in the subdivision will maintain the existing condition with the area being set aside as a drainage reserve in favour of Melbourne Water.

Lots 1,2 and 3 FLs will be set to a minimum of 494.11m AHD and Lots 17 and 18 to 494.9m AHD.

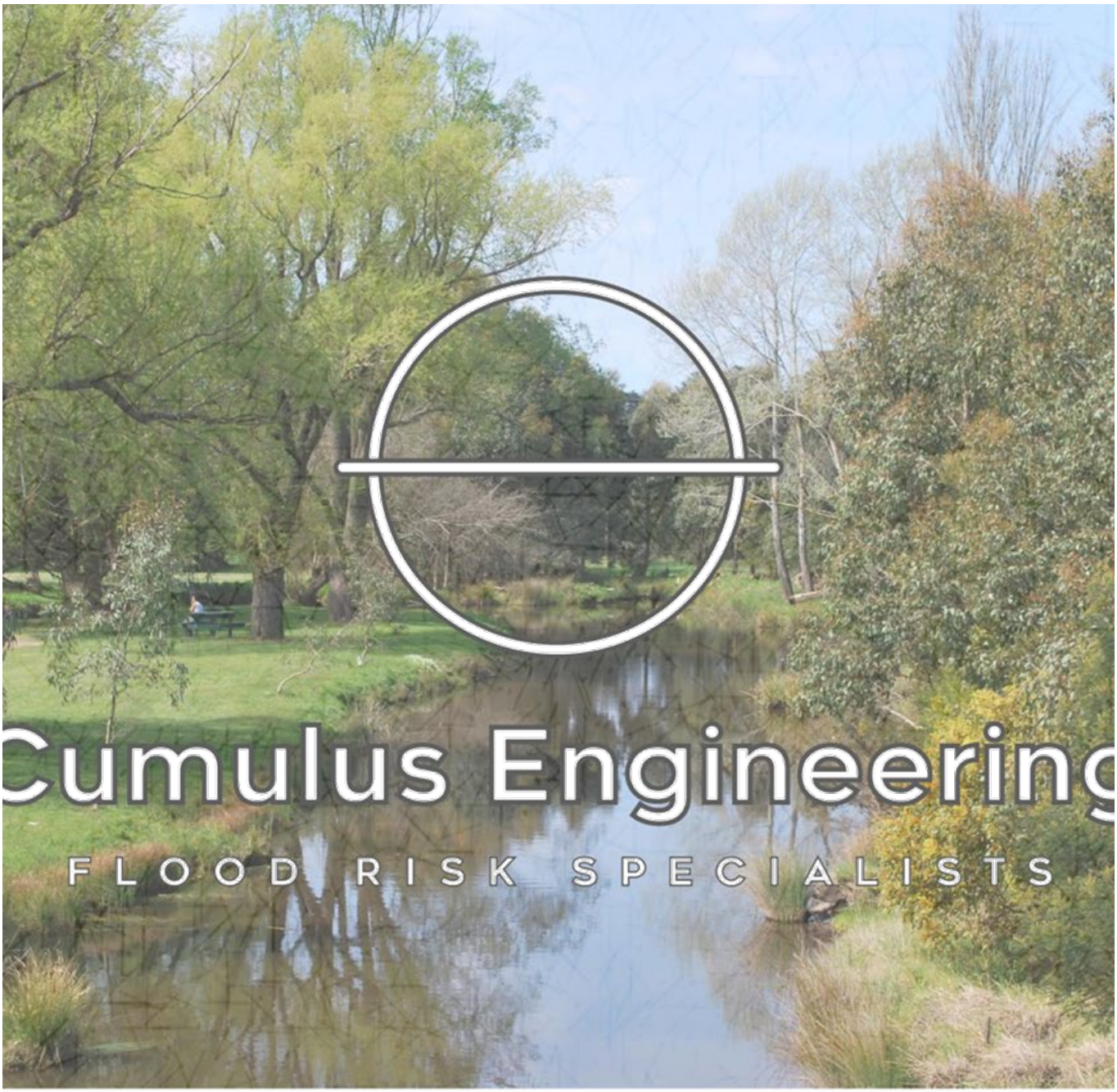
The Hazard Mapping for the flow path (same as existing) demonstrates a DxV of less than 0.3 for the access/egress to the lots.

