

Our Ref: **QLD01C0001-LTS-AP-0009**

Mr David Stolz
 Assistant Coordinator-General
 Planning and Service
 (as delegate of the Coordinator-General)
 Level 14, 1 William Street
 Brisbane, QLD 4000

Attention: Mt Michael Moran
 Michael.moran@coordinatorgeneral.qld.gov.au

7 March 2024

Dear Michael,

Information Request Response – APC2023/007 – Change Application for an SDA Approval (APC2022/008) for a material change of use for a medium impact industry (Electrolyser Manufacturing Facility) in the Gladstone State Development Area (SDA)

I write on behalf of the Applicant, Fortescue, please find below a full response to the Information Request required for AP2023/007-SDA sent on 26 February 2023. To assist State Development with the continued assessment of the Change Application we have provided the following details:

No	Issue	Information Requested
Assessment criteria		
1	Assessment against the relevant development scheme	<p>The planning report includes an assessment of the proposed development against the strategic vision, overall objectives, the preferred development of the precincts and relevant assessment criteria outlined in the Gladstone State Development Area (SDA) Development Scheme dated November 2015.</p> <p>The current version of the Gladstone SDA Development Scheme came into effect in May 2022. The May 2022 development scheme is the regulatory document that contains the development assessment framework for making, assessing and deciding applications and requests relating to development within the Gladstone SDA.</p> <p>The proponent is requested to provide a detailed assessment of how the proposed development satisfies the strategic vision, overall objectives, the preferred development intent of the precincts, and relevant assessment criteria as outlined in the current Gladstone SDA Development Scheme (May 2022).</p>

		Noting the original SDA approval AP2021/006 for a material change of use for medium impact industry (electrolyser manufacturing facility) was assessed against the previous development scheme (November 2017) the change application for an SDA approval will be assessed under the current development scheme (May 2022).
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Response item 1:

Regarding the assessment against the relevant development scheme, Fortescue have updated the MCU Planning Report **Revision 2 dated 23 February 2024**. A consolidated Assessment Report (Dropbox download link) with attachments was provided to the Coordinator-General's Office Planning and Service (South Team) on 23 February (via email to felicity.mccann@coordinatorgeneral.qld.gov.au). Don't hesitate to contact me should you require another download link.

2	Amount of emissions/output	<p>The planning report includes section 3.4 Proposal Description that provides details on the proposed site layout, relationship of the proposed development to the existing, previously approved development and expected outputs from the functional test stations including hydrogen gas and brine.</p> <p>The proponent is requested to provide details on the amount of gas and other emissions to be released from the functional test stations. Including</p> <ul style="list-style-type: none"> • Confirm each test station is capable of outputting approximately 18kg/hr and 90kg/hr if all test stations operate simultaneously of hydrogen gas only. • The amount of other emissions including oxygen, likely to be released. • The amount of wastewater and contaminates likely to be produced.
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Response item 2:

The amount of emissions/output from the four (4) functional test stations (FTS) assuming testing of a single (1) 1MW capacity electrolyser unit / stack per FTS per day (24hrs) is tabulated below.

Gas Emissions	Rate (per stn)	24hr period (per stn)	Total Emission 24hrs (4 stn)
Hydrogen (H2)	18 kg/hr	432kg	1,728kg
Oxygen (O2)	144 kg/hr	3,456kg	13,824kg
Nitrogen (N2)	7.5 kg/hr + 81 kg/hr*	220.5kg	882kg

* 81 kg/hr of N2 of each test unit for single start-up purge and single shutdown purge for ~15 minutes.

3	Wastewater treatment	<p>The planning report states that all waste process water will be directed to the reverse osmosis (RO) system and temporarily treated onsite to be redirected offsite to a suitable disposal centre.</p> <p>The proponent is requested to confirm the proposed management plan for the wastewater produced by the test stations and that it is not incorporated into the onsite stormwater management system.</p>
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Response item 3:

Raw water from the GAWB mains supply will be put through an RO Water Treatment Plant (WTP) which will be located within the Balance of Plant (BOP) area adjoining the FTS building. During FTS operations (electrolyser testing), ultrapure demineralised water from the RO WTP will be pumped into each FTS at a rate of 1,420 L/hr. Of this, 220 L/hr is consumed in the production of H₂, while 1200 L/hr is carried through the membrane to the cathode side. This water will then be collected (1200 L/hr) and pumped via a return loop to the raw water tank of the RO WTP.

The RO system is high recovery and will have a recovery of 85% during normal operations i.e. 15% of the feed volume becomes a concentrated waste. During initial ramp up and commissioning activities, the volumes of waste produced will be far less and is expected to be around 5% of the feed water volumes when recovering process water is considered.

