

SITE BASED STORMWATER MANAGEMENT PLAN

54 GEORGE ALEXANDER WAY, COOMERA

THE COOMERA GA UNIT TRUST



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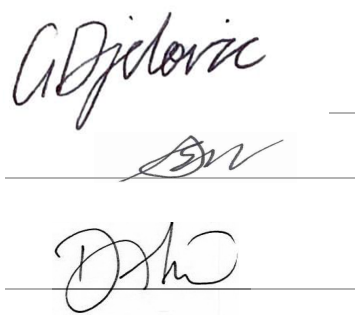
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GLOSSARY OF TERMS

Australia Rainfall and Runoff (ARR) 2019 recommends adaptation of new terminology relating to storm events summarised in Table A below. As recommended, this report documents data with respect to AEP (%).

The following definitions should be noted:

- EY = Number of exceedances per year.
- AEP = Annual Exceedance Probability.
- AEP (1 in x) = 1/AEP.
- ARI = Average Recurrence Interval (years).

The below table should be referred to for a comparison of storm events.

Table A – Adopted Terminology

EY	AEP (%)	AEP (1 in)	ARI
1	63.21	1.58	1
0.69	50	2	1.44
0.5	39.35	2.54	2
0.22	20	5	4.48
0.2	18.13	5.52	5
0.11	10	10	9.49
0.05	5	20	20
0.02	2	50	50
0.01	1	100	100

ASSOCIATED MODELLING FILES

For internal reference, the following modelling file packages are associated with this report.

- 54 george alexander-H DRAINS Model
- 54 george alexander - F- MUSIC

1 EXECUTIVE SUMMARY

Coomera GA Pty Ltd ATF The Coomera GA Unit Trust has commissioned Arcadis to prepare Site Based Stormwater Management Plan (SBSMP) for a residential development application for the site located over the following allotment, on George Alexander Way, Coomera:

- Lot 96 on RP187418 (54 George Alexander Way, Coomera 4209).

The proposed development intended for the site is for the creation of 22 residential allotments and a management lot. Supporting infrastructure such as roads, utilities, park area and stormwater management areas are also proposed.

This report demonstrates the proposed development will be constructed and operated in accordance with the Water Sensitive Urban Design (WSUD), Requirements of Council, the South-East Queensland State Planning Policy (SPP), the Queensland Development Code, the Queensland Urban Drainage Manual (QUDM), Australian Rainfall and Runoff (2019) and the Environmental Protection (Water) Policy (2009). The primary objectives of this Site Based Stormwater Management Plan are achieved as follows:

Lawful Point of Discharge (LPD)

Stormwater was only considered for the eastern portion of the site as there has not been any proposed development within the western catchment. Stormwater will be discharged to the existing four lawful points of discharge, being Pioneer and Mercy Street to the north of the site, the drainage corridor along the eastern boundary and the lot to the south of the site (Lot 95 on RP187418).

Stormwater Quantity

The site proposes to mitigate the increase in peak run off, expected to occur at Legal Points of Discharge, through the use of a local detention basin and reduction in catchment areas.

An increase in flow is expected at LPD 4, when compared to previously approved stormwater management report (*Conceptual Stormwater Management Plan - 54 George Alexander Way, Coomera, BC-22167*, prepared by Biome). Council has advised Arcadis to direct flows from catchment DEV 2 to this location. It is understood this will drain to a detention basin located north of the site. This report has not assessed the downstream infrastructure capacity.

Stormwater Quality

A stormwater quality assessment is provided which demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of City of Gold Coast (CoGC) during the operational phase of the proposed development. The proposed treatment system features bio-retention areas. All the stormwater quality controls detailed in this document will be ultimately handed over to Council to become public assets. Regular maintenance of the treatment devices must be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Waterway Stability

The development does not trigger the application requirement specified under Table 4.12 of City Plan SC6.11 Part 4. Discharge to a tidal waterway that is not degraded therefore does not trigger the application requirement.

Erosion and Sediment Control

Erosion and sediment control measures during construction shall be undertaken in accordance with the SPP and Council requirements.

1.1 Revision 03

Revision 03 involves the response to Council's information request dated 11/10/2023 as part of application COM/2023/16. Previous revisions of this report proposed larger than frequent flows events from catchment DEV 2 to be directed to LPD2 via splitter pit infrastructure. Council's information request calls for all events to be directed to LPD4. This will remove the splitter pit infrastructure.

2 SITE CHARACTERISTICS

2.1 Location Details

The subject site is located within Alexander Way, Coomera, Australia over the following allotment:

- Lot 96 on RP 187418 (54 George Alexander Way, Coomera QLD 4209)

A site locality plan is provided in Figure 2-1 below.

The site is bounded George Alexander Way to the west, rural residential allotment to the south, a future residential development to the north and residential dwellings to the east.

- Lot 1 on SP312031 to the north of the site is currently subject to development approval OPW/2022/155. Construction is nearing completion.

The Gold Coast City Council is the local government authority.

The total area of the site is approximately 30,100m².

2.2 Land Usage

In its current state, the project site consists of a residential dwelling and its associated driveway. Figure 2-1 below provides a current locality plan of the site.



Figure 2-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

2.3 Topography and Features

The site has slopes ranging from 5 to 12%. With the high point at the centre being RL34m, everything slopes away from the centre of the site. The lowest point of the site is located in the northeaster corner at RL24m.

There are two existing dams located on the site, one large dam in the north western corner and a smaller dam located in the northeaster corner.

Further catchment and topographic information can be seen on the Engineering Drawings attached in Appendix B.

3 PROPOSED DEVELOPMENT

The proposed development involves the construction of residential dwellings, including:

- 22 residential allotments, 6 of which will be dual occupancy.
- 1 balance parcel (Will be subject to development applications).
- Residential road network.
- Stormwater management areas.
- LGIP Park

A plan extract of the proposed development has been provided in Figure 3-1.

A full set of development proposal plans are provided within the development application package and should be referred to for further information.



Figure 3-1 Proposed Development Proposed Plans

3.1 Clarifications

This report assumes that works associated with the development north of the site, summarised as Lot 1 on SP312031 will be completed in full (including modifications as needed to support proposed outcomes of this proposal) to enable relevant services connections and earthworks interfacing. Likewise, this report assumes that the basins designed in the 'Conceptual Stormwater Management Plan 66 George Alexander Way, Coomera' prepared by BIOME for Lot 1 on SP312031 will be completed in full. In this report part of 54 George Alexander Way have been considered for detention and treatment purposes.

These works are envisaged under the following approvals:

- Development Approval OPW/2022/155.

To the best of our understanding, these works are close to completion.

4 LAWFUL POINT OF DISCHARGE AND DRAINAGE

4.1 Existing Stormwater Drainage

This report only focuses on the proposed developed areas, the western portion of the site has not been considered in this assessment.

In its existing state the site has four LPD, being Pioneer Street to the north of the site, Mercy Street to the north of the site, the drainage corridor along the eastern boundary and the lot to the south of the site (Lot 95 on RP187418). It's noted that Pioneer Street and Mercy Street have the same ultimate discharge point to the east, however, locally have two separate downstream basins that manage their catchments. Refer to the Section 3.1 of the BIOME report (approved under OPW/2022/155), which outlines the discharge and catchments for Pioneer and Mercy Streets.

The catchment delineation is derived from survey provided in Appendix A.

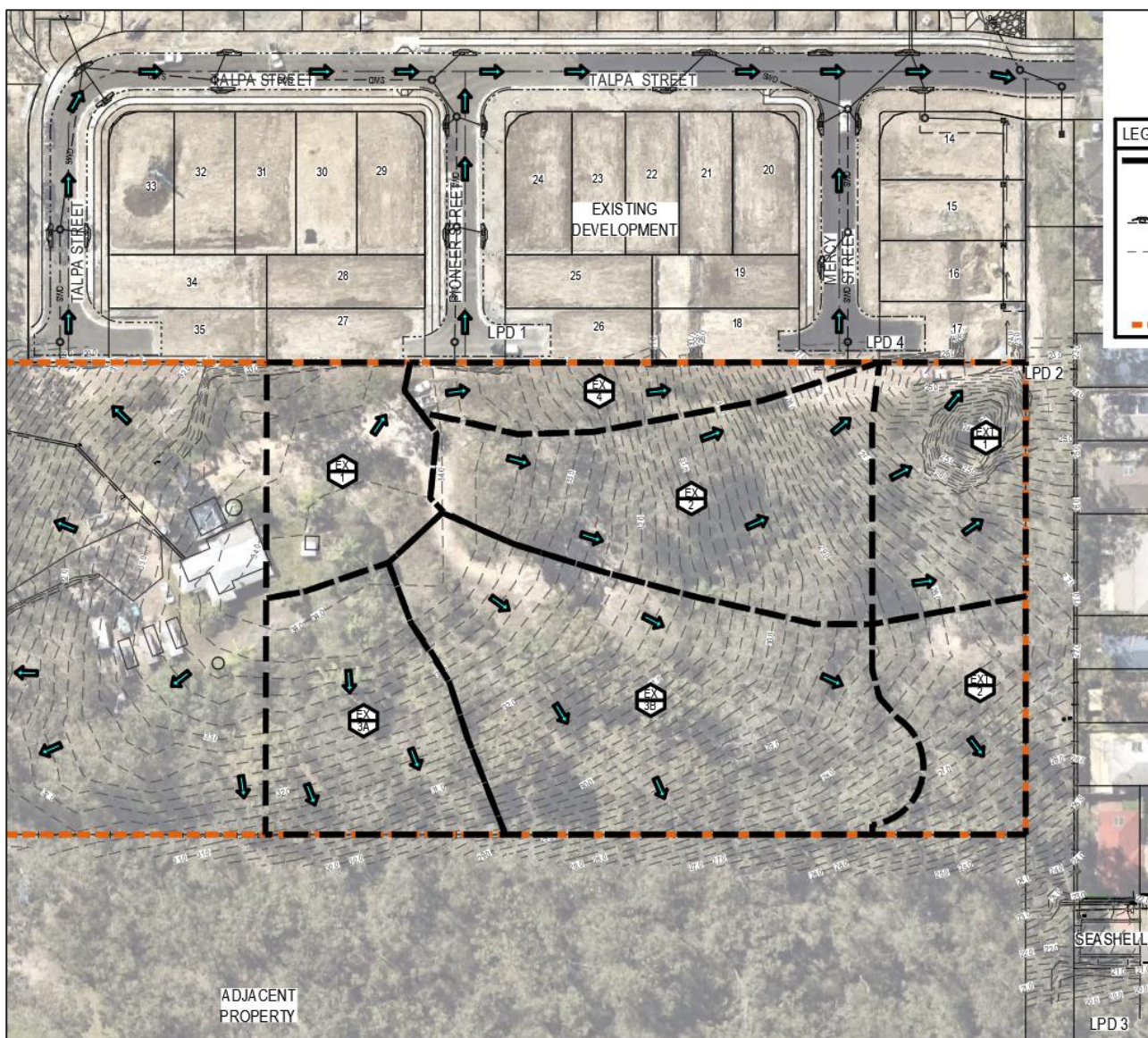


Figure 4-1 Existing Stormwater Catchments

4.2 Proposed Drainage Characteristics and LPD Test

The below diagram illustrates proposed drainage philosophy for the site, which is adopted for the purposes of detailed calculations in subsequent reporting sections.

The site proposes to maintain the four LPD's being Pioneer Street and Mercy Street to the north of the site, the drainage corridor along the eastern boundary and the lot to the south of the site (Lot 95 on RP187418). Through the use of a stormwater detention basin and catchment reduction, flows will be mitigated to predeveloped flow.

The basin has been modelled to allow for

- Minor piped flow ($\leq 10\%$ AEP) from catchment DEV 3a,
- Minor piped flow ($\leq 50\%$ AEP) from catchment DEV 1 and
- All flows from catchment DEV 3b
- Basin proposes to outlet control piped flows to drainage reserve south of Seashell Avenue for (LPD3).

Further details can be found on Engineering Drawings in Appendix B.

The model has been set up to allow for

- Major flows ($> 50\%$ AEP) for catchment DEV 1 to travel via overland flow to LPD1.
- As requested by Council (IR dated 11/10/2023), all flows from DEV 2 will discharge to LPD 4, minor flows (up to 10% AEP) are to be piped whereas, major flows (1% AEP – 10% AEP) can travel via overland flow.
- Major flows ($> 10\%$ AEP) for catchment DEV 3a to travel via overland flow to LPD3a.

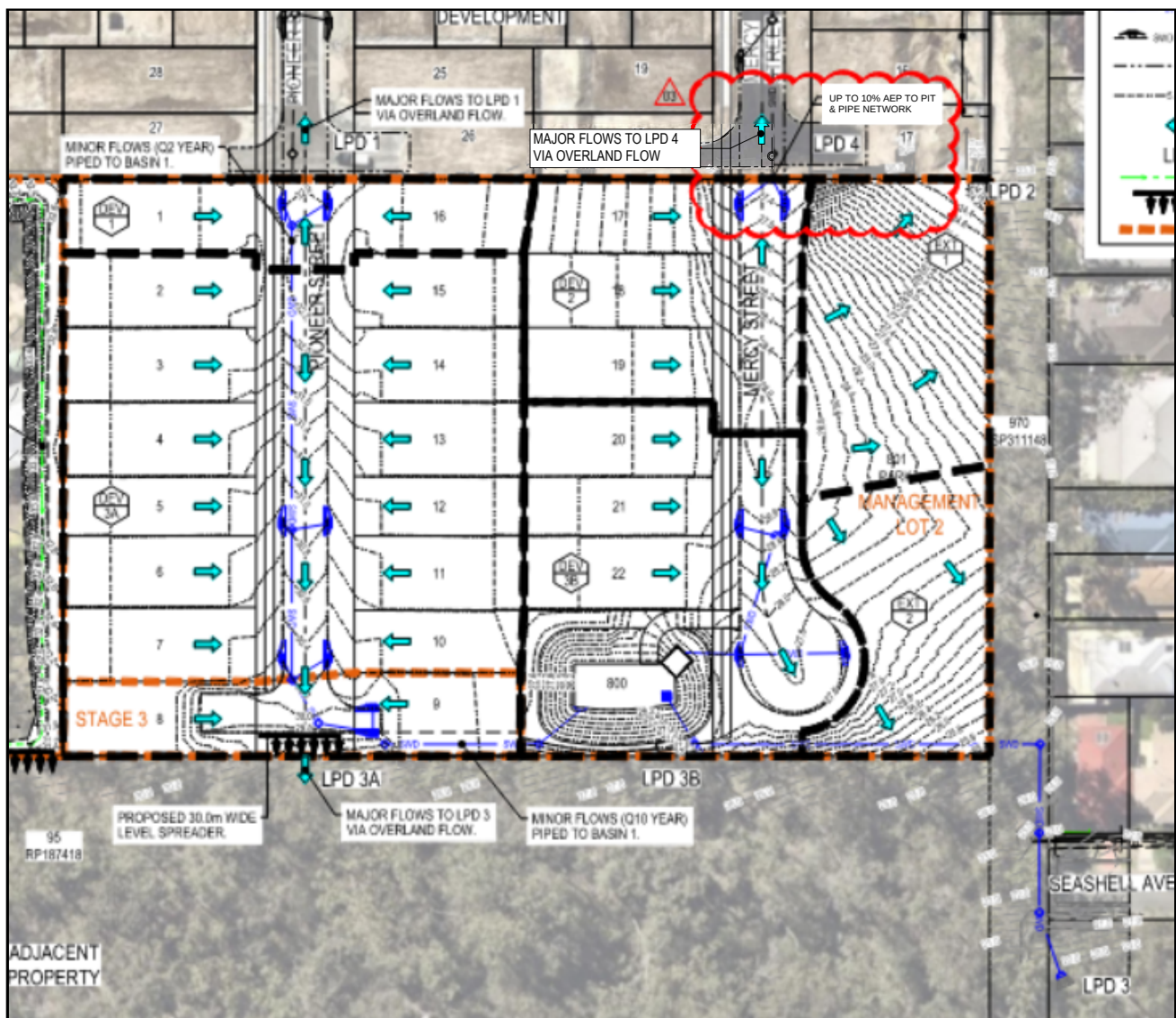


Figure 4-2 Drainage Schematic (Lot side boundaries and numbers shown are indicative)

In the developed case, the site demonstrates compliance with the QUDM (2017) as follows:

The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement.

The site will demonstrate compliance with QUDM (2017) by maintaining as much as practically possible the existing discharge characteristics, by discharging controlled flows to the existing lawful points of discharge.

That in discharging in that location, the discharge will not cause an actionable nuisance. In general terms this implies no worsening as a result of discharge.

Sections 5, 6, 7 and 8 of this report provide detailed calculations and discussions illustrating no actionable nuisance anticipated. It is noted that optimisation of the development sites drainage system will be undertaken during the operational works phase of the development.

An increase in flow is expected at LPD 4, when compared to previously approved stormwater management report (*Conceptual Stormwater Management Plan - 54 George Alexander Way, Coomera, BC-22167*, prepared by Biome). Council has advised Arcadis to direct flows from catchment DEV 2 to this location. It is understood this will drain to a detention basin located north of the site. This report has not assessed the downstream infrastructure capacity.

Engineering drawings in Appendix B provide further details of the proposed system.

5 STORMWATER QUANTITY

5.1 Objective

The following assessment has been undertaken to demonstrate that the proposed development will not adversely affect the existing drainage conditions adjacent to the site. Existing drainage characteristics are assessed to determine peak flow rates for the median storm event up to and including the 1% AEP.

5.2 Temporal Patterns

In accordance with CoGC's City Plan SC6.11.4.4.3 & ARR2019, Rainfall Intensities Frequency Duration data were obtained from The Bureau of Meteorology (<http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016>). The Latitude and Longitude of used for the site is summarised in Table 5-1 below.

Table 5-1 Site Latitude and Longitude

Parameter	Value
Latitude	-27.8480
Longitude	153.3227

5.3 Catchments

Two hydrologic conditions were modelled to appropriately demonstrate the stormwater quantity objective:

- **Existing Scenario (E)** – The catchment including the site in its existing state.
- **Developed Scenario (D)** – The catchment including the site in its developed state as per the proposal.

The following catchment details in Table 5-2 and Table 5-3 were determined.

- Lots assumed 50% roof area with remaining area assumed ground area 50% impervious.
- Roads measured 80% impervious.
- Stormwater areas were assumed 20% impervious.

Table 5-2 Modelling Existing Catchment Details

Catchment	Area (ha)	Slope (%)	Impervious Area (%)	Manning's (n)
E1	0.14	1%	1%	0.06
E2	0.31	8%	0%	0.06
E3a	0.20	8%	0%	0.06
E3b	0.48	8%	0%	0.06
E4	0.10	11%	0%	0.06
EXT1	0.27	8%	0%	0.06
EXT2	0.12	7%	0%	0.06

*Note that only the developed area was accounted for in this model, any undeveloped area was not assessed (1.39ha)

Table 5-3 Modelling Developed Catchment Details

Catchment	Area (ha)	Time of Concentration (min)	Impervious Area (%)
DEV1	0.10	5,7	76%
DEV2	0.18	5,7	77%
DEV3a	0.65	5,7	76%
DEV3b	0.30	5,7	62%

Catchment	Area (ha)	Slope (%)	Impervious Area (%)	Manning's (n)
EXT1	0.16	8%	0%	0.06
EXT2	0.12	7%	0%	0.06

5.3.1 Detention System Design

Table 5-4 presents the design details for the proposed onsite detention system for the site which is required to achieve the objective of no post development increase up to the 1% AEP event at the assessment point. The detention system has been iteratively optimised to ensure peak performance.

