4/06/2025

Belinda Ryan
Frasers Property Australia
Level 8, 97 Boundary St, West End Q 4101

Dear Belinda,

RE: MOUNTAIN RIDGE ROAD AND BRIDGE – OPERATIONAL WORKS (DEV2024/1551)

This letter is provided to confirm the Operational Works design for Mountain Ridge Road and Bridge documented in the Colliers Drawings 23-01523 4000 to 4541 is consistent with the detail defined in the approved *New Beith – Mountain Ridge Road Extension West – Stormwater Management Plan* (DesignFlow November 2022).

The report illustrates *stormwater generated by the bridge and road will not result in net worsening of the rail corridor in all flood and stormwater events*. Peak flows are actually reduced based on the approved report.

If you have any queries regarding these responses, please do not hesitate to call.

Yours sincerely

Shaun Leinster
DesignFlow

NEW BEITH – MOUNTAIN RIDGE ROAD EXTENSION – WEST
STORMWATER MANAGEMENT PLAN

DesignFlow
Prepared for Frasers Property Australia
November 2022

Document Control Sheet

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1 INTRODUCTION

New Beith development is a greenfield development proposed across Lot4 SP332712 located within the Greater Flagstone Priority Development Area (PDA). The development will ultimately support mostly residential landuses with the potential for school and small commercial as well. Frasers Property Australia are in the process of planning the development and have recently submitted the following documents to Economic Development Queensland (EDQ) for approval:

- *New Beith - Stormwater Infrastructure Masterplan* (Frasers Property Australia, 2022)
- *New Beith Context Planning Area Strategy – Stormwater Management* (DesignFlow, 2022)

This current application is the first for the Frasers New Beith project and supports the extension of Mountain Ridge Road into the PDA (Figure 1). It involves the creation of a lot to be dedicated to Logan City Council for the section of bridge over the future railway corridor, with new road reserve to be dedicated to Logan City Council west of this for the two lane cross section of a trunk connector road. Separate applications will be made for a sublease to Logan City Council for the section of bridge over the existing Brisbane Sydney railway corridor, with new road reserve to be dedicated to Logan City Council east of this to connect into the existing Mountain Ridge Road reserve.

This stormwater management plan presents the interim stormwater management strategy for the road to ensure no impacts downstream. The ultimate stormwater management plan is to be developed with Frasers Property Australia for this catchment, including management of the residential development areas adjacent to the road, and will be submitted separately for approval.

