AVENIS ENERGY

MOREE BESS AVENIS ENERGY

Site Based Stormwater Management Plan

September 2025

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MOREE BESS AVENIS ENERGY
Site Based Stormwater Management Plan

AVENIS ENERGY

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Rev	Date	Details
A	08/04/2024	Preliminary Issue for Client Review
B	01/07/2025	Updated Section 4 - Issue for Client Review
C	01/09/2025	Updated Section 4, Appendix B to E – Issue for Client Review

	Name	Date	Signature
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Reviewed by:	Fraser McLauchlan	01/09/2025	
Approved by:	Joe Manitta	01/09/2025	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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List of Appendices

1 Purpose of Document

WSP has been commissioned by Avenis Energy to provide a Site Based Stormwater Management Plan (SBSMP) to support a Development Works (Civil Works) Application to Moree Shire Plain Council for the construction of a Battery Energy Storage Systems (BESS) yard on part of Lots 144 DP751780 and 8 DP751780 at Bulluss Dr, Moree NSW 2400, Australia.

This report outlines the design criteria, parameters, specifications, and implementation of the proposed water quality for two possible geotechnical scenarios, water quantity infrastructure design for the proposed development.

1.1 Stormwater Management Objectives

The most important stormwater management objectives for the construction and operational phase have been identified as follows:

1.1.1 Construction

The stormwater management objectives for the construction phase are to minimise the nutrient and sediment load that gets generated by the earthworks and construction activities. They need to be retained on site and prevented from entering the natural watercourses. This can be addressed by including sedimentation basins on site that capture the sediments.

1.1.2 Operation

The main stormwater management objective for the operation phase is to limit the additional runoff that gets generated by the increased impervious area. This objective can be achieved by constructing on-site detention basins or tanks that limit the discharge flows to the pre-developed volumes.

2 Site Characteristics

2.1 Site Description

The proposed development is situated on approximately 4.084 ha of land at Bulluss Dr, Moree NSW 2400, Australia. Lots 144 DP751780 and 8 DP751780 (the red area in Figure 1 below) shows where the proposed BESS yard is located.

The following key elements define the immediate surrounds of the site:

- A vacant, cleared parcel of land surrounds the site in the west, south and east directions.
- To the north are existing industrial buildings, a power station and substation.
- An existing pond at Lot 82 DP751780 (to be refilled as part of the development)
- An existing detention basin and open channel at Lot 201 DP1186601 (external) – at the east side of the site. The open channel connects to Mehi River situated 1.7km north of the site.

2.2 Proposed Development

Figure 1 - Existing Site Context

2.3 Existing Topography

Based on the detailed site survey provided by the client, the existing levels range from an approximate peak level of RL 212.6 (AHD) on the southwestern boundary to an approximate low level of RL 212.0 (AHD) on the northeastern boundary of the site. This results in an average (west to east) grading of 0.5%. It is understood that site levels can be altered to ensure runoff can flow to the most advantageous areas for drainage and detention. Refer to Appendix A for the existing site survey plan prepared by Avenis Energy.

2.4 Existing Stormwater Infrastructure

According to the detailed site survey and information available through Before You Dig Search, there is no existing stormwater infrastructure within the site as seen in Figure 2 below.

2.5 Lawful Point of Discharge

The site stormwater is currently discharging via sheet flow into the urban stormwater open channel and ultimately flows into Mehi River. The proposed development will involve the construction of a new onsite combined detention and sediment basin and grassed swale to collect and treat the additional runoff ensuring no increased flows are released to the existing legal point of discharge.

Refer to Figure 2 below showing the existing stormwater infrastructure and discharge points surrounding the proposed development.

Figure 2 - Existing Stormwater Infrastructure

3 External Catchment

A catchment analysis was conducted to assess the basin within the site survey contours, design contours, and the developed General Arrangement (GA). The analysis aimed to understand the external catchment influences on the proposed site.

3.1 External Catchment Overview

The analysis revealed a significant upstream undisturbed rural catchment that conveys through the proposed site. The catchment area, approximately 9 hectares in size, primarily consists of an average grassed surface. The average grading of the site is approx. 0.5%. The flow within this catchment moves from the southwest to the northeast direction. The time of concentration calculated is approximately 30 minutes for a flow path length of 378 minutes.

Please see the figure below of the applied catchment Drains Input.

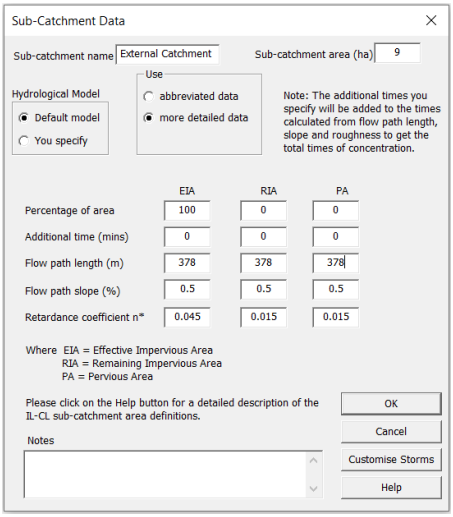

Figure 3 - Catchment Input Data - Drains

3.2 Impact on Proposed Infrastructure

The BESS (Battery Energy Storage System) yard and the substations intersect with the external catchment. Runoff from the upstream catchments will be intercepted and diverted around the BESS yard by drains. Please refer to Appendix B on the locations of the proposed drains. The drains will be designed for a minimum rainfall event of 1% AEP with 0.3m freeboard.

4 Stormwater Quality

In the following sections 4.1 to 4.4, two scenarios have been presented to provide recommendations to how stormwater quality is to be managed and what infrastructure is required to meet the stormwater quality requirements set by NSW Water Sensitive Urban Design (WSUD) Guideline. The stormwater quality measures have been considered for two geotechnical scenarios:

- Option A: Medium Clay Scenario and
- Option B: Heavy Clay Scenario

Where the following Sections 4.1 to 4.4 do not specify an Option A or Option B scenario, it may be assumed that the recommendation will be applicable for both scenarios. Before the commencement of works, the stormwater quality management Option A or Option B is to be decided via further Geotechnical investigations to verify the type of existing soils that are present on site.

Option A is the preferred stormwater quality management scenario for an assumed Medium Clay classification. Option B has been presented as a contingency, only if the geotechnical assumption of Medium Clay classification is determined to be incorrect.

4.1 Stormwater Quality Management

The proposed development will increase the sites impervious area and subsequently increase the pollutants running off the site. The pollutants will vary between the construction phase and the operational phase of the development. Since the proposed site is a largely unsealed yard, TSS is considered to be the primary urban pollutant attributed to this site.

To limit the impact of the anticipated pollutants, the WSUD best practice guidelines were adopted. NSW Water Sensitive Urban Design Guideline details the water quality control objectives for development as follows:

- 80% Total Suspended Solids Removed
- 45% Total Nitrogen Removed
- 60% Total Phosphorus Removed
- 90% Gross Pollutants Removed

Stormwater quality measures reduce the impact of the contaminated runoff by treating the captured runoff. It is proposed to use water quality measures during the construction phase and operational phase to ensure minimal impact to the downstream catchments.

4.2 Proposed Stormwater Quality Treatment Train

4.2.1 Option A

The proposed stormwater quality treatment train incorporates the use of a Sedimentation Basin, Detention Basin and Grassed swales, as applicable based on the available layout.

The Sedimentation basin was modelled in MUSIC, in accordance with the current Water by Design Guidelines. Modelling parameters and outputs are provided in Appendix C1 of this report. For the stormwater layout plan for the location of the proposed detention, refer to Appendix B.

Additionally, the site will be covered with a 100mm thick layer of 20mm blue stone. Aligned with the engineering hierarchy of controls, this measure is aimed at eliminating pollutants, contrasting with lower-tier engineering controls. Although challenging to quantify within standard MUSIC nodes, this approach is regarded as preferable for pollution

control (elimination versus engineering controls). To incorporate this measure into the MUSIC model, a generic node with a 50% sediment removal efficiency has been employed. Literature review suggests that a reduction of raindrop impact energy by 89% led to over a 90% decrease in soil loss, indicating that soil detachment primarily resulted from raindrop impacts. – *"Young RA, Wiersma JL (1973) The role of rainfall impact in soil detachment and transport. Water Resources Res 9: 1629-1636"*. RUSLE calculations also support this approach by indicating a reduction in sediment generation based on soil cover. Therefore, adopting a 50% reduction is deemed suitable for this specific site, alongside other implemented measures.

4.2.2 Option B

The proposed stormwater quality treatment train incorporates the use of a Sedimentation Basin, Detention Basin, Grassed swales, and Gross Pollutant Trap (GPT) as applicable based on the available layout.

The Sedimentation basin was modelled in MUSIC, in accordance with the current Water by Design Guidelines. Modelling parameters and outputs are provided in Appendix C2 of this report. For the stormwater layout plan for the location of the proposed detention, refer to Appendix B.

The BESS yard and access roads are to be treated by stormwater conveyance via pit and pipe network and through the proposed Gross Pollutant Trap, then stored in the sedimentation/detention basin before ultimate discharge. The gross pollutant trap was modelled in MUSIC as an Ocean Protect Jellyfish Filter (Full Length Cartridge) Model JF-3300-28-5. The technical design guide and specification drawing are included in this report in Appendix E. The JF-3300-28-5 model is the minimum cartridge quantity and GPT size to meet the NSW stormwater quality reduction requirements.

The landscaped surrounds of the BESS yard are treated via the grassed swales then stored in the sedimentation/detention basin before ultimate discharge.

4.3 MUSIC Modelling

4.3.1 Option A

Utilising the above-mentioned treatment train, a stormwater quality model was produced utilising the MUSIC software package. The MUSIC model output can be found in Appendix C1. The following table details the resulting outputs of the proposed treatment train methodology.

Table 1 - Post-Development MUSIC Modelling Results

Pollutant	Required Pollutant Reduction (%)	Achieved Reduction (%)
Total Suspended Solids	80	91.7
Total Nitrogen	45	45.7
Total Phosphorous	60	70.1
Gross Pollutants	90	100

4.3.1.1 Gross Pollutants

GP removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.1.2 Total Phosphorus

TP removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.1.3 Total Suspended Solids.

TSS removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.1.4 Total Nitrogen

TN removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.1.5 MUSIC Summary and Assumptions

All targets have been met. The MUSIC model layout is shown in Appendix C. The model assumes the soil to have an exfiltration rate of 1.5mm/hr, reflective of Medium Clays.

The input nodes for the BESS yard are Unsealed Roads (travelling through the Generic Gravel Node) and Industrial reflecting the individual cabinets and battery slabs, whilst reflecting the general site will be trafficked by industrial equipment for maintenance.

4.3.2 Option B

Utilising the above-mentioned treatment train, a stormwater quality model was produced utilising the MUSIC software package. The MUSIC model output can be found in Appendix C2. The following table details the resulting outputs of the proposed treatment train methodology.

Table 2 - Post-Development MUSIC Modelling Results

Pollutant	Required Pollutant Reduction (%)	Achieved Reduction (%)
Total Suspended Solids	80	93.8
Total Nitrogen	45	46.4
Total Phosphorous	60	69.1
Gross Pollutants	90	100

4.3.2.1 Gross Pollutants

GP removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.2.2 Total Phosphorus

TP removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.2.3 Total Suspended Solids.

TSS removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.2.4 Total Nitrogen

TN removal targets are achieved based on the incorporated treatment measures in the MUSIC model.

4.3.2.5 MUSIC Summary and Assumptions

All targets have been met. The MUSIC model layout is shown in Appendix C2. The model assumes the soil to have an exfiltration rate of 0.0mm/hr, reflective of Heavy Clays.

The input nodes for the BESS yard are Unsealed Roads, Sealed Roads and Industrial reflecting the individual cabinets and battery slabs, whilst reflecting the general site will be trafficked by industrial equipment for maintenance.

4.4 Stormwater Maintenance Plans

4.4.1 Sediment Basin

The proposed Sediment basin for both options allows for the build-up of sediment and prevents sedimentation of downstream waterways. Debris removal and system maintenance is an ongoing function to ensure successful operation of the devices and prolong design life. The basin shall be desilted once sediment levels reach the demarcated maximum silt levels on the outlet pit. The frequency of this clean out will be determined during operations, based on observations of rate of sediment build up.
Appropriate access to the Basin for maintenance activities will be allowed from the BESS yard and walkway platform.

4.4.2 Construction

Maintenance during the construction period is to be carried out by the contractor on a fortnightly basis and after every rain event; it will involve the following duties:

- Emptying of on-site refuse bins.
- Cleaning up any oil and grease spills on the pavement with suitable materials such as absorbents, bunds, handling equipment and then ensure proper disposal.
- Keeping the paved areas and gully grates free of debris; and
- Maintaining and/or replacing of sediment fences, inlet traps and sandbag check dams until full coverage of the landscaping works is achieved.

5 Stormwater Quantity

5.1 Stormwater Quantity Management

To ensure the proposed development's stormwater runoff will not cause an actionable nuisance to downstream properties, existing and developed stormwater peak flows from the proposed developable areas have been calculated and analysed. These have been modelled using the hydraulic software DRAINS. Australian Rainfall Runoff 2019 (ARR2019) rainfall data was used in the DRAINS analysis. The IL-CL model was used in the DRAINS analysis. Initial (IL) and Continuing Loss (CL) parameters were sourced from the ARR Data Hub for the location 29.4866 South and 149.8556 East. Figure 4 below shows the parameter inputted into the program.

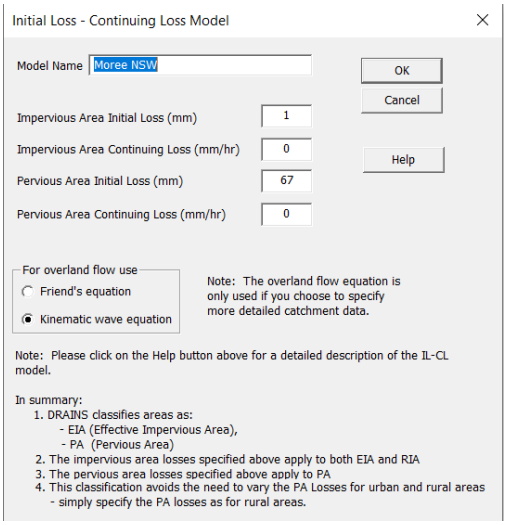

Figure 4 - Modelled Loss Parameters

5.2 Catchments

5.2.1 Pre-Developed Catchments

The existing catchment consists of an area of 4.08 hectares, with no impervious area. The pre-developed peak flows from the development area were analysed for 10% AEP (1 in 10 years) and 1% AEP (100 year ARI). DRAINS input parameters for the pre-developed catchments are depicted in Table 3.

Table 3: DRAINS Input Parameters (Pre-Developed)

Pre-Developed Catchments	Catchment Area (Hectares)	Imperviousness (%)
Pre-Catchment	4.082	0

In order to develop runoff hydrographs in the IL-CL model, DRAINS requires delineation of the Pervious Areas, Directly Connected Impervious areas and Indirectly Connected Impervious areas. For this development, there has been no Directly Connected Impervious Areas as there is no development connected directly to the stormwater network, rather overland flow over pervious areas is captured by urban stormwater open channel.

5.2.2 *Post-Developed Catchments*

Post-developed peak flows from the developed areas were analysed for 10% AEP (1 in 10 years) and 1% AEP (100 year ARI).

5.2.2.1 Stormwater Management

The stormwater management consists of graded overland flow paths designed to convey peak flows for storm events up to the 1% AEP (major storm event) to the designed low points of the site. The low points remain consistent with the existing pre-development site, being over sheet flow however there will be grassed swales at the north and east perimeter of the site and OSD basin at northeast side to convey flow to the discharge location and ultimately to the existing open channels. Please refer to the Appendix B for the proposed swale and basin locations.

5.2.2.2 Catchment Areas

The following catchment areas listed in Table 3 have been utilised to assist with the proposed stormwater design network. Please refer to Appendix B for the catchment plan.

Table 4 - DRAINS Input - Parameters (Post-Developed)

Post Developed Catchments	Catchment Area (Hectares)	Imperviousness (%)	Flow Path Slope (%)	Flow Path Length (m)
C1	1.456	96	1	218
C2	1.836	93	1	190
C3	0.790	90	1	111.6

5.2.3 *DRAINS Design*

The following design parameters have been used for the proposed stormwater network design analysis through DRAINS:

- Hydrological Design Storm Data (ARR & BOM Data)
  - Minor Storm = 10% AEP, 1 in 10-year event
  - Major Storm = 1% AEP, 1 in 100-year event

DRAINS peak flow analysis outputs for the Pre vs Post developed major and minor storm events are outlined below:

Table 5 - Catchment DRAINS Results

Catchment	Minor Storm (1 in 10 year)	Major Storm (1 in 100 year)
Pre-Developed Peak Runoff (m3/s)	0.228	0.593
Post-Developed Peak Runoff (m3/s)	0.166	0.308

5.3 Proposed Infrastructure

5.3.1 *Proposed Overland Flow Strategy*

The proposed overland flow strategy involves the use of appropriate site grading and earthworks to convey the 1% AEP (100 year ARI) stormwater flows. Overland flows are directed to the grassed swales and combined sediment and detention basin to the north of the site via sheet flow.

5.3.2 *Proposed On-site Detention (OSD)*

The stormwater attenuation strategy, proposed for the development, consists of a combined sediment and detention basin. The proposed basin will capture the flow from most of internal catchments. Table 5 details the detention volume, pit and orifice size to attenuate all flows up to 1% AEP (100-year ARI) to pre-developed conditions. The stormwater will be discharged into the existing urban stormwater open channel.

The proposed-on side detention basin is designed to hold more than 200kL of fire water to manage a BESS fire.

The combined sediment and detention basin will be maintained by the owner of the property and is not intended be handed over to Moree Shire Plains Council.

Table 6: Detention System Design Details (Area and Height includes Extended Detention for Water Quality)

OSD System	Internal Base Area (m^2)	Minimum Basin Height (m)	Storage Volume (m^3) (excl. extended sediment basin and weir)	Control Outlets
Detention Basin	1112m^2	0.58m	528m^3	Less than 1% AEP (100 year ARI) Inlet with a 225mm Orifice Plate on a ⌀375mm Pipe Outlet For 1% AEP (100 year ARI) Flow – 20m Wide Weir at RL 212.7m AHD

Due to drainage easement and the risk of overflowing to the substations, the weir level of the basin has been designed to provide 300mm freeboard above the maximum external peak 1% AEP (100 year ARI) flood level of 212.7mAHD.