The Table 5-5 to Table 5-10 illustrate that there is no worsening at any of the LPD's.

Table 5-4 Summary of Proposed Detention Basin Parameters

Parameters	Detention System
Min. Required Detention Storage (m ³)	432
Batters	1:4
Area of Forebay Sediment Storage Required (m ²)	5.9
Height of Forebay Sediment Storage Required (m)	0.2
Detention Depth (m)	1.2
Total Basin Depth (m)	1.5m
Outlet Orifices	1 x DN150 outlet @ 0.0m above the top of the extended detention, 1 x DN250 outlet @ 0.6m above top of the extended detention, 1 x DN100 outlet @ 0.7m above the top of the extended detention 2.5m weir @ 1.1m above the top of the extended detention

*Volume from extended detention was not considered in the function of the detention basin design.

5.3.2 Model Results

A DRAINS model has been developed to assess the proposed development site. The following results have been captured from the DRAINS model as a result of implementing the above detention system. Table 5-5 to Table 5-10 below summarises the peak flow rates for each identified critical storm across the assessed AEP range at the assessment point for the catchment.

Table 5-5 Summary of DRAINS Hydrologic/Hydraulic Results Catchment at LPD 1

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.011	0.013	0.022	0.029	0.036	0.042	0.049
Developed	Median Flow (m ³ /s)	0	0	0.012	0.02	0.028	0.039	0.047

Table 5-6 Summary of DRAINS Hydrologic/Hydraulic Results Catchment LPD 2

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.057	0.070	0.120	0.141	0.171	0.210	0.238
Developed	Median Flow (m ³ /s)	0.021	0.26	0.045	0.052	0.064	0.077	0.088

Table 5-7 Summary of DRAINS Hydrologic/Hydraulic Results Catchment LPD 3

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.091	0.113	0.192	0.198	0.277	0.345	0.392
Mitigated	Median Flow (m ³ /s)	0.069	0.100	0.163	0.230	0.232	0.313	0.391
Height*	m	0.68	0.75	0.9	1.01	1.11	1.16	1.2

*Height taken from top of extended detention.

Table 5-8 Summary of DRAINS Hydrologic/Hydraulic Results Catchment LPD 3a

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.053	0.066	0.114	0.136	0.165	0.203	0.234
Developed	Median Flow (m ³ /s)	0	0	0	0	0.017	0.128	0.183

Table 5-9 Summary of DRAINS Hydrologic/Hydraulic Results Catchment LPD 3b

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.026	0.032	0.054	0.062	0.077	0.095	0.108
Developed	Median Flow (m ³ /s)	0	0	0	0	0.004	0.062	0.134

Table 5-10 Summary of DRAINS Hydrologic/Hydraulic Results Catchment LPD 4

Scenario	AEP (%)	63.2	50	20	10	5	2	1
Existing	Median Flow (m ³ /s)	0.015	0.018	0.029	0.036	0.041	0.051	0.059
Developed*	Median Flow (m ³ /s)	0.041	0.047	0.069	0.082	0.098	0.118	0.133

5.4 Objective Discussion

5.4.1 Peak Flow Mitigation

The above hydraulic investigation and runoff-routing exercise has demonstrated that suitable measures can be included in the design of the proposed development to ensure that there is no increase in median discharge flow rates being directed off-site to existing infrastructure for 63.2% AEP events to 1% AEP events in accordance with QUDM and ARR2019.

Results presented in Table 5-9 show that during the 1% AEP event, the flow discharges to LPD3b increase by 26 L/s. The localised increase will be managed by directing weir flows to the future road reserve via a proposed channel. It should be noted that when combined with flows from LPD3a and catchment EXT2, the total discharge from the site remains below existing conditions, as shown in Table 5-7.

A comparison between pre- and post-development flows, as presented in Table 5-10, indicates that there is an increase in developed conditions due to Councils requests at LPD4. A Council Information Request calls for all flows from the DEV 2 catchment be discharged to LPD4 even though it will not meet existing conditions. These flows will be redirected into Basin B, located in the adjacent lot to the north, via piped drainage and overland flow (approved under OPW/2022/155).

5.4.2 Temporary Level Spreader Design Check

The proposed solution for the LPD3a involves the installation of a level spreader spanning the entire width of the road reserve, which measures 30 meters in width. This recommendation is based on the findings presented in Table 5-8, which indicate that the peak flows from catchment 3a are currently at 234L/s during the 1% AEP event. In contrast, under the developed scenario, the peak flows are reduced to 183L/s. Although the peak flows are lower than the existing conditions, it is important to note that the effective discharge boundary has been diminished, resulting in a higher concentration at the level spreader's boundary. Consequently, a weir flow check was conducted for the level spreader, revealing a depth of flow of 25mm and a depth velocity product of 0.006m²/s during the 1% AEP event.

6 STORMWATER QUALITY (OPERATION)

6.1 Objectives

The following operational water quality objectives are set out by Council:

- Gross Pollutants (>5mm) – 90% reduction in mean annual load.
- Total Suspended Solids (TSS) – 80% reduction in mean annual load.
- Total Phosphorous (TP) – 60% reduction in mean annual load.
- Total Nitrogen (TN) – 45% reduction in mean annual load.

6.2 Proposed Stormwater Treatment Devices

WSUD aims to minimise the impact of a development on the natural water cycle by reducing the export of pollutants, sediments and nutrients from the site into the natural watercourse. In order to treat the stormwater runoff from the site, various treatment devices can be used throughout the development area and these concepts can be integrated into the overall design of the road layouts, road cross sections, stormwater layouts and water supply reticulation systems. Stormwater from the development will follow a specially designed stormwater quality treatment train prior to discharge from the site, which will ensure compliance with the water quality objectives.

A treatment train has been proposed for the site which comprises of a number of individually designed treatment devices that collectively contribute to the achievement of whole site water quality objectives.

The site proposes to send flows from DEV1, DEV3 and DEV4 into the basin within the south eastern corner of the site, D2 is proposed to be discharged into the existing Bioretention Basin B in the site to the north (Lot 1 on SP312031). The approved Conceptual Stormwater Management Plan prepared by Biome under application number OPW/2022/155 has accounted for a portion of the development site in their model. Therefore, this quality assessment has replicated the catchments from OPW/2022/155 as well as, included the new catchments for 54 George Alexander to correctly assess stormwater quality.

A copy of the treatment devices information can be seen in Appendix C.

6.2.1 Bio-Retention Areas

A bio-retention area is a vegetated region where runoff is filtered through a filter media layer (e.g. sandy loam) as it percolates downwards to receiving underlying drainage. Specific vegetation is to be incorporated into the landscaping of bio-retention areas which effectively reduce nutrient loads. Appendix A of Healthy Waterways' Water Sensitive Urban Design Technical Guidelines for South East Queensland provides guidance on selecting appropriate plant species for systems where plants have a functional role in stormwater treatment.

A typical example of a bio-retention area in operation with suitable vegetation is presented in Figure 6-1 below. A typical section and further standard details and maintenance checklist are provided in Appendix C.



Figure 6-1 Example of Urban Bio-Retention Basin (Courtesy Water by Design)

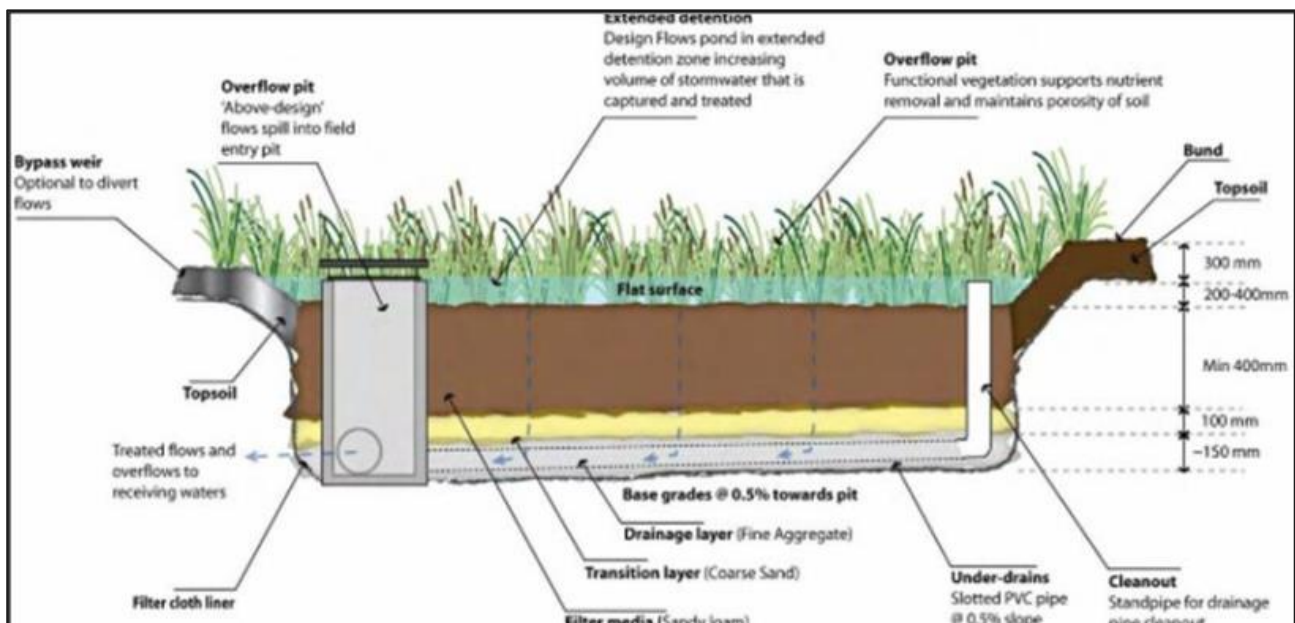


Figure 6-2 Example of Urban Bio-Retention Garden-Bed (Courtesy Water by Design)

6.3 Modelling

Modelling of the site was undertaken using the 'Model for Urban Stormwater Improvement Conceptualisation (MUSIC)' as promoted by LCC and the South East Queensland Healthy Waterways Partnership. The development was modelled using the split catchment approach. An appropriate type of land use was applied to all surface types within the developed catchments; where individual treatment devices were assigned the relevant modelling treatment parameters. Consequently, a treatment train was established for the site, ensuring that water discharging from site adheres to the specified Water Quality Objectives.

Meteorological data for input into MUSIC was obtained from Shailer Park Station 40715 from the Bureau of Meteorology. Six-minute time step rainfall data was obtained for the climate period from 01/01/1990 to 31/12/1999. The catchment parameters of the MUSIC modelling are specified within the South East Queensland Healthy Waterways Partnerships' Water by Design MUSIC Modelling Guidelines for South East Queensland Version 1 (2010), and have been modelled as such.

6.3.1 Pollutant Source Node Details

The pollutant source node parameters input into the MUSIC model were determined using the South East Queensland Healthy Waterways Partnership's Water by Design MUSIC Modelling Guidelines for South East Queensland version 1 (2010), specifically Tables 3.7 and 3.8 for urban residential surface types. It is noted that all base flow parameters for roof surfaces are adopted as 0.00 or N/A.

To calculate the landscape imperviousness the total lot area was split into 50% being roof area and 50% being ground area. The roof area was considered to be 100% impervious while the ground area was assumed to be 50% grassed and 50% paved. The road area was considered to be 80% impervious based on council road design standards. Finally, the stormwater area was assumed 20% impervious.

A summary of the source these nodes have been provided in Table 6-1 and Table 6-2 below.

Table 6-1 Summary of Source Node Details for 54 George Alexander Way

Catchment	MUSIC Source Node	Imperviousness (%)	Area (ha)*
Roof (D1, D3a & D3b)	Roof	100%	0.35
Road (D1, D3a & D3b)	Ground	80%	0.28
Ground (D1, D3a & D3b)	Ground	50%	0.35
Stormwater Area (D1, D3a & D3b)	Ground	20%	0.08
Roof – D2	Roof	100%	0.06
Road – D2	Ground	80%	0.06
Ground – D2	Ground	50%	0.06

Table 6-2 Summary of Source Node Details for 66 George Alexander Way (Courtesy of Conceptual Stormwater Management Plan 66 George Alexander Way, Coomera Prepared by Biome)

Catchment	MUSIC Source Node	Imperviousness (%)	Area (ha)*
Roof A	Roof	100%	0.443
Road A	Ground	70%	0.346
Ground A	Ground	30%	0.268
Roof B	Roof	100%	0.342
Road B	Ground	70%	0.240
Ground B	Ground	30%	0.218

6.3.2 Treatment Device Node Details

The bio-retention area has been designed specifically in accordance with the Bio-retention Technical Design Guidelines (2014) and local data testing of soil parameters. Details of the location and standard design of the proposed treatment device areas are presented in the Engineering Drawings in Appendix B of this report.

Once the site is fully developed, the stormwater run-off from sub-catchments will be collected via a drainage system and directed to the relevant areas per Figure 4-2.

General parameters for the Bio-retention treatment system have been modelled as per Table 6-3 and Table 6-4 below.

Table 6-3 Sites Bio-Retention Design Parameters

Parameter	Bio-retention Basin
Minimum Filter Media Area (m ²)	95m ²
Minimum Ponding Surface Area (m ²)	95m ²
Extended Detention Depth Within Ponding Area(m)	0.30
Minimum Filter Media Depth (m) (excluding transition layer and under drainage)	0.50
Underdrainage Layers (m)	0.10
Minimum Saturated Hydraulic Conductivity (mm/hour)	200
Maximum Filter Media Total Nitrogen (mg/kg)	400
Maximum Filter Media Orthophosphate (mg/kg)	30

Table 6-4 66 George Alexander Way Bio-Retention Design Parameters (Courtesy of Conceptual Stormwater Management Plan 66 George Alexander Way, Coomera Prepared by Biome)

Parameter	Bio-retention Basin	Bio-retention Basin
Minimum Filter Media Area (m ²)	110m ²	80m ²
Minimum Ponding Surface Area (m ²)	130m ²	95m ²
Extended Detention Depth Within Ponding Area(m)	0.30	0.30
Minimum Filter Media Depth (m) (excluding transition layer and under drainage)	0.60	0.60
Underdrainage Layers (m)	0.01	0.01
Minimum Saturated Hydraulic Conductivity (mm/hour)	200	200
Maximum Filter Media Total Nitrogen (mg/kg)	400	400
Maximum Filter Media Orthophosphate (mg/kg)	30	30

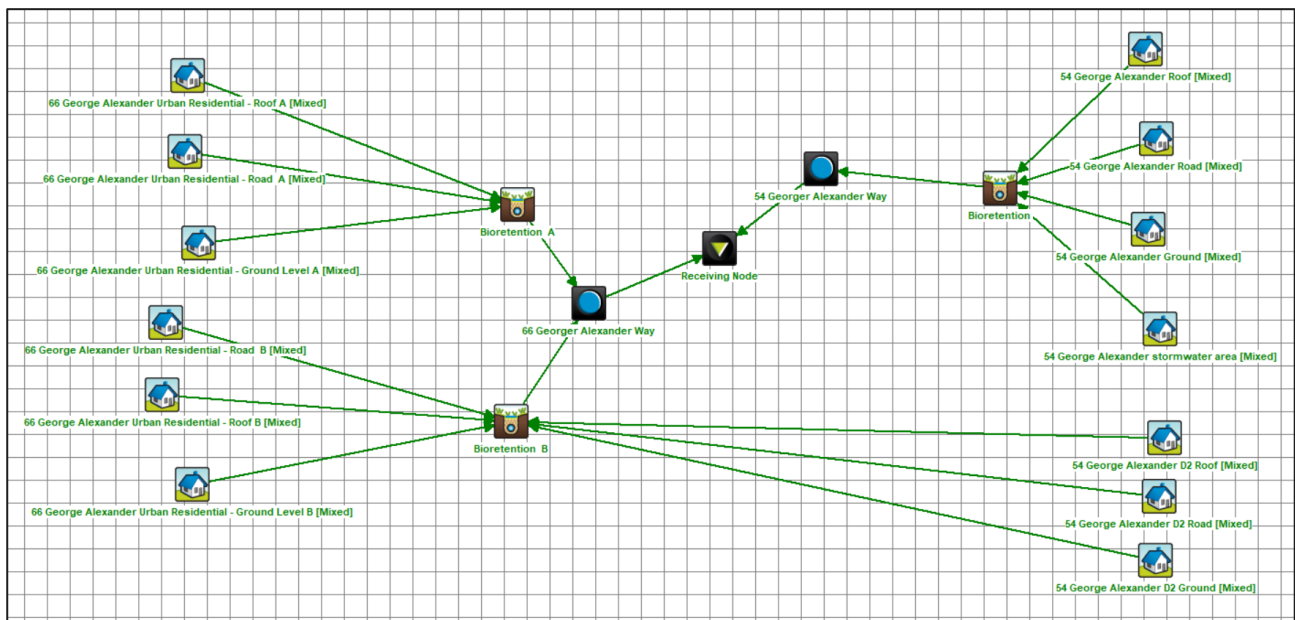
Table 6-5 Sediment Forebay Parameters

Parameter	Basin
Catchment Area (Ac) (ha) <i>Includes basin Area</i>	1.23
Coarse Sediment Removal	Forebay
Capture Efficiency (R) *	0.8
Sediment Loading Rate (Lo) (m ³ /ha/year) *	0.6
Desired Clean out Frequency (Fc) (years)	2
Volume of Forebay (Vs) (m ³)	1.18
Forebay Depth (m)	0.20
Minimum Forebay Area (m ²)	5.9

* in accordance with WSUD bio-retention technical guidelines table 13

6.3.3 Model Layout and Results

A diagrammatical view and pollutant reduction results can be found in Figure 6-3 and Figure 6-4 below.