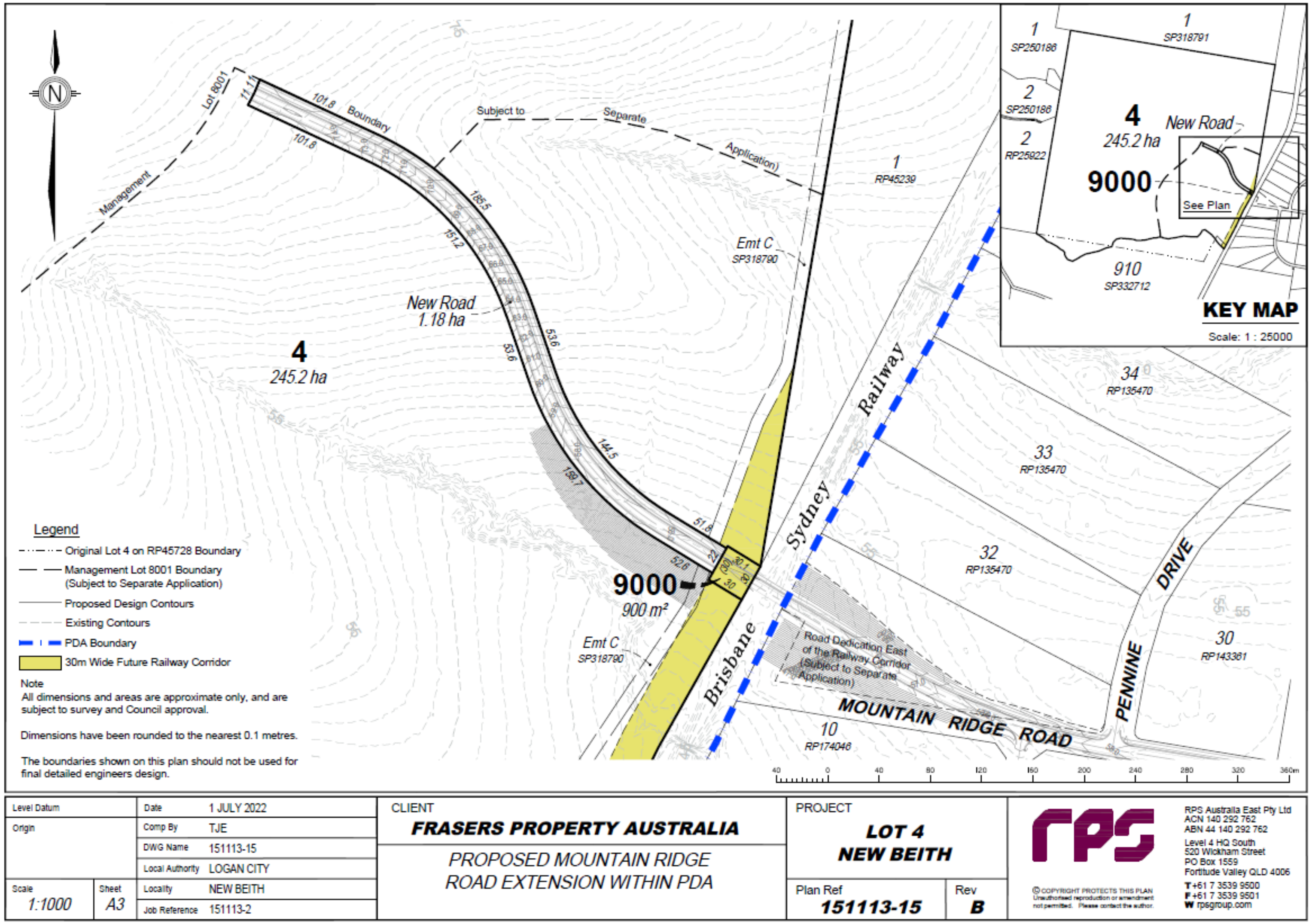

Figure 1: Proposed Mountain Ridge Road Extension within New Beith and Greater Flagstone PDA

2 SITE DESCRIPTION

The proposed road lot is located on the eastern side of the Lot4 SP332712 adjacent to the Brisbane Sydney Rail Corridor. The site is characterised by moderate topography (4-8%), with topography across the site ranging from an approximate high point of ~76mAHD to ~47mAHD. The proposed road (1.18ha) straddles two catchments which drain eastern towards the railway corridor. The road will drain into the southern catchment to be discharge to the corridor at the southern discharge point effectively reducing the size of the northern catchment.

Figure 2 shows the existing topography, drainage and catchments across the site.

