COVEY
ASSOCIATES PTY LTD
Consulting Engineers

STORMWATER MANAGEMENT PLAN

FOR

PROPOSED RESIDENTIAL SUBDIVISION – STAGE 1

AT

DISCOVERY DRIVE, AGNES WATER

FOR

SUNSHINE STATE DEVELOPMENTS PTY LTD & JAMWORTH PTY LTD

PROJECT NO: 212991
REPORT NO: 200084 ISSUE A
APRIL 2023

DOCUMENT ISSUE APPROVAL

Project Title:	Stormwater Management Plan
Project Scope:	Proposed Residential Subdivision – Stage 1
Project Location:	Agnes Water, Qld
Project Address:	Discovery Drive, Agnes Water
LGA:	Gladstone Regional Council
Client:	Sunshine State Developments Pty Ltd & Jamworth Pty Ltd
Project No:	212991
Report No:	200084
Issue:	A
Date:	April 2023
Distribution:	Sunshine State Developments Pty Ltd
	Jamworth Pty Ltd
	Covey Associates
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CONTENTS

1 INTRODUCTION 1
2 SITE DESCRIPTION 2
2.1 Site Location 2
2.2 Previous Land-use, Topography and Drainage 2
2.3 Proposed development 3
3 WATER QUALITY 4
3.1 Scenario Method 4
3.2 Water Quality Modelling 6
3.2.1 MUSIC model Parameters 6
3.3 Proposed Stormwater Treatment Train 6
3.4 MUSIC Modelling 7
4 CONCLUSIONS 8
5 REFERENCES 9

Figures

Figure 2-1 Site Locality (QGIS) 2
Figure 2-2 Topography of the site (1m Contours) 3
Figure 2-3 Proposed Residential Lots 3
Figure 4-1 Contributing Sub-catchments and the Proposed Wetland System 5

Tables

Table 4-1 MUSIC Source Node Characteristics for the Sub-catchments 6
Table 4-2 Proposed Wetland Areas for Development Sub-catchment 6
Table 4-3 MUSIC Modelling Results 7

List of Appendices

Appendix A Plan of Development

Appendix B MUSIC Model (electronic)

1 INTRODUCTION

This Stormwater Management Plan (SMP) contains information regarding the stormwater management strategies for a proposed 20 lot subdivision at Discovery Drive, Agnes Water. This SMP refers to the proposed stormwater quality management proposed for Stage 1 of the Discovery Drive Development.

Gladstone Regional Council (GRC) requires that stormwater runoff be appropriately managed prior to discharge from the site. The Queensland State Planning Policy (SPP, 2017) also requires that urban development projects demonstrate how the potential impacts of stormwater runoff to receiving environments are mitigated. The objective of this report is to outline the requirements for effective stormwater management at the site.

Due to the nature of the site, it is proposed that this development, along with future stages, be managed in a constructed wetland system that will be sized to treat the developed catchments which flow to it. This SMP provides an overview of the approach and demonstrates that there is suitable area for the constructed wetland and that the system can achieve the required annual pollutant load reduction objectives.

2 SITE DESCRIPTION

2.1 Site Location

The site is located at Discovery Drive, Agnes Water. The real property description is Lot Plan 2 SP117407.

This SMP details the stormwater management of Stage 1 of the proposed residential development, that has an area of approximately 2.5 ha. A Site Plan (RL103 – Stage 1 Layout Plan) is presented in Appendix A for additional information and details of the proposed development.

The site is approximately 88.2 ha in area and is bounded by residential properties to the east, rural residential and low density residential properties to the west and south and the Agnes Water Airfield to the north. (Figure 2-1).