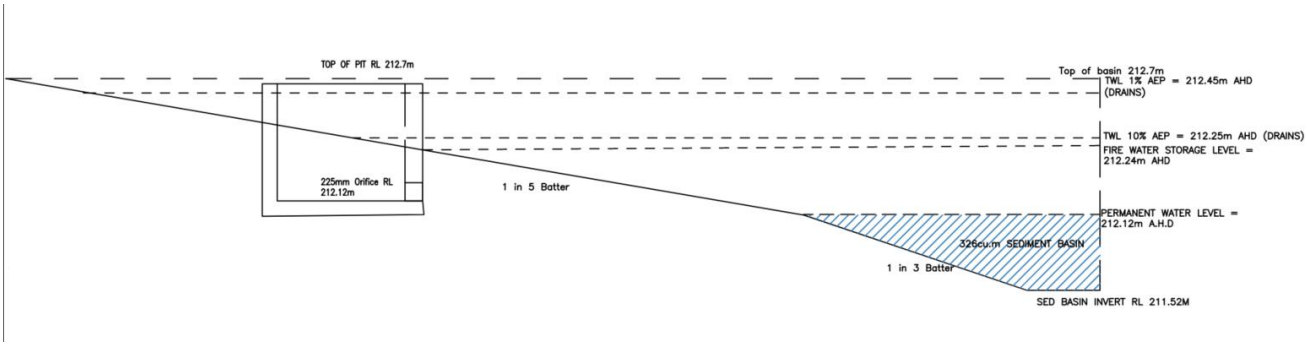

Figure 5 - Basin Longitudinal Section Sketch

6 Conclusion

This report addresses the stormwater quality and stormwater quantity for the BESS yard located at Bulluss Dr, Moree NSW 2400, Australia.

The stormwater network has been modelled with DRAINS software, demonstrating that the post developed attenuated peak run-off will not exceed the pre-developed peak run-off due to the on-site detention basins.

Stormwater quality has been considered in a holistic approach throughout the Development, incorporating all stormwater treatment requirements for the surrounding development into an end of line treatment method. It is inevitable the development will have an impact on the existing landform and stormwater runoff characteristics due to earthworks, change of landscape and impervious areas. By following the recommendations of this report and implementing appropriate measures during construction and operation of the development, it can be predicted that there will be minimal impact on the existing environment because of the proposed development.

7 Limitations

This report is provided by WSP Australia Pty Limited (*WSP*) for Avenis Energy (*Client*) to support the Operational Works (Civil Works) Application to Moree Shire Plains Council for the construction of a BESS yard on part of Lots 144 DP751780 and 8 DP751780 at Bulluss Dr, Moree NSW 2400, Australia.

This report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

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Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information)*, those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

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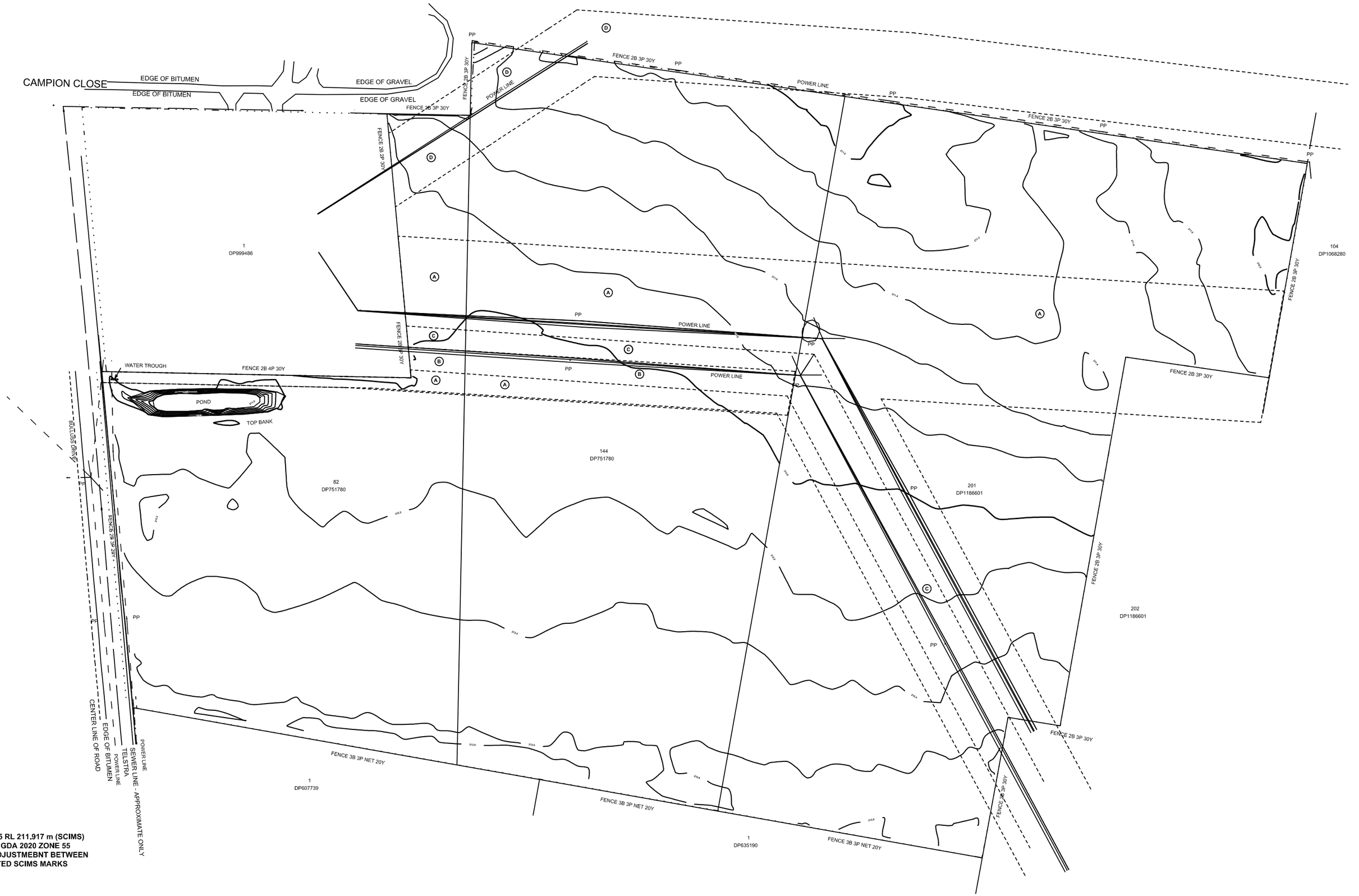
Appendix A

Site Survey Plan



SURVEY DATUM:
AHD FROM PM 56945 RL 211.917 m (SCIMS)
HORIZONTAL - MGA GDA 2020 ZONE 55
LEAST SQUARES ADJUSTMEBNT BETWEEN
LOCAL CO-ORDINATED SCIMS MARKS

Appendix B

Development Application Drawing Package

DO NOT SCALE

NSW GOVERNMENT

MOREE BESS

WSP CIVIL DRAWINGS

LOCALITY PLAN
N.T.S.

DRAWING SCHEDULE	
DRAWING No.	DRAWING TITLE
C000	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
C005-A	EROSION AND SEDIMENT CONTROL LAYOUT PLAN - OPTION A
C005-B	EROSION AND SEDIMENT CONTROL LAYOUT PLAN - OPTION B
C006	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS - SHEET 1 OF 2
C007	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS - SHEET 2 OF 2
C010	BULK EARTHWORKS LAYOUT PLAN
C011	VEHICLE TURNING PATHS
C030-A	ROAD WORKS AND STORMWATER DRAINAGE LAYOUT PLAN - OPTION A
C030-B	ROAD WORKS AND STORMWATER DRAINAGE LAYOUT PLAN - OPTION B
C031-A	STORMWATER CATCHMENT LAYOUT PLAN - OPTION A
C031-B	STORMWATER CATCHMENT LAYOUT PLAN - OPTION B
C032	FENCE LAYOUT PLAN
C100	CIVIL DETAILS - SHEET 1 OF 2
C101	CIVIL DETAILS - SHEET 2 OF 2

REV	DATE	BY	DESCRIPTION	CHK	APP
B	01/09/2025	FM	DRAWING SCHEDULE AMENDED	JM	SN
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: COVER SHEET, LOCALITY PLAN AND DRAWING INDEX

SCALE @ A1:	CHECKED:	APPROVED:
N/A	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C000 REV: B

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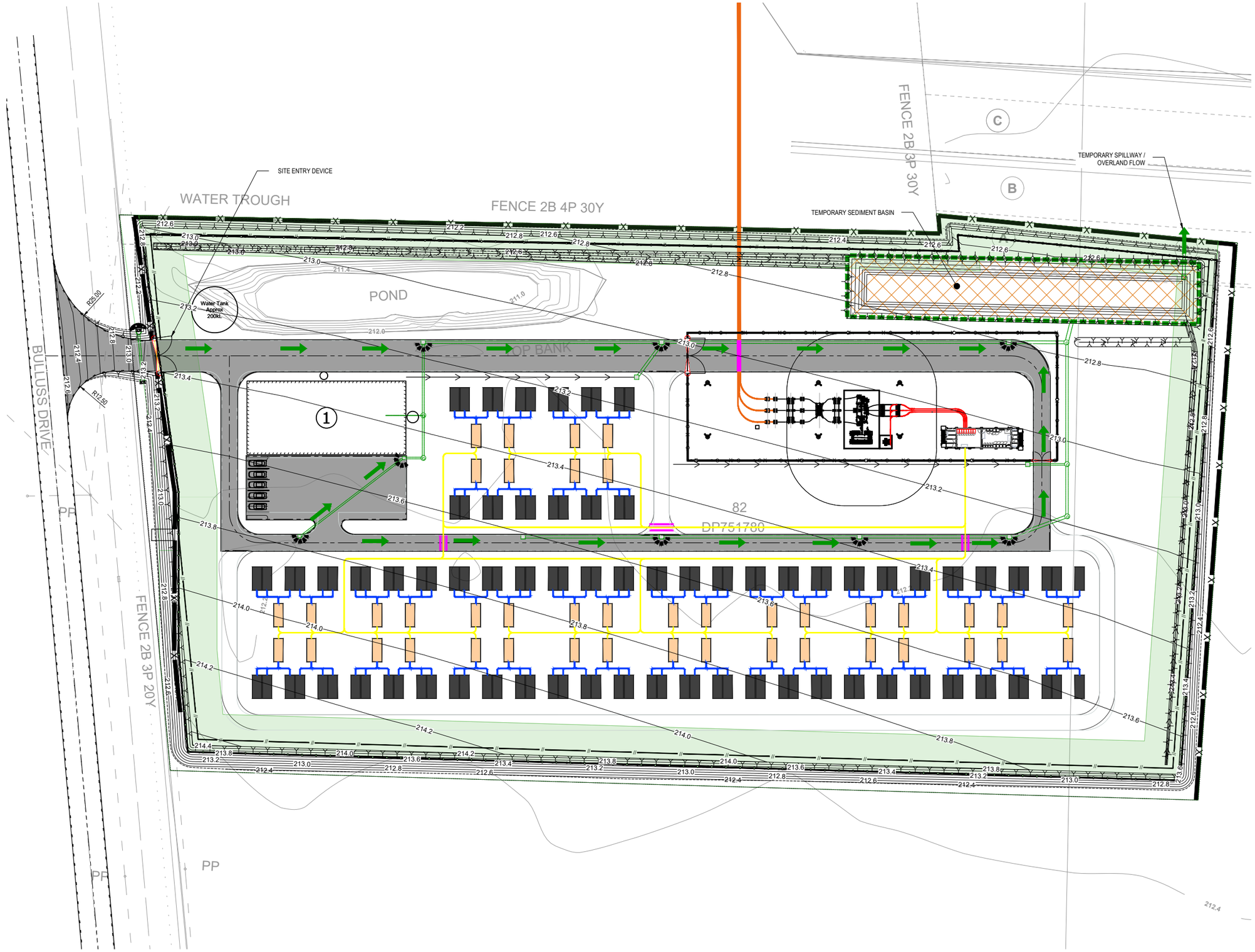


LEGEND

- PROPOSED BUILDING AREA
- TEMPORARY SEDIMENT BASINS DURING CONSTRUCTION REFER DETAIL DWG 0000
- PROPOSED STABILISED SITE ENTRY/EXIT LOCATION TO BE DETERMINED BY CONTRACTOR
- PROPOSED 100mm TOPSOIL AND HYDROSEED WITH SHORT AND LONG TERM SEEDING
- PROPOSED CONSTRUCTION ACCESS ROAD REFER DETAIL DWG 0000
- OVERLAND FLOW PATH
- PROPOSED STORMWATER DRAINAGE PIPE AND MANHOLE
- PROPOSED SEDIMENT FENCE
- PROPOSED INLET SEDIMENT TRAP
- PROPOSED ROCK CHECK DAM
- PROPOSED TEMPORARY DIVERSION DRAIN
- PROPOSED SWALE DRAIN
- PROPOSED FINISHED PLATFORM LEVELS CONTOUR

REV	DATE	BY	DESCRIPTION	CHK	APP
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

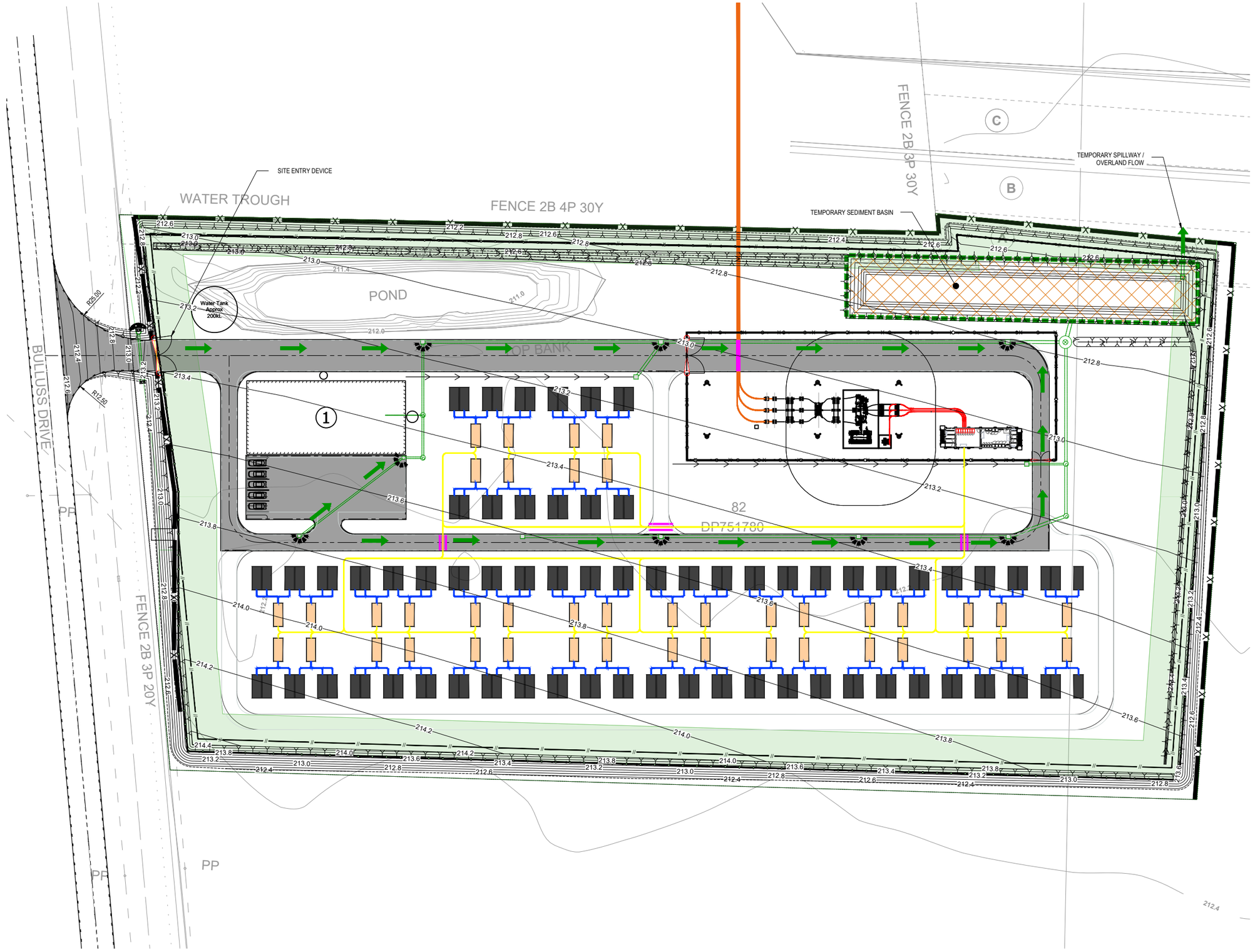
PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: EROSION AND SEDIMENT CONTROL LAYOUT PLAN OPTION A

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C005-A REV: A

DO NOT SCALE



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A	01/09/2025	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: EROSION AND SEDIMENT CONTROL LAYOUT PLAN OPTION B

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C005-B REV: A

DO NOT SCALE

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, LANDSCAPING PLANS AND WRITTEN INSTRUCTIONS RELATING TO THE SUBJECT DEVELOPMENT.
2. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTROL EROSION AND DOWNSTREAM SEDIMENTATION DURING ALL STAGES OF CONSTRUCTION INCLUDING THE MAINTENANCE PERIOD.
3. THE EXTENT AND POSITION OF THE EROSION AND SEDIMENT CONTROL MEASURES TO BE DETERMINED ON SITE BY THE CONTRACTOR TO SUIT THE CONSTRUCTION PROGRAM.
4. THESE PLANS PRESENT CONCEPTS ONLY AND THE MEASURES SHOWN ON THIS DRAWING(S) ARE MINIMUM REQUIREMENTS ONLY.
5. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT, MANAGEMENT AND MAINTENANCE OF THE EROSION AND SEDIMENT CONTROL MEASURES TO MEET COUNCIL STANDARDS.
6. LARGE OPEN AREAS OR STEEP BATTERS SHOULD NOT BE LEFT EXPOSED/UNSTABILISED FOR MORE THAN 10 DAYS OR IF WET WEATHER IS FORECAST.
7. EXPOSED AREAS INCLUDING BATTERS WHICH REMAIN UN-WORKED FOR MORE THEN 10 DAYS SHOULD BE STABILISED USING TEMPORARY HYDROMULCHING, HYDROSEEDING OR MULCHING, EVEN IF AREAS WILL BE WORKED AT A LATER TIME.
8. ALL WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST VERSION OF THE INSTITUTION OF ENGINEERS AUSTRALIA, 'SOIL EROSION AND SEDIMENT CONTROL - ENGINEERING GUIDELINES FOR QUEENSLAND CONSTRUCTION SITES.
9. THE CONTRACTOR SHALL BE AWARE OF ITS RESPONSIBILITIES FOR PROTECTING THE DOWNSTREAM ENVIRONMENT AND RECEIVING WATER FROM POLLUTION AND ENVIRONMENTAL HARM, UNDER THE ENVIRONMENTAL PROTECTION ACT. 1994.
10. ADDITIONALLY THE CONTRACTOR SHALL BE AWARE OF ITS DUTY TO NOTIFY THE LOCAL AUTHORITY AND THE ENVIRONMENTAL PROTECTION AGENCY (QLD) OF A POTENTIAL OR ACTUAL INCIDENT OF ENVIRONMENTAL HARM, UNDER THE ENVIRONMENTAL PROTECTION ACT. 1994.