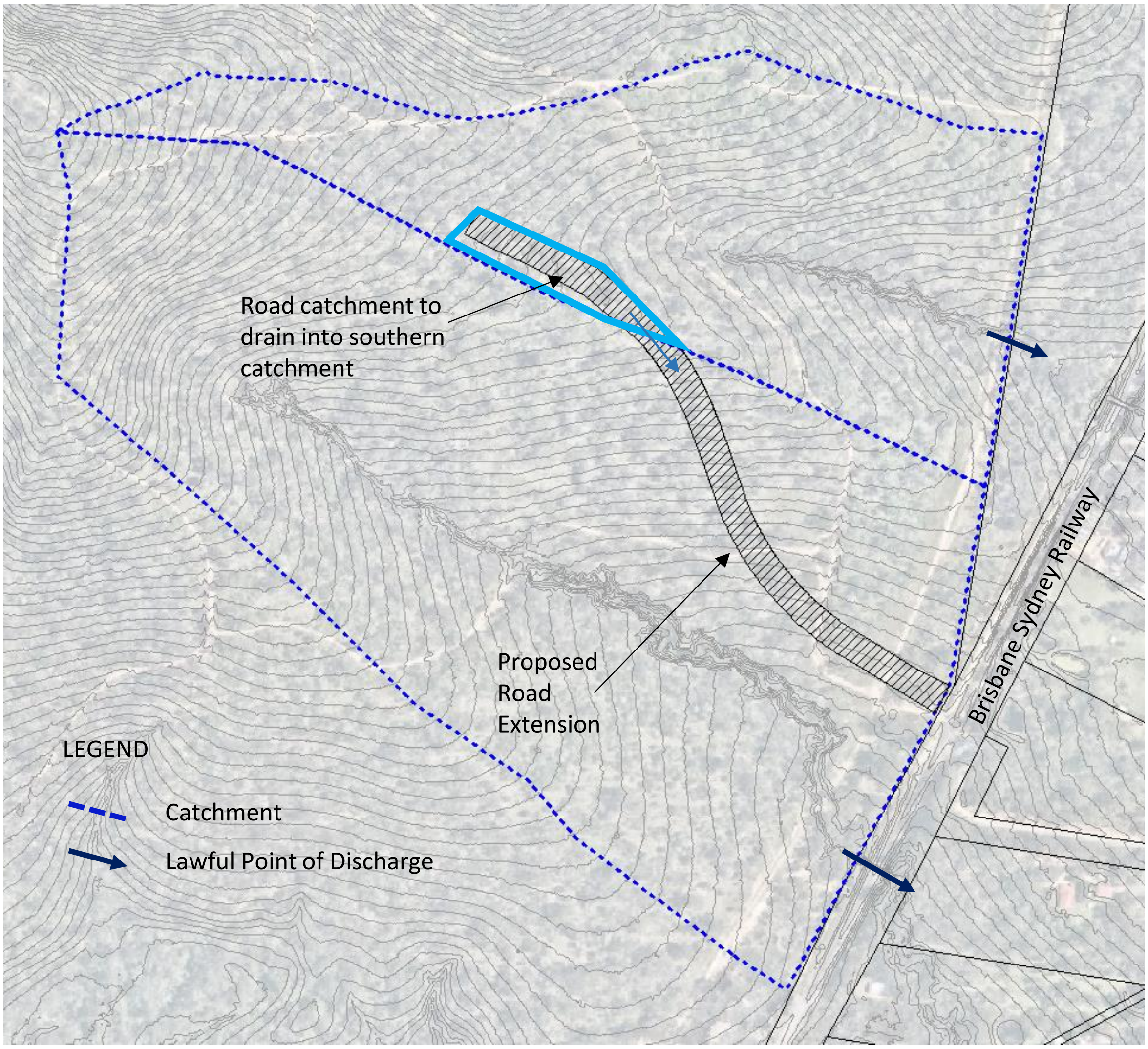

Figure 2: Topography, catchments and drainage

3 OBJECTIVES

The stormwater management strategy for the site has been designed to achieve the objectives defined in the following:

- *New Beith - Stormwater Infrastructure Masterplan* (Frasers Property Australia, 2022)
- *New Beith Context Planning Area Strategy – Stormwater Management* (DesignFlow, 2022)
- *State Planning Policy* (DLGIP, 2017).
- *Queensland Urban Drainage Manual* (IPWEAQ, 2016).

3.1 STORMWATER QUALITY

3.1.1 Construction Phase

The management of stormwater runoff during the construction phase is a critical part of protecting the waterways. The objectives defined in the State Planning Policy will apply as listed in Table 1 to Table 3 and will require compliance during construction.

This report does not provide an Erosion and Sediment Control Plan to meet these objectives. This will be provided as part of the detailed design (self certification) and also again prior to commencement of construction and certified by a CPESC.

Table 1: Construction phase stormwater quality

Issue	Desired Outcome
Drainage control	1. Manage stormwater flows around or through areas of exposed soil to avoid contamination.
	2. Manage sheet flows in order to avoid or minimise the generation of rill or gully erosion.
	3. Provide stable concentrated flow paths to achieve the construction phase stormwater management design objectives for temporary drainage works (part 2).
	4. Provide emergency spillways for sediment basins to achieve the construction phase stormwater management design objectives for emergency spillways on temporary sediment basins (part 3).
Erosion control	1. Stage clearing and construction works to minimise the area of exposed soil at any one time.
	2. Effectively cover or stabilise exposed soils prior to predicted rainfall.
	3. Prior to completion of works for the development, and prior to removal of sediment controls, all site surfaces must be effectively stabilised13 using methods which will achieve effective short-term stabilisation.
Sediment control	1. Direct runoff from exposed site soils to sediment controls that are appropriate to the extent of disturbance and level of erosion risk.
	2. All exposed areas greater than 2500 metres2 must be provided with sediment controls which are designed, implemented and maintained to a standard which would achieve at least 80% of the average annual runoff volume of the contributing catchment treated (i.e. 80% hydrological effectiveness) to 50mg/L Total Suspended Solids (TSS) or less, and pH in the range (6.5–8.5).
Litter, hydrocarbons and other contaminants	1. Remove gross pollutants and litter.
	2. Avoid the release of oil or visible sheen to released waters.
	3. Dispose of waste containing contaminants at authorised facilities.
Waterway stability and flood flow management	1. Where measures are required to meet post-construction waterway stability objectives (specified in table B), these are either installed prior to land disturbance and are integrated with erosion and sediment controls, or equivalent alternative measures are implemented during construction.
	2. Earthworks and the implementation of erosion and sediment controls are undertaken in ways which ensure flooding characteristics (including stormwater quantity characteristics) external to the development site are not worsened during construction for all events up to and including the 1 in 100 year ARI (1% AEP).

Notes:

1. Drainage, erosion and sediment controls should be appropriate to the risk posed by the activity for the relevant climatic region e.g. considering the potential soil loss rate, monthly erosivity or average monthly rainfall.
2. An effectively stabilised surface is defined as one that does not, or is not likely to result in visible evidence of soil loss caused by sheet, rill or gully erosion or lead to sedimentation water contamination.