**Figure 6-3 MUSIC Model Layout**

Treatment Train Effectiveness - 66 Georger Alexander Way			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	21.1	20.6	2.5
Total Suspended Solids (kg/yr)	3540	656	81.5
Total Phosphorus (kg/yr)	7.35	2	72.7
Total Nitrogen (kg/yr)	44.1	22.2	49.7
Gross Pollutants (kg/yr)	498	0	100

Treatment Train Effectiveness - 54 Georger Alexander Way			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	10.8	10.6	2.4
Total Suspended Solids (kg/yr)	1990	394	80.2
Total Phosphorus (kg/yr)	4	1.65	58.6
Total Nitrogen (kg/yr)	22.5	11.3	49.6
Gross Pollutants (kg/yr)	257	0	100

Figure 6-4 MUSIC Results

7 STORMWATER QUALITY (CONSTRUCTION)

7.1 Water Quality Objectives

Table 7-1 Construction Phase Quality Objectives (SPP and CoGC LDG)

Pollutant	Criteria
Drainage Control	Design life and design storm of temporary drainage works: - Disturbed area open for <12 months—1 in 2 ARI. - Disturbed area open for 12-24 months—1 in 5 ARI. - Disturbed area open for > 24 months—1 in 10 ARI.
Erosion Control	- Minimise exposure of disturbed soils at any time. - Avoid or minimise large construction activities in the wet season. - Divert water run-off from undisturbed areas around disturbed areas. - Use erosion risk ratings to determine appropriate erosion control measures.
Sediment Control	Use soil loss rates to determine appropriate sediment control measures Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water run-off Site discharge during sediment basin dewatering should not exceed 50 mg/L TSS and pH between 6.5–8.5
Stormwater Drainage / Flow Management	Hydraulics and hydrology—Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: - peak flow for the one-year and 100-year ARI event (respectively for aquatic ecosystems and flood protection). - run-off frequency and volumes entering receiving waters. - Uncontrolled release of contaminated stormwater.
Water Quality Outcomes	Stormwater flows from undisturbed and disturbed areas—manage to help protect environmental values Coarse sediment—coarse sediment is retained on site Fine sediment—Site discharge during sediment basin dewatering has a TSS concentration less than 50 mg/L Turbidity—Site discharge during sediment basin dewatering has a turbidity (NTU) less than 10% above receiving waters turbidity— measured immediately upstream of the site Nutrients (N & P)—Nitrogen and phosphorus are managed through sediment control. pH—Site discharge during sediment basin dewatering has a pH range 6.5–8.5 Litter and other waste—Prevent litter/waste entering the site, the stormwater system or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins Hydrocarbons and other contaminants—Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. Wash down water—Wash down water is prevented from entering the stormwater system or internal watercourses that discharge from the site Cations and anions—Cations and anions including aluminium, iron and Sulfate are managed as required under an approved acid Sulfate soil management plan

Table 7-1 provides the construction phase stormwater quality objectives outline by the State Planning Policy. Additional relevant acts, policies and information that may be useful for construction phase planning include:

- Environmental Protection Act (1994).
- Environmental Protection (Water) Policy (2009).
- Queensland Development Code, Sediment and Erosion Control (2010).
- Best Practice Erosion and Sediment Control for Building and Construction Sites Guidelines (2008).

7.2 Erosion and Sediment Control Plan Purpose

During the construction phase it shall be the Principal Contractor's responsibility to ensure the objectives of Table 7-1 are achieved.

The following section of this report provides a suggested framework for an Erosion and Sediment Control Plan. This includes recommended actions and responses for specific activities; monitoring and reporting; and construction of specifically designed site-specific sediment basins.

7.3 Specific Activities

7.3.1 Erosion and Sediment Control of Disturbed Land

During the construction phase it shall be the Principal Contractor's responsibility to ensure the following:

- Diversion of any clean water runoff that may interfere with land disturbance by the use of earth bunds, or other control devices deemed appropriate by a suitable supervisor.
- Reduction of sediment migration from disturbed land parcels by implementing silt fences, sediment basins or other control devices as deemed appropriate by a suitable supervisor.
- Where cut to fill operations produce a spoil it is recommended that the excess material be placed upstream of the excavation location to ensure any sediment runoff is directed back into the trench. Earth bunds or sediment fences may be required to control direction of sediment flow should the spoil be placed on the downstream side of the excavation site.
- Control measures such as a gully pit sediment barrier (see Arcadis drawings attached) shall be installed around inlet pits where required reducing the potential for sediment discharge into the surrounding stormwater system.
- Any sediment deposited from construction vehicles will be swept up and removed.
- Erosion and sediment control devices may only be removed once disturbed lands which they are protecting are rehabilitated and capable of resisting further erosion.

7.3.2 Spoil and Stockpile Management

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase unless otherwise specified:

- The placement of spoil and stockpile material shall be kept at a maximum distance from stormwater inlets, gutters and stormwater pipes to reduce unnecessary sediment migration into nearby infrastructure.
- Spoil and stockpile material shall be placed in a way that reduces the likelihood of sedimentation, erosion and slippage. Advice from an appropriate project manager/representative shall be sought in this instance.
- Spoil or stockpile material that is deemed a contaminant shall be placed on a designated zone of either fill material, plastic or concrete with the installation of appropriate containment devices. Advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the severity of contamination.
- It shall be the Project Manager's responsibility to foresee and develop appropriate control measures to prevent the impacts of spoil and stockpile material prior to construction activities. Monitoring and reporting shall also be required during the implementation of any given device associated with spoil and stockpile management.

7.3.3 Erosion Control

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase:

- Traffic of any type shall be kept away from areas of rehabilitation to promote stabilisation of the zone.
- Where wind and water are acknowledged as potential erosion sources temporary protection shall be installed. Such measures only apply to zones of spoil, stockpile and land disturbance which are unlikely to receive works within a period of 6-8 weeks. Further advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the disturbance type and erosion source.
- Once viable, final landscaping shall be undertaken on applicable zones to increase stability.

7.3.4 Personnel Training

It shall be the Principal Contractor's responsibility to oversee the following training protocols during the construction phase:

- Environmental management and incident reporting is to be included on all site induction courses.
- All personnel are to receive adequate training in; workplace health and safety issues, environmental management, best practice erosion and sediment control practices, incident reporting procedures and where applicable site inspection and maintenance procedures.

7.3.5 Miscellaneous

It is the Principal Contractor's responsibility to ensure erosion and sediment controls are operated and maintained in an effective operational condition. These structures are not allowed to accumulate sediment volume in excess of 70% sediment storage design capacity as per Section 6 of the Urban Stormwater Quality Planning Guidelines 2010.

- Sediment removed from control measures must be disposed of in a manner approved by the local Council that does not cause pollution and forms part of the Contractor's obligation.
- Any chemicals, fuel or oil stored on site shall be stored under cover in a bounded area or placed sufficiently above ground level to prevent contamination of surface water.
- A waste concrete receptor (disposal area) must be established if significant concreting is to occur on site. The site must be surrounded by perimeter bunds and be clearly signed.
- A general waste collection area shall be established which is to include appropriate pollutant runoff controls, dependent on the nature of the waste.

7.4 Project Personnel Responsibilities

A description of the key personnel involved with implementing the Erosion and Sediment Control Plan are listed in Table 7-2. It is recommended that all parties involved attend a pre-construction conference to discuss and clarify all issues associated with sediment and erosion control as well as this plan.

Table 7-2 Project Personnel Responsibilities

Project Role	Responsibilities
Superintendent	• Authorisation of this plan; and • Review and monitoring of this plan.
Contractor / Site Manager	• Implementation of this plan; • Monitoring of this plan; • Supervising any activities or requirements required by this plan; and • Ensuring all personnel are aware of the contractual agreements associated with this plan.
All Personnel	• Ensuring they are aware of the contractual agreements associated with this plan; and • Informing appropriate personnel of any issues that may arise with respect to the desired sediment and erosion control measures.

7.5 Monitoring and Responsibility

7.5.1 All Personnel

It is the obligation of all personnel to report any failures in the erosion and sediment control works utilised during the projects life cycle. Any identified errors within the sediment and erosion control system shall be reported in writing to a relevant project manager. A formal inquiry shall be undertaken in accordance with the reported issue as well as the relevant party procedures (i.e. Principal Contractor).

7.5.2 Contractor/Contractor's Foreman

It shall be the responsibility of the Contractor and Contractor's Foreman to monitor and report on the erosion and sediment control measures utilised in the construction phase. Inspections are to be undertaken:

- On a daily basis during earthworks, land disturbance, spoil or stockpile activities and rain events.
- Weekly during site inactivity.
- Within 24 hours prior to expected rainfall and 18 hours prior to intense rainfall events.

The following shall be inspected or reported on:

- Erosion and sediment control devices are in the correct location and are working as defined by this plan.
- Drainage systems both internal and external to the site are operating effectively or to pre-construction efficiencies.
- Spilled material is removed if it can potentially mobilise via stormwater runoff or wind.
- Stabilisation of disturbed land parcels has been undertaken in an effective manner.
- Excess sediment has been removed from erosion and sediment measures appropriately if the device is operation ineffectively or requires decommissioning.
- It is understood that repairs, maintenance or reinstallation may be required if any control measures are operating inadequately, or if infrastructure is damaged due to inefficient operation of the outlined measures.

7.5.3 Environmental Representative

It shall be the responsibility of the environment representative to periodically inspect and report on the effectiveness of the erosion and sediment controls during the construction phase of the project. Technical advice shall be given to personnel outlying any uncertainty with regards to the; applicability, installation, operation, maintenance, removal or rehabilitation of any sediment and erosion control.

7.6 Construction Phase Sediment Control Devices

As the site has been assessed as a single catchment, it is appropriate to approach the assessment of construction phase sediment devices in a similar manner.

In accordance with the Best Practice Erosion and Sediment Control Manual (IECA 2009) the construction phase catchment has been classified to determine the level of sediment and erosion control techniques required. The site is identified as per Table 4.4.6 (IECA 2009) to be closest to the Southport locality and therefore attracts an average monthly rainfall depth of 56mm to 205mm.

As the extent of soil disturbance is widespread, Type 1 techniques will be used in accordance with Table 4.5.3. This will require control techniques such as a vehicle shakedown at the site entry, sediment fences, sediment basins and check dams. Preliminary explanations of the measures can be found in the engineering drawings in Appendix B.

8 ASSET MAINTENANCE AND HANDOVER

All the stormwater quantity controls detailed in this document are contained within the development site and will be transferred to Council as a public asset.

Additional information including standard integration drawings and maintenance requirements can be found in Appendix C.

9 CONCLUSION

This SBSMP has been prepared to provide a design proposal and guide to the stormwater quantity and quality management techniques for the site.

The primary objectives of this report are achieved as follows:

Lawful Point of Discharge (LPD)

- Stormwater will be discharged to the 4 existing lawful points of discharge, being Pioneer and Mercy Street to the north of the site, the drainage corridor along the eastern boundary and the lot to the south of the site (Lot 95 on RP187418).

Stormwater Quantity

- The site proposes to mitigate the increase in peak run off, where expected to occur at Legal Points of Discharge through the use of a detention basin and catchment reduction.
- An increase in flow is expected at LPD 4, when compared to previously approved stormwater management report (*Conceptual Stormwater Management Plan - 54 George Alexander Way, Coomera, BC-22167*, prepared by Biome). Council has advised Arcadis to direct flows from catchment DEV 2 to this location. It is understood this will drain to a detention basin located north of the site. This report has not assessed the downstream infrastructure capacity.

Stormwater Quality

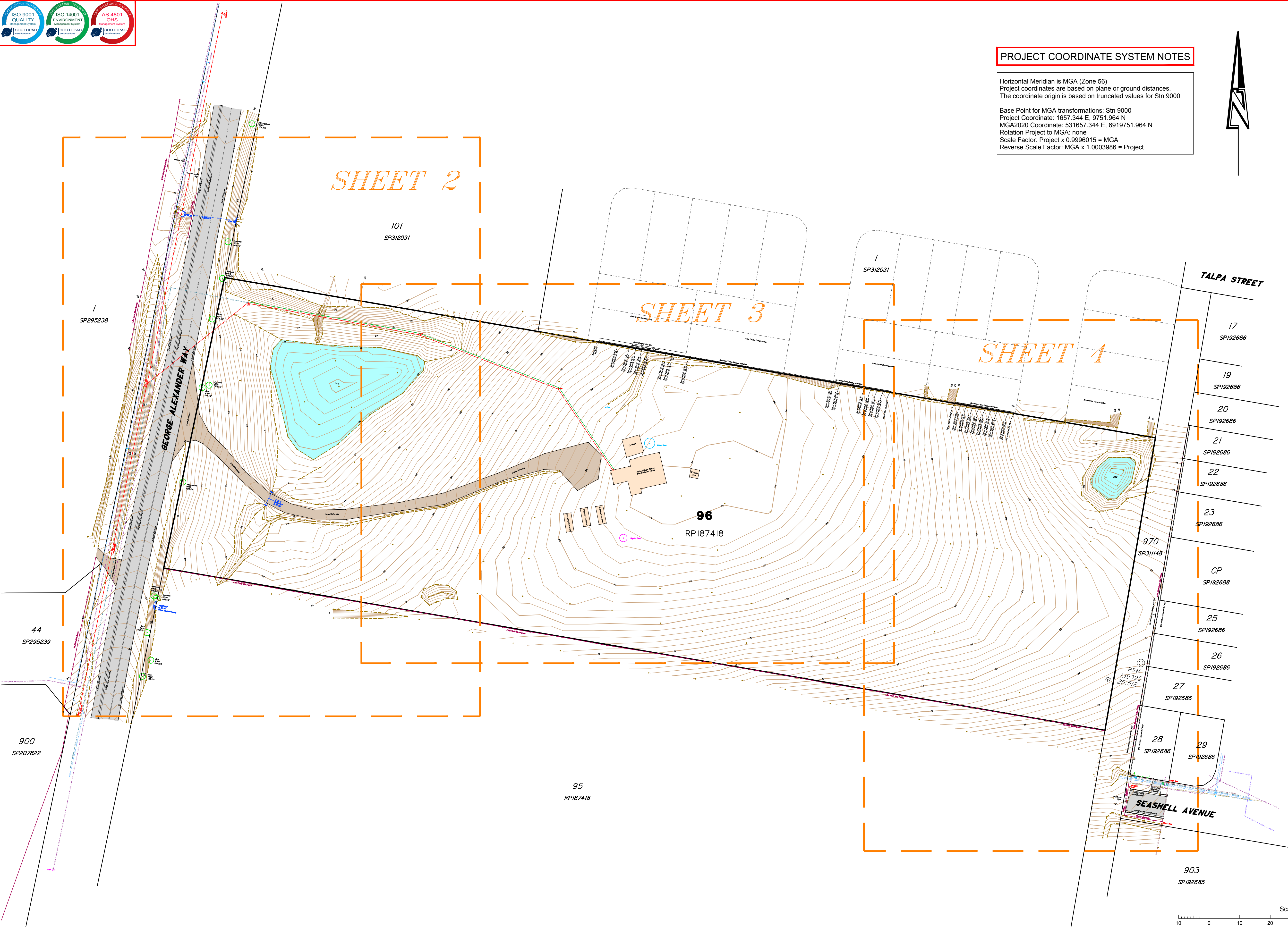
- A stormwater quality assessment is provided which demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of City of Gold Coast during the operational phase of the proposed development. The proposed treatment system features a bio-retention area.

Erosion and Sediment Control

- Erosion and sediment control measures during construction shall be undertaken in accordance with the SPP and Council requirements.

APPENDIX A

Survey



PROJECT COORDINATE SYSTEM NOTES

Horizontal Meridian is MGA (Zone 56)
Project coordinates are based on plane or ground distances.
The coordinate origin is based on truncated values for Stn 9000

Base Point for MGA transformations: Stn 9000
Project Coordinate: 1657.344 E, 9751.964 N
MGA2020 Coordinate: 531657.344 E, 6919751.964 N
Rotation Project to MGA: none
Scale Factor: Project x 0.9996015 = MGA
Reverse Scale Factor: MGA x 1.0003986 = Project

LEGEND

Quality levels are shown on linetypes along with service type eg.
—E(A)— First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	—E(A)—	—E(D)—
O/H ELECTRICITY	—E—	—E—
U/G TELECOMMUNICATIONS	—T(A)—	—T(D)—
O/H TELECOMMUNICATIONS	—T—	—T—
U/G DRAINAGE	—D(A)—	—D(D)—
O/H DRAINAGE	—D—	—D—
SEWERAGE	—S(A)—	—S(D)—
O/H SEWERAGE	—S—	—S—
WATER	—W(A)—	—W(D)—
O/H WATER	—W—	—W—
GAS	—G(A)—	—G(D)—
FENCE	—F—	—F—

SYMBOLS

Sewer Manhole	○ SMH	MH	Manhole
Gully Trap	○ GT	SL	Surface Level
Stormwater Manhole	○ SWMH	IL	Invert Level
Fire Hydrant	○ FH	BM	Bench Mark
Valve	○ V	Ø	Diameter
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Electricity Box / Pillar	□ Elect Box	GI	Galvanised Iron
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Power Pole	○ PP		
Electricity Manhole	□ Elect MH		
Electricity Pit	□ Elect Pit		
Traffic Signal Pit	□ Traffic Pit		
Traffic Light	○ Traffic Light		
Telecommunications Manhole	□ Tel MH		
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Tree / Shrub	○		

ABBREVIATIONS

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QUALITY LEVELS

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Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

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No.	Drawn	Date	Description	Checked
A	MD	31/10/2022	Original Issue	JC

Plan of

DETAIL PLAN

Sheet 1 of 4

Project

54 George Alexander Way, Coomera

Client

Coomera GA Pty Ltd ATF The Coomera GA Unit Trust

Surveyed

BC

Date

Oct 2022

Level Datum: AHD der.