RECOMMENDED IMPLEMENTATION SEQUENCE:

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND FUNCTIONAL PRIOR TO WORKS COMMENCING AND IN THE FOLLOWING SEQUENCE.
   a. CONSTRUCT TEMPORARY STABILISED SITE ACCESS, ENSURING ADJACENT STORMWATER RUN OFF IS DIVERTED AWAY FROM ACCESS
   b. INSTALL SEDIMENT FENCING AND/OR BARRIER FENCING TO CONFINE INGRESS TO AND EGRESS FROM THE SITE TO STABILISED ACCESS POINT(S) ONLY.
   c. PROVIDE INLET PROTECTION TO STORMWATER INLETS AND GULLIES ON ALL ROADS ADJOINING THE SITE.
   d. CONSTRUCT BARRIER FENCING AROUND RESTRICTED 'NO-GO' ZONES OF RETAINED VEGETATION, AREAS NOT TO BE DISTURBED AND AREAS WHICH WILL REMAIN UN-WORKED.
   e. CONSTRUCT UPSTREAM DIVERSION CHANNELS TO DIVERT CLEAN WATER AROUND WORKSITE, AND INSTALL APPROPRIATE CHANNEL STABILISATION.
   f. CONSTRUCT LOW FLOW EARTH BANKS AS CATCH DRAINS PARALLEL TO CONTOURS TO LIMIT LARGE SLOPE LENGTHS (SLOPES SHOULD BE LESS THEN 80M IN LENGTH).
   g. INSTALL ALL TEMPORARY SEDIMENT FENCES.
   h. CONSTRUCT ANY NOMINATED SEDIMENT BASINS AND SEDIMENT TRAPS.
   i. STABILISE ALL DISTURBED AREAS ASAP AND PROGRESSIVELY AS WORKS ARE COMPLETED. TEMPORARY STABILISATION TO BE DONE USING MULCHING, HYDROMULCHING, HYDROSEEDEDING OR DIRECT SEEDING TO GIVE A 70% COVERAGE OF GROUND SURFACE WITHIN 14 DAYS OF WORKS COMPLETING (EVEN IF WORKS MAY CONTINUE LATER).
2. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO MINIMUM WORKABLE AREAS.
3. DISTURBED AREAS TO EXTEND NO MORE THAN 5 METRES (PREFERABLY 2 METRES) FROM ESSENTIAL WORKS AREAS.
4. WORK AREAS TO BE DELINEATED BY BARRIER FENCING AND DIVERSION CHANNEL UPSLOPE AND SEDIMENT FENCING DOWNSLOPE.
5. THE CONTRACTOR SHALL ENSURE THAT THE EXISTING VEGETATION AND GROUNDCOVER IS RETAINED AS MUCH AS POSSIBLE.
6. TOPSOIL SHALL BE STRIPPED AND STOCKPILED FOR LATER USE ONSITE.
7. NATIVE SITE VEGETATION REQUIRED AND APPROVED FOR CLEARING SHOULD BE MULCHED AND STOCKPILED FOR LATER USE IN LANDSCAPING, STABILISATION AND/OR SITE REHABILITATION WORKS.
8. AT ALL TIMES THE CONTRACTOR SHALL MONITOR THE PREVAILING WEATHER CONDITIONS AND PROTECT ANY DOWNSTREAM CONSTRUCTION AND RECEIVING ENVIRONMENTS.
9. EROSION AND SEDIMENT CONTROL PROTECTION MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR THROUGHOUT CONTRACT.
10. PLANS AND CONTROL MEASURES FOR LARGE SITES WILL NEED TO BE REVISED AND UPDATED TO REFLECT THE SITE STAGES AND PROGRESSION OF WORKS.
11. MEASURES INCLUDING SEDIMENT FENCES SHOULD BE MOVED AND REINSTATED AS WORKS PROGRESS.
12. FOOT AND VEHICULAR TRAFFIC TO BE RESTRICTED IN RECENTLY STABILISED AREAS INCLUDING THOSE HYDROSEEDED, TURFED OR SEEDED.

CONTROL MEASURES

1. FINAL SITE LANDSCAPING SHALL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS OF CONSTRUCTION COMPLETION
2. SEDIMENT LADEN WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM BY USING INLET PROTECTION.
3. ALL PERIMETER BANKS AND CHANNEL DRAINS SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
4. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED ONCE SITE IS STABILISED AND UPSTREAM WORKS HAVE BEEN COMPLETED.
5. AT CONSTRUCTION COMPLETION ALL TEMPORARY EARTH STRUCTURES, INCLUDING SOIL STOCKPILES ARE TO BE TRACK ROLLED AND SEEDED. THE CONTRACTOR IS TO ENSURE A 70% COVERAGE WITHIN 14 DAYS.

DUST CONTROL

1. DURING WINDY AND DRY WEATHER ANY UNPROTECTED AREAS SHALL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL. WHERE WATER IS NOT AVAILABLE IN SUFFICIENT QUANTITIES, SOIL BINDERS OR DUST RETARDANTS TO BE USED FOR DUST SUPPRESSION.
2. EXPOSED SURFACES INCLUDING BATTERS SHOULD BE LEFT ROUGH TO REDUCE WIND SPEEDS AND POTENTIAL FOR WIND EROSION.
3. USE OPEN WEAVE BARRIER FENCING ON WINDWARD SIDE OF SITE IF REQUIRED (REFER DETAIL). FENCING IS GENERALLY REQUIRED WHERE AREA OF DISTURBANCE IS >5000m².

OTHER MATTERS

1. ACCEPTABLE RECEPTORS AND DISPOSAL PRACTICES WILL BE USED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHERS, LITTER AND GENERAL WASTE MATERIALS.
2. ANY EXISTING TREES WHICH ARE NOT REQUIRED OR APPROVED TO BE CLEARED FOR THE WORKS AND/OR FORM PART OF THE FINAL LANDSCAPING PLAN SHOULD BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   a. PROTECTING THEM WITH BARRIER FENCING OR MARKERS.
   b. ENSURING NOTHING IS NAILED TO THEM
   c. PROHIBITING PAVING, GRADING OR PLACING OF STOCKPILES WITHIN DRIP LINE.
3. ALL VEHICLE AND EQUIPMENT WASHING SHOULD BE CONTAINED IN SPECIFIC BUNDED AREAS, DISCONNECTED FROM CONCENTRATED FLOW PATHS AND THE STORMWATER SYSTEM.
4. ANY NECESSARY VEHICLE OR EQUIPMENT REFUELING SHOULD BE UNDERTAKEN AWAY FROM CONCENTRATED FLOW PATHS AND PREFERABLY WITHIN A BUNDED AREA.
5. ANY ONSITE FUEL STORAGE AREAS SHOULD BE COVERED AND BUNDED.

MAINTENANCE OF PUBLIC ROADS

1. ALL CONSTRUCTION VEHICLES DEPARTING FROM THE SITE SHALL HAVE THEIR TYRES WASHED DOWN OR SEDIMENT REMOVED BY A STABILISED SITE ACCESS DEVICE.
2. THE STABILISED SITE ACCESS AREAS SHALL BE LOCATED SUCH THAT SILTED WATER IS FILTERED THROUGH A SUITABLE SEDIMENT TRAP (SUCH AS A SEDIMENT FENCE) INSTALLED DOWNSTREAM OF ACCESS.
3. THE CONTRACTOR SHALL INSPECT THE PUBLIC ROADS ADJACENT TO THE SITE DAILY AND MANUALLY REMOVE ANY SEDIMENT DEPOSITS (BY SWEEPING NOT WASH DOWN).

SITE INSPECTION AND MAINTENANCE

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED REGULARLY, IMMEDIATELY BEFORE SITE CLOSURE, PRIOR TO PREDICTED LARGE STORM EVENTS AND AFTER EVERY SIGNIFICANT (> 5MM) RAINFALL EVENT OR AT LEAST ON A WEEKLY BASIS.
2. THE CONTRACTOR WILL AS A MINIMUM CONDUCT EACH INSPECTION IN LINE WITH THE FOLLOWING
   a. RECORD TYPE OF DEVICE/CONTROL MEASURE BEING INSPECTED AND ITS LOCATION;
   b. RECORD THE CONDITION OF EVERY CONTROL MEASURE;
   c. RECORD MAINTENANCE REQUIREMENTS FOR EVERY CONTROL DEVICE;
   d. RECORD SEDIMENT VOLUMES REMOVED FROM SEDIMENT TRAPPING DEVICES;
   e. RECORD DETAILS OF SEDIMENT BASIN TREATMENT, FLOCCULANT DOSAGE AND CLEANOUT;
   f. RECORD SEDIMENT DISPOSAL PROCEDURES AND LOCATION.
3. REPAIRS AND MAINTENANCE OF ALL DEVICES AND MEASURES INCLUDING DIVERSION CHANNELS SHALL BE UNDERTAKEN AS REQUIRED, ENSURING ALL MEASURES ARE FULLY FUNCTIONAL AT ALL TIMES.
4. ENSURE SEDIMENT LADEN WATER HAS NOT BEEN DIVERTED AROUND DEVICES.
5. REPAIR SCOUR DAMAGE TO SEDIMENT CONTROL MEASURES AFTER RAINFALL EVENTS AND REINSTATE DEVICES AS NECESSARY.
6. SEDIMENT FENCES WILL REQUIRE CLEANING WHEN SEDIMENT REACHES 300MM DEPTH OR ONE-HALF THE HEIGHT OF THE FILTER FABRIC AND ALL OTHER SEDIMENT TRAPS WILL REQUIRE CLEANING OUT WHEN 30% OF DESIGN CAPACITY IS REACHED.
7. ALL INLET AND GULLY TRAPS TO BE CLEANED NOT HOSED AFTER EVERY RAINFALL EVENT, (1>5mm) OR AT LEAST ON A WEEKLY BASIS.
8. SEDIMENT REMOVED FROM ANY TRAPPING DEVICE TO BE RELOCATED, ENSURING FURTHER POLLUTION TO DOWNSTREAM ENVIRONMENTS WILL NOT OCCUR.
9. ALL SEEDING, HYDROSEEDING AND TURFING REQUIRES REGULAR WATERING, UNTIL EFFECTIVE COVER ESTABLISHED AND PLANTS ARE GROWING VIGOROUSLY. WATERING SHOULD VARY DEPENDING ON WEATHER AND SOIL CONDITIONS.
10. WATERING SHOULD START IMMEDIATELY AFTER PLANTING AND SHOULD COMPLY WITH THE FOLLOWING AS A MINIMUM:
    WEEK 1 3 WATERINGS/WEEK
    WEEK 2-6 2 WATERINGS/WEEK
    WEEK 7-12 1 WATERING/WEEK
11. EXCESSIVE VEGETATION GROWTH WILL BE CONTROLLED THROUGH MOWING OR SLASHING.
12. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE INSPECTION, MAINTENANCE AND TESTING OF DEVICES IS UNDERTAKEN ON SITE.
13. THE CONTRACTOR TO KEEP DETAILED AND LEGIBLE RECORDS OF ALL INSPECTION AND MAINTENANCE UNDERTAKEN ON THE EROSION AND SEDIMENT CONTROL DEVICES.
14. ALL SITE WASTE INCLUDING GENERAL RUBBISH TO BE DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER IN ACCORDANCE WITH THE ENVIRONMENTAL PROTECTION (WASTE MANAGEMENT) POLICY 2000 AND ENVIRONMENTAL PROTECTION (WASTE MANAGEMENT) REGULATION 2000.
15. THE CONTRACTOR SHALL CONSTRUCT AND IMPLEMENT ADDITIONAL MEASURES AS NECESSARY TO ENSURE PROTECTION OF DOWNSTREAM ENVIRONMENTS.

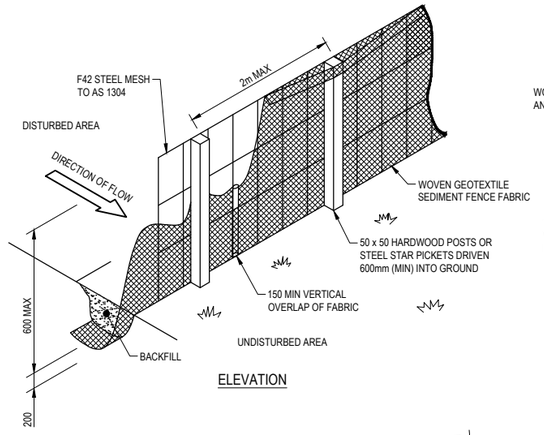
SEDIMENT BASIN MAINTENANCE

1. THE CONTRACTOR SHALL KEEP DETAILED AND ACCURATE RECORDS OF THE MONITORING, TREATMENT, TESTING AND MAINTENANCE OF THE SEDIMENT BASIN INCLUDING RECORDED RAINFALL VOLUME, FLOCCULATING AGENTS USED AND TEST RESULTS PRIOR TO DEWATERING.
2. THE STORMWATER RUNOFF COLLECTED IN THE SEDIMENT BASIN SHALL BE MONITORED, TREATED AND TESTED PRIOR TO DISCHARGE, INCLUDING WATER TO BE REUSED ON SITE.
3. WATER TESTING TO BE UNDERTAKEN BY A SUITABLY QUALIFIED PERSON.
4. ALL LABORATORY TESTING TO BE UNDERTAKEN BY A NATA ACCREDITED LABORATORY.
5. ALL WATER PUMPED FROM THE SEDIMENT BASIN SHALL BE TESTED FOR ENVIRONMENTAL COMPLIANCE AGAINST THE RELEASE CRITERIA IN THE TABLE BELOW (AS A MINIMUM), UNLESS ALTERNATIVE (MORE STRINGENT) STANDARDS ARE SPECIFIED BY THE LOCAL AUTHORITY PRIOR TO RELEASE.

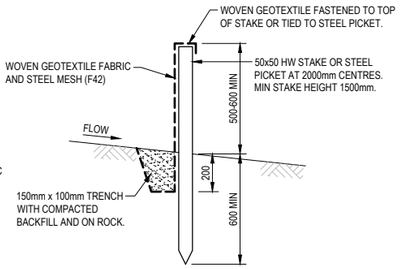
PARAMETER	RELEASE CRITERIA
SUSPENDED SOLIDS	50mg/l MAX
pH	WITHIN RANGE 6.5-8.5
VISUAL AMENITY	NO VISUAL PLUME

6. WATER TESTING TO BE UNDERTAKEN USING EITHER A HANDHELD PH/TURBIDITY METER OR SAMPLES COLLECTED FOR LABORATORY TESTING PRIOR TO BASIN DEWATERING.
7. THE SEDIMENT BASIN SHALL BE TREATED BY FLOCCULATION AFTER ALL RAINFALL EVENTS (> 5MM) USING GYPSUM OR ALUM. MANUAL DOSAGE OF BASIN SHALL BE UNDERTAKEN USING A MINIMUM RATE OF 32kg/100m3 FOR GYPSUM AND 1.5-8kg/100m3 FOR ALUM. HIGHER DOSAGE MAY BE REQUIRED DEPENDING ON SOIL TYPE AND APPLICATION TECHNIQUE.
8. THE CHOSEN FLOCCULENT SHALL BE SPREAD EVENLY OVER THE BASIN SURFACE AREA. THE BASIN WILL REQUIRE A PUMP SYSTEM TO SPRAY SLURRY OF FLOCCULANTS OVER SURFACE AT AN ANGLE OF 10 - 20 DEGREES.
9. THE TREATED BASIN SHALL BE DEWATERED WITH A PUMP SYSTEM WITH A FLOATING INLET TO ENSURE SETTLED SEDIMENT IS NOT ENTRAINED AND DISCHARGED.
10. BASIN DEWATERING SHALL OCCUR WITHIN 5 DAYS FROM CONCLUSION OF RAINFALL EVENT.
11. SEDIMENT BASINS WILL REQUIRE DEWATERING AND SEDIMENT CLEANOUT ONCE STORAGE CAPACITY REACHES 70%.
12. CAPTURED SEDIMENT WILL BE DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER AS TO NOT CAUSE FURTHER CONTAMINATION OR DOWNSTREAM POLLUTION. SEDIMENT SHOULD NOT BE DISPOSED OF IN CONCENTRATED FLOWS, WHERE IT CAN BE RE-ENTRAINED OR WHERE THE RECEIVING WATER HAS A PH OF < 5.5.
13. THE BASIN AND ALL OTHER CONTROL DEVICES WILL BE MAINTAINED IN AN OPERATIONAL STATE UNTIL SITE STABILISED.
14. REPAIR ANY SCOUR DAMAGE TO THE SEDIMENT BASIN BATTERS AND EMERGENCY SPILLWAY FOLLOWING RAINFALL EVENTS.
15. SEDIMENT BASIN SHOULD NOT BE CONSTRUCTED WITH SMOOTH INTERNAL SLOPES AND BASIN BATTERS SHOULD NOT BE STEEPER THEN 3(H):1(V).
16. BASINS SHOULD BE APPROPRIATELY FENCED AND MARKED BY WARNING SIGNS IF UNSUPERVISED PUBLIC ACCESS IS LIKELY AND PUBLIC SAFETY IS AT RISK.

NOTE: ALL NOTES ON THIS PAGE ARE MINIMUM REQUIREMENTS AND ARE TO BE CONFIRMED BY THE CERTIFYING CPESC OR RPEQ ENGINEER



ELEVATION



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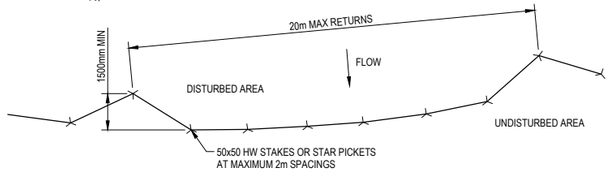
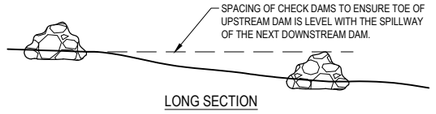


PLAN

SEDIMENT FENCE DETAIL

NTS

NOTES:
1. HORIZONTAL BAR STEEL MESH TO BE FLUSH WITH TOP OF GEOTEXTILE FABRIC WITH NO VERTICAL BARS PROTRUDING PAST TOP OF SEDIMENT FENCE.
2. NO SHADE CLOTH TO BE USED FOR SEDIMENT FENCING.
3. CATCHMENT DRAINING TO SEDIMENT FENCE SHOULD BE MAX 0.6ha.
4. UPSTEAM SLOPE TO BE 1:2 max AND SLOPE LENGTH 60m MAX.
5. SEDIMENT FENCES ARE TO BE INSTALLED PARALLEL TO CONTOURS WHERE POSSIBLE AND HAVE RETURNS EVERY 20m, TO LIMIT CONTRIBUTING CATCHMENT AND ENCOURAGE PONDING
6. SEDIMENT FENCES TO BE INSTALLED NO MORE THAN 5m FROM DISTURBED AREAS OR STOCKPILES.



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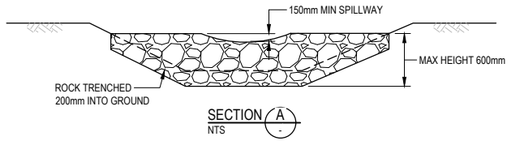

SECTION
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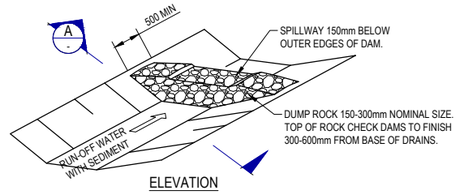
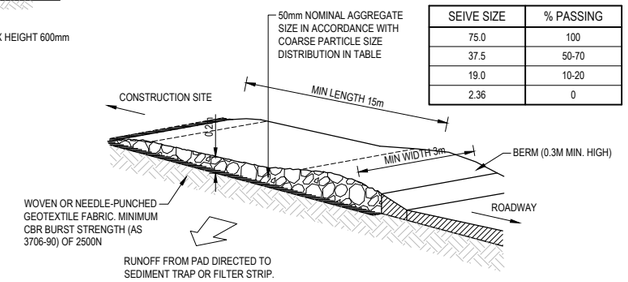


ELEVATION

ROCK CHECK DAM DETAIL

NTS

NOTES
1. INSPECT DAMS REGULARLY FOR SIGNS OF SCOUR, UNDERCUTTING AND SEDIMENT BUILD-UP.
2. MAINTAIN THE DAM SO THAT RUNOFF WILL FLOW THOUGH WASHED ROCK OR OVER SPILLWAY AND NOT ERODE STREAM BANKS.
3. REMOVE SEDIMENT ACCUMULATED BEHIND DAM WHEN NOTED.