Table 2: Construction Phase Objectives for temporary drainage

Temporary drainage works	Anticipated operation design life and minimum design storm event		
	< 12 months	12–24 months	> 24 months
Drainage structure	1 in 2 year ARI / 39% AEP	1 in 5 year ARI / 18% AEP	1 in 10 year ARI / 10% AEP
Where located immediately up-slope of an occupied property that would be adversely affected by the failure or overtopping of the structure	1 in 10 year ARI / 10% AEP		
Culvert crossing	1 in 1 year ARI / 63% AEP		

Table 3: Construction Phase Objectives Emergency spillway on temporary sediment basins

Drainage structure	Anticipated operation design life and minimum design storm event		
	< 3 months	3-12 months	> 12 months
Emergency spillways on temporary sediment basins	1 in 10 year ARI / 10% AEP	1 in 20 year ARI / 5% AEP	1 in 50 year ARI / 2% AEP

Note: Refer to IECA 2008 Best Practice Erosion and Sediment Control (as amended) for details on the application of the Construction Phase requirements. Advice should be obtained from a suitably qualified person e.g. Certified Practitioner in Erosion and Sediment Control, or Registered Professional Engineer Queensland, with appropriate knowledge and experience in erosion and sediment control design and implementation.

3.1.2 Operational Phase

The stormwater quality management objectives that apply to the operational phase of the development are defined in the *State Planning Policy* (DSDIP, 2017) which applies the load-based objectives presented in Table 4.

Table 4: Operational Phase Stormwater quality objectives.

Operational Phase	Discharge Criteria (% reduction in mean annual load)
Total suspended solids (TSS)	80%
Total phosphorus (TP)	60%
Total nitrogen (TN)	45%
Gross Pollutants (GP)	90%

3.2 FLOOD AND STORMWATER QUANTITY MANAGEMENT

The management objectives presented in Table 5 have been applied to the development. In addition, the performance outcomes outlined in Table 6 are applicable to development in a railway environment.

Table 5: Flood/stormwater quantity objectives.

Criterion	Design Objective
Peak flows / levels	Mitigate flood impacts on people, property and infrastructure external to New Beith by preserving peak site flows and flood levels upstream and downstream of the site to predevelopment conditions for all events from 50% to 1% AEP. In this case peak flows are to be preserved at the discharge point to the Brisbane Sydney Railway.
Flood immunity	Maintain flood conveyance through the site while providing 1% AEP plus freeboard flood immune development.

Table 6 Stormwater performance outcomes for development in a railway environment (State Code 2, SDAP version 3.0)

Stormwater and overland flow	
PO12 Stormwater run-off or overland flow from the development site does not create or exacerbate a safety hazard in a railway corridor.	No acceptable outcome is prescribed.
PO13 Stormwater run-off or overland flow from the development site does not result in a material worsening of operating performance of the railway corridor, rail transport infrastructure or other rail infrastructure.	No acceptable outcome is prescribed.
PO14 Stormwater run-off or overland flow from the development site does not interfere with the structural integrity or physical condition of the railway corridor, rail transport infrastructure or other rail infrastructure.	No acceptable outcome is prescribed.
Flooding	
PO15 Development does not result in a material worsening of flooding impacts within a railway corridor.	No acceptable outcome is prescribed.
Drainage Infrastructure	
PO16 Drainage infrastructure does not create a safety hazard in a railway corridor.	**AO16.1** Drainage infrastructure is wholly contained within the development site. AND **AO16.2** Drainage infrastructure can be maintained without requiring access to a railway corridor.

3.3 WATERWAY STABILITY

The waterway stability objective is based on protecting waterways and drainage lines from erosion because of increase flow from urban development. This applies to waterways and drainage lines within the site as well as downstream receiving waterways beyond the development boundary. Table 7 provides a summary of the waterway stability objectives applied, based on the requirements of the *State Planning Policy* (DLGIP, 2017).

Table 7: Waterway stability objectives

Waterway	Waterway stability criteria
Protection of waterway stability	Limit the peak 63.2% AEP (1-year ARI) event discharge within the receiving waterway downstream of the site to the pre-development peak 1-year ARI discharge.

4 STORMWATER TREATMENT STRATEGY

4.1 TREATMENT STRATEGY

The stormwater treatment strategy for catchment will involve an interim and ultimate strategy:

- Interim Strategy (Figure 3) - Mountain Ridge Road will be an interim strategy only. This will involve preferably a sediment basin located on the north side of the road. This achieves the TSS and TP objectives and 38% removal of TN. If required, partial construction of the ultimate bioretention basin (80m²). This would be adopted if the ultimate strategy is not to be constructed for a number of years.
- Ultimate Strategy (Figure 4) – The interim strategy will be very quickly converted to the ultimate strategy which is a large bioretention basin which treats the road and the broader residential catchment .

Table 8 summaries the interim strategy elements.