Origin of Levels: PM139395

RL of Origin: 26.512

Contour Interval: 0.2m

Lot Description

Lot 96 on RP187418

Locality: Coomera

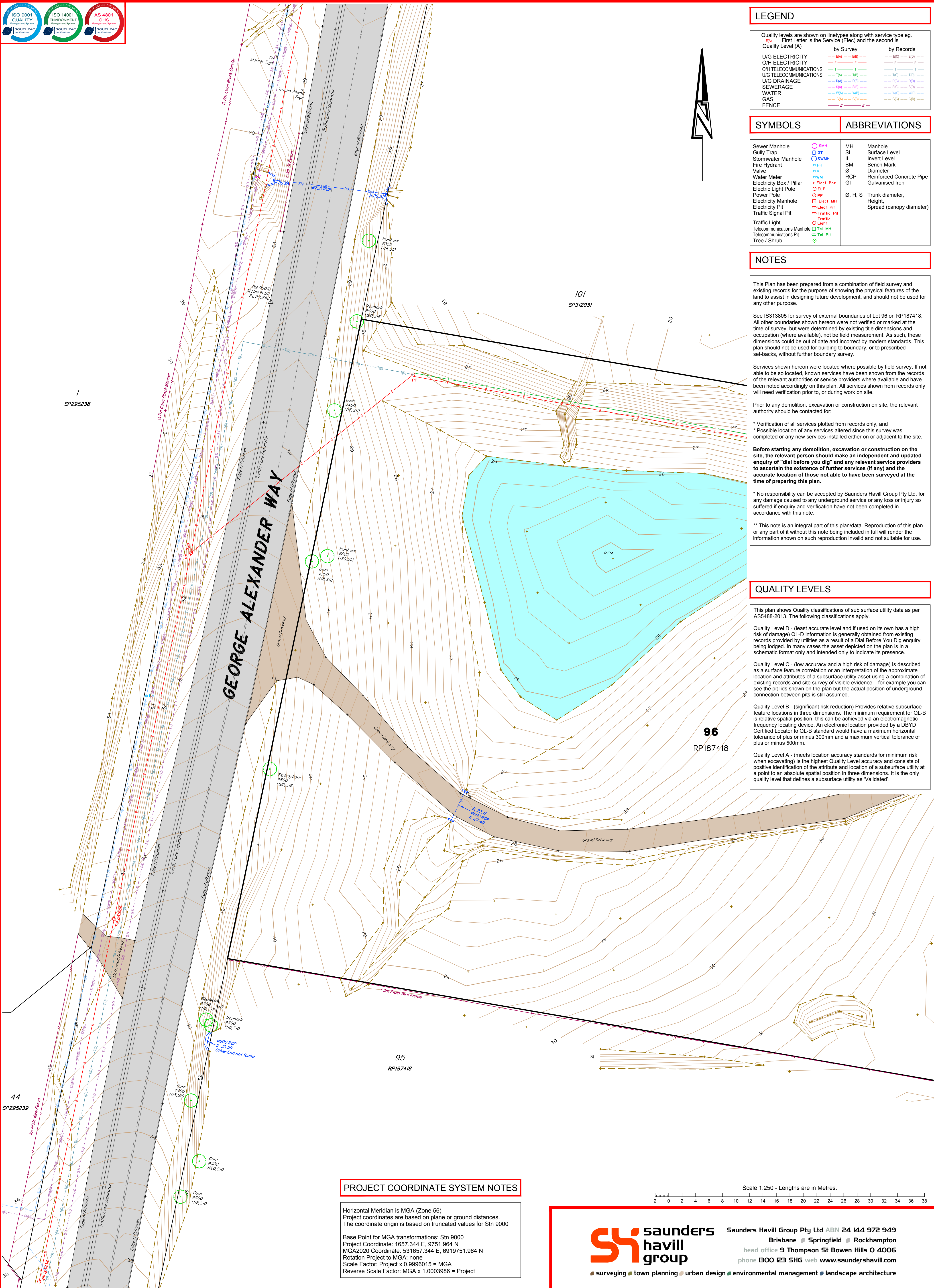
Local Government: Gold Coast City

■ surveying

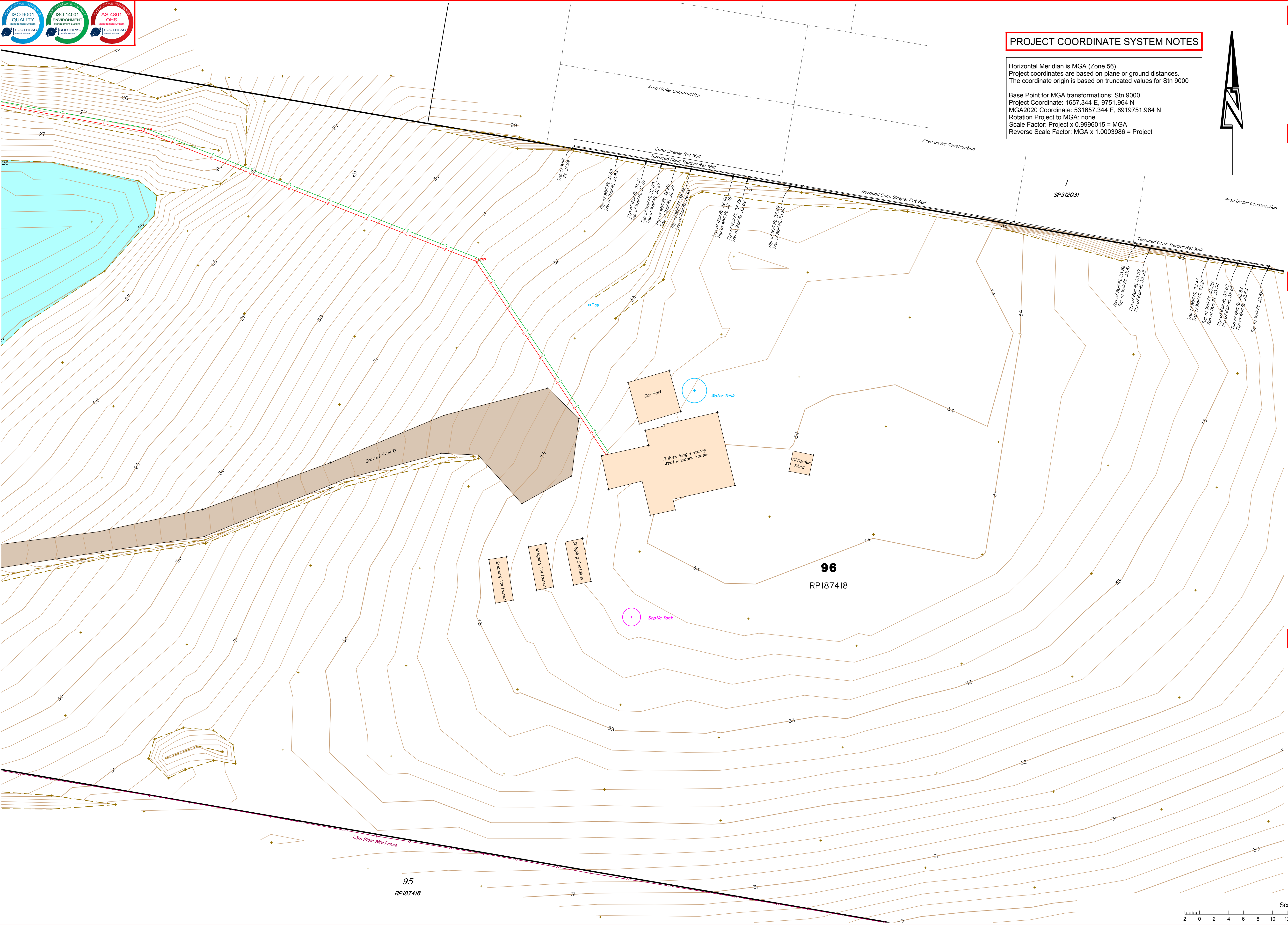
Scale @A1 1: 600

@A3 1: 1200

Dwg No. 11241 S 03 DT A



Issues	No.	Drawn	Date	Description	Checked	Plan of DETAIL PLAN Sheet 2 of 4 Project 54 George Alexander Way, Coomera Client Coomera GA Pty Ltd ATF The Coomera GA Unit Trust	Surveyed	Date	Lot Description Lot 96 on RP187418 Locality: Coomera Local Government: Gold Coast City	 Scale @A1 1: 250 @A3 1: 500 Dwg No. 11241 S 03 DT A
	A	MD	31/10/2022	Original Issue	JC		BC	Oct 2022		



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U/G TELECOMMUNICATIONS	-T(A) -T(B) -T(C) -T(D) -T	-T(A) -T(B) -T(C) -T(D) -T
U/G DRAINAGE	-D(A) -D(B) -D(C) -D(D) -D	-D(A) -D(B) -D(C) -D(D) -D
SEWERAGE	-S(A) -S(B) -S(C) -S(D) -S	-S(A) -S(B) -S(C) -S(D) -S
WATER	-W(A) -W(B) -W(C) -W(D) -W	-W(A) -W(B) -W(C) -W(D) -W
GAS	-G(A) -G(B) -G(C) -G(D) -G	-G(A) -G(B) -G(C) -G(D) -G
FENCE	-F(A) -F(B) -F(C) -F(D) -F	-F(A) -F(B) -F(C) -F(D) -F

SYMBOLS

Sewer Manhole	○ SMH	MH	Manhole
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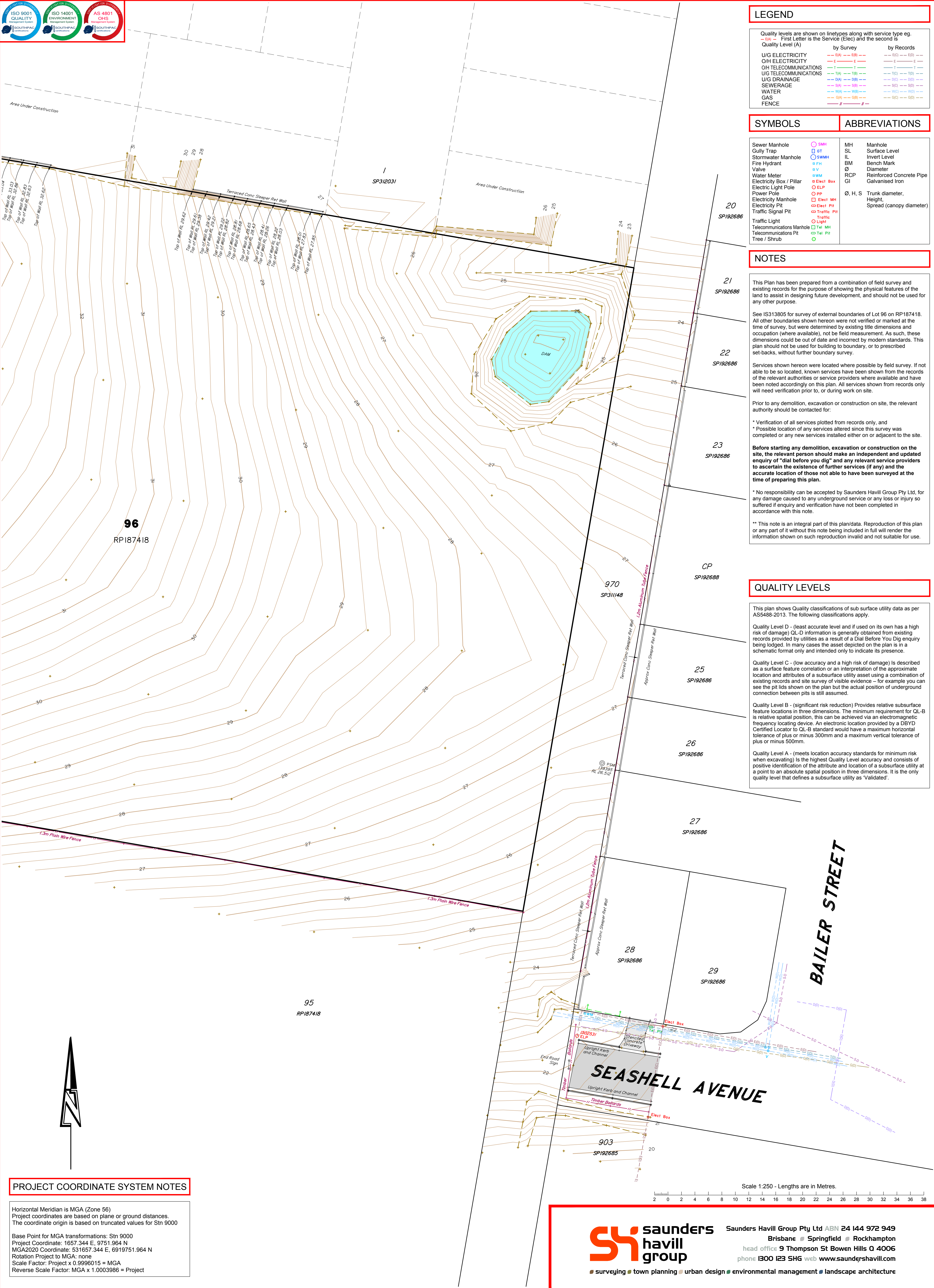
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Plan of	DETAIL PLAN Sheet 3 of 4
Project	54 George Alexander Way, Coomera
Client	Coomera GA Pty Ltd ATF The Coomera GA Unit Trust

Surveyed BC	Date Oct 2022	Lot Description Lot 96 on RP187418
Level Datum: AHD der.		Locality: Coomera Local Government: Gold Coast City
Origin of Levels: PM139395 RL of Origin: 26.512		
Contour Interval: 0.2m		



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O/H ELECTRICITY	--- 1A --- 1B ---	--- 1A --- 1B ---
O/H TELECOMMUNICATIONS	--- 1A --- 1B ---	--- 1A --- 1B ---
U/G TELECOMMUNICATIONS	--- 1A --- 1B ---	--- 1A --- 1B ---
U/G DRAINAGE	--- 1A --- 1B ---	--- 1A --- 1B ---
SEWERAGE	--- 1A --- 1B ---	--- 1A --- 1B ---
WATER	--- 1A --- 1B ---	--- 1A --- 1B ---
GAS	--- 1A --- 1B ---	--- 1A --- 1B ---
FENCE	--- 1A --- 1B ---	--- 1A --- 1B ---

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Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

- * Verification of all services plotted from records only, and
- * Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence - for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

PROJECT COORDINATE SYSTEM NOTES

Horizontal Meridian is MGA (Zone 56)
Project coordinates are based on plane or ground distances.
The coordinate origin is based on truncated values for Stn 9000

Base Point for MGA transformations: Stn 9000
Project Coordinate: 1657.344 E, 9751.964 N
MGA2020 Coordinate: 531657.344 E, 6919751.964 N
Rotation Project to MGA: none
Scale Factor: Project x 0.9996015 = MGA
Reverse Scale Factor: MGA x 1.0003986 = Project

No.	Drawn	Date	Description	Checked
A	MD	31/10/2022	Original Issue	JC

Plan of	DETAIL PLAN Sheet 4 of 4
Project	54 George Alexander Way, Coomera
Client	Coomera GA Pty Ltd ATF The Coomera GA Unit Trust

Surveyed	Date
BC	Oct 2022
Level Datum:	AHD der.
Origin of Levels:	PM139395
RL of Origin:	26.512
Contour Interval:	0.2m

Lot Description	Lot 96 on RP187418
Locality:	Coomera
Local Government:	Gold Coast City

surveying	Scale @A1 1: 250 @A3 1: 500
Dwg No.	11241 S 03 DT A

APPENDIX B

Engineering Drawings

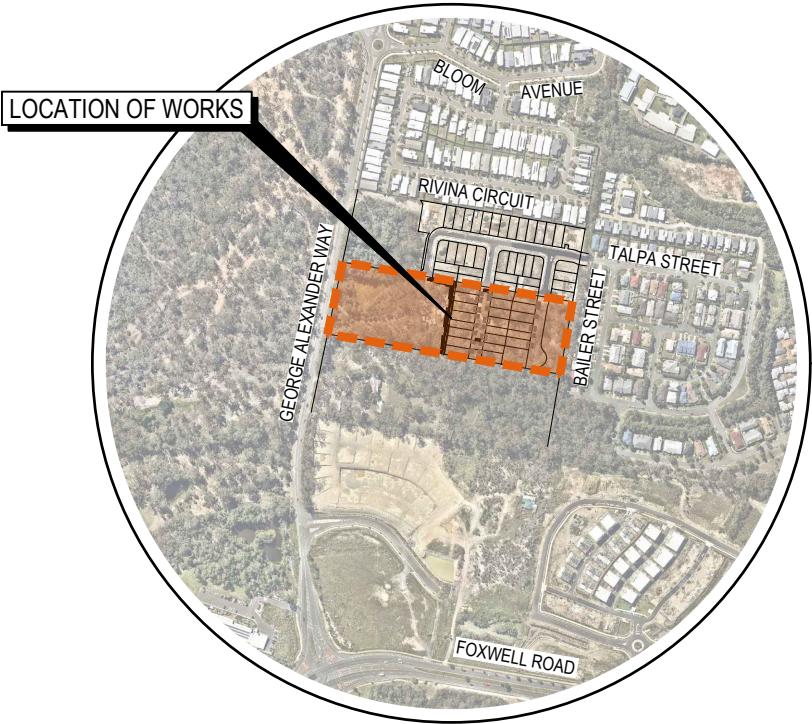
54 GEORGE ALEXANDER WAY, COOMERA

DEVELOPMENT APPLICATION

CITY OF GOLD COAST

DRAWING SCHEDULE

DWG. No.	DESCRIPTION
GENERAL	
0001	COVER SHEET, LOCALITY PLAN & DRAWING SCHEDULE
EARTHWORKS	
0100	BULK EARTHWORKS CUT & FILL LAYOUT PLAN
0105	TYPICAL RETAINING WALL DETAILS
0110	BULK EARTHWORKS SECTIONS
ROADWORKS	
0210	ROADWORKS AND DRAINAGE LAYOUT PLAN
0211	ROADWORKS AND DRAINAGE DETAILS & NOTES
0220	PIONEER STREET AND MERCY STREET LONGITUDINAL SECTIONS
0240	ON-STREET PARKING PLAN
STORMWATER DRAINAGE	
0310	STORMWATER CATCHMENT PLAN - PRE DEVELOPMENT
0311	STORMWATER CATCHMENT PLAN - POST DEVELOPMENT
0380	COMBINED DETENTION - BIO-RETENTION BASIN 1 LAYOUT PLAN
0381	BIO-RETENTION TYPICAL SECTIONS AND DETAILS
SERVICES	
0400	SEWER AND WATER RETICULATION LAYOUT PLAN