SEIVE SIZE	% PASSING
75.0	100
37.5	50-70
19.0	10-20
2.36	0

TEMPORARY STABILISED SITE ENTRY/EXIT (ROCK)

NTS

NOTES:
1. STABILISED ACCESS SHOULD BE CLEANED AND MAINTAINED AFTER EVERY RAINFALL EVENT (>5mm) AND WHEN SEDIMENT ACCUMULATION IS NOTED.
2. FINE ACCUMULATED SEDIMENTS SHOULD BE REMOVED FROM AGGREGATE REGULARLY.

REV	DATE	BY	DESCRIPTION	CHK	APP
B	20/02/2025	FM	BASIN AMENDED	JM	SN
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

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PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: EROSION AND SEDIMENT CONTROL NOTES AND DETAILS SHEET 1 OF 2

SCALE @ A1:	CHECKED:	APPROVED:
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PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	20/02/2025

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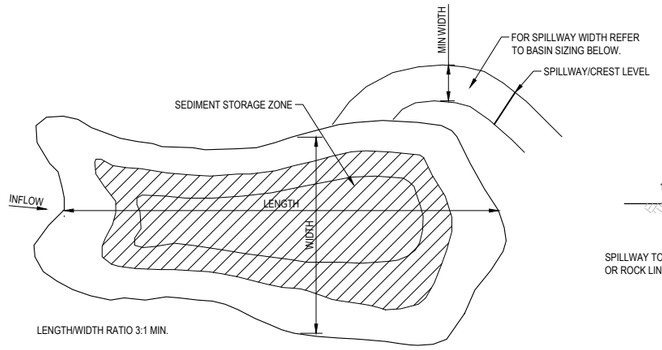
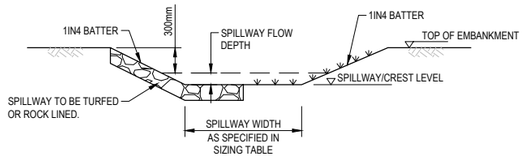
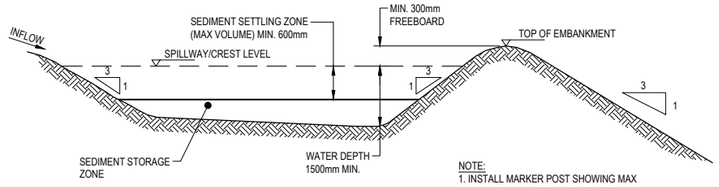
DO NOT SCALE



PLAN



TYPICAL SPILLWAY DETAIL
NTS



CROSS SECTION

NOTE:
1. INSTALL MARKER POST SHOWING MAX STORAGE AND SETTING ZONE DEPTHS.

SEDIMENT BASIN - TYPE D AND F DETAIL
NTS

TEMPORARY SEDIMENT BASIN SIZING (MINIMUM)

BASIN NAME	TOTAL VOLUME	SETTLING ZONE VOLUME	SEDIMENT STORAGE VOLUME	TOTAL CATCHMENT AREA	DISTURBED CATCHMENT AREA	SPILLWAY WIDTH	SPILLWAY FLOW DEPTH
BASIN A	3774m³	2516m³	1258m³	18.5ha	6.5ha	13m	200mm
BASIN B	816m³	544m³	272m³	4ha	4ha	11m	200mm
BASIN C	1632m³	1088m³	544m³	8ha	8ha	19m	200mm
BASIN D	245m³	163m³	82m³	1.2ha	1.2ha	4m	200mm
BASIN E	3468m³	2312m³	1156m³	17ha	4ha	25m	250mm
BASIN F	1020m³	680m³	340m³	5ha	1.2ha	13m	200mm
BASIN G	3672m³	2448m³	1224m³	18ha	10ha	20m	200mm

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LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: EROSION AND SEDIMENT CONTROL NOTES AND DETAILS SHEET 2 OF 2

SCALE @ A1:	CHECKED:	APPROVED:
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PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	20/02/2025

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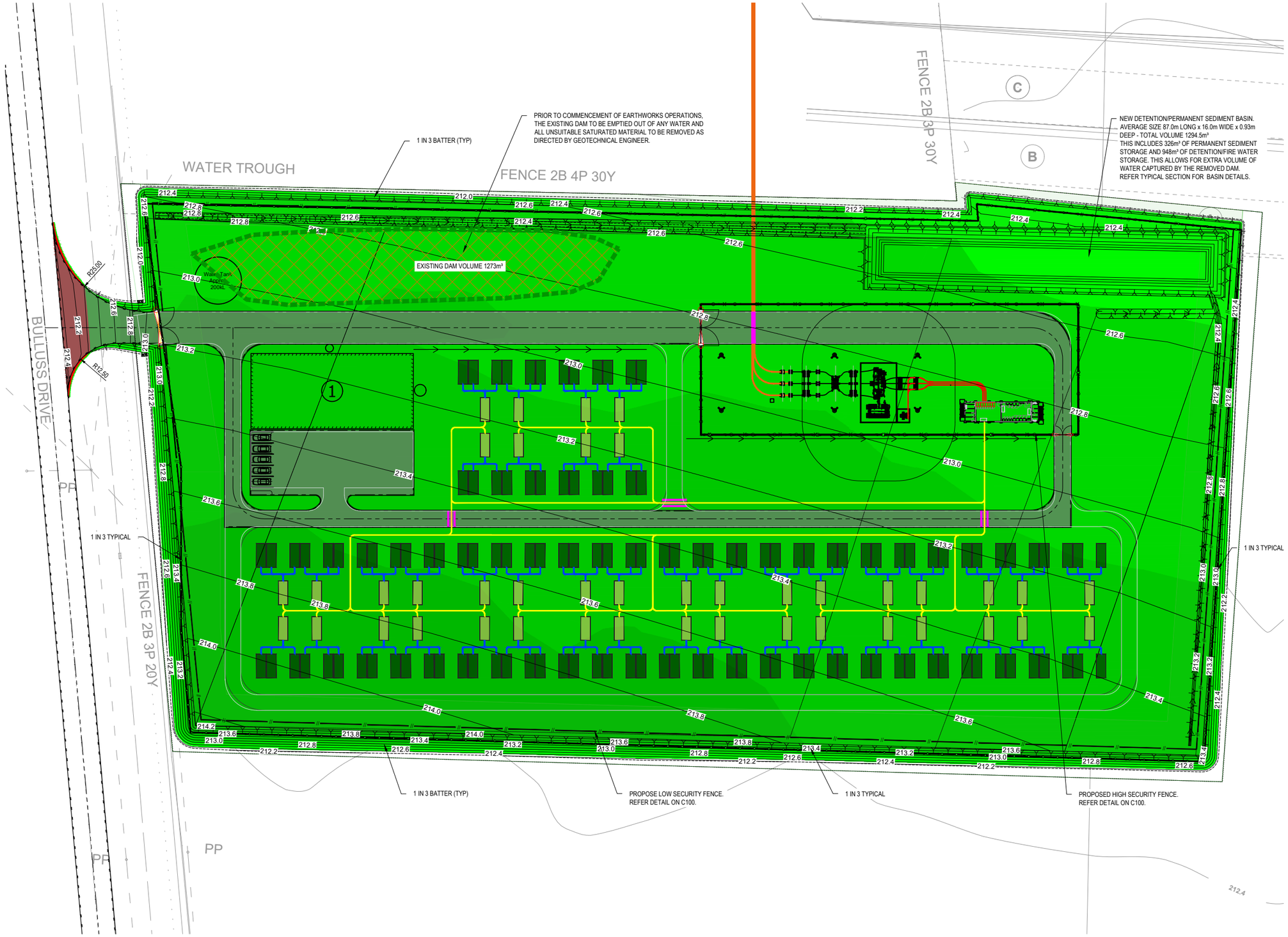
DO NOT SCALE



LEGEND

- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- 250 — PROPOSED FINISHED BULK EARTHWORKS LEVELS CONTOUR
- BE250.00+ — PROPOSED BULK EARTHWORKS LEVEL
- PROPOSED CUT-OFF DRAIN
- PROPOSED LOW SECURITY FENCE TYPE

BULK EARTHWORKS DEPTHS

-5.0	to	-4.5	m	
-4.5	to	-4.0	m	
-4.0	to	-3.5	m	
-3.5	to	-3.0	m	
-3.0	to	-2.5	m	
-2.5	to	-2.0	m	
-2.0	to	-1.5	m	
-1.5	to	-1.0	m	
-1.0	to	-0.5	m	
-0.5	to	0	m	
0	to	0.5	m	
0.5	to	1.0	m	
1.0	to	1.5	m	
1.5	to	2.0	m	
2.0	to	2.5	m	
2.5	to	3.0	m	
3.0	to	3.5	m	
3.5	to	4.0	m	
4.0	to	4.5	m	
4.5	to	5.0	m	

BULK EARTHWORKS CUT/FILL VOLUMES

*ALLOW FOR 100mm STRIPPING (NO GEOTECHNICAL REPORT PROVIDED - DEPTH TO BE CONFIRMED)

TOTAL CUT	-405.600
TOTAL FILL	41779.615
EXCESS OF CUT OVER FILL	41374.015

20 10 0 20 40 60m
1:1000 @A1

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ARCHITECT: -

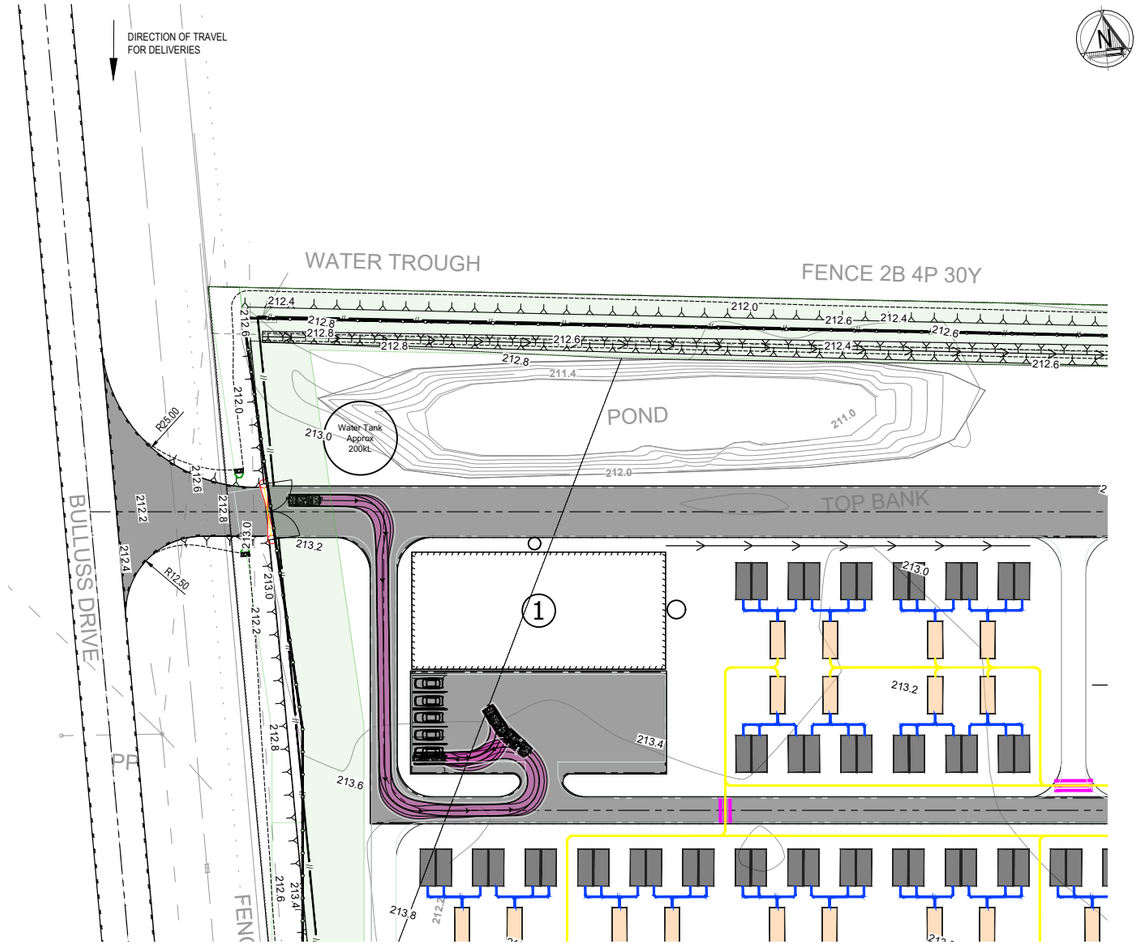
PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

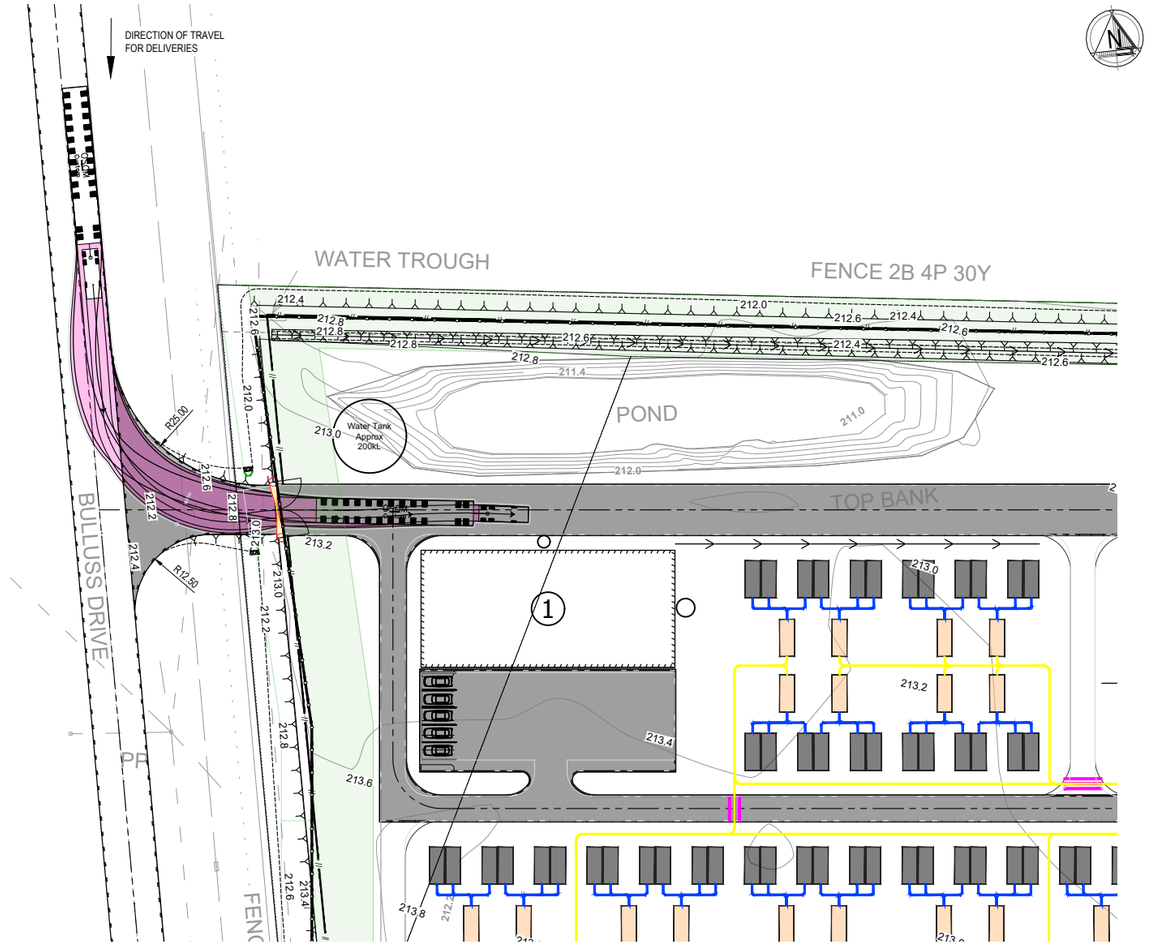
TITLE: BULK EARTHWORKS LAYOUT PLAN

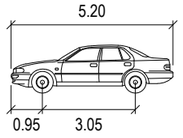
SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C010 REV: A

DO NOT SCALE

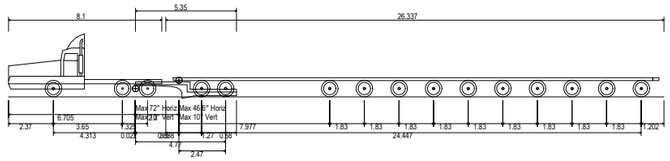






Width	:	1.94m
Track	:	1.84m
Lock to Lock Time	:	6.0m
Steering Angle	:	33.6m

PASSENGER-CAR
NTS



Drake 10 (4 Row) (4.00Trailer) (3.73m Dolly)

Overall Length	34.654m
Overall Width	4.000m
Overall Body Height	3.341m
Min Body Ground Clearance	-0.062m
Max Track Width	4.000m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	23.400m

OSOM DESIGN VEHICLE PROFILE
NTS

REV	DATE	BY	DESCRIPTION	CHK	APP
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

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http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: VEHICLE TURNING PATHS
LAYOUT PLAN

SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C011 REV: A

DO NOT SCALE

LEGEND

- PROPOSED STORMWATER DRAINAGE PIT, PIPE AND MANHOLE
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- 250 — PROPOSED FINISHED PLATFORM LEVELS CONTOUR
- PROPOSED CUT-OFF DRAIN
- PROPOSED HIGH SECURITY FENCE TYPE
- PROPOSED LOW SECURITY FENCE TYPE
- SMK — PROPOSED SEMI MOUNTABLE KERB
- SMK (SL) — PROPOSED SLOTTED MOUNTABLE KERB (SL)
- PROPOSED 2 COAT SEAL PAVEMENT - REFER DWG C100

WATER TROUGH

PROPOSED TABLE DRAIN.
REFER DETAIL ON C100.
LENGTH 168m
GRADE 0.2%

FENCE 2B 4P 30Y

FENCE 2B 3P 30Y

POND

TOP BANK

DETENTION/SEDIMENT BASIN RL 211.52

OUT/A8

TOB 212.7

SECTION A

SECTION C

SECTION D

BULLUSS DRIVE

82

DP751780

FENCE 2B 3P 20Y

PP

SMK

PROPOSED TABLE DRAIN.
REFER DETAIL ON C100.
LENGTH 111m
GRADE 0.8%

REV	DATE	BY	DESCRIPTION	CHK	APP
C	01/09/2025	FM	DRAINAGE AMENDED	JM	SN
B	20/02/2025	FM	BASIN AMENDED	JM	SN
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