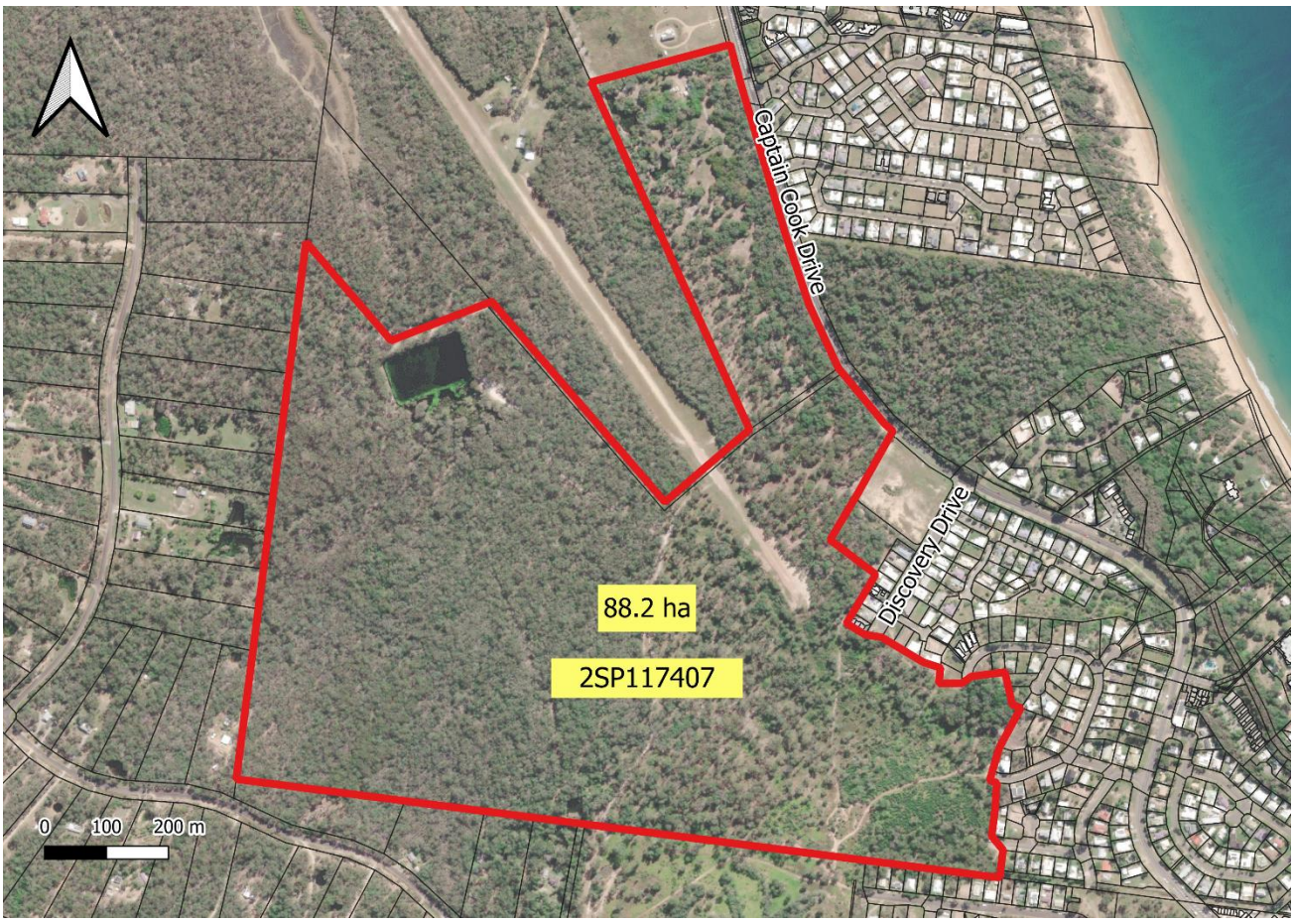

Figure 2-1 Site Locality (QGIS)

2.2 Previous Land-use, Topography and Drainage

The site is currently vacant land and includes an existing dam at the northeast side of the property. (Figure 2-1). The property grades from the southwest and southeast corners of the lot towards the north, with changes of elevation from 36 m AHD to 3 m AHD. Refer to Figure 2-2 for the topography of the site.