APPENDIX A - PROPOSED DEVELOPMENT PLAN



REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
F	ADJUSTED ALLOTMENT LAYOUT	22/07/24	C.R.	--	--	--
E	ADJUSTED EASEMENT NOTATION	18/06/24	C.R.	--	--	--
D	ADDED ALLOTMENT FRONTAGE DIMENSIONS	13/06/24	C.R.	--	--	--
C	ADJUSTED DRAINAGE EASEMENT WIDTHS	30/04/24	C.R.	--	--	--
B	ADJUSTED CONCEPT LAYOUT	18/04/24	C.R.	--	--	--

APPENDIX B – DETENTION MODELLING MEMO



58 INGLISTON ROAD, BALLAN

RORB MODELLING MEMO

PREPARED FOR DRYSIDE ENGINEERING

APRIL 24

Cumulus Engineering
FLOOD RISK SPECIALISTS

Cumulus Engineering Pty. Ltd.
www.cumuluseng.com.au
ABN 63 661 813 869

Project Name	58 Ingliston Road, Ballan – RORB Modelling Memo
Client	Dryside Engineering
Project Number	J0020
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Document Control

Version No.	Date	Status	Author(s)	Reviewer
001	30/04/2024	Draft	YW	JLS

In the spirit of reconciliation, Cumulus Engineering acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea, and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

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List of Tables

1 Introduction

Cumulus Engineering has undertaken hydrological modelling to assess storage and flow requirements for a proposed residential development at 58 Ingliston Rd, Ballan, VIC 3342. The proposed development consists of 19 residential lots ranging from 803 m² to 1771 m² in area and is located 65km west of Melbourne. This hydrological and detention assessment has been undertaken to inform the stormwater management plan for the site prepared by Dryside Engineering.

This report summarises the modelling methodology and presents the key findings of the investigation. The analysis involved development a new hydrological model of the site to determine design flows, and then using the model to assess storage requirements consisting of oversized pipes or detention tanks.

The proposed layout plan for the site is shown in Figure 1-1 with the stormwater outfall marked from the eastern and western portions of the development marked.

FIGURE 1-1 PROPOSED LAYOUT PLAN

The existing land use for the site is predominantly rural residential with an existing dwelling located near the southern boundary of the site. Planning overlays for the site indicated an overland flow path exists across the eastern portion of the site flowing from south to north. The overland flow path divides the site into an east and west catchment with one combined outlet under where the overland flow path crossing proposed road (see Figure 1-1). The results demonstrate that the total peak runoff from western and eastern outlets is higher than under existing conditions. Detention tanks or oversized pipes under the road are suggested to detain the 1% peak flow back to pre-developed conditions.

2 Hydrological Analysis

The RORB hydrological model Version 6.51 (Laurenson, Mein and Nathan, 2010) was used for this analysis. RORB calculates flood hydrographs from storm rainfall hyetographs and can be used for modelling natural, part urban and fully urban catchments. RORB is an industry standard modelling package that is used widely in hydrological studies in Australia.

Critical duration and associated peak mean temporal pattern for the 1% AEP storm event (in accordance with ARR2019) was determined through an Ensemble approach where results informed the critical duration for the 1% AEP event.

The total area of the eastern catchment is 0.35 Ha, while the total area of the western catchment is 1.56 Ha. The total area of the development is 1.91 Ha.

Sub-catchment delineation of the site and surrounding areas was determined through tools in QGIS using publicly available LiDAR obtained online (Geoscience, 2021) in combination with the proposed development layout as illustrated in Figure 2-1.