20 10 0 20 40 60m
1:1000 @A1

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: ROAD WORKS AND STORMWATER DRAINAGE LAYOUT PLAN - OPTION A

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C030-A

REV: C

DO NOT SCALE

LEGEND

- PROPOSED STORMWATER DRAINAGE PIT, PIPE AND MANHOLE
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- 250 — PROPOSED FINISHED PLATFORM LEVELS CONTOUR
- PROPOSED CUT-OFF DRAIN
- PROPOSED HIGH SECURITY FENCE TYPE
- PROPOSED LOW SECURITY FENCE TYPE
- SMK — PROPOSED SEMI MOUNTABLE KERB
- SMK (SL) — PROPOSED SLOTTED MOUNTABLE KERB (SL)
- PROPOSED 2 COAT SEAL PAVEMENT - REFER DWG C100
- PROPOSED OCEAN PROTECT JELLYFISH FILTER 3300-28-5 GPT

PROPOSED TABLE DRAIN. REFER DETAIL ON C100. LENGTH 168m GRADE 0.2%

PROPOSED TABLE DRAIN. REFER DETAIL ON C100. LENGTH 111m GRADE 0.8%

WATER TROUGH

FENCE 2B 4P 30Y

FENCE 2B 3P 30Y

FENCE 2B 3P 20Y

POND

TOP BANK

DETENTION/SEDIMENT BASIN RL 211.52

BULLUSS DRIVE

82

DP751780

PP

SMK

Ø900x450 RCBC US IL 0.000 DS IL 0.000 LENGTH 12m GRADE 1%

Ø450 RCP US IL 0.000 DS IL 0.000 LENGTH 61m GRADE 0.4%

Ø600 RCP US IL 0.000 DS IL 0.000 LENGTH 89m GRADE 0.54%

Ø750 RCP US IL 0.000 DS IL 0.000 LENGTH 14m GRADE 0.4%

Ø825 RCP US IL 0.000 DS IL 0.000 LENGTH 6m GRADE 0.9%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 7m GRADE 2.2%

Ø100 RCP US IL 0.000 DS IL 0.000 LENGTH 10m GRADE 1%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 32m GRADE 0.5%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 18m GRADE 0.9%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 11m GRADE 0.9%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 4m GRADE 0.4%

Ø375RCP US IL 0.000 DS IL 0.000 LENGTH 10m GRADE 0.9%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 10m GRADE 0.4%

Ø600 RCP US IL 0.000 DS IL 0.000 LENGTH 31m GRADE 0.9%

Ø600 RCP US IL 0.000 DS IL 0.000 LENGTH 15m GRADE 0.4%

Ø600 RCP US IL 0.000 DS IL 0.000 LENGTH 13m GRADE 0.9%

Ø375 RCP US IL 0.000 DS IL 0.000 LENGTH 35m GRADE 0.4%

Ø450 RCP US IL 0.000 DS IL 0.000 LENGTH 50m GRADE 0.4%

Ø525 RCP US IL 0.000 DS IL 0.000 LENGTH 38m GRADE 0.4%

B1 0.2038HA

B2 0.0504HA

C1 0.2320HA

D4 0.0792HA

D2 0.1644HA

D1 0.0691HA

E1 0.1728HA

A1 0.2498HA

A2 0.2104HA

A3 0.2938HA

A4 0.2272HA

IL 213.200

IL 212.81

IL 212.93

IL 212.84

IL 212.65

IL 212.50

IL 213.45

SECTION A

SECTION C

SECTION D

TOB 212.7

OUT/A8

20 10 0 20 40 60m
1:1000 @A1

REV	DATE	BY	DESCRIPTION	CHK	APP
A	01/09/2025	HN	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

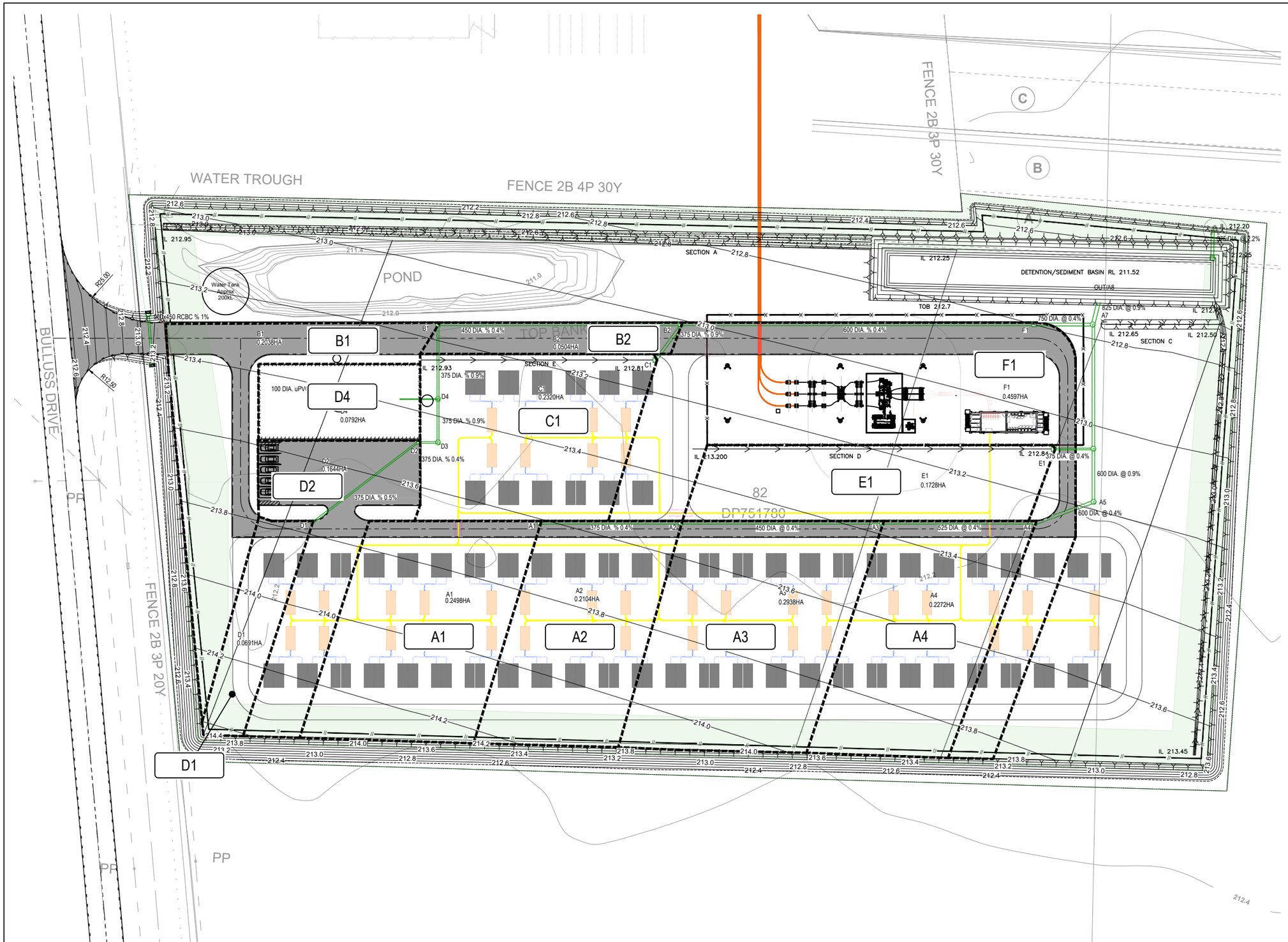
PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: ROAD WORKS AND STORMWATER DRAINAGE LAYOUT PLAN - OPTION B

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C030-B REV: A

DO NOT SCALE



LEGEND

- PROPOSED STORMWATER DRAINAGE PIT, PIPE AND MANHOLE
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- PROPOSED FINISHED PLATFORM LEVELS CONTOUR
- PROPOSED CUT-OFF DRAIN
- PROPOSED HIGH SECURITY FENCE TYPE
- PROPOSED LOW SECURITY FENCE TYPE
- PROPOSED CATCHMENT BOUNDARY
- A1 PROPOSED CATCHMENT NUMBER

CATCHMENT AREA

CATCHMENT ID	CATCHMENT AREA (ha)
A1	0.2498
A2	0.2104
A3	0.2938
A4	0.2272
B1	0.2038
B2	0.0504
C1	0.2320
D1	0.0691
E1	0.1728
F1	0.1728

20 10 0 20 40 60m
1:1000 @A1

REV	DATE	BY	DESCRIPTION	CHK	APP
B	01/09/2025	FM	DRAINAGE AMENDED	JM	SN
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: STORMWATER CATCHMENTS LAYOUT PLAN OPTION A

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C031-A REV: B

DO NOT SCALE

LEGEND

- PROPOSED STORMWATER DRAINAGE PIT, PIPE AND MANHOLE
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- 250 PROPOSED FINISHED PLATFORM LEVELS CONTOUR
- PROPOSED CUT-OFF DRAIN
- PROPOSED HIGH SECURITY FENCE TYPE
- PROPOSED LOW SECURITY FENCE TYPE
- PROPOSED CATCHMENT BOUNDARY
- A1 PROPOSED CATCHMENT NUMBER
- PROPOSED OCEAN PROTECT JELLYFISH FILTER 3300-28-5 GPT

CATCHMENT AREA

CATCHMENT ID	CATCHMENT AREA (ha)
A1	0.2498
A2	0.2104
A3	0.2938
A4	0.2272
B1	0.2038
B2	0.0504
C1	0.2320
D1	0.0691
E1	0.1728
F1	0.1728

20 10 0 20 40 60m
1:1000 @A1

REV	DATE	BY	DESCRIPTION	CHK	APP
A	01/09/2025	HN	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: STORMWATER CATCHMENTS LAYOUT PLAN OPTION B

SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C031-B REV: A

DO NOT SCALE

N

LEGEND

- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- 250 PROPOSED FINISHED PLATFORM LEVELS CONTOUR
- PROPOSED HIGH SECURITY FENCE TYPE
- PROPOSED LOW SECURITY FENCE TYPE

WATER TROUGH

FENCE 2B 4P 30Y

FENCE 2B 3P 30Y

POND

Water Tank Approx 200kL

DOUBLE SECURITY GATE REFER DETAIL ON C100.

DOUBLE SECURITY GATE REFER DETAIL ON C100.

PROPOSED HIGH SECURITY FENCE. REFER DETAIL ON C100.

DOUBLE SECURITY GATE REFER DETAIL ON C100.

TOP BANK

BULLUSS DRIVE

FENCE 2B 3P 20Y

82

DP751780

PROPOSED LOW SECURITY FENCE. REFER DETAIL ON C100.

PP

20 10 0 20 40 60m
1:1000 @A1

REV	DATE	BY	DESCRIPTION	CHK	APP
A	28/03/2024	EH	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

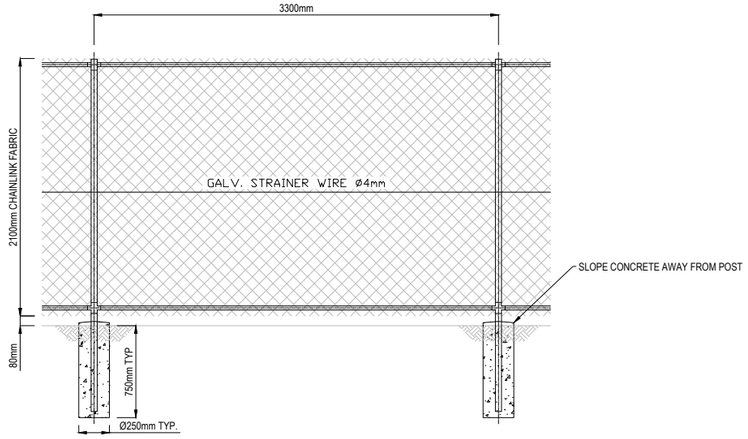
PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: FENCE LAYOUT PLAN

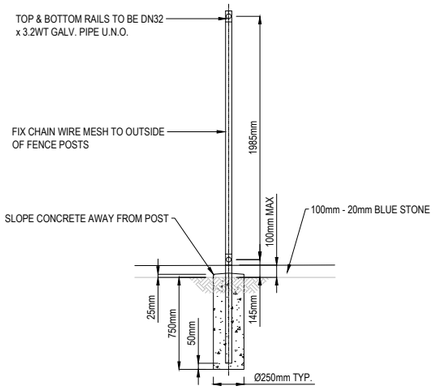
SCALE @ A1:	CHECKED:	APPROVED:
1:500	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	01/09/2025

DRAWING No: C032 REV: A

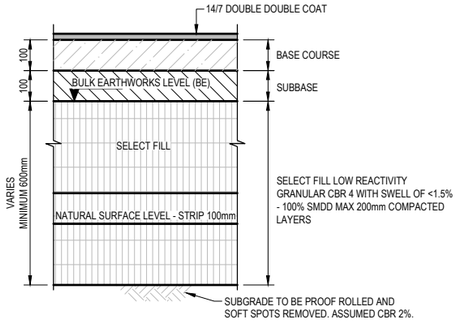
DO NOT SCALE



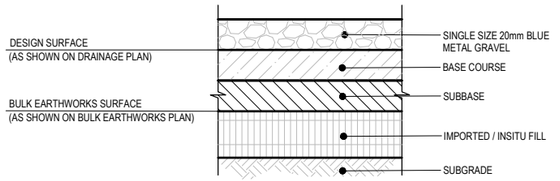
LOW SECURITY FENCE ELEVATION
SCALE 1:25



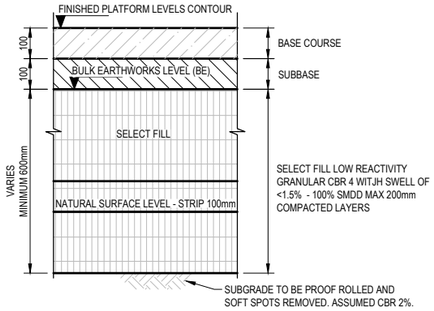
TYP LOW SECURITY FENCE POST
SCALE 1:25



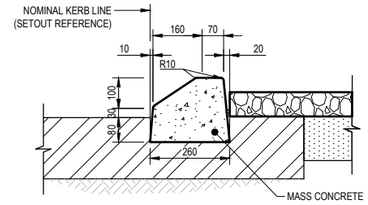
TYPICAL SEALED INTERANL ROADWAY
SCALE 1:10



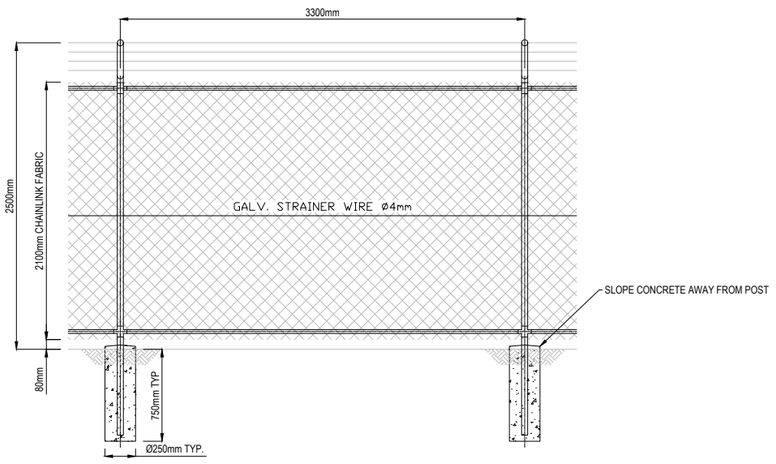
TYPICAL SWITCHYARD SURFACING
SCALE 1:10



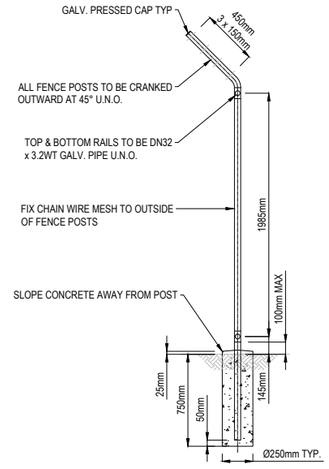
TYPICAL ACCESS TRACK & BESS YARD PAVEMENT DETAIL
SCALE 1:10



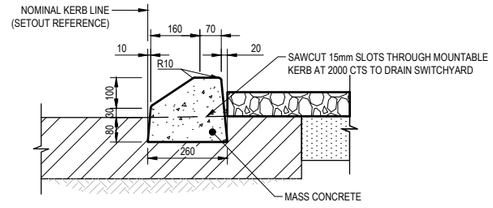
SEMI MOUNTABLE KERB - SMK
SCALE 1:10
RMS STANDARD SF KERB
IN ACCORDANCE WITH RMS STANDARD DRAWING R0300-01



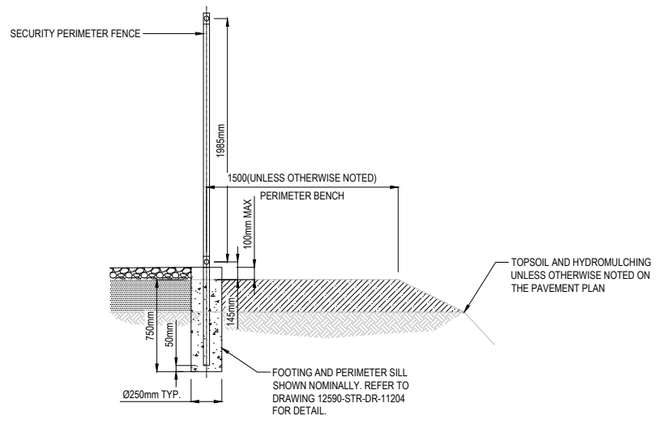
HIGH SECURITY FENCE ELEVATION
SCALE 1:25



TYP HIGH SECURITY FENCE POST
SCALE 1:25



SLOTTED MOUNTABLE KERB - SMK (SL)
SCALE 1:10
RMS STANDARD SF KERB
IN ACCORDANCE WITH RMS STANDARD DRAWING R0300-01



TYP PERIMETER BENCH DETAIL - LOW SECURITY PERIMETER FENCE
SCALE 1:25

PAVEMENT SCHEDULE

DESIGNATION	LAYER	THICKNESS	MATERIAL QUALITY	COMPACTION REQUIREMENTS
BESS YARD BENCH	CRUSHED ROCK	100mm - BESS YARD 100mm - SUBSTATION 100mm - O&M AREA	SIZE 20mm (BLUE METAL GRAVEL)	NONE
	BASE COURSE	100	PLASTICITY INDEX OF BETWEEN 6% AND 12%; 4-DAY SOAKED (BR OF AT LEAST 80%; MAXIMUM PARTICLE SIZE OF 20mm; BETWEEN 35% AND 65% OF MATERIAL TO BE RETAINED ON A 2.36mm SIEVE; A FINES (% LESS THAN 0.075mm) CONTENT OF BETWEEN 10% AND 40% MAXIMUM AGGREGATE WET/DRY STRENGTH VARIATION OF 35%.	MINIMUM 98% MODIFIED COMPACTION
SUBSTATION BENCH	SUBBASE COURSE	100mm - BESS YARD 100mm - SUBSTATION 100mm - O&M AREA	CONFORM TO AUSROADS (2008), APPENDIX B - "CLASS 3" CRUSHED ROCK, OR IPWEA NSW (2010), "CLASS R2"	MINIMUM 95% MODIFIED COMPACTION
O&M YARD BENCH	SELECT	600	LOW PERMEABILITY MATERIAL WITH A MINIMUM CBR VALUE OF 4% AND CBR SWELL < 1.5%,	MINIMUM 98% STANDARD COMPACTION
	SUBGRADE	-	MINIMUM CBR 2% WITH THE TOP 150mm BELOW SUBGRADE LEVEL HAVING A CBR VALUE OF ATLEAST 4% OR LIME STABILISATION OF SUBGRADE TO A DEPTH OF 200mm, TARGETING A CBR VALUE OF AT LEAST 4%.	MINIMUM 98% STANDARD COMPACTION