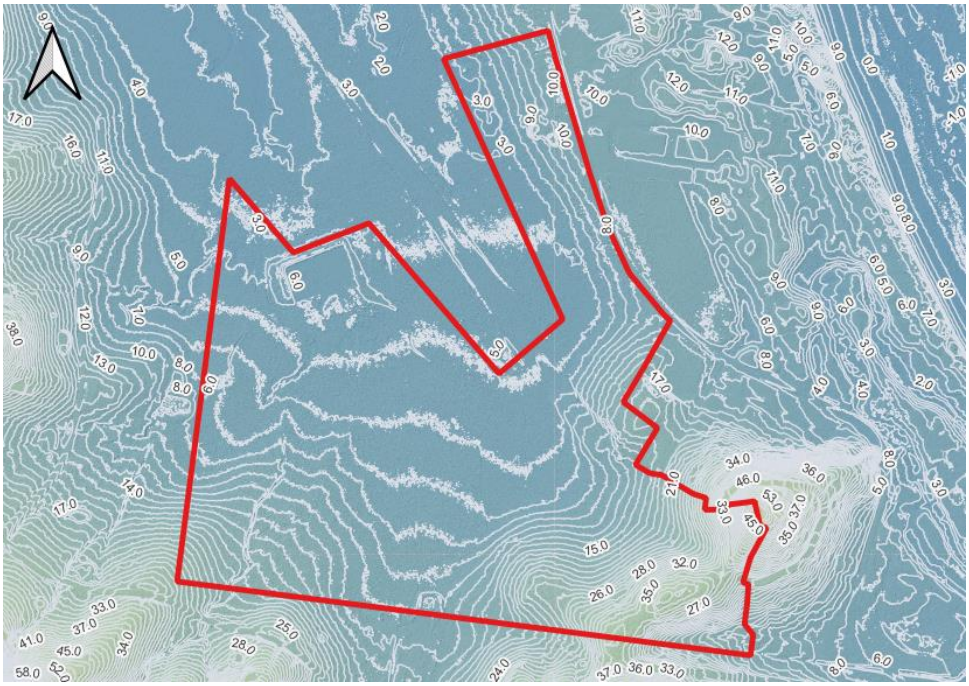

Figure 2-2 Topography of the site (1m Contours)

2.3 Proposed development

Stage 1 of the proposed residential development at Discovery Drive will be comprised of 20 lots, inclusive of the proposed extension of Discovery Drive. Associated infrastructure will also be constructed e.g., water and sewer connections, footpaths, etc. Refer to Figure 2-3 or Appendix A for further details.

Figure 2-3 Proposed Residential Lots

3 WATER QUALITY

3.1 Scenario Method

Stage 1 of the Discovery Drive development is approximately 2.5 ha and is comprised of 20 residential lots and associated infrastructure (Figure 2-3). The overall residential development will cover 23.7 ha of the entire site, and a large section of the property will be utilised for stormwater quality treatment, allowing for future developments. Refer to Table 3-1.

It is proposed to treat the entirety of the ultimate development, inclusive of Stage 1, within a constructed wetland. This wetland will ensure the development achieves the required annual pollutant load reduction objections prior to discharging to the receiving environment. The overall development has been modelled as of three (3) sub-catchments (A-C). The total area of the site is 88.2 ha, including Catchment A, B and C, the proposed treatment area, and future sub-arterial road dedication. Refer to Figure 3-1 or Appendix A for further information.

The proposed development (Sub-catchment A1) was modelled in MUSIC using split catchment source nodes for the development sub-catchment. Three (3) source nodes were used for modelling purposes and are comprised of road, roof, and ground cover nodes. Catchment B and C were modelled as future rural residential and commercial developments with a fraction impervious of 20% and 90%, respectively (Table 3-1).

While the overall development is under construction, a High Efficiency Sediment (HES) basin, designed to capture sediment loads during the construction phase, will be established in the wetland location, namely the future inlet pond. When 80% of the dwellings associated with the contributing development catchment area built, the wetland will be planted out and brought online after a suitable establishment time. Refer to Figure 3-1 for the proposed locations of the wetland and inlet pond.

Detailed design of the wetland, inlet pond and HES basin will be provided in a future Operational Works application.