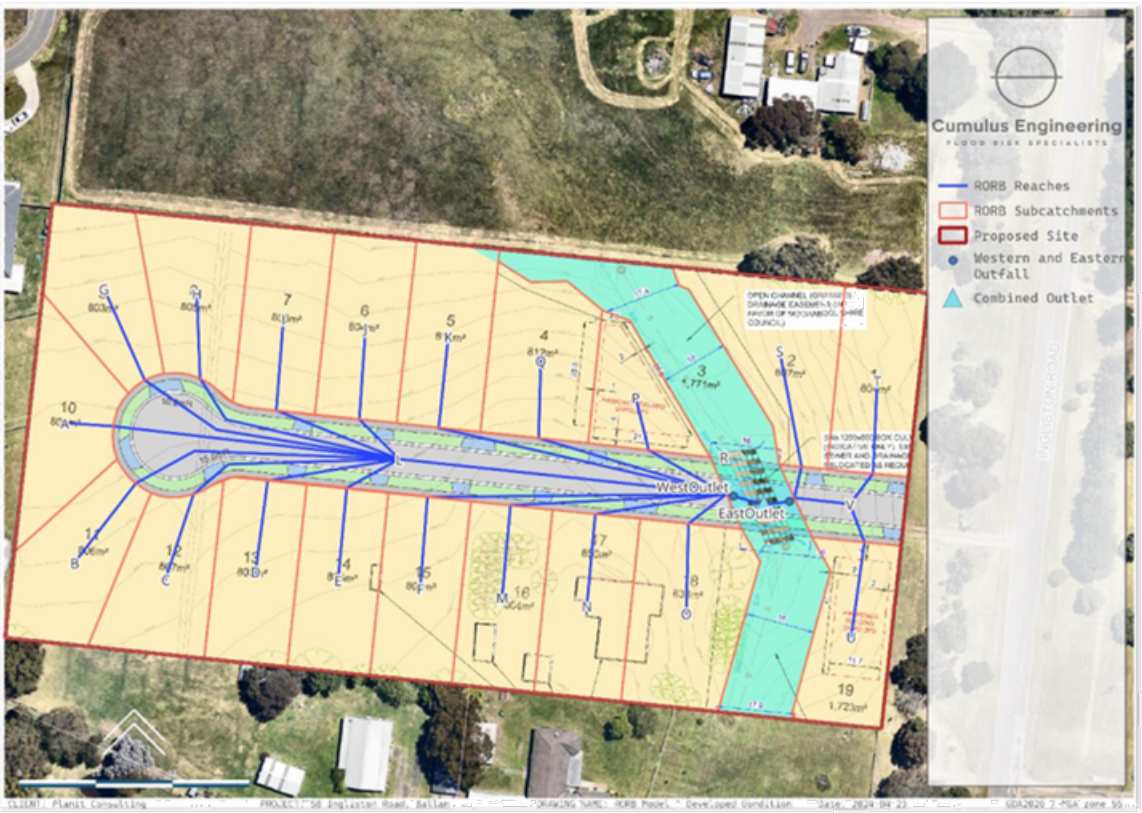


FIGURE 2-1 CATCHMENT DELINEATION – DEVELOPED CONDITIONS

2.1 RORB Modelling Parameters

2.1.1 Values of Fraction Imperviousness

Values of fraction imperviousness (FI) were determined through aerial imagery and planning zone codes adopting proposed development plan layouts for the post developed scenario and using standard values based on land use where values were obtained from MUSIC Guidelines: Input parameters and modelling approaches for MUSIC users in Melbourne Water's service area 2018.

Adopted values of FI for the post developed scenario are outlined in Table 2-1 and illustrated in Figure 2-4.

For the predeveloped scenario, aerial imagery shows that the subject site is currently paddocks except the residential areas on the south side, and therefore an FI value of 0.1 was adopted for all subareas for the predeveloped (rural) scenario.