Table 8 Interim Stormwater Treatment Elements

Treatment		Catchment	Comment
Type	Area/length	ha	
Sediment Basin	400m²	1.18ha	Achieved TSS and TP objective but not quite the TN objective. Could be as interim strategy
OR			
Bioretention	80m² (treatment)	1.18ha	

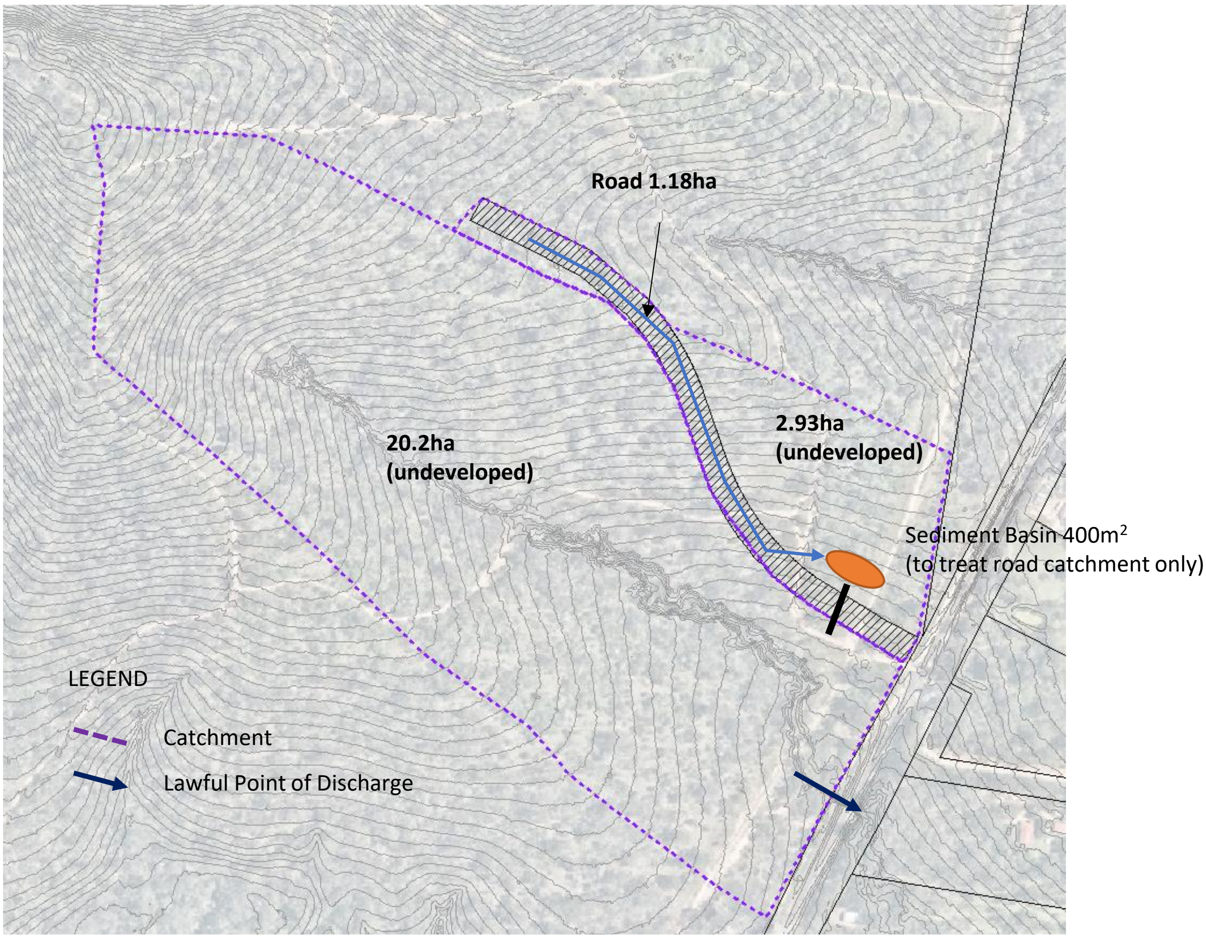

Figure 3 Interim stormwater treatment strategy

Figure 4 Ultimate stormwater treatment startegy

4.2 TREATMENT PERFORMANCE (MUSIC MODELLING)

MUSIC modelling was conducted to quantitatively assess the stormwater treatment performance of the proposed stormwater strategy. MUSIC version 6.3 was used for the assessment and the parameters have been established in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2010).

Figure 5 shows the MUSIC model whilst the general data upon which the model is based is provided Table 9. Table 10 provides a summary of the load reductions. The results demonstrate that load based objectives are achieved at each point of discharge from the development.