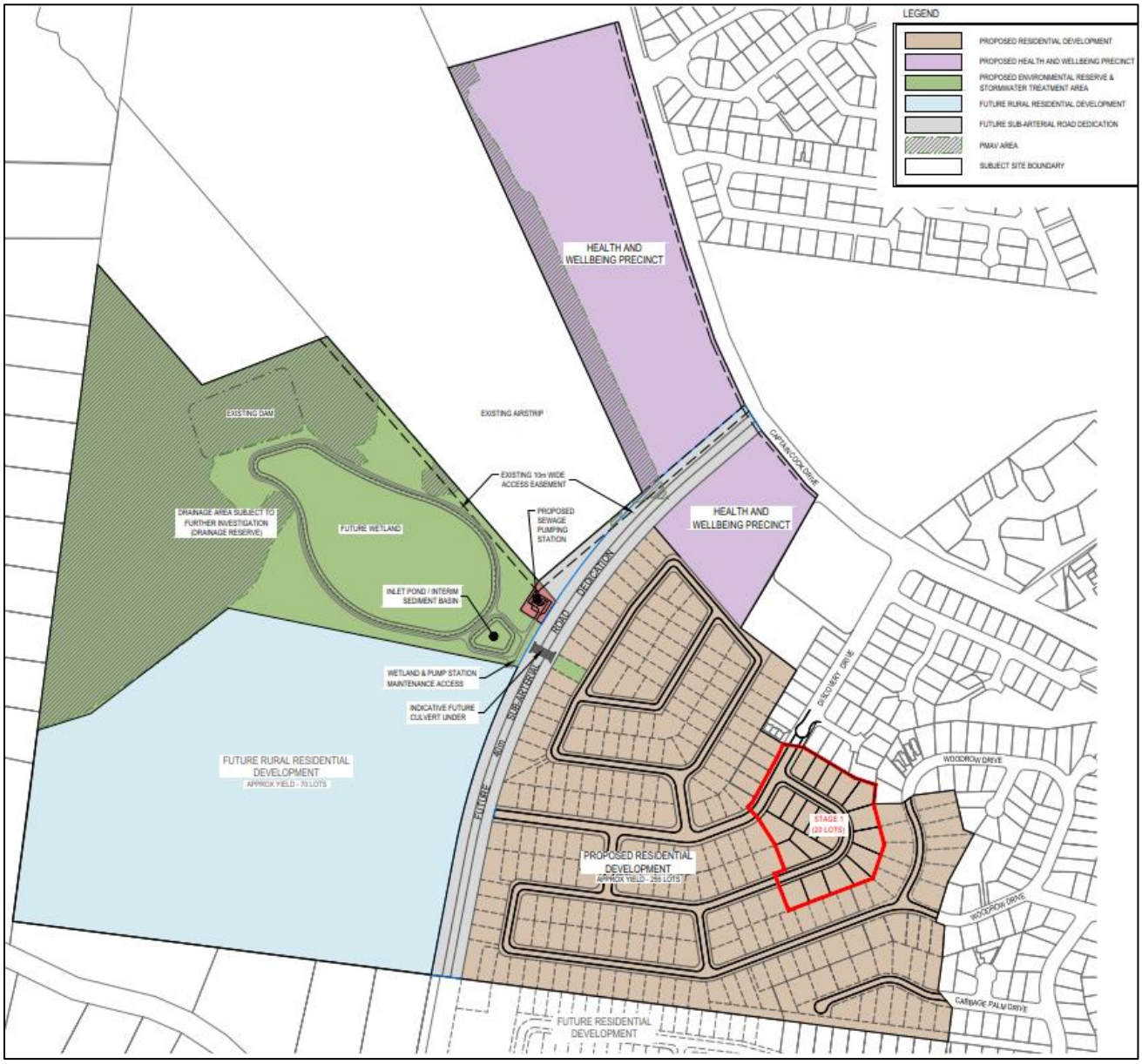

Figure 3-1 Contributing Sub-catchments and the Proposed Wetland System

Stage 1 of the development sub-catchment area (A1) includes road reserve areas, and these are modelled as 70% impervious. Roof areas have been estimated to be approximately 200 m^2 per dwelling, which is approximately 23% of the average lot area of 870 m^2. This leaves approximately 77% of the lot area to be accommodated by lawns, gardens, driveways, sheds, or similar. This is accounted for in the 20% impervious area within the ground cover nodes.