TABLE 2-1 ADOPTED VALUES OF FI

Land Use	Adopted Value
Residential Zones – Large Residential - Allotment size 601 - 1000 m²	0.60
Low Density Residential Zone - Allotment size > 1001 m²	0.40
Road Zone - Category 2 - Secondary and local roads	0.60
Rural Zone - Main zone to be applied in most rural areas	0.10

2.2 Hydrological Modelling

The analysis was undertaken using the current version of RORB (version 6.51), RORB is an industry-standard software utilised widely in Australia for modelling of rainfall & runoff, and design flood hydrologic modelling.

The key features of the RORB model are presented below and further details regarding the model schematisation is provided in Appendix A.

The catchment was delineated based on contours and development layout to determine the routing and areas of flow accumulation, with the hydrological modelling undertaken in RORB to determine design hydrographs for the site.

FIGURE 2-2 RORB MODEL SCHEMATISATION UNDER EXISTING CONDITIONS

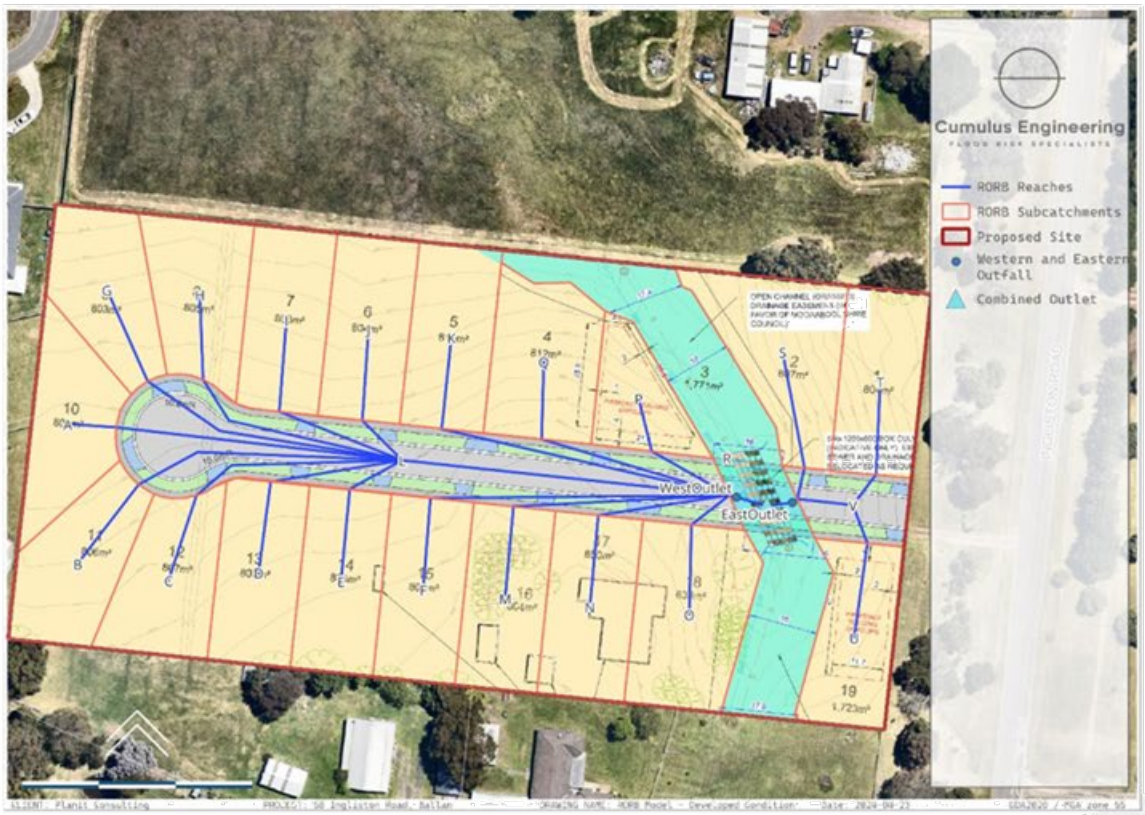


FIGURE 2-3 RORB MODEL SCHEMATISATION UNDER DEVELOPED CONDITIONS

FIGURE 2-4 POST DEVELOPED VALUES OF FI

2.2.1 Loss and Routing Parameters

Recommended loss values for the catchment were accessed via online ARR Data Hub (Babister et al 2016). The RORB routing parameter k_c was estimated using the Pearse et al equation which is commonly adopted for Victorian catchments. The site has two separate areas for analysis and therefore interstation points have been adopted at each of these locations, upstream of the proposed basins. Individual values of k_c for catchments upstream of each discharge point were adopted. The typical value for the m value of 0.8 was adopted across all catchments and scenarios.