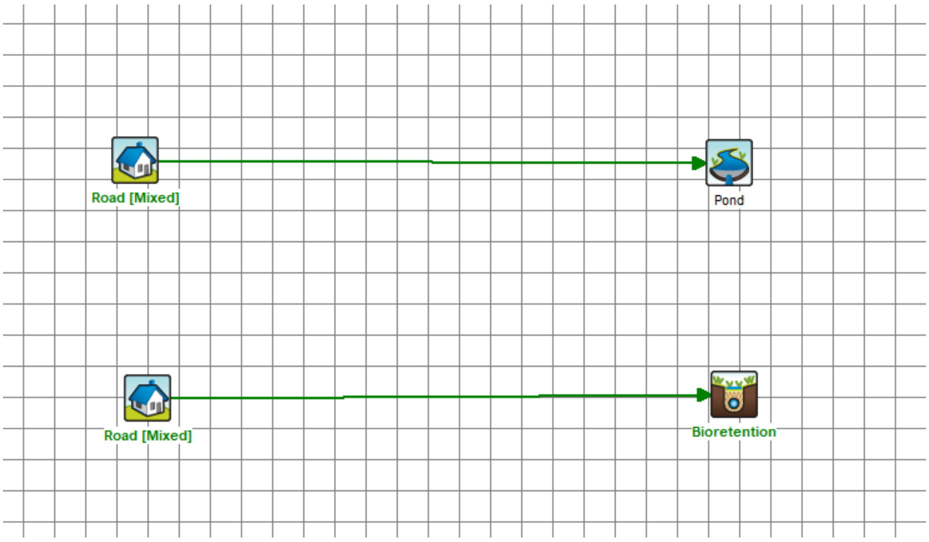

Figure 5 Music model

Table 9 MUSIC modelling assumptions

Parameter	Value
Source Data	
Rainfall data set	1997-2006 – 40659 GREENBANK
Modelled time step	6 minute
Mean annual rainfall 1990-1999	787 mm
Potential evapotranspiration	1427 mm
Soil properties (runoff generation parameters)	Table 3.7 Music Modelling Guidelines for SEQ (as appropriate depending on land use)
Pollutant concentrations (base and storm flow concentration parameters)	Table 3.9 Music Modelling Guidelines for SEQ (as appropriate depending on land use)
Percent impervious	Table 3.6 Music Modelling Guidelines for SEQ (70% impervious for road)
Treatment Devices	
Sediment basin (pond)	Surface area = 400m^2 Permanent Pool = 600m^2 Extended detention depth = 0.3 m Seepage = 0 mm/hr Notional Detention Time = 42hrs
Bioretention	Filter area– 80m^2 Surface area = 1.2 x filter area Filter media depth = 0.6 m Extended detention depth = 0.3 m Seepage = 0 mm/hr TN content 400 mg/kg Orthophosphate content 30mg/kg

Table 10 MUSIC model summary

Treatment ID	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction achieved (%)	Water quality objective
Sediment Basin	TSS TP TN	2500 3.83 12.5	366 0.94 7.74	85% 76% 38%	80% 60% 45%
Bioretention (optional only if required)	TSS TP TN	2500 3.83 12.5	456 0.94 6.51	81% 76% 48%	80% 60% 45%

5 FLOOD MANAGEMENT

5.1 INTERIM FLOOD MANAGEMENT STRATEGY

The flood modelling complete in XP-SWMM (see following sections) indicates no detention is required to meet the flood objectives and the waterway stability objective for the interim strategy associated with the Mountain Ridge Road extension.

This is because:

- The catchment area has not changed significantly
- The impervious area is only a very small portion of the catchment
- The runoff from the impervious areas occurs quickly compared to the pervious areas meaning the hydrographs from each surface have different timing. Given the majority of the catchment is pervious, the peak flow is dictated by flow from this area not the impervious zone.

If required, a temporary flood storage can easily be provided at the sediment basin location (refer Figure 3) but the modelling presented in the following sections illustrates detention is not required.

5.2 FLOOD PERFORMANCE (XP-SWMM MODELLING)

Modelling of pre and post developed flows has been completed using XP-SWMM software to review peak flows and flood levels as a result of development. A brief summary of the modelling and performance is provided in the following sections.

5.2.1 Rainfall

Rainfall parameters were based on the following:

- Temporal patterns were based on the Australian Rainfall and Runoff 2019 approach. Temporal patterns were sourced for the site from ARR data hub web site.

- Rainfall Intensity Frequency Duration (IFD) data for the site were sourced from the Bureau of Meteorology website. Values are based on ARR2016 intensities.

- Rainfall durations from 15minutes to 3 hours were assessed.

5.2.2 Catchments

<u>Predeveloped</u>

Predeveloped (existing land use) catchments follow the contours of the existing land form. The sub catchment sub-division used in the modelling are presented in Figure 6. Modelled catchment slopes were based on the equal area method, as derived from existing topography, sourced from LIDAR survey.