REV	DATE	BY	DESCRIPTION	CHK	APP
C	27/08/2025	FM	TABLE AMENDED	JM	SN
B	20/02/2025	FM	BASIN AMENDED	JM	SN
A	28/03/2024	FM	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

wsp
http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

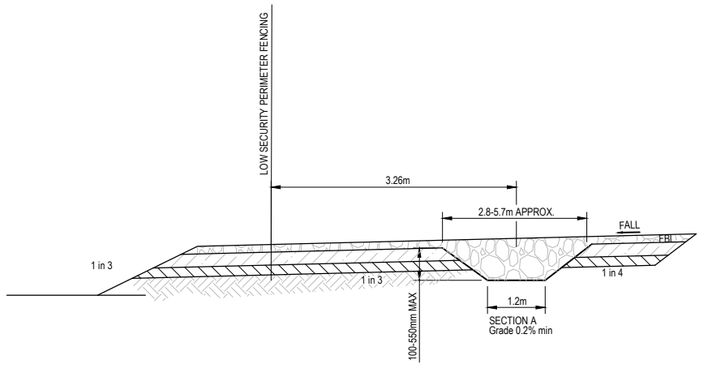
PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: CIVIL DETAILS
SHEET 1 OF 2

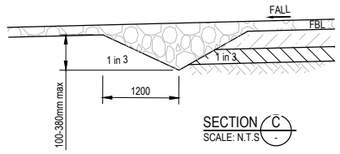
SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	27/08/2025

DRAWING No: C100 REV: C

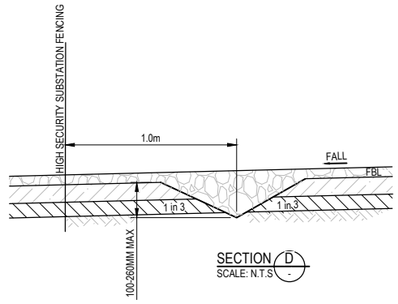
DO NOT SCALE



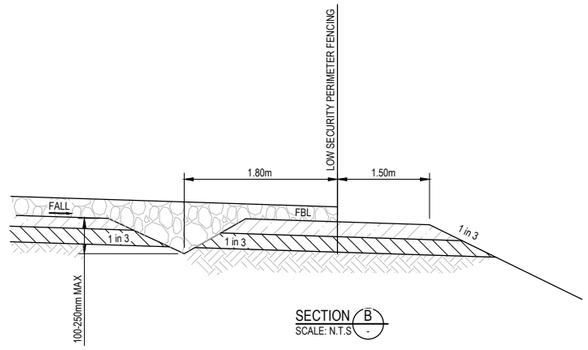
SECTION A
SCALE: N.T.S



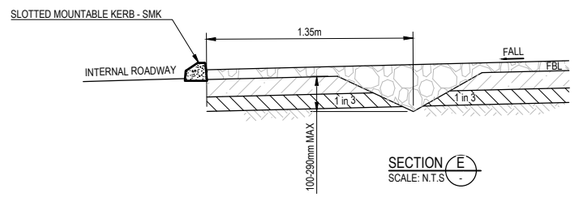
SECTION C
SCALE: N.T.S



SECTION D
SCALE: N.T.S



SECTION B
SCALE: N.T.S



SECTION E
SCALE: N.T.S

REV	DATE	BY	DESCRIPTION	CHK	APP
B	20/02/2025	FM	BASIN AMENDED	JM	SN
A	28/03/2024	KU	PRELIMINARY ISSUE	JM	SN

DRAWING STATUS: PRELIMINARY

http://www.wsp.com

CLIENT: NSW GOVERNMENT

ARCHITECT: -

PROJECT: MOREE BESS
LOTS 82 & 144, DP 751782 AND LOT 201, DP 1186601
BULLUSS DRIVE, MOREE NSW 2400

TITLE: CIVIL DETAILS
SHEET 2 OF 2

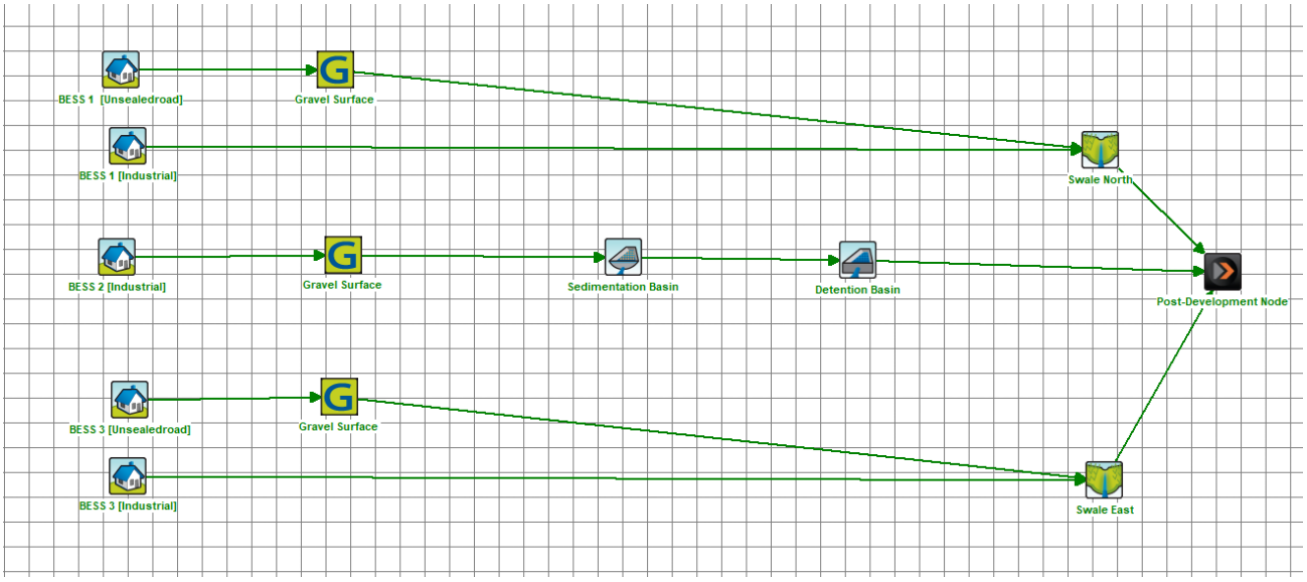
SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	JM	SN
PROJECT NUMBER:	DRAWN:	DATE:
PS212248	FM	20/02/2025