Loss and routing parameters adopted for the model are outlined in Table 2-2.

TABLE 2-2 ADOPTED LOSS AND ROUTING PARAMETERS

Input Parameter	Adopted Value
m	0.80
K_c	
• Eastern Catchment	0.24 (Existing), 0.11 (Developed)
• Western Catchment	0.24 (Existing), 0.11 (Developed)
• Combined Catchment	0.24 (Existing), 0.11 (Combined)
Initial Loss (IL)	26.00 mm (Pervious), 1.00 mm (Directly Connected), 18.9 mm (Indirectly Connected)
Continuing Loss (CL)	4.2 mm/h (Pervious), 0.00 mm/h (Directly Connected), 2.5 mm/hr (Indirectly Connected)

2.2.2 Preburst Rainfall

Use of standard design rainfall inputs in Victoria is likely to result in an underestimation of design flow estimates when comparing calibrated flows to gauged data (HARC, 2020). Therefore, Victorian catchments within the influence of loss region 3 (in lieu of further research) require the adoption of 75th percentile pre-burst rainfall where ARR2019 losses are adopted, where there is insufficient calibration data available to warrant using calibration losses.

As the site is located within loss region 3, 75th percentile pre-burst rainfall was adopted for the purposes of this study. Upon review of the data, the 75th percentile pre-burst was found to consist entirely of negative values in the ARR2019 datahub file and so as a conservative measure the application of pre-burst was omitted, as the negative preburst would have reduced the total rainfall applied to the model.

2.2.3 Event Durations and Temporal Patterns

A range of design storms have been evaluated for durations ranging from 10 minutes to 24 hours for the 1% AEP event using Storm Injector software. In line with procedures outlined in ARR2019 the full range of temporal patterns (TPs) for the region were adopted for the ensemble analysis.

Within Storm Injector, the temporal pattern which provided a peak flow closest to the Ensemble peak for the critical duration is adopted as the indicative temporal pattern for that event. The adopted TP is detailed in the following section.

2.3 Storage Design

The aim of the RORB modelling was first to establish critical peak flows under existing conditions and then model post-developed conditions and test detention basin requirements within the model to ensure no net increase in combined peak flow from the site.

RORB was used to size the storage at the proposed tank (storage) locations. The developed conditions have been modelled under the conditions that 19 lots across the site.

The RORB model was run for:

- Pre-Developed Conditions
- Post-Developed Conditions

A summary of the design flows and critical durations under each scenario is shown in Table 2-1 below. The results show that the 1% AEP, detained flow is no higher than under existing conditions.

TABLE 2-3 ADOPTED DESIGN EVENTS AND PEAK FLOW AT 1% AEP

Event	Location	Scenario	Critical Duration	Adopted Temporal Pattern	Peak Flow (m^3/s)
1% AEP	Eastern Catchment	Pre-developed	45 minutes	24	0.050
		Post-developed	45 minutes	26	0.048
1% AEP	Western Catchment	Pre-developed	90 minutes	26	0.124
		Post-developed	90 minutes	27	0.106
1% AEP	**Combined Catchment Flows**	**Pre-developed**	**90 minutes**	**24**	**0.147**
		Post-developed	**45 minutes**	**26**	**0.147**

Storage requirements are detailed in Table 2-4 below.