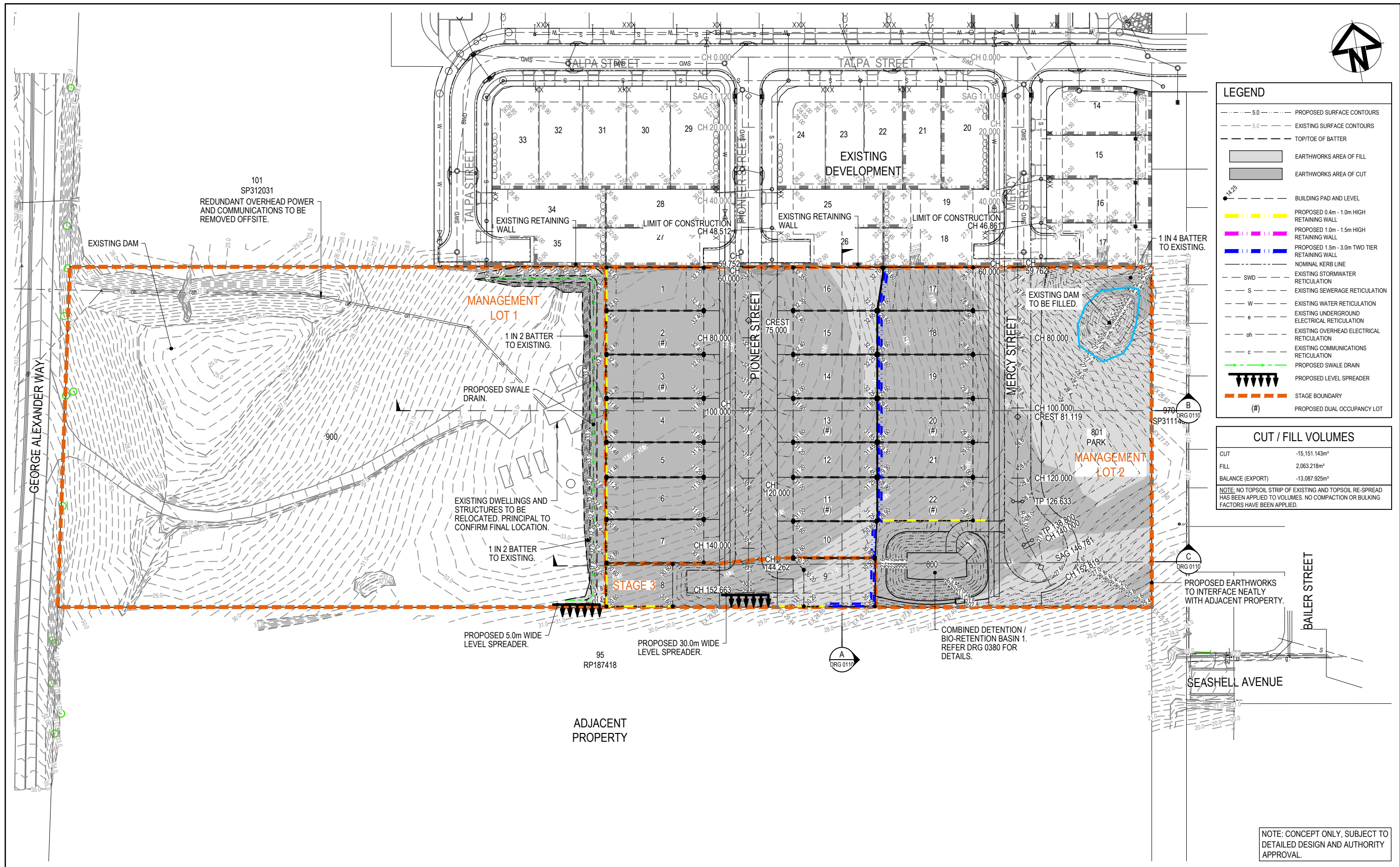


LOCALITY PLAN
1 : 5000

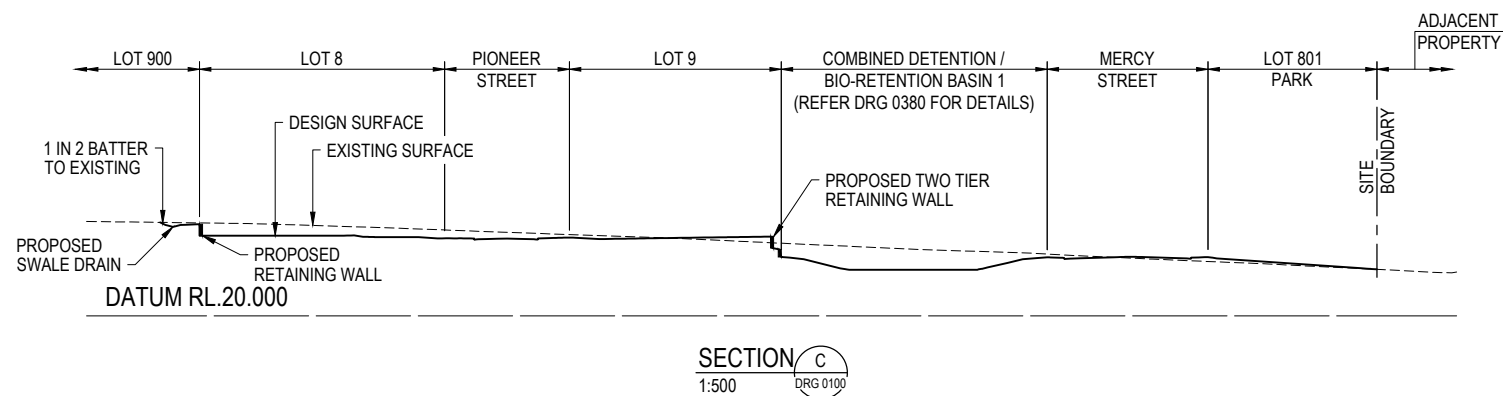
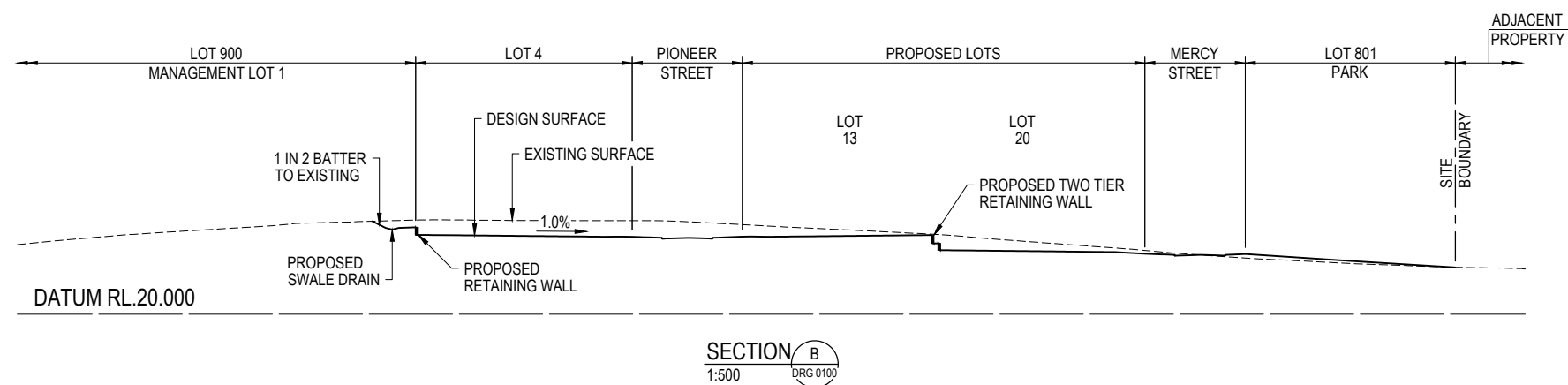
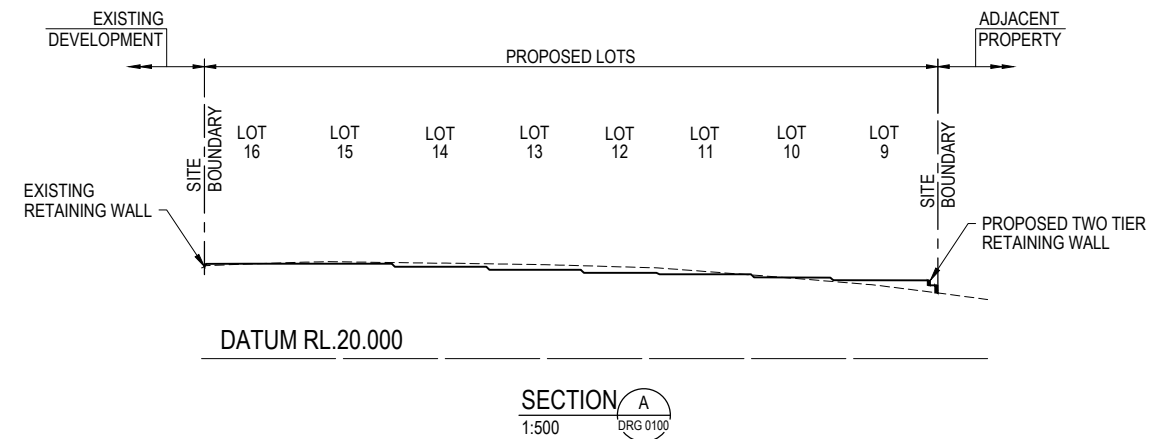
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						 1 : 5000				Coomera GA Pty Ltd ATF The Coomera GA Unit Trust		© Copyright reserved						
												Original Issue Signatures						
												Drawn		D. KEARNEY	Original Size			A1
												Designed		G. MENZIES	Height Datum			AHD
02 RFI ISSUE						DK		GM		22.06.2023						Title COVER SHEET, LOCALITY PLAN & DRAWING SCHEDULE		
01 ORIGINAL ISSUE						DK		GM		01.02.2023								
Issue						Description		DR		CH		VE		Date				
																Project No. Folder Prefix Zone Stage Phase Discipline Type Drawing No. Issues		
																30157884 - DABA - 0000DA - CV - DRG - 0001 - 02		

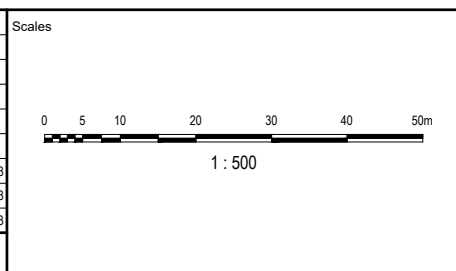


					Scales		Surveyor																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</	
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NOTE: CONCEPT ONLY, SUBJECT TO DETAILED DESIGN AND AUTHORITY APPROVAL.

03	LIMIT OF EARTHWORKS AMENDED	DK	GM		31.07.2023
02	RFI ISSUE	DK	GM		22.06.2023
01	ORIGINAL ISSUE	DK	GM		01.02.2023
Issue	Description	DR	CH	VE	Date



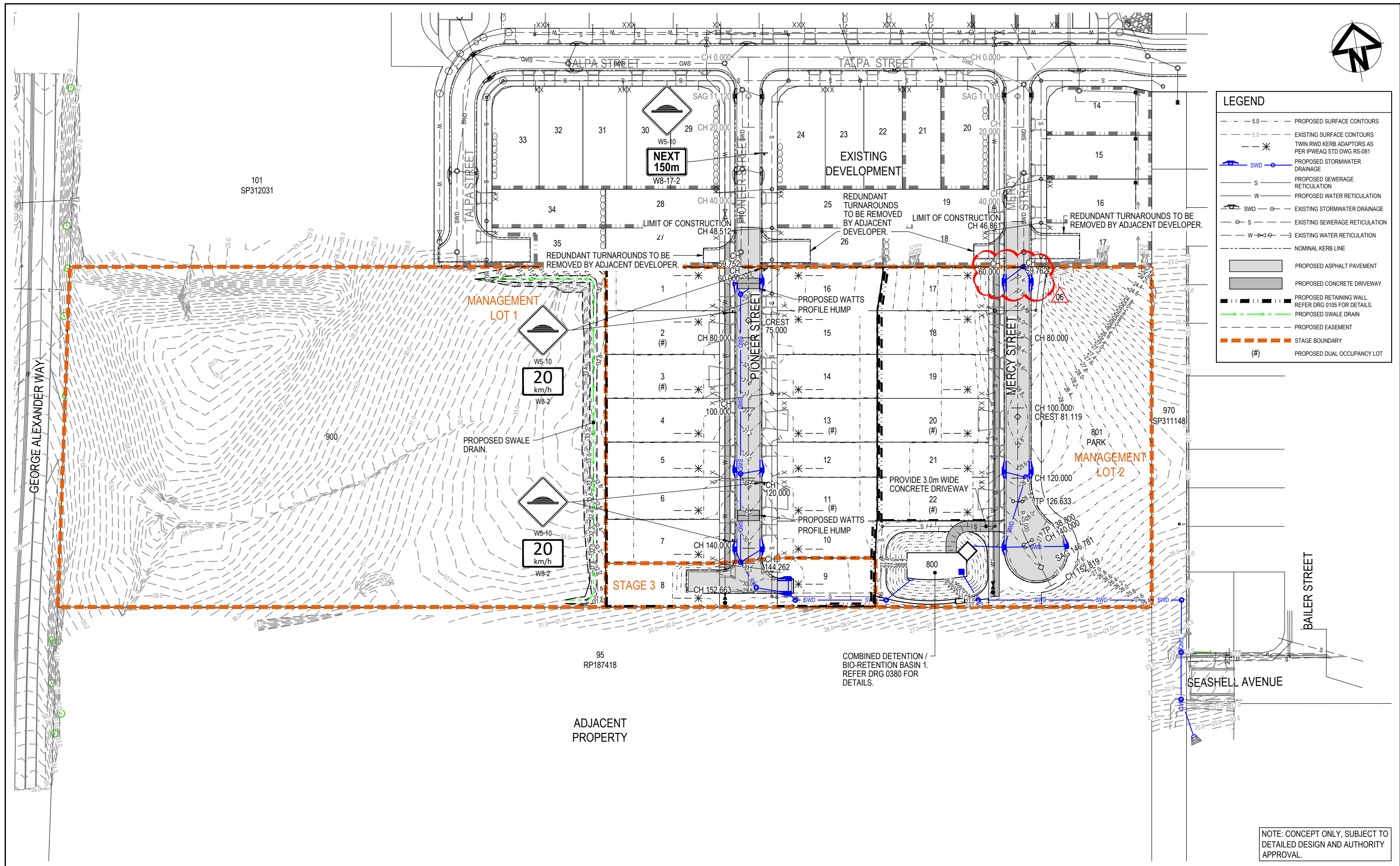
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GA Unit Trust

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Original Issue Signatures			
Drawn	D. KEARNEY	Original Size	A1
Designed	A. STA. CRUZ	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified	-		

Project	54 GEORGE ALEXANDER WAY, COOMERA
Title	BULK EARTHWORKS SECTIONS

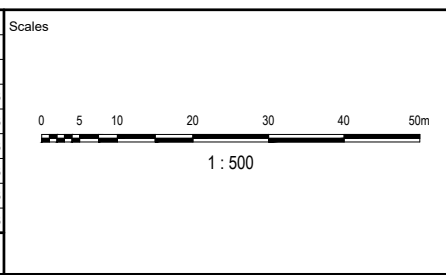
Arcadis Australia Pacific Pty Limited
P O Box, 1653
Southport QLD 4215
ABN 76 104 485 289
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
www.arcadis.com

Project No.	Folker Prefix	Zone Stage Phase	Discipline	Type	Drawing No.	Issue
30157884	DABA	- 0000DA	- CV	- DRG	- 0110	- 03



LEGEND	
5.0	PROPOSED SURFACE CONTOURS
5.0	EXISTING SURFACE CONTOURS
---	TWIN RWD KERB ADAPTORS AS PER IPWEAQ STD DWG RS-081
SWD	PROPOSED STORMWATER DRAINAGE
S	PROPOSED SEWERAGE RETICULATION
W	PROPOSED WATER RETICULATION
SWD	EXISTING STORMWATER DRAINAGE
S	EXISTING SEWERAGE RETICULATION
W	EXISTING WATER RETICULATION
---	NOMINAL KERB LINE
	PROPOSED ASPHALT PAVEMENT
	PROPOSED CONCRETE DRIVEWAY
---	PROPOSED RETAINING WALL. REFER DRG 0105 FOR DETAILS.
---	PROPOSED SWALE DRAIN
---	PROPOSED EASEMENT
---	STAGE BOUNDARY
(#)	PROPOSED DUAL OCCUPANCY LOT

Issue	Description	DR	CH	VE	Date
06	ADDITIONAL INFORMATION REQUEST - DRAINAGE LINES AMENDED	DK	GM		20.10.2023
05	SIGNAGE ADDED AND SPEED HUMP DETAILS AMENDED	DK	GM		17.08.2023
04	FLAT TOP SPEED HUMP ADDED	DK	GM		11.08.2023
03	LIMIT OF EARTHWORKS AMENDED	DK	GM		31.07.2023
02	RFI ISSUE	DK	GM		22.06.2023
01	ORIGINAL ISSUE	DK	GM		01.02.2023



Surveyor

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Designed	G. MENZIES	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified			

Project

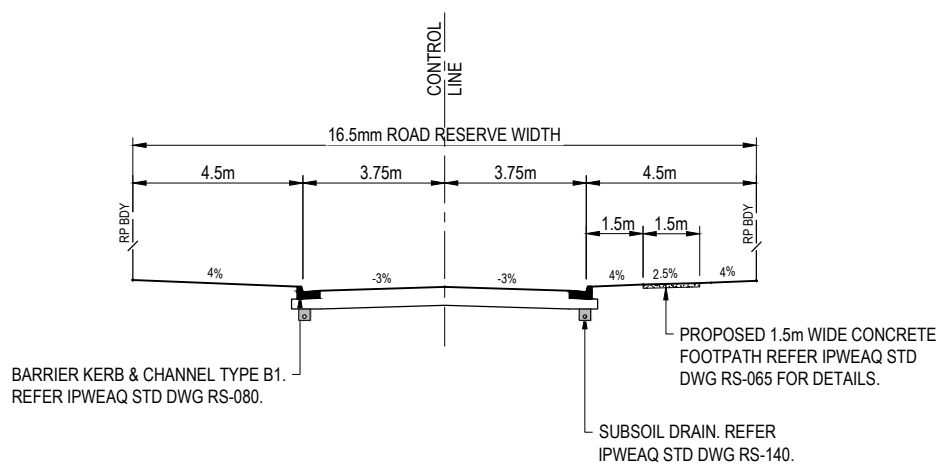
54 GEORGE ALEXANDER WAY,
COOMERA

Title

ROADWORKS AND
DRAINAGE LAYOUT PLAN

Arcadis Australia Pacific Pty Limited
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Southport QLD 4215
ABN 76 104 485 289
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
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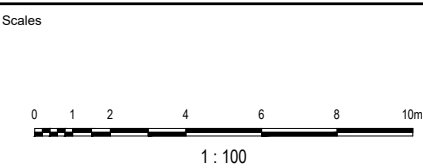
Project No.	Forker Prefix	Zone Stage Phase	Discipline	Type	Drawing No.	Issue
30157884 - DABA - 0000DA - CV - DRG - 0210 - 06						V1



TYPICAL CROSS SECTION
PIONEER STREET AND MERCY STREET
RESIDENTIAL ACCESS STREET
SCALE 1 : 100

NOTE: CONCEPT ONLY, SUBJECT TO
DETAILED DESIGN AND AUTHORITY
APPROVAL.

01	ORIGINAL ISSUE	DK	GM		01.02.2023
Issue	Description	DR	CH	VE	Date



Surveyor

saunders
havill
group

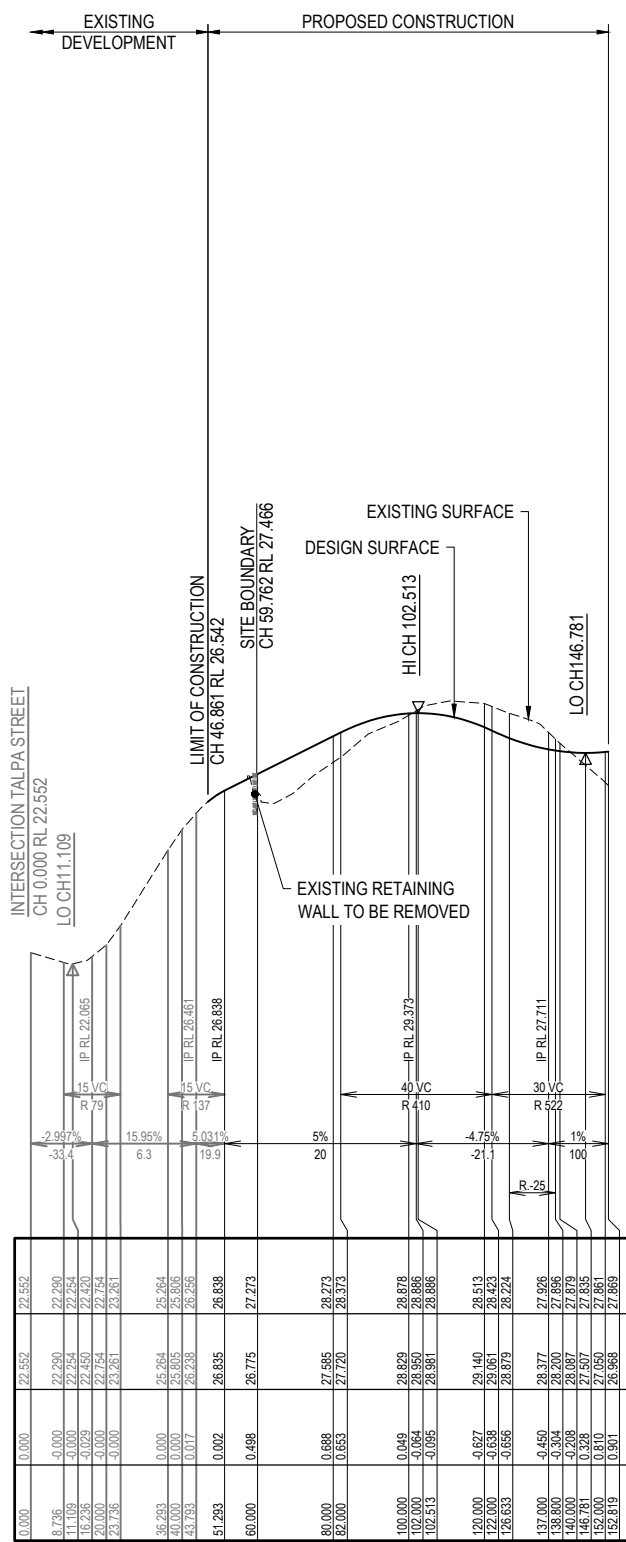
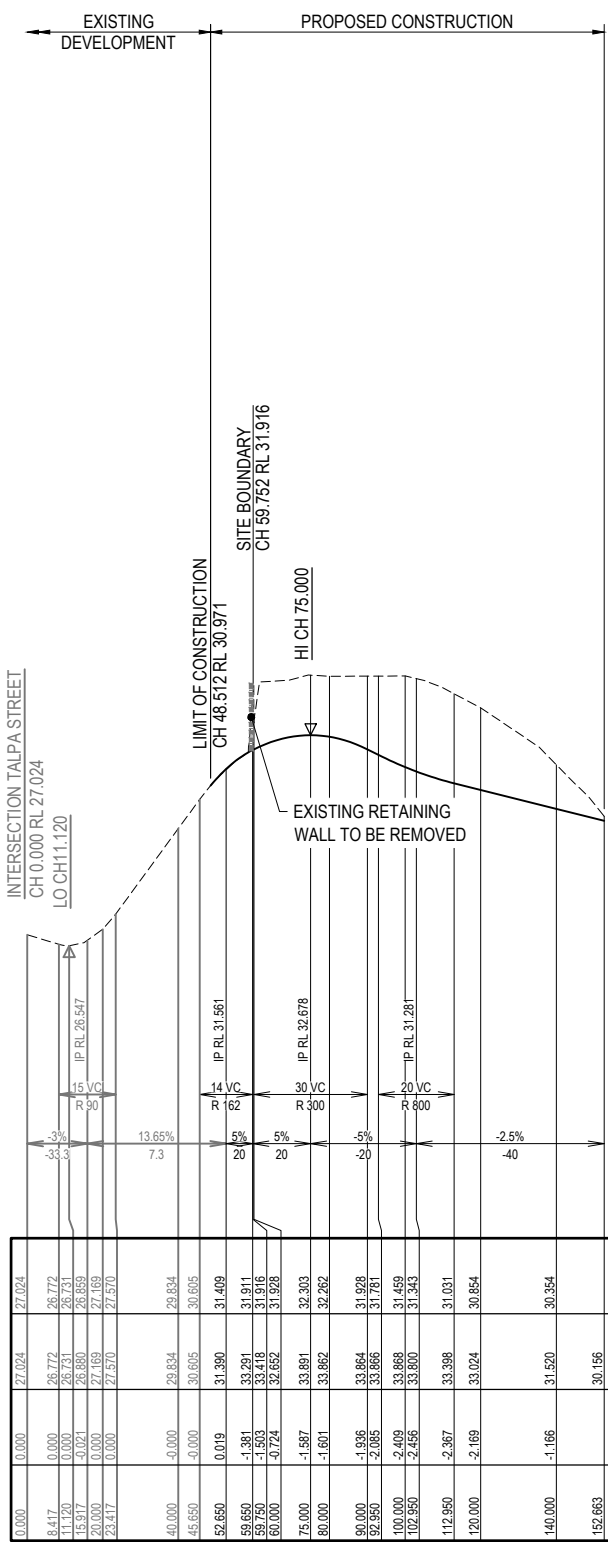
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Original Issue Signatures			
Drawn	D. KEARNEY	Original Size	A1
Designed	G. MENZIES	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified	.		