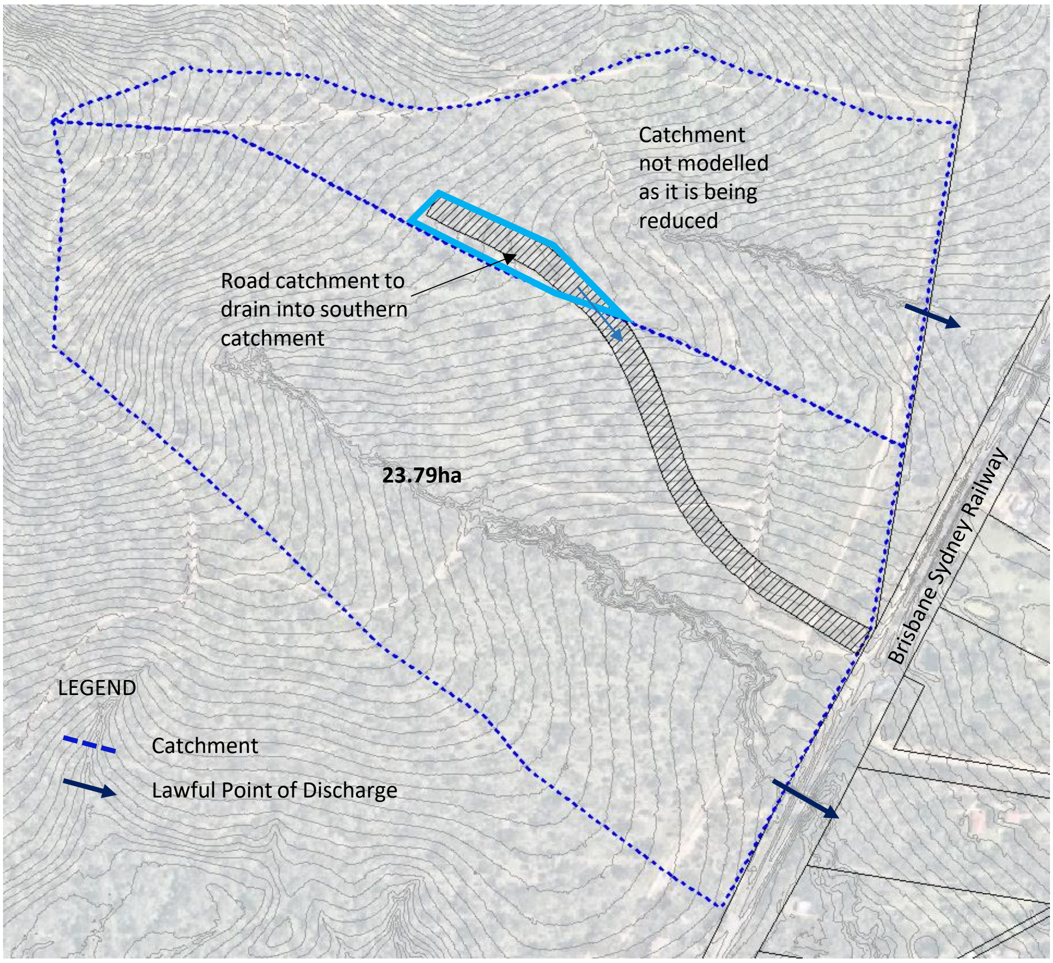

Figure 6 Pre-developed catchments

Post developed

Post developed catchments are based on the preliminary earthworks and drainage for the road extension and upgrade. Figure 7 shows the post developed catchments modelled to the lawful point of discharge.