TABLE 2-4 STORAGE REQUIREMENTS

Storage	Attributes	Values
Eastern Storage	Peak 1% AEP Outflow	0.05 m^3/s
	Peak 1% AEP Storage	50.9 m^3
	Peak Depth	0.37 m
	Total Upstream Catchment Area	0.304 Ha
	Outlet Configuration	1x 225 mm pipe
Western Storage	Peak 1% AEP Outflow	0.10 m^3/s
	Peak 1% AEP Storage	366 m^3
	Peak Depth	0.65 m
	Total Upstream Catchment	1.585 Ha
	Outlet Configuration	1x 250mm pipe*

* Non-standard pipe size so a 250mm orifice plate on a 300mm pipe is recommended.

Table 2-5 shows the 20% AEP peak flow for existing and developed scenarios.

TABLE 2-5 ADOPTED DESIGN EVENTS AND PEAK FLOW AT 20% AEP

Event	Location	Scenario	Critical Duration	Adopted Temporal Pattern	Peak Flow (m^3/s)
20% AEP	Eastern Catchment	Pre-developed	90 minutes	4	0.007
		Post-developed	20 minutes	10	0.047
20% AEP	Western Catchment	Pre-developed	270 minutes	2	0.022
		Post-developed	20 minutes	4	0.157
20% AEP	**Combined Catchment Flows**	**Pre-developed**	**270 minutes**	**2**	**0.025**
		Post-developed	**60 minutes**	**6**	**0.053**
		Post-developed (Undetained)	**25 minutes**	**8**	**0.192**

3 Conclusions & Recommendations

Cumulus Engineering have undertaken a Detention Storage Analysis for the site located at 58 Ingliston Road, Ballan, Victoria to determine storage requirements to detain post-developed flows to pre-developed flows in the 1% AEP event from the development site.

An iterative design approach has resulted in the determination of storage requirements to detain the 1% AEP event post-developed flows to below pre-development flows with two detention tanks proposed to detain the two separate portions of the development located either side of the waterway.

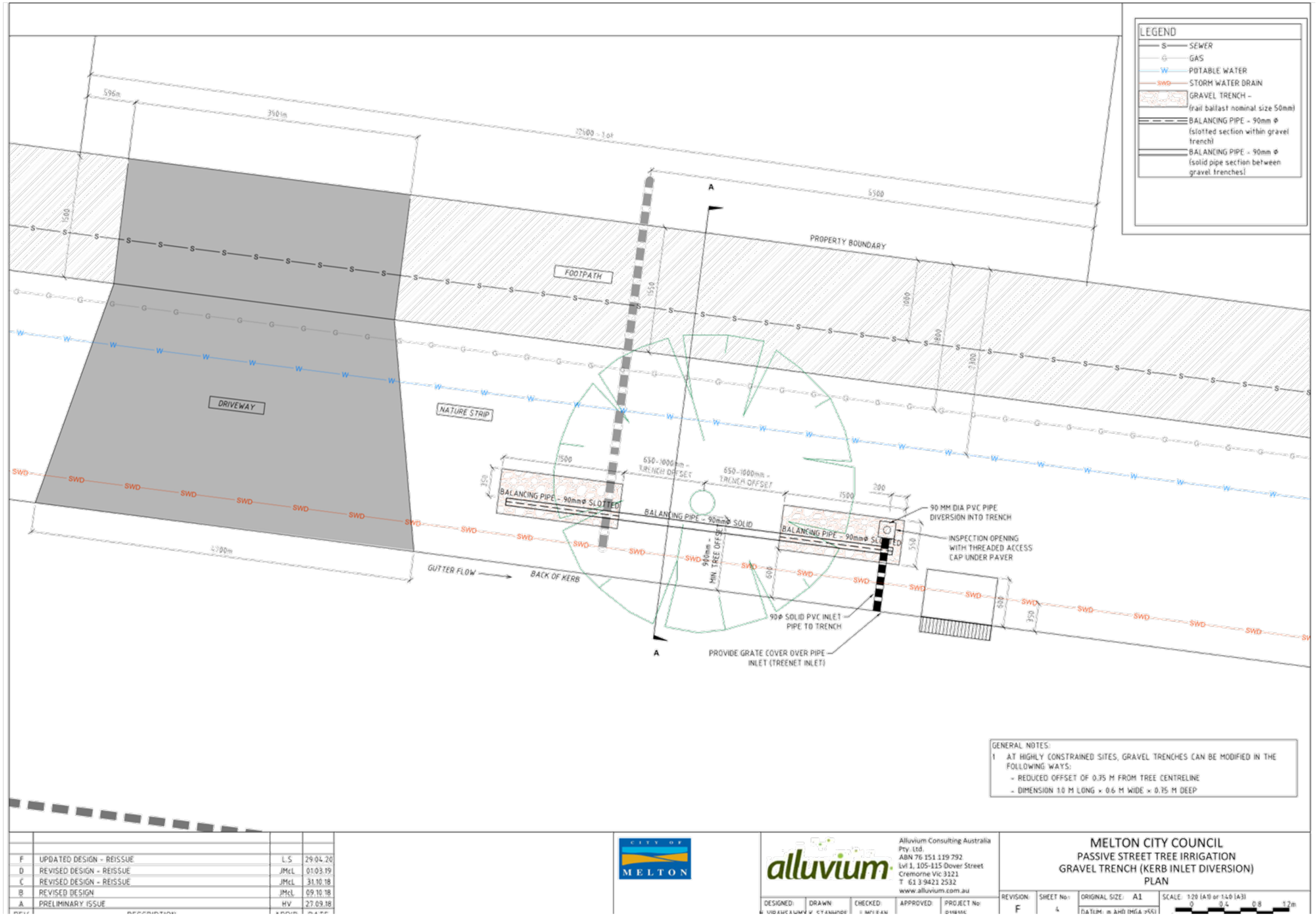
Please do not hesitate to contact us if you have any questions regarding this report.