Project	54 GEORGE ALEXANDER WAY, COOMERA
Title	ROADWORKS AND DRAINAGE DETAILS & NOTES

Arcadis Australia Pacific Pty Limited
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Fax No: +61 7 5591 4778
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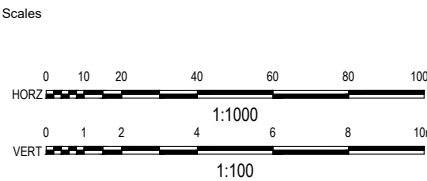
Project No.	Folker Prefix	Zone Stage Phase	Discipline	Type	Drawing No.	Issue
30157884	DABA	- 0000DA	- CV	- DRG	- 0211	- 01



Project No	Folio Prefix	Zone Stage Phase	Discipline	Type	Drawing No	Issue
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30157884 - DABA - 0000DA - CV - DRG - 0220 - 02

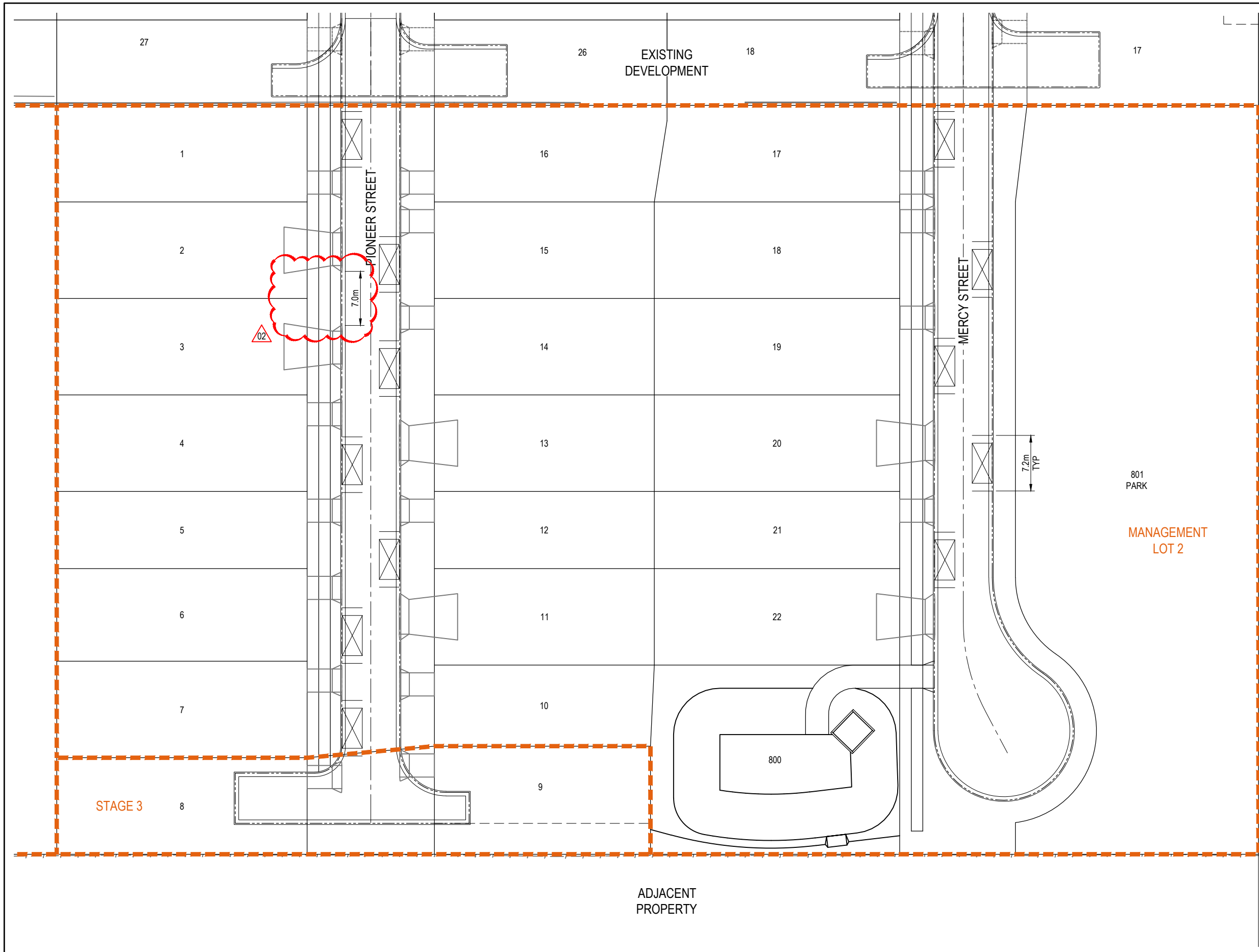
100mm on Original



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Designed	A. STA. CRUZ	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 5)
Verified	.		

PIONEER STREET AND
MERCY STREET
LONGITUDINAL SECTIONS



LEGEND

- INDICATIVE DRIVEWAY LOCATION
- SINGLE CAR SPACE LOCATION
- NOMINAL KERB LINE
- STAGE BOUNDARY

- DRAWING NOTES**
- INDICATIVE DRIVEWAYS SHOWN ARE IN ACCORDANCE WITH THE INSTITUTION OF PUBLIC WORKS ENGINEERING AUSTRALASIA STANDARD DRAWING RS-049 RESIDENTIAL DRIVEWAYS - PLAN 1 OF 2. FOR SINGLE DWELLINGS, THE WIDTH AT KERB IS 4.0m. DRIVEWAYS PROVIDED FOR PROPOSED DUAL OCCUPANCY LOTS ARE IN ACCORDANCE WITH THE ARCHITECTS PLANS.
 - 0.5 CAR SPACES REQUIRED PER DWELLING. 22 LOTS PROPOSED, PROVISION FOR 12 CAR SPACES MADE.

970
SP311148

801
PARK

MANAGEMENT
LOT 2

5.20
3.05
0.95

7.2m
TYP

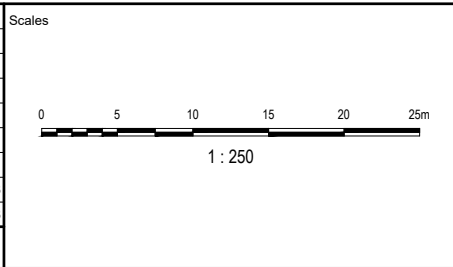
PASSENGER-CAR

meters

Width : 1.94
Track : 1.84
Lock to Lock Time : 6.0
Steering Angle : 33.6

NOTE: CONCEPT ONLY, SUBJECT TO DETAILED DESIGN AND AUTHORITY APPROVAL.

02	ADDITIONAL INFORMATION REQUEST - VXO AMENDED LOTS 2 & 3	DK	GM		20.10.2023
01	ORIGINAL ISSUE	DK	GM		22.06.2023
Issue	Description	DR	CH	VE	Date



Surveyor

SH saunders havill group

Coomera GA Pty Ltd
ATF The Coomera
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Drawn	D. KEARNEY	Original Size	A1
Designed	G. MENZIES	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified	-		

Project

54 GEORGE ALEXANDER WAY,
COOMERA

Title

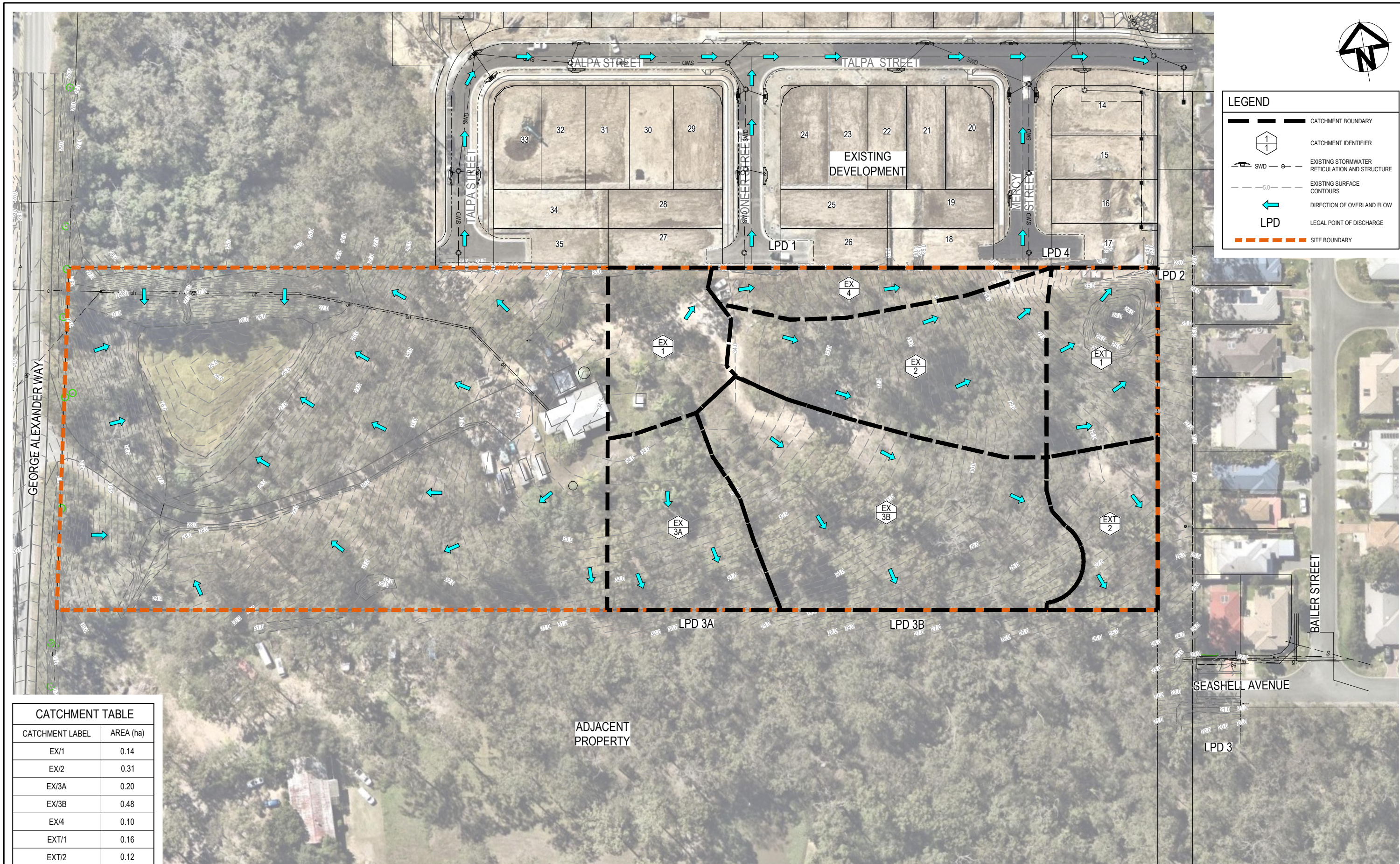
ON-STREET
PARKING PLAN

ARCADIS

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Fax No: +61 7 5591 4778
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Project No. | Folder Prefix | Zone | Stage | Phase | Discipline | Type | Drawing No. | Issue

30157884 - DABA - 0000DA - CV - DRG - 0240 - 02



LEGEND

CATCHMENT BOUNDARY

CATCHMENT IDENTIFIER

EXISTING STORMWATER RETICULATION AND STRUCTURE

EXISTING SURFACE CONTOURS

DIRECTION OF OVERLAND FLOW

LEGAL POINT OF DISCHARGE

SITE BOUNDARY

CATCHMENT TABLE	
CATCHMENT LABEL	AREA (ha)
EX/1	0.14
EX/2	0.31
EX/3A	0.20
EX/3B	0.48
EX/4	0.10
EXT/1	0.16
EXT/2	0.12

01	ORIGINAL ISSUE	DK	GM	22.06.2023	
Issue	Description	DR	CH	VE	Date

Scales

0 5 10 20 30 40 50m

1 : 500

Surveyor

SH

saunders
havill
group

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Drawn	D. KEARNEY	Original Size	A1
Designed	G. DJELOVIC	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified	.		

Project

54 GEORGE ALEXANDER WAY,
COOMERA

Title

STORMWATER
CATCHMENT PLAN -
PRE DEVELOPMENT

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Project No.

Folio Prefix

Zone | Stage | Phase

Discipline

Type

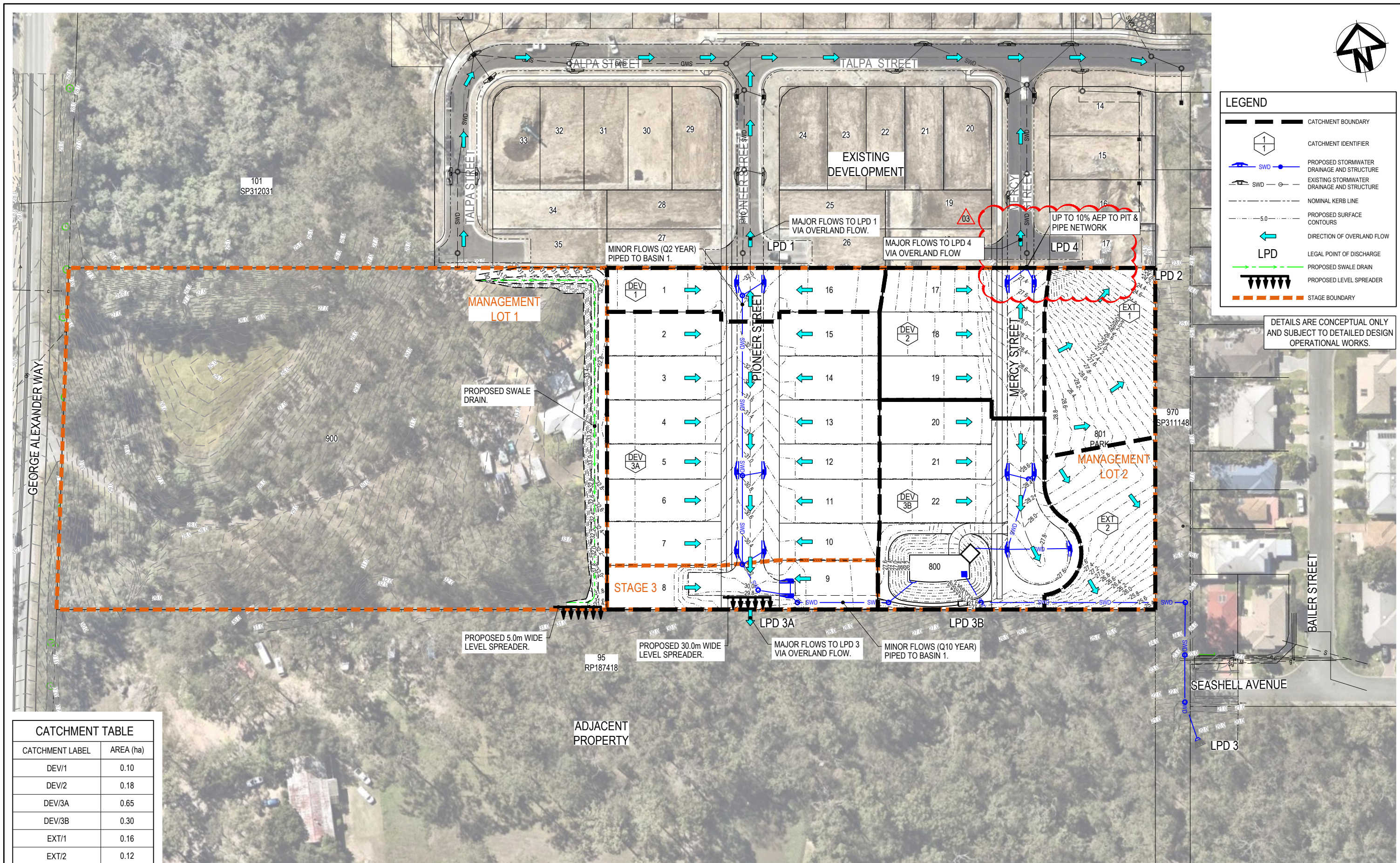
Drawing No.