The nominated fraction impervious for each source node modelled in MUSIC is shown in Table 3-1.

3.2 Water Quality Modelling

3.2.1 MUSIC model Parameters

The MUSIC Modelling Guidelines–- Version 1 (HLW, 2010) was used to source base and storm flow concentrations and runoff generation. The model was calibrated using the Bureau of Meteorology (BoM) data from Gladstone, 1980 – 1989 at a six-minute time step as per guideline recommendations (HLW, 2018). All source nodes were set up in accordance with this guideline. No routing of drainage links was adopted as a conservative approach. This approach assumes that the flow through the drainage system is instantaneous, which most likely overestimates the actual pollutant load. MUSIC version 6.3.0 was used for this assessment.

Refer to Table 3-1 for catchment source node characteristics for the proposed development and contributing sub-catchments. A copy of the MUSIC model can be found in Appendix B.

Table 3-1 MUSIC Source Node Characteristics for the Sub-catchments

Sub-catchment			**Sub-catchment Area** (ha)	**Impervious %**
Catchment A (Urban Residential)	**A1– Discovery Drive**	Roof	0.40	100%
		Road Reserve	0.656	70%
		Ground Cover	1.44	20%
	A2		21.21	45%
Catchment B (Rural Residential)			22.70	20%
Catchment C (Commercial)	**C1**		11.10	90%
	C2		2.80	90%

3.3 Proposed Stormwater Treatment Train

Stormwater runoff from the proposed sub-catchment will be treated by one large wetland system prior to discharge into the stormwater network. The wetland will be designed according to recommended wetland technical design guidelines (WBD, 2017). Table 3-2 identifies the total contributing catchment size and its associated wetland details. The wetland has been designed to have an extended detention depth of 0.5 m, and a 48-hour retention time respectively.

Table 3-2 Proposed Wetland Areas for Development Sub-catchment

	Total Contributing Catchment Area (ha)	**Wetland Surface Area** (m^2)	**Wetland Permanent Pool Volume** (m^3)
Wetland	**60.3**	**45,000**	**13,500**

3.4 MUSIC Modelling

MUSIC modelling of the proposed sub-catchment was performed to ensure the nominated treatment strategy achieves the required pollutant reduction objectives. The target reductions in stormwater pollutants are based on a comparison of an unmitigated scenario, having no treatment on site, and the mitigated scenario, which has stormwater treatment measures incorporated onto the site. Target reductions for pollutants are shown in Table 3-3.

As per the SPP (2017) guidelines, MUSIC modelling is performed to avoid or minimise impacts on the environmental values of receiving waters by managing the release of nutrients and sediments into waterways. The discharge water from the wetland system was modelled to ensure that it met the pollutant reduction objectives.

Table 3-3 provides the MUSIC modelling results using one (1) large wetland system to treat stormwater runoff from the total contributing development catchment. The MUSIC modelling demonstrates that compliance has been met or exceeded for the objectives required by GRC (2017) and the SPP (2017) for TSS, TP, TN and GP.

Table 3-3 MUSIC Modelling Results

	Pollutant	**Unmitigated** (kg/yr)	**Mitigated** (kg/yr)	**Reduction Achieved** (%)	**Reduction Target** (%)	**Compliance** (Y/N)
Proposed Wetland	**TSS**	64800	9710	85	85	**Y**
	TP	126	27.9	77.8	60	**Y**
	TN	601	270	55	45	**Y**
	GP	7330	0	100	90	**Y**

As the results in Table 3-3 demonstrate, the stormwater management strategy proposed for the Discovery Drive development and future developments within the contributing catchment area, meet, or exceed the target reduction rates for major pollutants required by the GRC (2017) and the SPP (2017).

There is additional space available within the proposed wetland treatment area. If necessary, this wetland could likely be increased in size to accommodate additional development area.

4 CONCLUSIONS

This SMP demonstrates that the recommended stormwater treatment measures for the proposed development at Discovery Drive, Agnes Water, will successfully achieve the performance criteria set by the GRC (2017) and by the SPP (2017).