Many thanks,

Julian Skipworth
Director & Principal Engineer
0404 631 712
julian.skipworth@cumuluseng.com.au

Sarah Hollis
Director & Senior Engineer
0420 579 233
sarah.hollis@cumuluseng.com.au

APPENDIX C – TREE PIT STANDARD DRAWING


LEGEND
S SEWER
G GAS
W POTABLE WATER
SWD STORM WATER DRAIN
GRAVEL TRENCH – (rail ballast nominal size 50mm)
BALANCING PIPE - 90mm Ø (slotted section within gravel trench)
BALANCING PIPE - 90mm Ø (solid pipe section between gravel trenches)
596m
3501m
32600 - Lot
5500
PROPERTY BOUNDARY
FOOTPATH
DRIVEWAY
NATURE STRIP
1500
550
1000
800
3300
A
1500
630-1000mm - TRENCH OFFSET
650-1000mm - TRENCH OFFSET
350
BALANCING PIPE - 90mmØ SLOTTED
BALANCING PIPE - 90mmØ SOLID
BALANCING PIPE - 90mmØ SLOTTED
200
1500
90 MM DIA PVC PIPE DIVERSION INTO TRENCH
INSPECTION OPENING WITH THREADED ACCESS CAP UNDER PAVER
350
900mm - MIN TREE OFFSET
600
600
350
4390m
GUTTER FLOW
BACK OF KERB
90Ø SOLID PVC INLET PIPE TO TRENCH
PROVIDE GRATE COVER OVER PIPE INLET (TREENET INLET)
A
GENERAL NOTES:
1 AT HIGHLY CONSTRAINED SITES, GRAVEL TRENCHES CAN BE MODIFIED IN THE FOLLOWING WAYS:
- REDUCED OFFSET OF 0.75 M FROM TREE CENTRELINE
- DIMENSION 1.0 M LONG x 0.6 M WIDE x 0.75 M DEEP
F UPDATED DESIGN - REISSUE L.S 29.04.20
D REVISED DESIGN - REISSUE JMcL 01.03.19
C REVISED DESIGN - REISSUE JMcL 31.10.18
B REVISED DESIGN JMcL 09.10.18
A PRELIMINARY ISSUE HV 27.09.18
CITY OF MELTON
alluvium
Alluvium Consulting Australia Pty. Ltd.
ABN 76 151 119 792
Lvl 1, 105-115 Dover Street
Cremorne Vic 3121
T 61 3 9421 2532
www.alluvium.com.au
DESIGNED: DRAWN: CHECKED: APPROVED: PROJECT No:
MELTON CITY COUNCIL
PASSIVE STREET TREE IRRIGATION
GRAVEL TRENCH (KERB INLET DIVERSION)
PLAN
REVISION: F
SHEET No: 4
ORIGINAL SIZE: A1
SCALE: 1:20 (A1) or 1:40 (A3)
0 0.4 0.8 1.2m