Issue

30157884 - DABA - 0000DA - CV - DRG - 0310 - 01

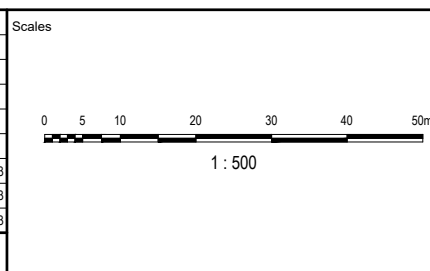
V1

Date Plotted: 19 Oct 2023 - 05:30PM File Name: C:\Users\dkaz3682\ARCADIS\30157884 - 54 George Alexander Way - DA & - Project Documents\EA-Eng\EA-Civil\Civil Drawings\30157884-DABA-0000DA-CV-DRG-0310-SWDCatchmentPlanPreDevelopment.dwg



CATCHMENT TABLE	
CATCHMENT LABEL	AREA (ha)
DEV/1	0.10
DEV/2	0.18
DEV/3A	0.65
DEV/3B	0.30
EXT/1	0.16
EXT/2	0.12

03	ADDITIONAL INFORMATION REQUEST - DRAINAGE LINES AMENDED	DK	GM		20.10.2023
02	LIMIT OF EARTHWORKS AMENDED	DK	GM		31.07.2023
01	ORIGINAL ISSUE	DK	GM		22.06.2023
Issue	Description	DR	CH	VE	Date



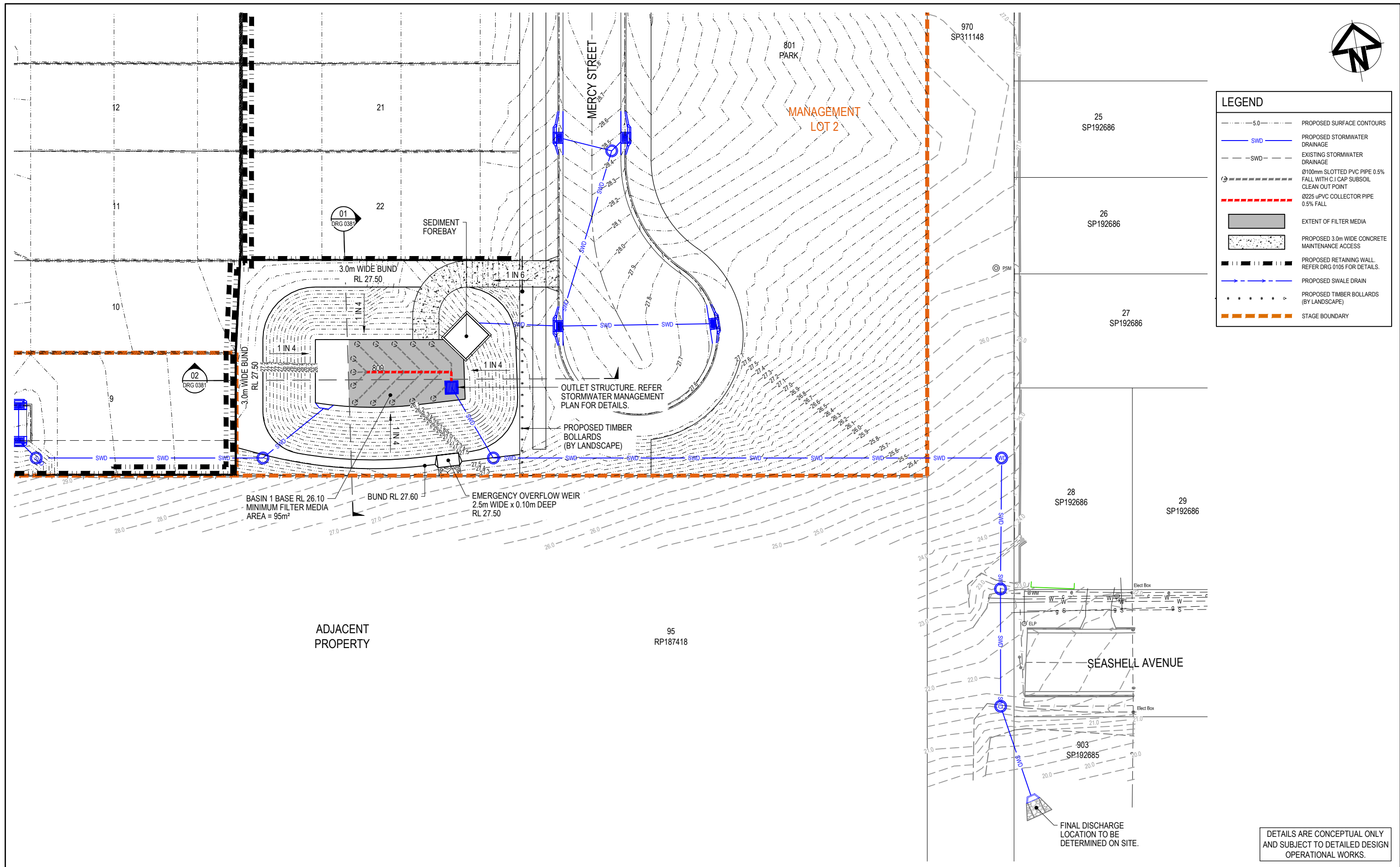
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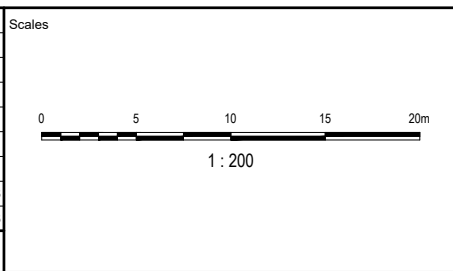
Project	
54 GEORGE ALEXANDER WAY, COOMERA	
Title	
STORMWATER CATCHMENT PLAN - POST DEVELOPMENT	

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Project No.	Folker Prefix	Zone Stage Phase	Discipline	Type	Drawing No.	Issue
30157884 - DABA - 0000DA - CV - DRG - 0311 - 03						V1



02	RFI ISSUE	DK	GM		22.06.2023
01	ORIGINAL ISSUE	DK	GM		01.02.2023
Issue	Description	DR	CH	VE	Date



Surveyor

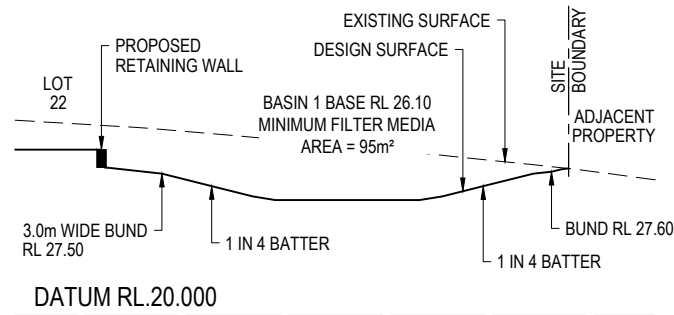
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Verified	-		

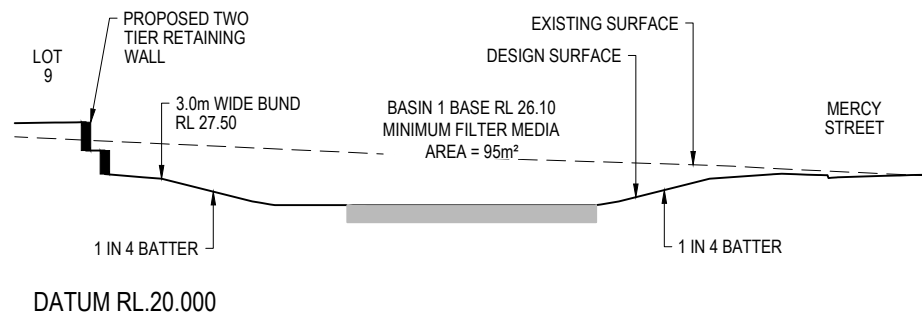
Project	54 GEORGE ALEXANDER WAY, COOMERA	
Title	COMBINED DETENTION / BIO-RETENTION BASIN 1 LAYOUT PLAN	

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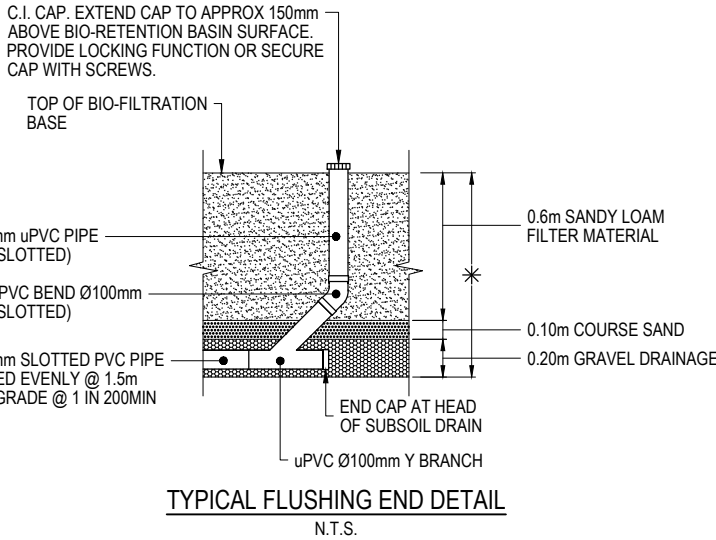
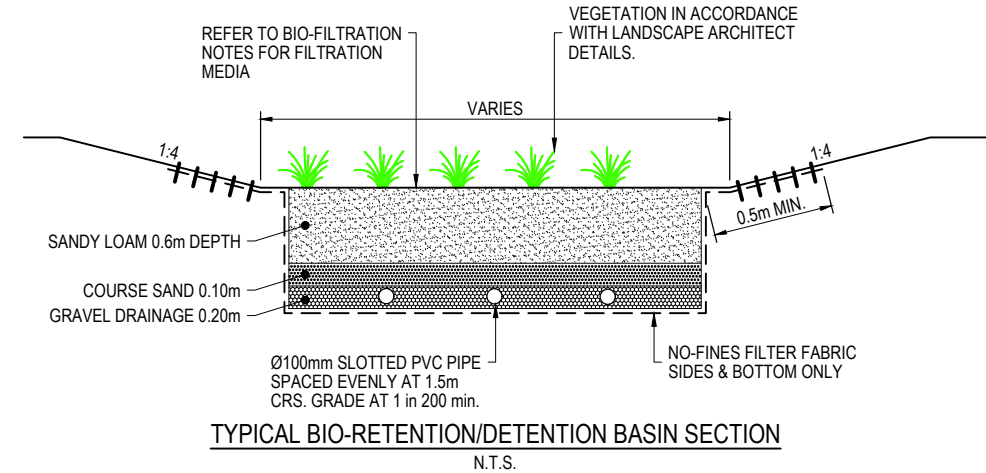
Project No.	Folker Prefix	Zone Stage Phase	Discipline	Type	Drawing No.	Issue
30157884	DABA	0000DA	CV	DRG	0380-02	V1



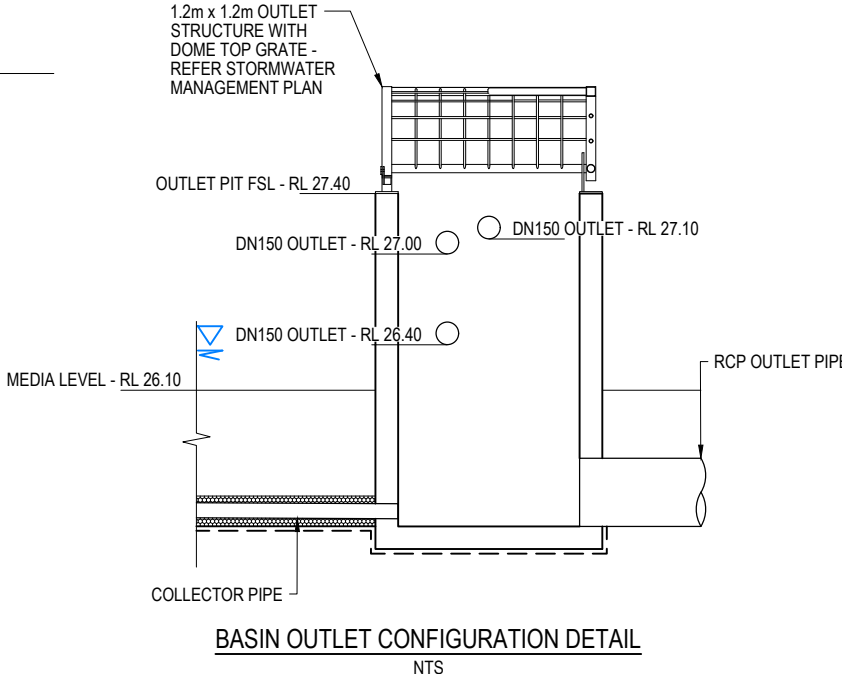
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DRG 0380



SECTION 02
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DRG 0380

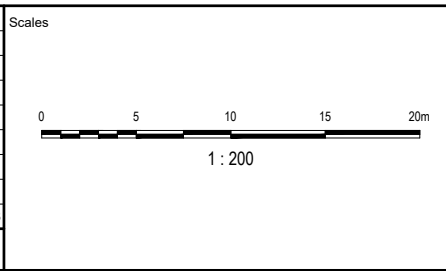


NOTE: CONCEPT ONLY, SUBJECT TO DETAILED DESIGN AND AUTHORITY APPROVAL.



- BIO-FILTRATION NOTES**
- MINIMUM FILTER DEPTH IS TO BE 0.9m AND IS TO CONSIST OF THE FOLLOWING MEDIA:
- 0.6m OF SANDY LOAM MATERIAL WITH A HYDRAULIC CONDUCTIVITY OF 50-500mm/h (200 PREFERRED).
 - TRANSITION LAYER - MINIMUM 100mm COARSE SAND TYPICALLY 1mm PARTICLE SIZE DIAMETER WITH <2% FINES.
 - DRAINAGE LAYER - FINE GRAVEL (NOMINAL 2-5mm) WITH <2% FINES.
 - ALL UNDERDRAINAGE PIPES TO BE COVERED BY A MINIMUM 50mm DRAINAGE LAYER MATERIAL.
 - CONTRACTOR TO ERECT SIGNAGE IDENTIFYING THE PURPOSE OF THE BIO-RETENTION BASIN AS PER COUNCIL REQUIREMENTS.
 - CONTRACTOR TO INSTALL GEOFABRIC, LAY TOPSOIL AND TURF AFTER BASIN INTERNAL DRAINAGE AND FILTER MEDIA IS INSTALLED TO PROTECT FILTER MEDIA. TURF AND GEOFABRIC TO BE REMOVED AFTER 80% OF BUILDINGS AND CONSTRUCTION IS COMPLETE.

01	ORIGINAL ISSUE	DK	GM		22.06.2023
Issue	Description	DR	CH	VE	Date



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Verified	.		

Project
54 GEORGE ALEXANDER WAY,
COOMERA

Title
BIO-RETENTION TYPICAL
SECTIONS AND DETAILS

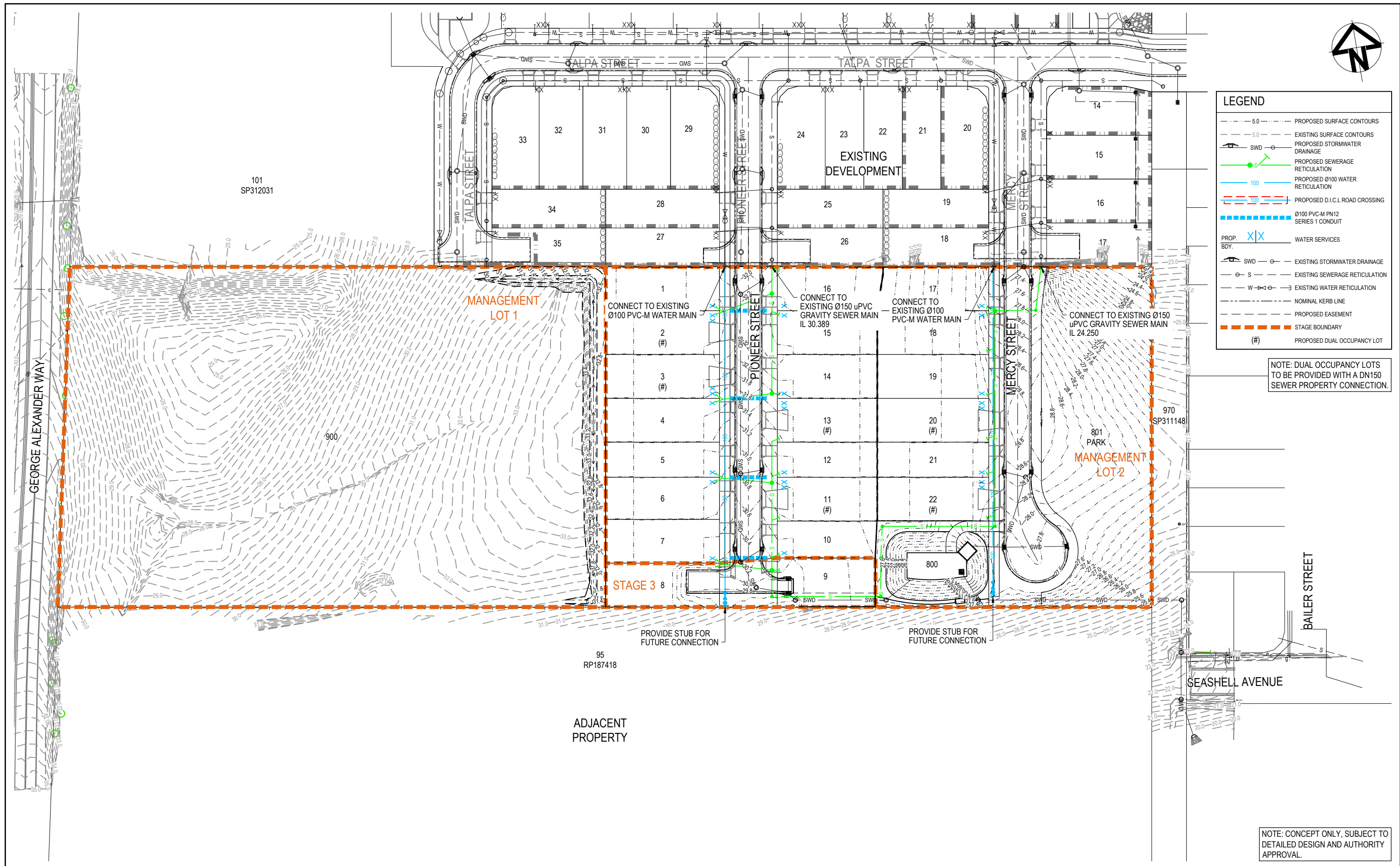
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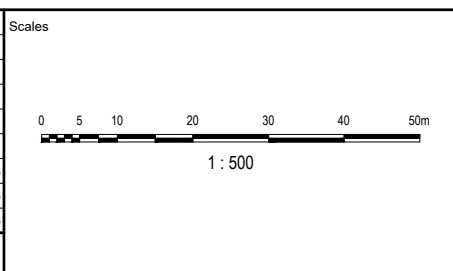
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30157884 - DABA - 0000DA - CV - DRG - 0380 - 01



Issue	Description	DR	CH	VE	Date
03	LIMIT OF EARTHWORKS AMENDED	DK	GM		31.07.2023
02	RFI ISSUE	DK	GM		22.06.2023
01	ORIGINAL ISSUE	DK	GM		01.02.2023



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Designed	G. MENZIES	Height Datum	AHD
Project Manager	G. MENZIES	Grid	MGA (ZONE 56)
Verified	-		