DRAWING No: C101 REV: B

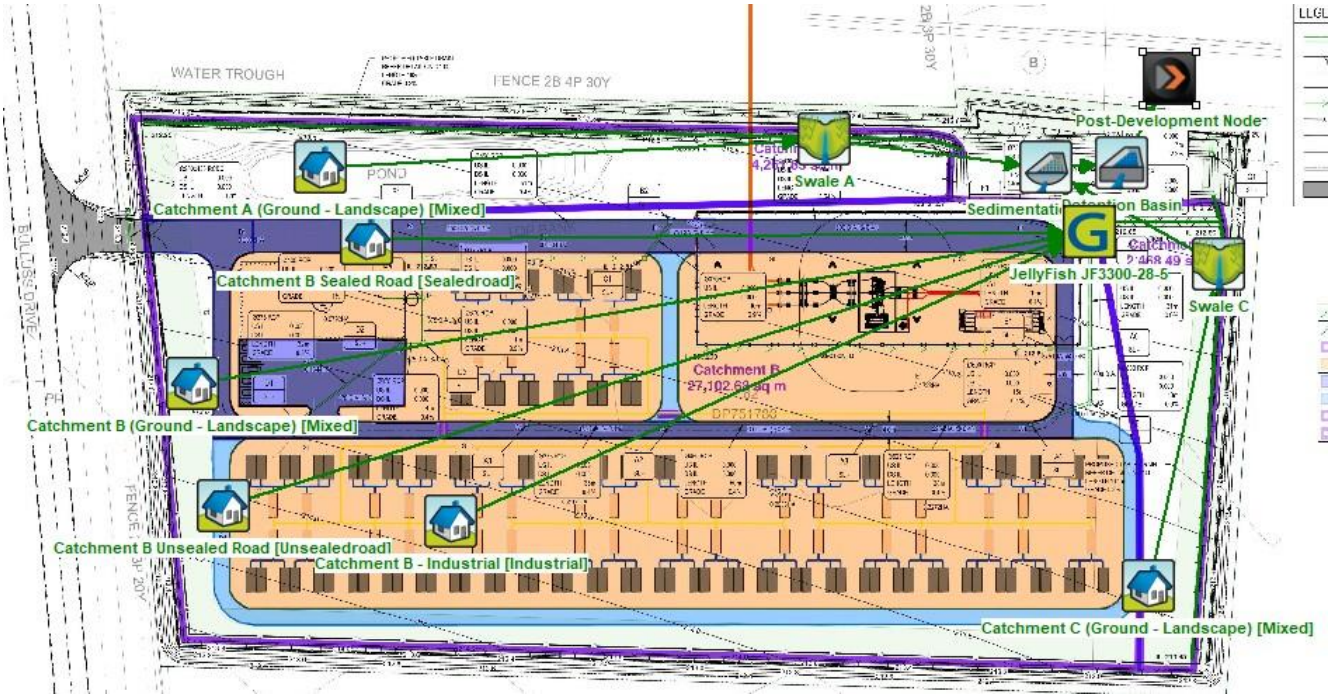
Appendix C

MUSIC Model

C1 Option A

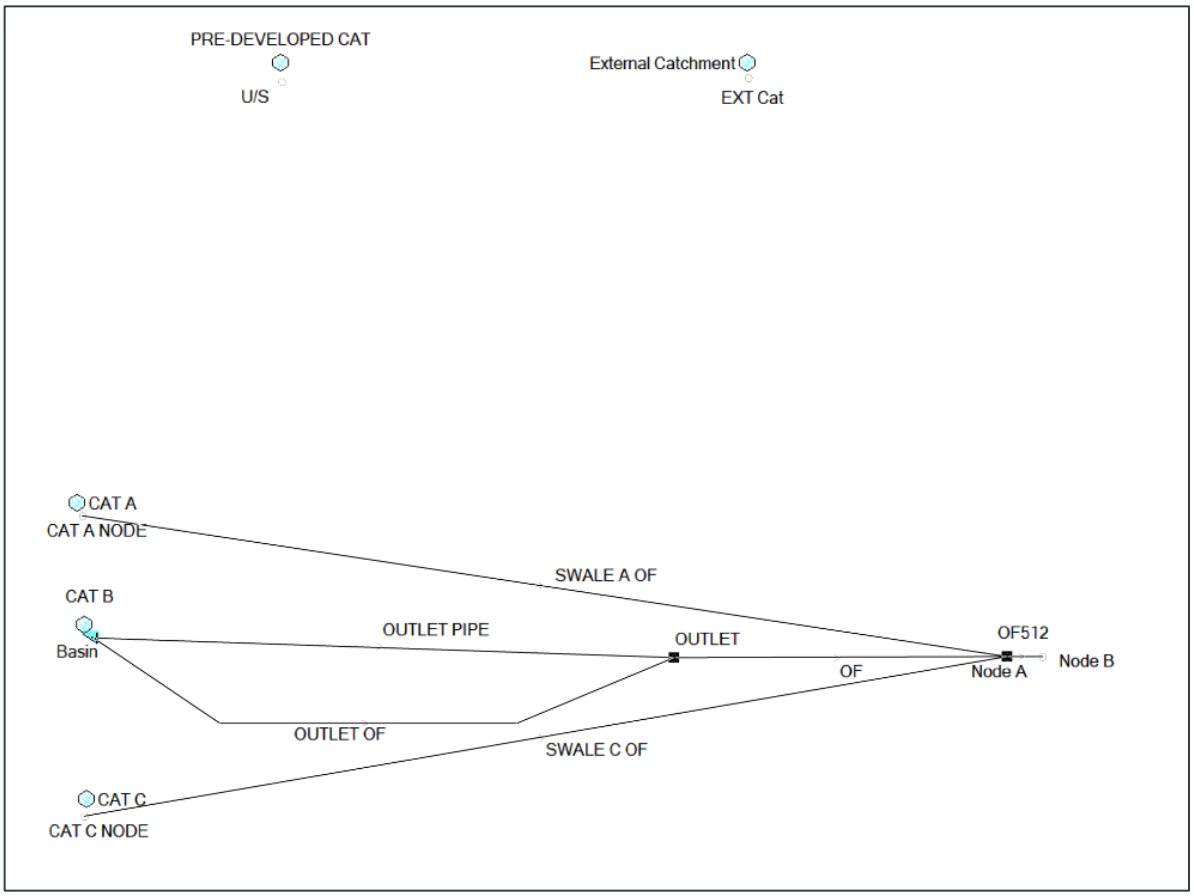


C2 Option B



Appendix D

DRAINS Model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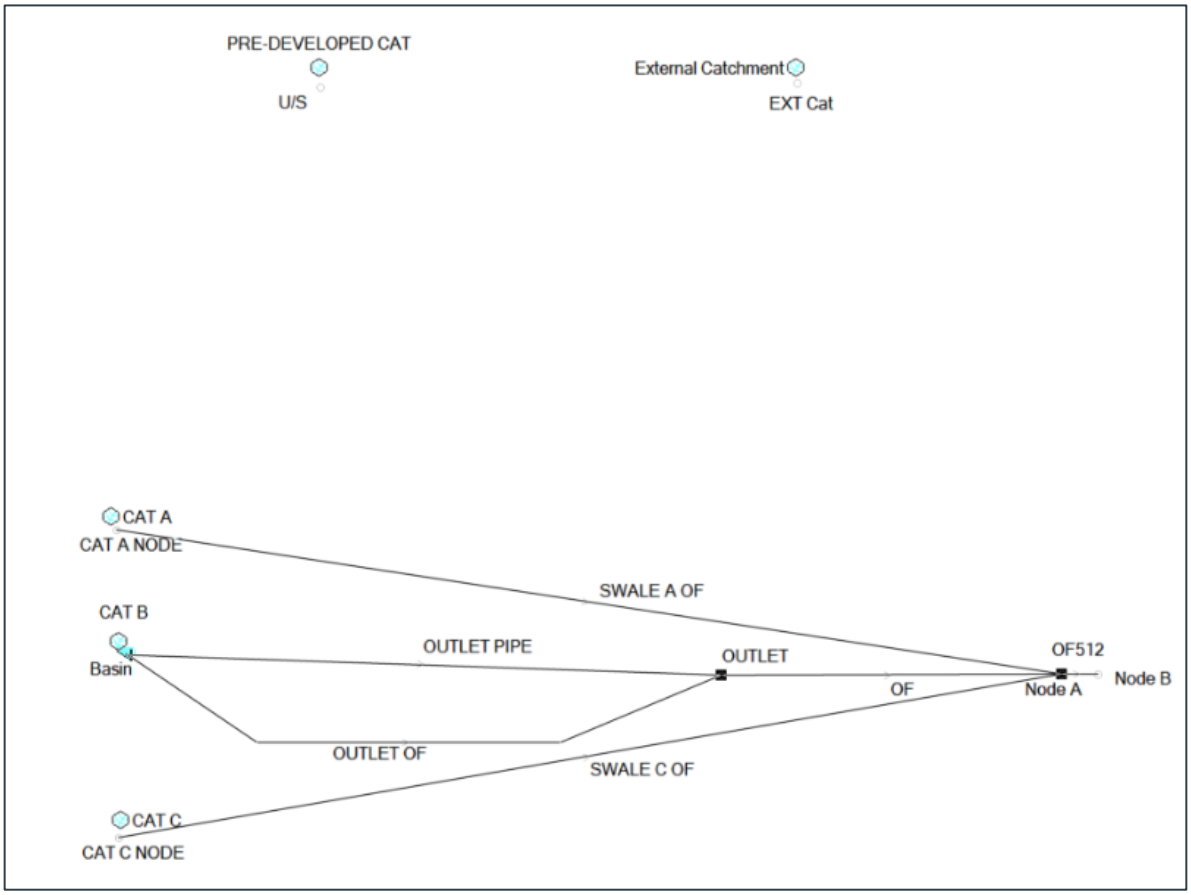
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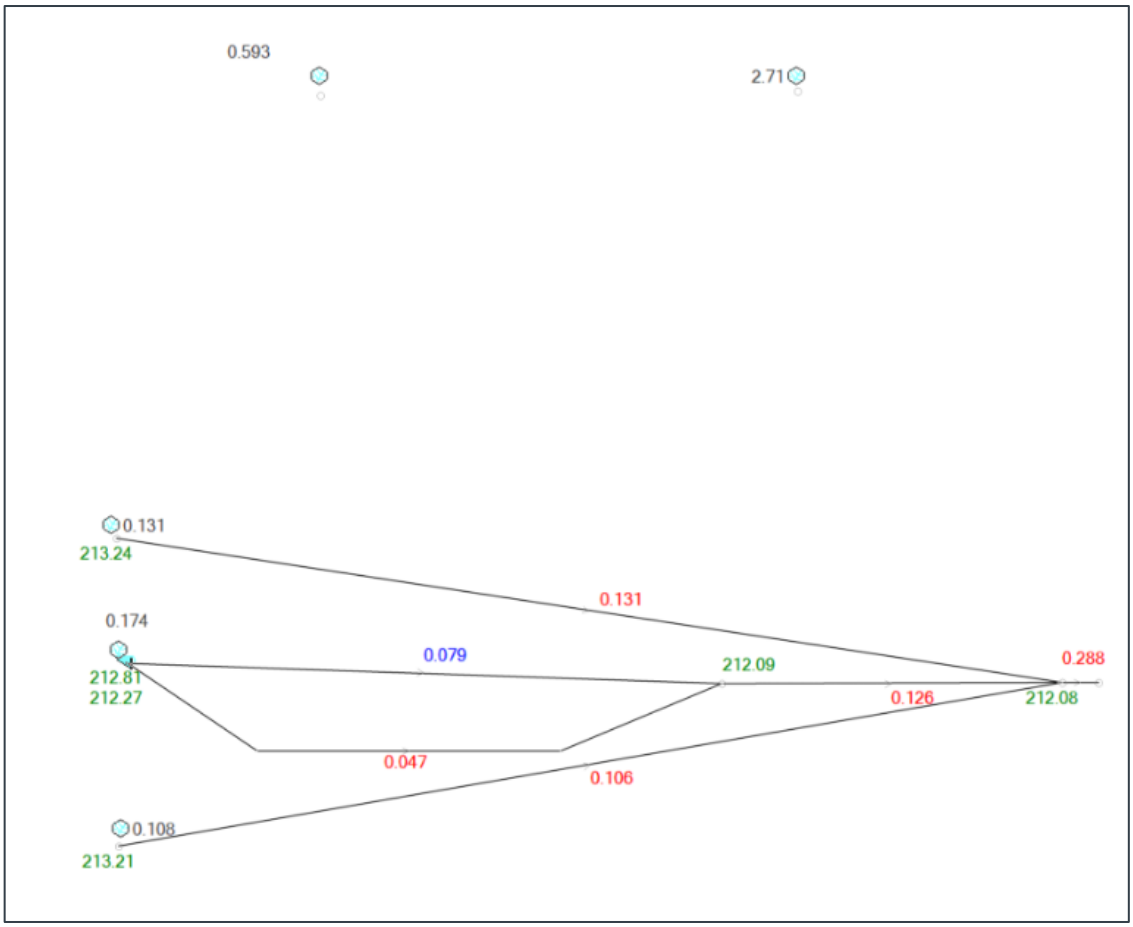
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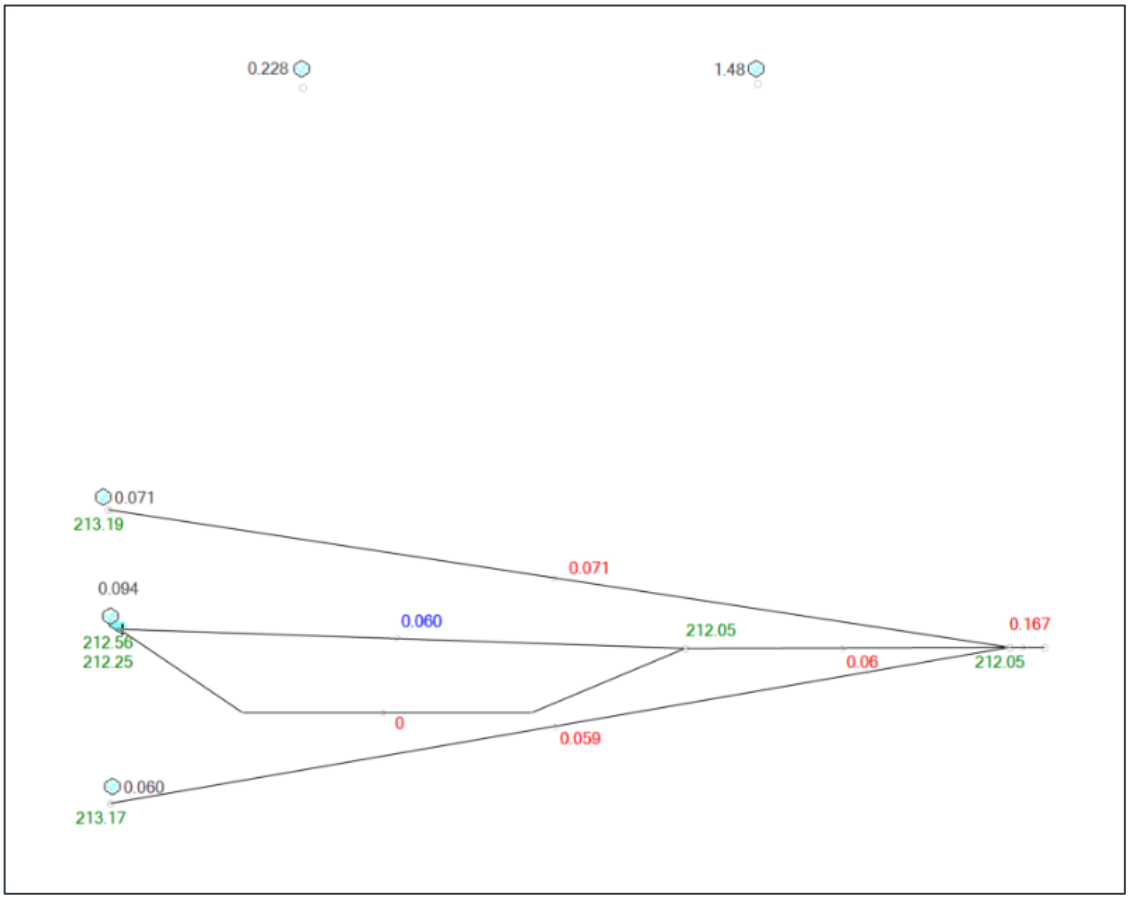
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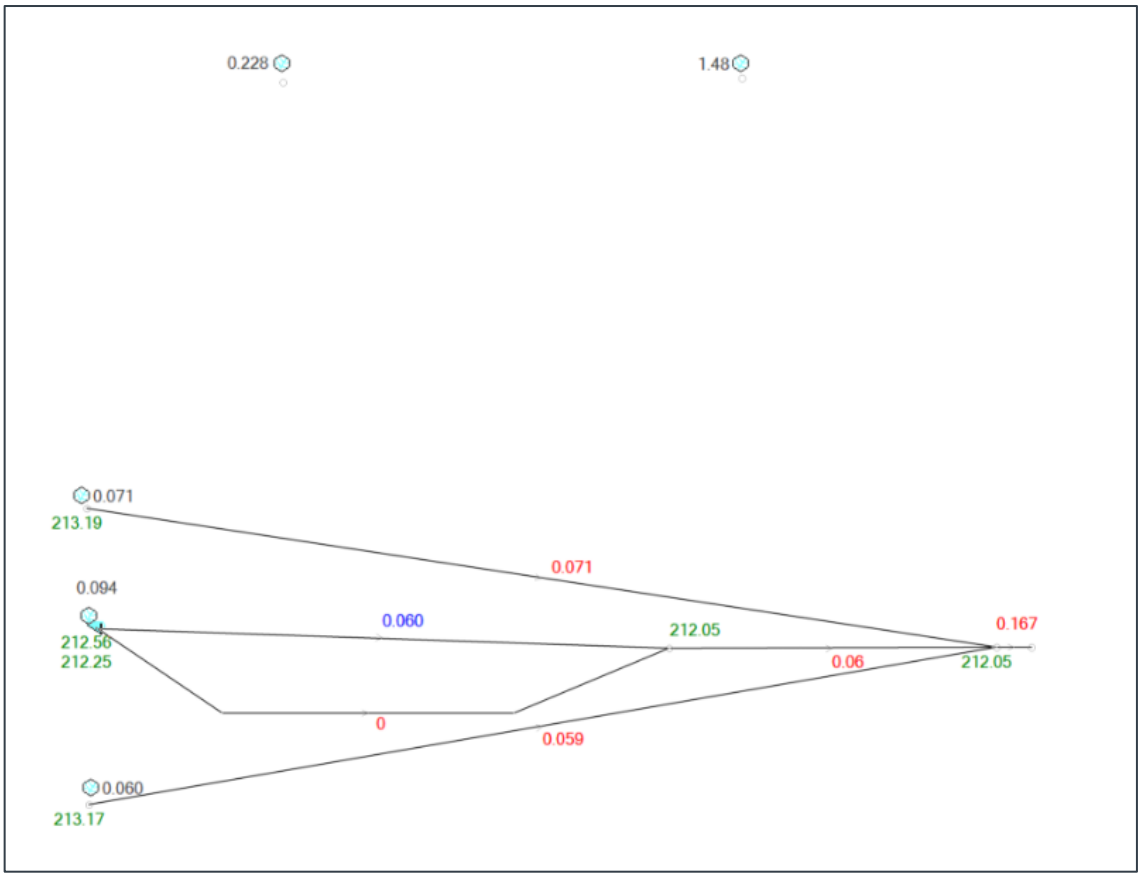
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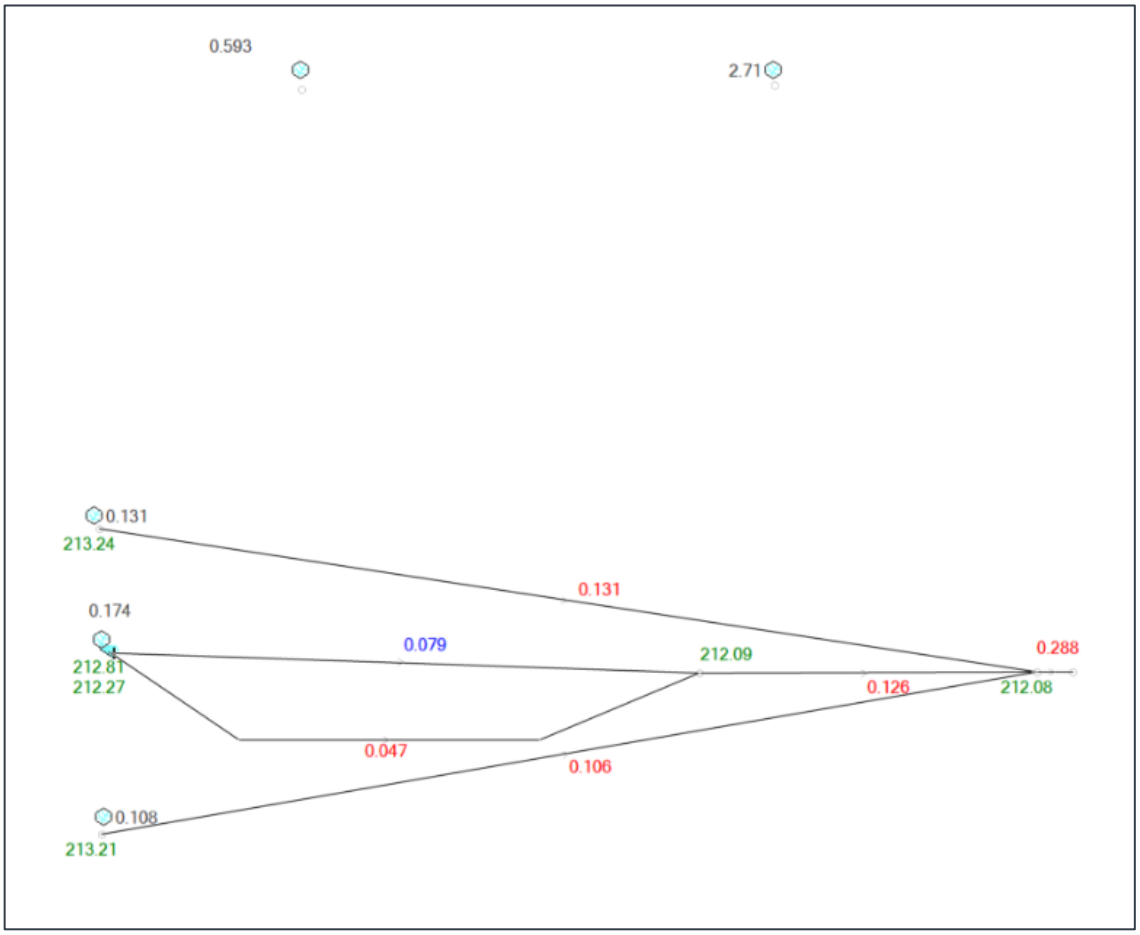
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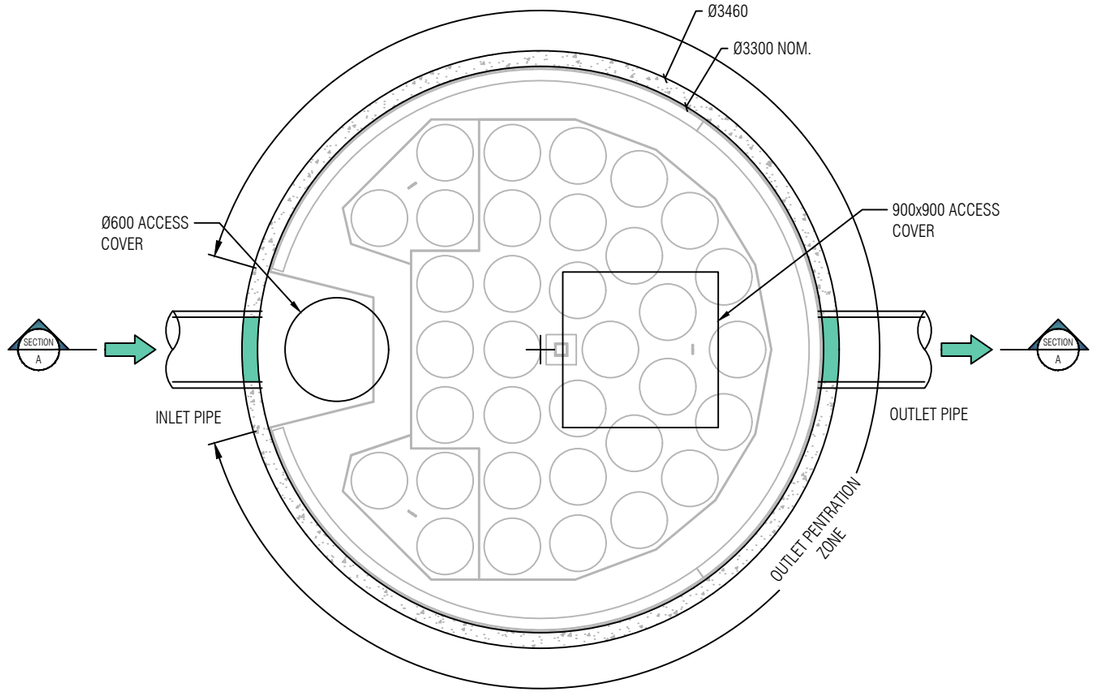
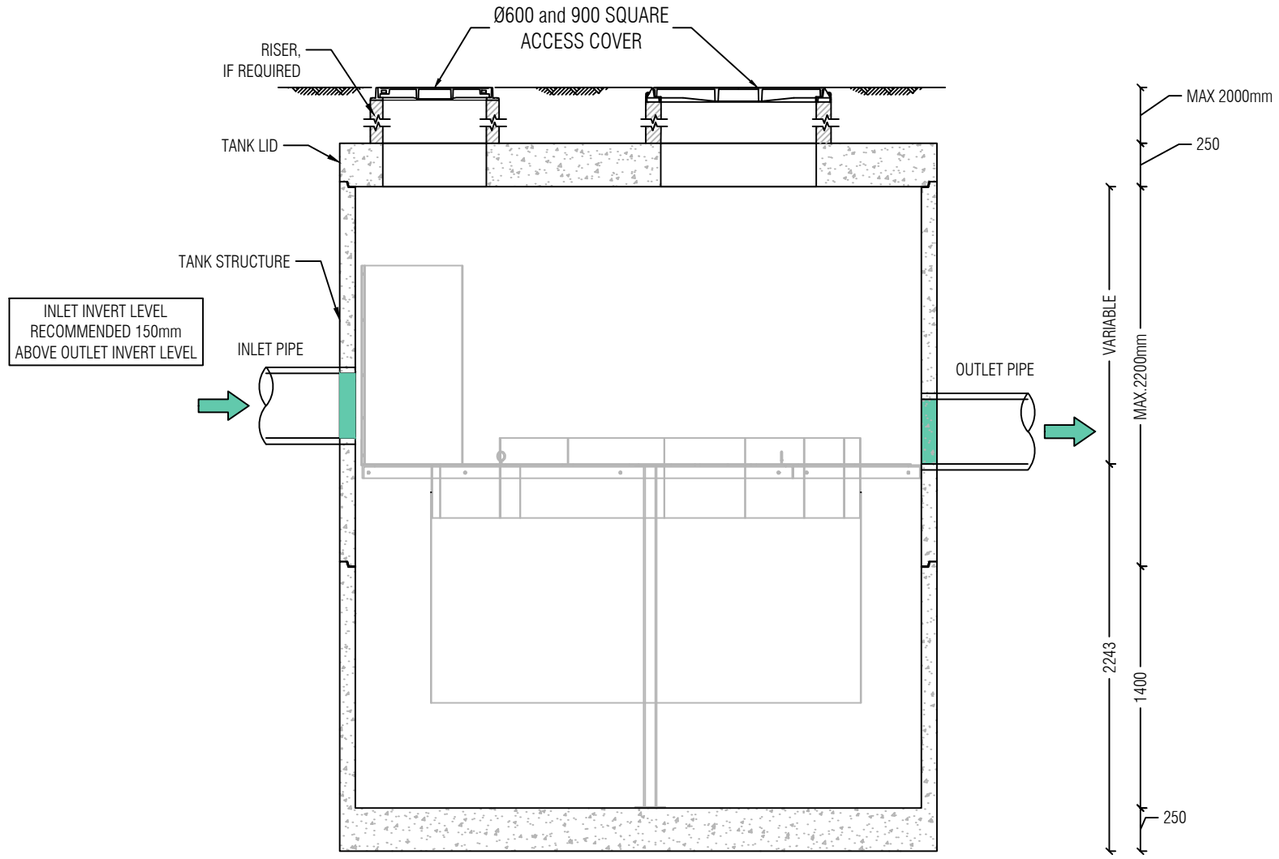
Appendix E

Ocean Protect Jellyfish 3300 Specification Drawing and Jellyfish Filter Technical Design Guide

NOT FOR CONSTRUCTION



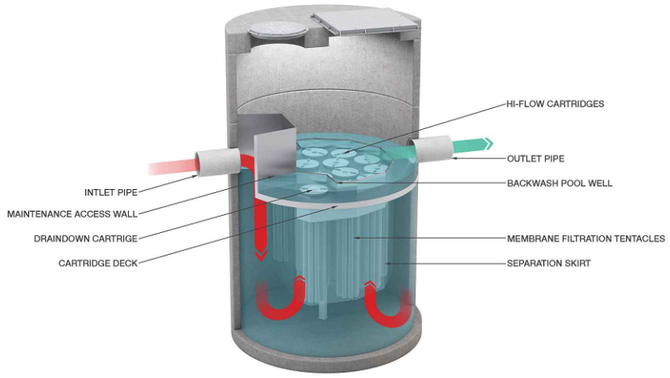
PLAN LAYOUT



SECTION A

LAST MODIFIED: 28-08-24

JELLYFISH DESIGN PARAMETERS (OFFLINE ONLY)



JELLYFISH TREATMENT FLOW IS A FUNCTION OF THE NUMBER OF CARTRIDGES AND THE DEVICE TOTAL HEAD DIFFERENTIAL. IF THE PIPE FLOW EXCEEDS THE TREATMENT FLOW THEN AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

# OF CARTRIDGES REQ'D (HF - DD)	UP TO 28-6
MAX. COMPONENT WEIGHT (kg) *MASS VARIABLE	9100
TANK LID WEIGHT (kg)	5100
MAXIMUM NOMINAL PIPE SIZE (mm)	Ø450

NOTE: TANK SUPPLIED IN MULTIPLE PARTS TO BE JOINED ON SITE

MINIMUM DEVICE TOTAL HEAD DIFFERENTIAL [mm]	460		310		230	
CARTRIDGE LENGTH [mm]	1375	686	1375	686	1375	686
CARTRIDGE FLOW RATE FOR HIGH-FLOW [L/s]	5	2.5	3.34	1.68	2.52	1.27
CARTRIDGE FLOW RATE FOR DRAINDOWN [L/s]	2.5	1.25	1.96	0.98	1.58	0.79
OUTLET INVERT TO STRUCTURE INVERT [mm]	1993	1304	1993	1304	1993	1304

GENERAL NOTES/ STRUCTURAL DESIGN CRITERIA

1. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF THE PROJECT.
2. PRECAST STRUCTURE SUPPLIED WITH PENETRATIONS TO SUIT OUTER DIAMETER OF NOMINATED PIPE SIZE / MATERIAL.
3. PRECAST STRUCTURE SHALL MEET W80 WHEEL LOAD RATING ASSUMING A MAXIMUM EARTH COVER OF 2.0m AND A GROUND WATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. CERTIFYING ENGINEER TO CONFIRM ACTUAL GROUNDWATER ELEVATION. PRECAST STRUCTURE SHALL BE IN ACCORDANCE WITH AS3600.
4. PRECAST STRUCTURE SHALL BE PLACED ON A STABLE GROUND WITH A MINIMUM SOIL BEARING CAPACITY OF 125kPa UNDER NORMAL SERVICE CONDITION.
5. IF THE PEAK FLOW RATE, AS DETERMINED BY THE CERTIFYING ENGINEER, EXCEEDS THE TREATMENT FLOW RATE OF THE SYSTEM, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.
6. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO THE OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
7. SITE-SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED UPON PLACEMENT OF ORDER.
8. DRAWING NOT TO SCALE.