Annual load reductions of TSS, TP and TN between the unmitigated and mitigated MUSIC model scenarios have been met or exceeded (Table 3-3). The modelling approach used is considered to be conservative as no routing in the drainage links was applied.

Sufficient consideration of stormwater controls has been demonstrated by:

- Compliance with the State Planning Policy (2017); and
- Compliance with QUDM (2017).

Further supporting information, such as detailed design of the wetland, inlet pond, HES basin, and maintenance requirements of the wetland system will be provided in a future Operational Works Application.

5 REFERENCES

Water by Design (2010). MUSIC Modelling Guidelines. SEQ Healthy Waterways Partnership, Brisbane, Queensland.

State Planning Policy (SPP), 2017. Department of State Development, Infrastructure and Planning, Brisbane, Queensland.

Gladstone Regional Council (GRC), 2017. Our Place Our Plan Gladstone Regional Council Planning Scheme Version 2.

Water by Design (2017). Draft Wetland Technical Design Guidelines (Version 1). Healthy Land and Water Ltd, Brisbane.

APPENDIX A

Plan of Development

LEGEND

- PROPOSED RESIDENTIAL DEVELOPMENT
- PROPOSED HEALTH AND WELLBEING PRECINCT
- PROPOSED ENVIRONMENTAL RESERVE & STORMWATER TREATMENT AREA
- FUTURE RURAL RESIDENTIAL DEVELOPMENT
- FUTURE SUB-ARTERIAL ROAD DEDICATION
- PMAV AREA
- SUBJECT SITE BOUNDARY

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE RELEVANT AUTHORITIES TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF EXCAVATION

00 50m 100m 150m

SCALE 1:2500 (A1) - 1:5000 (A3)

Check all dimensions before commencement of work.
Check Site boundary dimensions from the Title plans.
Check Building Boundary clearances by set out.
Notwithstanding the information supplied on this drawing, the location, depth and extent of underground or overhead services are to be confirmed and protected on site by the contractor prior to commencement of works.

Issue	Date	Description	By
P1	24.03.23	PRELIMINARY ISSUE	SK

Drawing title -

DEVELOPMENT LAYOUT PLAN

Project -

DISCOVERY DRIVE SUBDIVISION

Client -

JAMWORTH PTY LTD & SUNSHINE STATE DEVELOPMENTS PTY LTD

Site -

DISCOVERY DRIVE, AGNES WATER

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Checked : MF Design : SK Drawn : SK