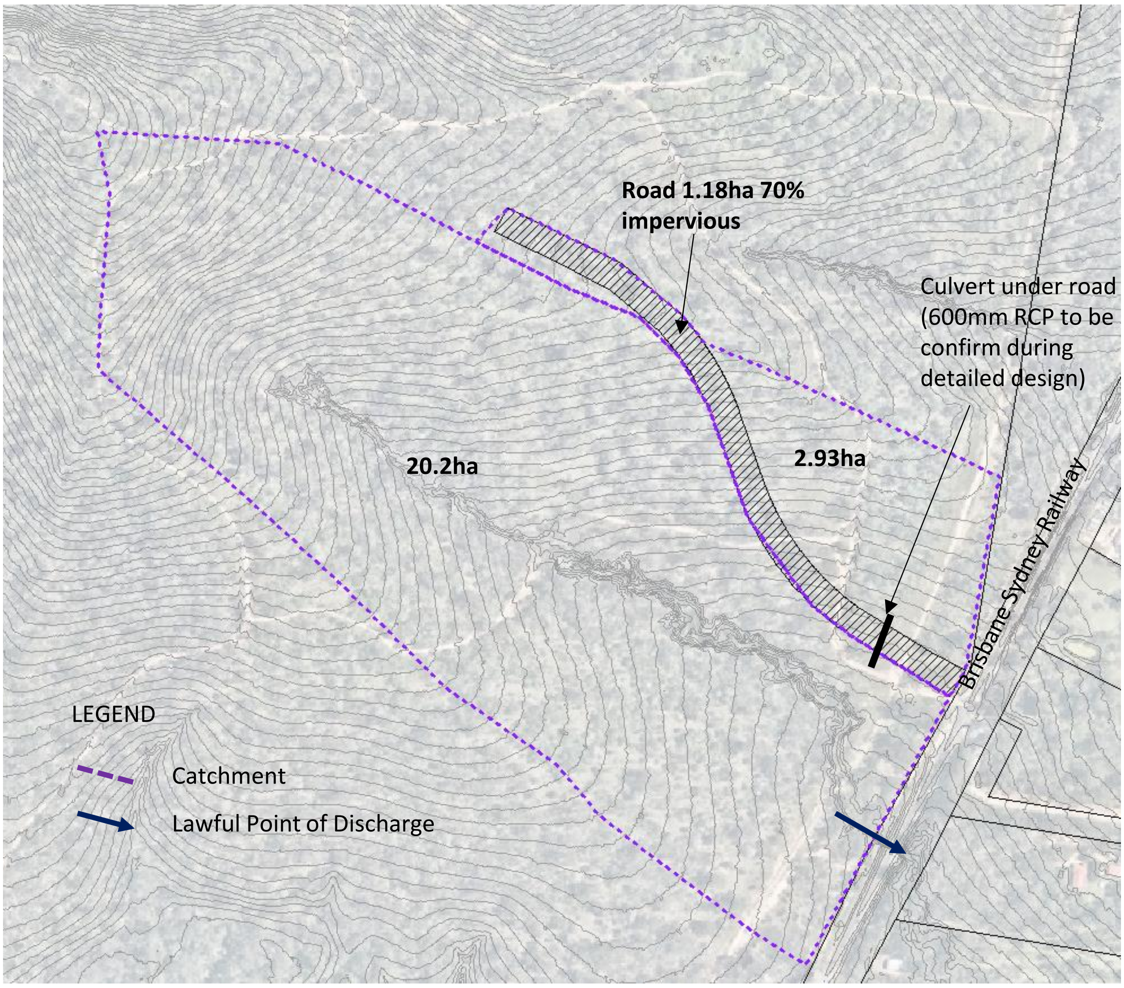

Figure 7 Post developed catchments

5.2.3 Catchment impervious

Percent impervious values applied to each land use were based on recommended values in QUDM (2007). The following values have been applied:

- Pre-developed vegetation: 0%
- Road reserve: 70%

Pervious and impervious areas were modelled in XP-SWMM as split catchments with 0% and 100% imperviousness with areas for each derived from the above impervious respectively and are summarised in Figure 7.

5.2.4 Mannings and initial/continuing loss

Hydrologic model parameters used in the analysis are presented in Table 11 Hydrologic routing uses the Laurenson method. The uniform loss method has also been used to model the runoff from the pervious and impervious fractions of the catchments. Loss parameters for the site have been derived from ARR data hub website.

Median pre-burst losses, as derived from the ARR data hub site, have been deducted from the pervious storm losses for each AEP event and duration to model burst loss.

Table 11 Hydrologic parameters

Model scenario	Initial loss (mm)		Continuing loss (mm/hr)	Mannings n	
	Pervious (storm loss) [1]	impervious	pervious	impervious	pervious
Predeveloped	24.0	1	1.6	0.015	0.05
Developed	24.0	1	1.6	0.015	0.035

Note 1.: modelled pervious storm burst loss is the pervious storm loss minus the median pre-burst value relevant for each AEP event and duration, as derived from ARR datahub

5.3 RESULTS

Table 12 provide the peaks flow at the boundary of the site (into the railway corridor) from the modelling. The modelling illustrates there is no increase in flows for all events. The very small impervious area in the catchment results in the impervious hydrograph peaking well before the main hydrograph from the pervious areas. Therefore, the peak flows do not increase and in fact decreases slightly.

No detention is required to achieve the objectives but can be easily provided on the north side of the road collocated with the sediment basin.

Table 12 Peaks flows at boundary

AEP	PreDev Peak Flow (m^3/s)	PostDev Peak Flow (m^3/s)	Difference (m^3/s)
63% AEP	0.67	0.64	-0.03
50% AEP	0.98	0.95	-0.03
20% AEP	2.03	1.95	-0.08
10% AEP	2.84	2.69	-0.15
5% AEP	3.72	3.59	-0.13
2% AEP	4.95	4.75	-0.2
1% AEP	5.87	5.62	-0.25

6 CONCLUSION

An interim stormwater management strategy has been developed for the proposed Mountain Ridge Road extension into the New Beith development, west of the Queensland-Sydney Rail corridor. The ultimate stormwater management strategy is to be developed with Frasers Property Australia for this catchment, including management of the residential development areas adjacent to the road, and will be submitted separately for approval.

Interim stormwater treatment for the Mountain Ridge Road extension is via a 400m² sediment basin that receives runoff from the new road. The interim strategy will be converted to the ultimate strategy which is a large bioretention basin which treats the road and the broader residential catchment. Details for the ultimate strategy will be submitted separately in a future application.

Performance assessments for the interim strategy have demonstrated that peak flows to the rail corridor are maintained at or below pre-developed levels for all storm events from 63% AEP (waterway stability) to 1% AEP without the need for any flood detention. This is due to the relatively small impervious area associated with the road extension peaking well before the main hydrograph from the much larger contributory pervious areas at the point of discharge. No detention is required to achieve the objectives but can be easily be provided on the north side of the road co-located with the sediment basin, if necessary.

7 REFERENCES

Australian Rainfall and Runoff (1987). *A Guide to Flood Estimation.* Engineers Australia.

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), *(2016) Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia.*

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