Project	54 GEORGE ALEXANDER WAY, COOMERA
Title	SEWER AND WATER RETICULATION LAYOUT PLAN

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Project No. | Folder Prefix | Zone | Stage | Phase | Discipline | Type | Drawing No. | Issue

30157884 - DABA - 0000DA - CV - DRG - 0400 - 03

APPENDIX C

Bio Checklist

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST									
Asset I.D.					Inspected By:				
Site:					Date:				
					Time:				
Constructed By:					Weather:				
					Contact During Visit:				

Items inspected	Checked		Satisfactory		Items inspected	Checked		Satisfactory	
	Y	N	Y	N		Y	N	Y	N
DURING CONSTRUCTION & ESTABLISHMENT									
A. FUNCTIONAL INSTALLATION					Structural components				
Preliminary Works					15. Location and configuration of inflow systems as designed				
1. Erosion and sediment control plan adopted					16. Location and levels of overflow pits as designed				
2. Temporary traffic/safety control measures					17. Under-drainage connected to overflow pits as designed				
3. Location same as plans					18. Concrete and reinforcement as designed				
4. Site protection from existing flows					19. Set down to correct level for flush kerbs (streetscape applications only)				
Earthworks and Filter Media					20. Kerb opening width as designed				
5. Bed of basin correct shape and slope									
6. Batter slopes as plans					B. SEDIMENT & EROSION CONTROL (IF REQUIRED)				
7. Dimensions of bioretention area as plans					21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin				
8. Confirm surrounding soil type with design					22. Silt fences and traffic control in place				
9. Confirm filter media specification in accordance with Step 4					23. Temporary protection layers in place				
9. Provision of liner (if required)									
10. Under-drainage installed as designed					C. OPERATIONAL ESTABLISHMENT				
11. Drainage layer media as designed					24. Temporary protection layers and associated silt removed				
12. Transition layer media as designed (if required)					Vegetation				
14. Extended detention depth as designed					25. Planting as designed (species and densities)				
					26. Weed removal and watering as required				

FINAL INSPECTION									
1. Confirm levels of inlets and outlets					6. Check for uneven settling of banks				
2. Confirm structural element sizes					7. Under-drainage working				
3. Check batter slopes					8. Inflow systems working				
4. Vegetation as designed					9. Maintenance access provided				
5. Bioretention filter media surface flat and free of clogging									

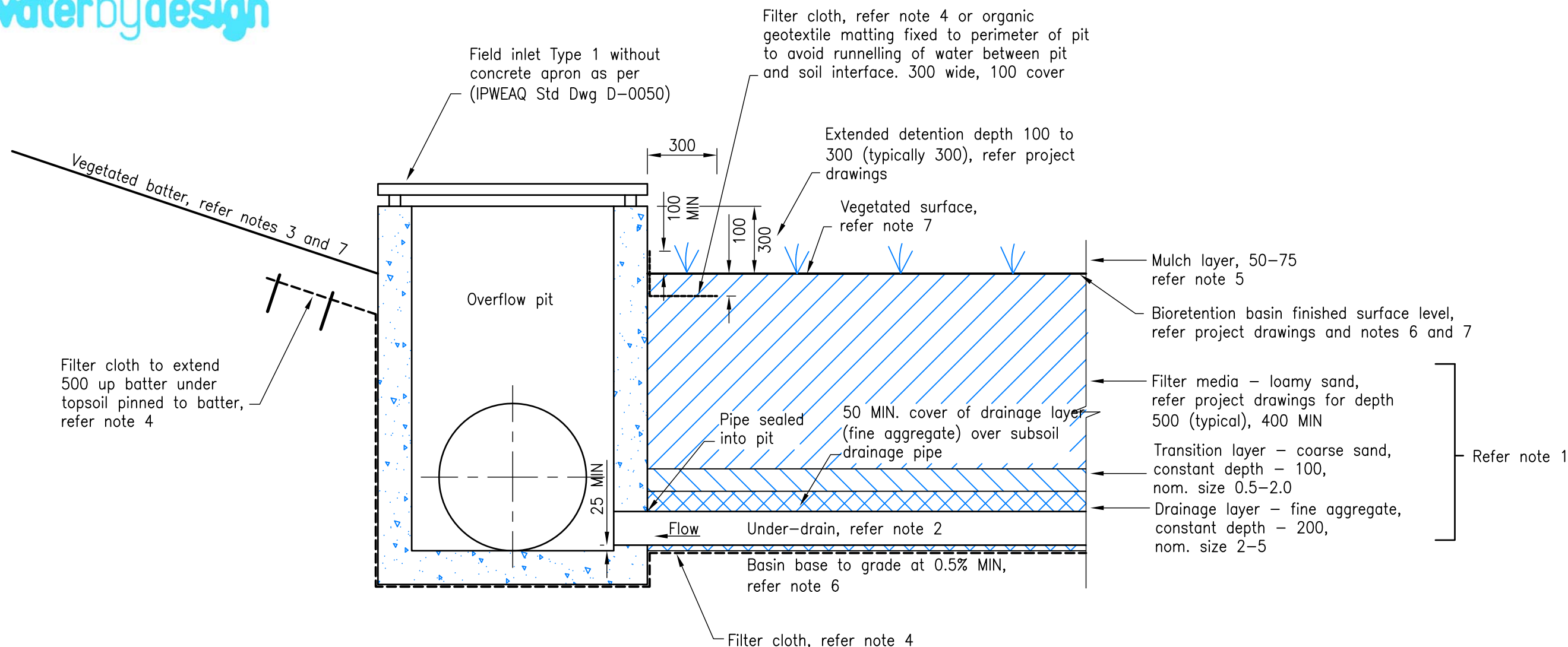
COMMENTS ON INSPECTION									

ACTIONS REQUIRED									

Inspection officer signature:									
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BIORETENTION BASIN MAINTENANCE CHECKLIST			
Inspection Frequency:	1 to 6 monthly	Date of Visit:	
Location:			
Description:			
Asset I.D.			
Site Visit by:			
INSPECTION ITEMS:	Y	N	Action Required (details)
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
Resetting of system required?			
COMMENTS			

BIORETENTION BASIN ASSET TRANSFER CHECKLIST			
Asset I.D.			
Asset Location:			
Construction by:			
'On-maintenance' Period:			
TREATMENT	Y	N	
System appears to be working as designed visually?			
No obvious signs of under-performance?			
MAINTENANCE	Y	N	
Maintenance plans and indicative maintenance costs provided for each asset?			
Vegetation establishment period completed (2 years)?			
Inspection and maintenance undertaken as per maintenance plan?			
Inspection and maintenance forms provided?			
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER	Y	N	
Sediment accumulation at inflow points?			
Litter within basin?			
Erosion at inlet or other key structures?			
Traffic damage present?			
Evidence of dumping (e.g. building waste)?			
Vegetation condition satisfactory (density, weeds etc)?			
Watering of vegetation required?			
Replanting required?			
Mowing/slashing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER			
ASSET INFORMATION	Y	N	
Design Assessment Checklist provided?			
As constructed plans provided?			
Copies of all required permits (both construction and operational) submitted?			
Proprietary information provided (if applicable)?			
Digital files (e.g. drawings, survey, models) provided?			
Asset listed on asset register or database?			



BIORETENTION BASIN OVERFLOW PIT DETAIL

NOTES:

1. Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration 'Practice Note 1: In Situ Measurement of Hydraulic Conductivity'. The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands (Water by Design)".
2. Under-drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (Typically $\phi 100-150$). Pipe should not be installed with a filter sock surrounding pipe. Under-drainage pipes shall be sealed into pits using grout or other approved watertight seal.
3. Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.
4. Filter cloth – non-woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
5. Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.
6. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits, pipes and base levels must be noted on project drawings.
7. Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
8. All dimensions are in millimetres unless otherwise noted.

These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

A	13/01/2010	ORIGINAL ISSUE
Rv.	DATE	REVISIONS



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STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
OVERFLOW PIT

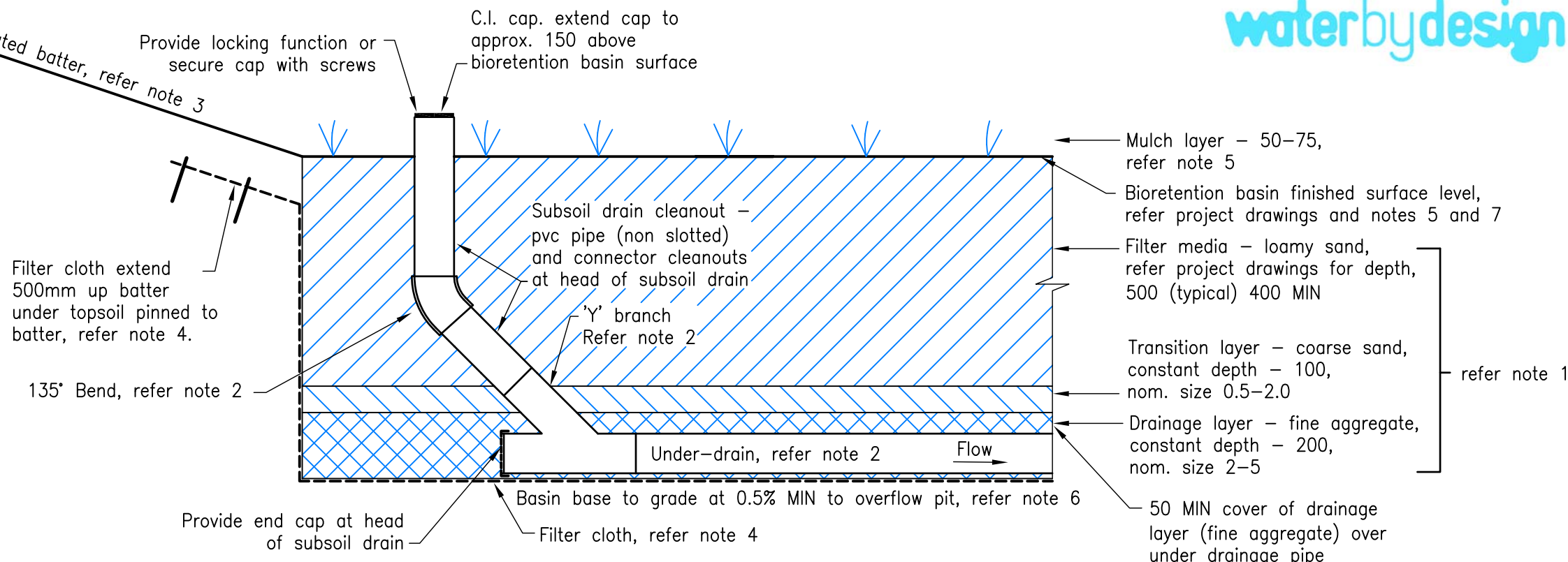
DRAWING No.

WSUD-001

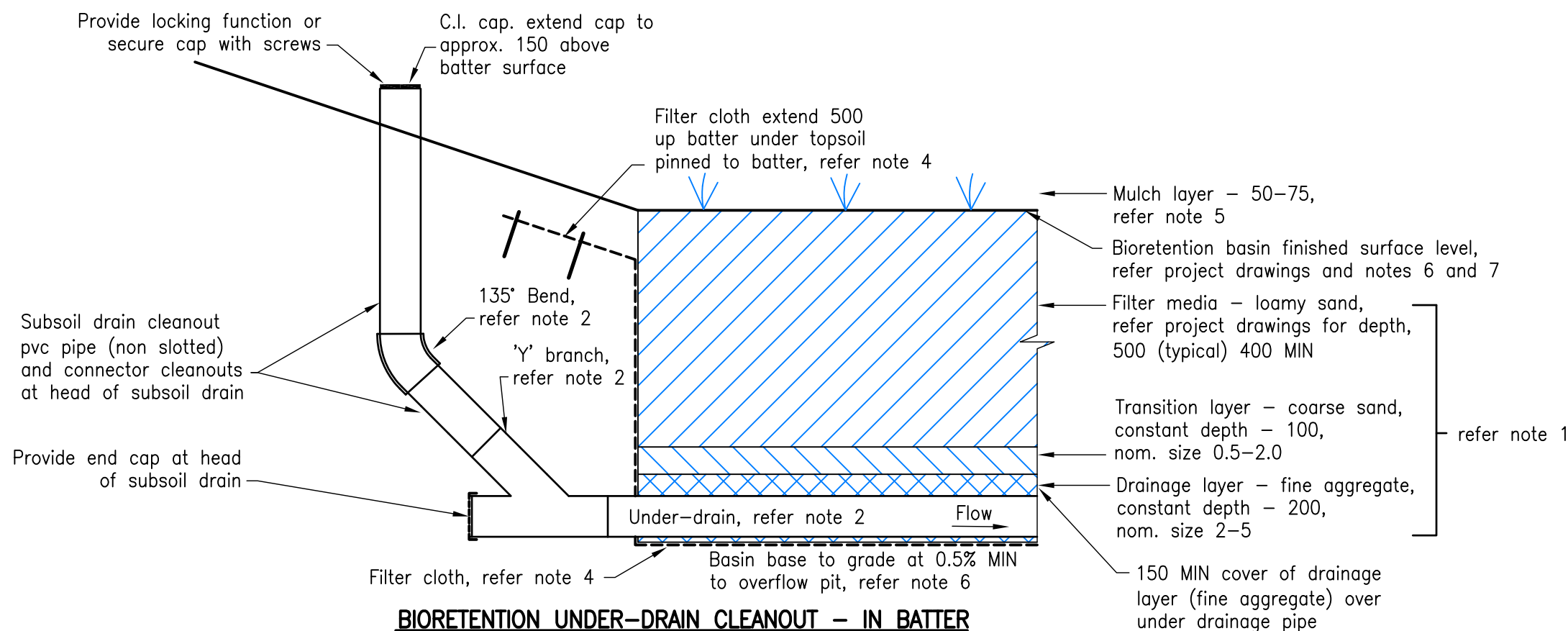
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Rv.

NOTES:

- Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration "Practice Note 1: In Situ Measurement of Hydraulic Conductivity". The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design).
- Under-drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (typically Ø100–150). Pipe joints should be glued using plumbing cement. Pipe should not be installed with a filter sock surrounding pipe. Under-drainage pipes shall be sealed into pits using grout or other approved watertight seal.
- Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.
- Filter cloth – non-woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
- Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.
- Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits and pipes and base levels must be shown on project drawings.
- Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
- All dimensions are in millimetres unless otherwise noted.



BIORETENTION UNDER-DRAIN CLEANOUT – IN BASIN



BIORETENTION UNDER-DRAIN CLEANOUT – IN BATTER

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STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
UNDERDRAIN CLEANOUT

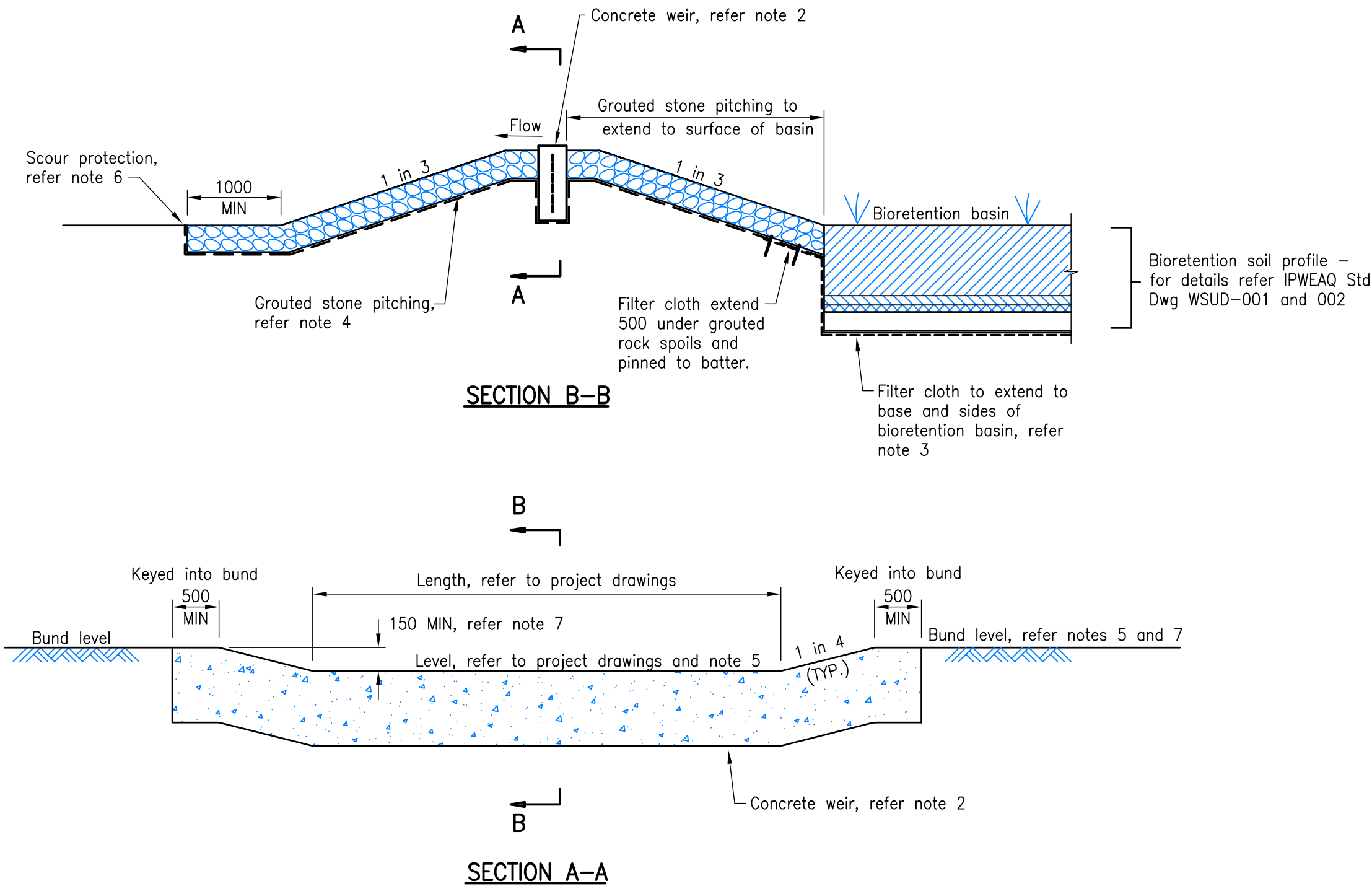
DRAWING No.

WSUD-003

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Rv.

NOTES:

- 1. Insitu material to be tested and approved by geotechnical engineer prior to weir construction.
- 2. Concrete weir – 300 wide x 800 high concrete (N32) with SL81 mesh placed centrally.
- 3. Filter cloth – non-woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
- 4. Grouted stone pitching – stones 75–100, 300 thick on filter cloth, refer note 3. Refer landscape drawings and project drawings for plant specification and details. Geotechnical engineer to confirm compaction requirements for bund subsoil. Option to drill 100 cores through to subsoil to provide voids for planting (subject to flow velocities and local government requirements). Refer landscape drawings for planting details.
- 5. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances and bund levels must be noted on project plans.
- 6. For extent and details of scour protection refer to project drawings.
- 7. Bund level, refer to project drawings for minimum freeboard requirements. Bund levels must be noted on project drawings.
- 8. All dimensions are in millimetres unless otherwise noted.



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STANDARD DRAWINGS

BIORETENTION BASIN
WEIR DETAILS

DRAWING No.
WSUD-006

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