Scales : AS SHOWN

Document Stage : PRELIMINARY

Project : 212991 Sheet No. RL100

Digital Ref : RL100 DEVELOPMENT LAYOUT PLAN Issue : P1

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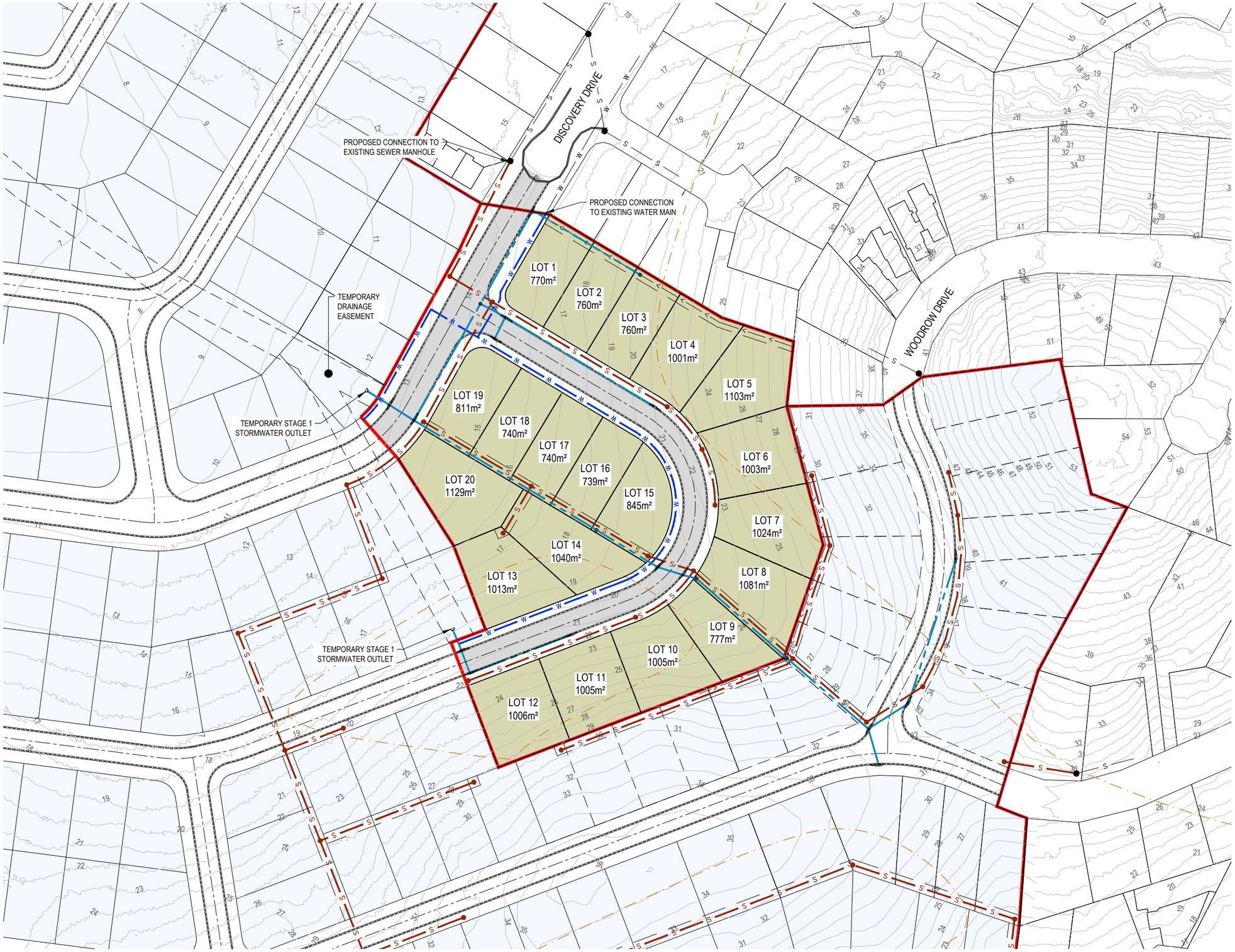

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE RELEVANT AUTHORITIES TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF EXCAVATION

LEGEND

- PROPOSED ROAD
- PROPOSED STAGE 1 ALLOTMENTS (20)
- FUTURE ALLOTMENTS
- PROPOSED EASEMENT BOUNDARY
- PROPOSED STORMWATER DRAINAGE
- S — PROPOSED SEWER MAIN
- W — PROPOSED WATER MAIN
- MAPPED STEEP LAND
- S — EXISTING SEWER MAIN
- W — EXISTING WATER MAIN
- STAGE BOUNDARY
- 30 — NATURAL CONTOURS @ 1m INTERVALS

0 10m 20m 30m 40m 50m

SCALE 1:750 (A1) - 1:1500 (A3)

Check all dimensions before commencement of work.
Check Site boundary dimensions from the Title plans
Check Building Boundary clearances by set out.
Notwithstanding the information supplied on this drawing, the location, depth and extent of underground or overhead services are to be confirmed and protected on site by the contractor prior to commencement of works.

Checked - MF
Design - SK Drawn - SK
Scales - AS SHOWN
Document Stage - PRELIMINARY

Issue	Date	Description	By
P1	24.03.23	PRELIMINARY ISSUE	SK

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Drawing title - STAGE 1 ENGINEERING SERVICES PLAN

Project - DISCOVERY DRIVE SUBDIVISION

Client - JAMWORTH PTY LTD & SUNSHINE STATE DEVELOPMENTS PTY LTD

Site - DISCOVERY DRIVE, AGNES WATER

Project No. 212991 Sheet No. RL103

Digital Ref : RL103 STAGE 1 ENGINEERING SERVICES PLAN Issue : P1

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APPENDIX B

MUSIC Model (electronic)