INSTALLATION NOTES

1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATION AND SHALL BE SPECIFIED BY THE CERTIFYING ENGINEER.
2. CONTRACTOR TO PROVIDE ALL EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING DETAIL PROVIDED SEPARATELY).
3. CONTRACTOR TO INSTALL AND LEVEL THE STRUCTURE, APPLY SEALANT TO ALL JOINTS AND TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES.
4. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED DEBRIS.
5. CARTRIDGE INSTALLATION BY OCEAN PROTECT SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT OCEAN PROTECT TO COORDINATE CARTRIDGE INSTALLATION WITH SITE COMPLETION.

OCEAN PROTECT
PHONE: 1300 354 722 www.oceanprotect.com.au

OCEAN PROTECT
JELLYFISH 3300
SPECIFICATION DRAWING

OCEAN PROTECT

Jellyfish® Filter

Technical Design Guide

Stopping Pollution Entering Waterways

11/24

www.oceanprotect.com.au

Introduction

The Ocean Protect Jellyfish® is a compact, below ground stormwater treatment device, configured offline to capture pollutants in stormwater run-off. The Jellyfish® Filter uses high flow rate membrane filtration at low driving head with a large surface area to filter stormwater. By incorporating pre-treatment with light-weight membrane filtration, the Jellyfish® removes floatables, litter, oil, debris, TSS, fine silt-sized particles, and a high percentage of particulate-bound pollutants; including phosphorus, nitrogen, metals and hydrocarbons. The large surface area membrane cartridges, combined with up flow hydraulics, frequent backwashing, and rinsable/reusable cartridges ensure long-lasting performance.

Operational Overview

During a storm, the upstream bypass structure directs low flows to the Jellyfish®. The system builds driving head, traps floating pollutants behind the Maintenance Access Wall (MAW) and drives flow below the cartridge deck where a separation skirt around the cartridges isolates oil, litter and debris outside the filtration zone. As a result of the upstream driving head, water is conveyed up from the treatment chamber through membrane tentacles where filtration occurs, retaining solids and other pollutants, before entering the back wash pool above. Once the water has filled the backwash pool, water overflows the weir and exits via the outlet pipe.

Once the rain event subsides, flow direction reverses such that the water in the backwash pool flows back into the lower treatment chamber. This passive backwash drops out some of the attached solids and extends cartridge life, assisting in preparing the system for the next rainfall event.

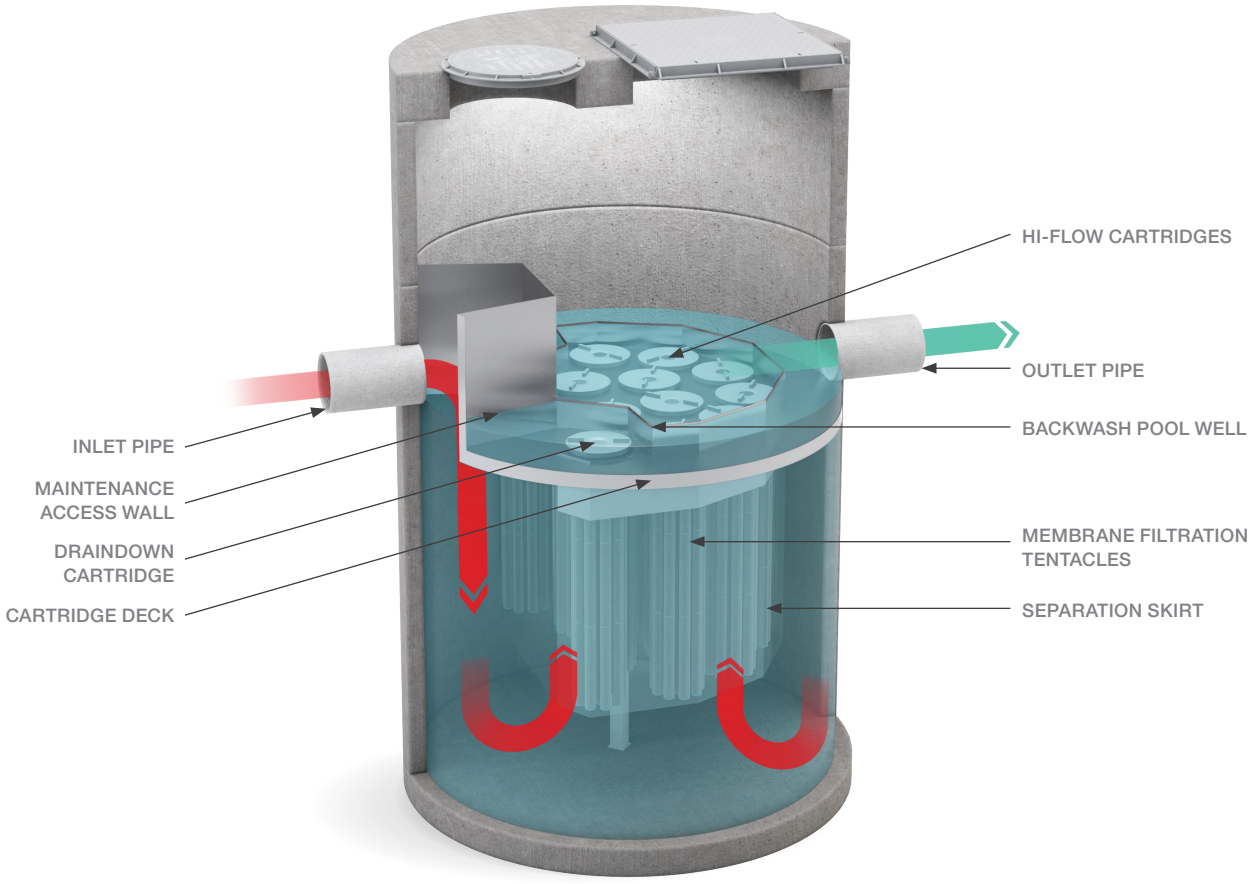


Figure 1: Jellyfish® operation

Features

Each Jellyfish® system consists of the following internal components:

- Maintenance Access Wall (MAW)
- Separation Skirt
- Filtration Zone (High-flow cartridges)
- Backwash Pool
- Drain-down cartridges

The Maintenance Access Wall creates an inlet zone for the stormwater inlet pipe. It allows for the dissipation of flows and capture of floatable pollutants whilst reducing the quantity of coarse material, solids and debris entering the Filtration Zone. The Separation Skirt provides further protection of the cartridges from coarse materials and hydrocarbons.

The High-flow and draindown cartridges are offered in a 1375mm length. Each cartridge consists of multiple pleated membranes referred to as "tentacles" that are washable and re-usable. The group of tentacles within every cartridge creates a large cumulative surface area membrane - and with a peak flux rate of 0.14L/s/m^2, it provides the most compact footprint available on the market.

Figure 2: Jellyfish® tentacle components

There are three (3) hydraulic loss options for the Jellyfish® system. Typically, 457mm of hydraulic loss is adopted, however for lower drop sites, the designed hydraulic loss can be reduced to 305 or 229mm. The flow rates, head loss, and head drop for each system are shown in *Table 1* below.

Hydraulic Loss (mm)	Cartridge length	High flow cartridge flow rate (L/s)	Drain Down cartridge flow rate (L/s)
457	54-in (1.37m)	5	2.5
	27-in (0.686m)	2.5	1.3
305	54-in (1.37m)	3.34	1.96
	27-in (0.686m)	1.68	0.98
229	54-in (1.37m)	2.52	1.58
	27-in (0.686m)	1.27	0.79

Table 1: Jellyfish® cartridge details

Configurations

The Jellyfish® treatment system can be housed in a variety of ways such that it suits the site specific requirements for flowrate, hydraulics, accessibility and footprint restrictions. The standard configuration offered by Ocean Protect is pre-cast concrete manholes. These systems are simple to install, as they arrive on site after being manufactured offsite to suit site specific requirements (pipe size, inlet/outlet orientation, levels etc.). Larger precast or cast-in-place Jellyfish® Filter vaults are available to treat higher flows. Pre-cast Manhole Jellyfish® Filter systems are pre-configured (pipe size, location, unit height etc.) prior to arrival upon site for ease of installation.

Figure 3: Jellyfish® precast manhole

Figure 4: Jellyfish® vault

Performance and Select Approvals

While laboratory testing provides a means to generate hydraulic and basic performance data, all filtration devices should also be complemented with long-term field data evaluations. As a minimum, field studies should generally comply with a recognised field testing protocol, for example, the Technology Acceptance Reciprocity Partnership (TARP) or the Technology Assessment Protocol – Ecology (TAPE) in the USA.

To be considered valid, all field monitoring programs should be peer reviewed by a reputable third party and replicate local pollutant concentrations including soluble fractions of nutrients together with rainfall. Such field testing has been undertaken for the Jellyfish – both locally in Australia and overseas. Further information on these studies is available in *A review of the application of Jellyfish® in Australia.*

Since 2017, over 1700 Jellyfish® have been installed within Australia by Ocean Protect. These assets have been successfully installed in a variety of applications to meet regulatory requirements set by authorities throughout Australia.

Specifically, Jellyfish® has been accepted by some of the most stringent stormwater quality regulators around the globe including:

- Stormwater Australia Quality Improvement Device Evaluation Protocol (SQIDEP) verification
- Brisbane City Council
- Wollondilly Shire Council
- Campbelltown City Council
- Blacktown City Council
- Hobsons Bay City Council
- City of Port Adelaide Enfield
- City of Hobart
- Washington State Department of Ecology (TAPE) GULD – Basic
- New Jersey Corporation of Advanced Technology (NJCAT)
  - » Field Performance per TARP Tier II Protocol
- Canada ISO 14034 Environmental Management – Environmental Technology Verification (ETV)

Please contact your Ocean Protect representative to obtain the Jellyfish® approval status in your area.

Maintenance

Every filtration device will eventually need routine maintenance. The question is how often and how much it will cost. Proper evaluation of long-term maintenance costs should be a consideration when selecting a manufactured treatment device.

Jellyfish® cartridges are lightweight and reusable and minor maintenance of the filter cartridges is performed by removing, rinsing and reusing the cartridge tentacles. Vacuum extraction of captured pollutants in the sump is recommended at the same time.

Full cartridge replacement intervals differ by site due to varying pollutant loading and type, and maintenance frequency and replacement is anticipated to be every 2-5 years.

Maintenance support

Ocean Protect provides flexible options and contract terms. A detailed maintenance guide and mass load calculation spreadsheet is available upon request.

For further information please refer to the *Jellyfish® Operations and Maintenance Manual.*

Design Basics

The design requirements of any Jellyfish® system is detailed in 3 typical steps:

1. Hydraulic Design
2. Water Quality Design
3. Mass Load Design

1 Hydraulic Design

All Jellyfish® systems must be designed to ensure that the hydraulic requirements of the system are met without adversely impacting the upstream hydraulics (limiting the likelihood of localised flooding). *Table 1* (page 5) details the available head loss options. **The designer must initially select an option and ensure the corresponding head loss can be catered for.**

A Jellyfish® system is typically designed 'offline' so that treatment flows are directed to the Jellyfish tank and higher flows are bypassed via an upstream weir or raised pipe. The upstream diversion arrangement is used to create the head loss required above the outlet IL of the Jellyfish unit *(see Table 1).* Please note that the standard arrangement for a Jellyfish allows for a flexible height difference between the inlet and outlet but is typically set at 150mm.

Jellyfish® cartridges have a unique backflush mechanism that is passively activated at the end of each storm to increase the longevity of each cartridge. Consequently, captured pollutants are stored within the system and in order to minimise scour peak flows into the treatment chamber need to be limited. Specifically, when **peak flows surpass the combined cartridge treatment flow rate the system needs to be arranged off-line** with a low flow splitter designed upstream.

It is also necessary to consider the impacts that tail water/submergence has on all stormwater treatment devices. In the case of the Jellyfish®, tailwater can adversely affect the long term cartridge operation. As such measures should be implemented during design to ensure that the system can operate effectively. If this cannot be achieved on your project an alternative treatment option, such as StormFilter®, is recommended. Please contact Ocean Protect for advice and complimentary design advice.

2 Water Quality Design

Ocean Protect uses the widely endorsed Model for Urban Stormwater Improvement Conceptualisation (MUSIC), which makes it easy to correctly size an appropriate Jellyfish® system for your site.

A complimentary design service which includes MUSIC modelling is provided by the Ocean Protect engineering team. Simply email your project details to **design@oceanprotect.com.au** or alternatively you can always call one of our engineers for a discussion or to arrange a meeting in your office. The team will provide you with an efficient design containing details of the devices required to meet your water quality objectives together with budget estimates, product drawings and the MUSIC (.sqz) file.

When designing/modelling a Jellyfish® system for water quality purposes in MUSIC, a single generic treatment node is utilised. The generic treatment node is utilised with relevant removal efficiencies inserted. These parameters can vary based on the jurisdiction (authority) of your project, relevant details can be obtained from Ocean Protect. The high-flow bypass figure is adjusted within the node to represent the treatable flow rate required to obtain water quality targets. Once finalised this figure can be matched with the system flow rates provided in *Appendix 1.*

All details such as drawings, specifications and maintenance manuals can also be downloaded from **www.oceanprotect.com.au** for integration into your project's documentation. Additionally, the Ocean Protect team is available to review your model and provide additional assistance and guidance on the configuration of the Jellyfish® system(s) for your project.

3 Mass Load Design

At the completion of your water quality design process (as above), it is necessary that maintenance frequency is considered in order to prevent excessive ongoing maintenance requirements. Ocean Protect recommends a minimum minor maintenance frequency of 6 months (rinsing) for the Jellyfish®.

All filtration devices occlude overtime, consequently they have a maximum sediment capacity (TSS load). By analysing the mean annual load figures for the Jellyfish® generic treatment node, the total annual retained TSS can be determined. To determine the minimum cartridge quantity required by mass load design, the annual retained TSS should be divided by the relevant cartridge sediment capacity. The Ocean Protect team can provide assistance and details on this process.

In determining the final cartridge quantity for your project, you must utilise the largest number of cartridges obtained from undertaking Water Quality and Mass Load design steps.

Appendix 1 – Jellyfish® Precast Manhole Standard Models

54-inch (1.37m) Full Length Cartridge

Model	High flow cartridges	Drain-down cartridges	457mm Head Flow rate (L/s)	305mm Head Flow rate (L/s)	229mm Head Flow rate (L/s)
JF-900-1-1	1	1	7.5	5.3	4.1
JF-900-2-1	2	1	12.5	8.6	6.6
JF-1200-1-1	1	1	7.5	5.3	4.1
JF-1200-2-1	2	1	12.5	8.6	6.6
JF-1500-3-1	3	1	17.5	12.0	9.1
JF-1500-4-1	4	1	22.5	15.3	11.7
JF-1500-5-1	5	1	27.5	18.7	14.2
JF-2300-6-1	6	1	32.5	22.0	16.7
JF-2300-7-2	7	2	40	27.3	20.8
JF-2300-8-2	8	2	45	30.6	23.3
JF-2300-9-2	9	2	50	34.0	25.8
JF-2300-10-2	10	2	55	37.3	28.4
JF-3300-11-2	11	2	60	40.7	30.9
JF-3300-12-2	12	2	65	44.0	33.4
JF-3300-13-3	13	3	72.5	49.3	37.5
JF-3300-14-3	14	3	77.5	52.6	40.0
JF-3300-15-3	15	3	82.5	56.0	42.5
JF-3300-16-3	16	3	87.5	59.3	45.1
JF-3300-17-3	17	3	92.5	62.7	47.6
JF-3300-18-3	18	3	97.5	66.0	50.1
JF-3300-19-4	19	4	105	71.3	54.2
JF-3300-20-4	20	4	110	74.6	56.7
JF-3300-21-4	21	4	115	78.0	59.2
JF-3300-22-4	22	4	120	81.3	61.8
JF-3300-23-4	23	4	125	84.7	64.3
JF-3300-24-4	24	4	130	88.0	66.8
JF-3300-25-5	25	5	137.5	93.3	70.9
JF-3300-26-5	26	5	142.5	96.6	73.4
JF-3300-27-5	27	5	147.5	100.0	75.9
JF-3300-28-5	28	5	152.5	103.3	78.5
JF-3300-29-5	29	5	157.5	106.7	81.0

27-inch (0.686m) Half Length Cartridge

Model	High flow cartridges	Drain-down cartridges	457mm Head Flow rate (L/s)	305mm Head Flow rate (L/s)	229mm Head Flow rate (L/s)
JF-900-1-1	1	1	3.8	2.7	2.1
JF-900-2-1	2	1	6.3	4.3	3.3
JF-1200-1-1	1	1	3.8	2.7	2.1
JF-1200-2-1	2	1	6.3	4.3	3.3
JF-1500-3-1	3	1	8.8	6.0	4.6
JF-1500-4-1	4	1	11.3	7.7	5.9
JF-1500-5-1	5	1	13.8	9.4	7.1
JF-2300-6-1	6	1	16.3	11.1	8.4
JF-2300-7-2	7	2	20.1	13.7	10.5
JF-2300-8-2	8	2	22.6	15.4	11.7
JF-2300-9-2	9	2	25.1	17.1	13.0
JF-2300-10-2	10	2	27.6	18.8	14.3
JF-3300-11-2	11	2	30.1	20.4	15.6
JF-3300-12-2	12	2	32.6	22.1	16.8
JF-3300-13-3	13	3	36.4	24.8	18.9
JF-3300-14-3	14	3	38.9	26.5	20.2
JF-3300-15-3	15	3	41.4	28.1	21.4
JF-3300-16-3	16	3	43.9	29.8	22.7
JF-3300-17-3	17	3	46.4	31.5	24.0
JF-3300-18-3	18	3	48.9	33.2	25.2
JF-3300-19-4	19	4	52.7	35.8	27.3
JF-3300-20-4	20	4	55.2	37.5	28.6
JF-3300-21-4	21	4	57.7	39.2	29.8
JF-3300-22-4	22	4	60.2	40.9	31.1
JF-3300-23-4	23	4	62.7	42.6	32.4
JF-3300-24-4	24	4	65.2	44.2	33.6
JF-3300-25-5	25	5	69	46.9	35.7
JF-3300-26-5	26	5	71.5	48.6	37.0
JF-3300-27-5	27	5	74	50.3	38.2
JF-3300-28-5	28	5	76.5	51.9	39.5
JF-3300-29-5	29	5	79	53.6	40.8

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

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