NOTES:
TOP OF GRAVEL TRENCH TO BE LINED WITH NON-WOVEN GEOTEXTILE MATERIAL AS SHOWN TO PREVENT FINE MIGRATION INTO THE TRENCH
PASSIVE IRRIGATION PIPES AND FITTINGS TO BE 90 MM DIAMETER PVC SEWER CLASS
ALL PVC JOINTS TO BE SEALED WITH SOLVENT CEMENT
ALL GRASSED AREAS TO BE TOP DRESSED WITH 100 MM TOPSOIL AND SEEDED AS SPECIFIED
SERVICE DEPTHS AND LOCATIONS ARE INDICATIVE ONLY
WHERE THE VERGE IS LESS THAN 4.2m (TYPICAL) A SPECIFIC DETAIL SHALL BE SHOWN ON THE ENGINEERING DRAWINGS THAT RETAINS THE PRINCIPALS AND

TREENET INLET

GRAVEL TRENCH (KERB INLET DIVERSION) A

F	UPDATED DESIGN	LS	29.04.20
D	REVISED DESIGN - REISSUE	JMcL	30.11.18
C	REVISED DESIGN - REISSUE	JMcL	31.10.18
B	REVISED DESIGN	JMcL	09.10.18
A	PRELIMINARY ISSUE	HV	27.09.18

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alluvium
Alluvium Consulting Australia Pty. Ltd.
ABN 76 151 119 792
Lvl 1, 105-115 Dover Street
Cremorne Vic 3121
T 61 3 9421 2532
www.alluvium.com.au

DESIGNED: DRAWN: CHECKED: APPROVED: PROJECT No:

MELTON CITY COUNCIL
PASSIVE STREET TREE IRRIGATION
GRAVEL TRENCH (KERB INLET DIVERSION)
CROSS SECTION

REVISION: F | SHEET No: 5 | ORIGINAL SIZE: A1 | SCALE: 1:10 (A1) or 1:20 (A3) 0 0.2 0.4 0.6m

NOTES:
TOP OF GRAVEL TRENCH TO BE LINED WITH NON-WOVEN GEOTEXTILE MATERIAL AS SHOWN TO PREVENT FINE MIGRATION INTO THE TRENCH
PASSIVE IRRIGATION PIPES AND FITTINGS TO BE 90 MM DIAMETER PVC SEWER CLASS
ALL PVC JOINTS TO BE SEALED WITH SOLVENT CEMENT
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TREENET INLET

GRAVEL TRENCH (KERB INLET DIVERSION) A

F	UPDATED DESIGN	LS	29.04.20
D	REVISED DESIGN - REISSUE	JMcL	30.11.18
C	REVISED DESIGN - REISSUE	JMcL	31.10.18
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CITY OF MELTON

alluvium
Alluvium Consulting Australia Pty. Ltd.
ABN 76 151 119 792
Lvl 1, 105-115 Dover Street
Cremorne Vic 3121
T 61 3 9421 2532
www.alluvium.com.au

DESIGNED: DRAWN: CHECKED: APPROVED: PROJECT No:

MELTON CITY COUNCIL
PASSIVE STREET TREE IRRIGATION
GRAVEL TRENCH (KERB INLET DIVERSION)
CROSS SECTION

REVISION: F | SHEET No: 5 | ORIGINAL SIZE: A1 | SCALE: 1:10 (A1) or 1:20 (A3) 0 0.2 0.4 0.6m