This water will be managed by disposing of it offsite (in accordance with the existing MCU approval APC2022/008 Condition 7.2) to a licenced facility or on-sold to another industrial water user. As there is currently very limited established development within close proximity to the proposed development, no commercial agreements are currently in place to take RO WTP waste.

Accordingly, due to the direct expense in disposal of waste volumes to a licenced facility, electrolyser testing will be scheduled so as not to generate excessive costs until such time as a commercial agreement is negotiated or an alternative on-site non-release waste treatment system is approved and operational elsewhere on Lot 4 as part of the Stage 2 project which is currently under assessment.

The process water balance has been designed to achieve a very high reuse of water re-use. wastewater treatment, Fortescue has designed a FTS process that will not generate any wastewater during normal mode of operations.

All process related wastewater from the assembly plant (water generated from wash-down of electrolysers) or the FTS units will be managed via collection and returning of this process affected water to the proposed RO WTP.

The electrolyser assembly plant also has an existing domestic sewerage waste water plant and approved irrigation area. This water treatment system has been established in accordance with the ERA 63 – Sewage Treatment conditions of the Environmental Authority (P-EA-100269285).

All wastewater or waste process affected water will be collected and managed separately from the on-site stormwater system. No releases of wastewater and or contaminants to any waters are proposed as part of the Substantial Change Application.

The electrolyser assembly plant has an operational Waste Management Plan (Doc Ref: QLD01-5620-EN-PLN-0001) which will be updated to account for the concentrated waste stream that will be produced from the proposed RO system. Accordingly, we request that this updated management plan be developed and submitted to the Coordinator-General prior to commencement of use (of the FTS) in accordance with the current approval APC2022/008 Condition 7.1.

Additional Information:

Further to the above information request responses, Fortescue have also developed a Site Based Stormwater Management Plan (SBSMP) and associated Preliminary Bulk Earthworks Plan and Sections for consideration as part of this MCU Development Application. Refer to the following attachments:

- 24011-SBSMP Rev 0.
- 24011-C01-A BULK EARTHWORKS PLAN.
- 24011-C02-A BULK EARTHWORKS SECTIONS.

It is noted that the SBSMP confirms that the runoff from the proposed new development will be directed to the existing basin which has sufficient capacity to satisfy the quantity and quality requirements expected from Gladstone Regional Council (GRC).

The attached SBSMP will be an addendum to the original SBSMP approved for Lot 4 and is provided as supporting material for the change application to APC2022/008.

The addendum covers the stormwater quantity and quality management for the test facility development, with quality focusing on the pollutants generated from rainwater runoff. All surface areas with the potential of contaminant spills will be appropriately bunded and sent for further treatment (specialist GPT).

Regarding Bulk Earthworks, the cut and fill volume is not of a significant nature but does exceed the minimum threshold for assessment (trigger volume is 100m³ of cut and fill) under the GRC Planning Scheme. Quantitates shown on the plans are included below.

EARTHWORKS QUANTITIES

SURFACE FROM	SURFACE TO	CUT m ³	FILL m ³	BALANCE m ³
EXISTING	STRIPPED 150mm	-1,031	0	-1,031
STRIPPED 150mm	EARTHWORKS	-309	+1,714	+1,405

The Gladstone Testing Facility will require two Operational Works Approvals

- Bulk Earthworks.
- Stormwater Management Plan.

Morgan Civil, who on behalf of Fortescue have prepared the SBSMP and Bulk Earthworks documents are currently engaging directly GRC and will be lodging both applications directly with GRC separate to the GSDA Substantial Change MCU Application process. They are also developing Preliminary ESC drawings as part of their scope.

Should you require additional information to support this notice please contact me directly on 0418 911 954 or michael.kilcullen@fortescue.com.

Yours sincerely

FORTESCUE



Philip Bradley
Principal Planning & Environment
 On behalf of Michael Kilcullen
Fortescue Hydrogen Systems

Attachments:

1. Site Based Stormwater Management Plan 24011-SBSMP Rev 0
2. 24011-C01-A BULK EARTHWORKS PLAN
3. 24011-C02-A BULK EARTHWORKS SECTIONS



◆STRUCTURAL◆CIVIL◆HOUSING◆FORENSIC◆

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SITE BASED STORMWATER MANAGEMENT PLAN

PROPOSED OPERATIONAL WORKS AT LOT 4 EUROA CIRCUIT GLADSTONE

Prepared for

Fortescue

Attention: Knox Hart

Document Reference

24011 - SBSMP/0

Record of Issue:

Issue	Status	Author	Date	Checked	Date	Authorised	Date
0	For Review	Ina Weinheimer	26 Feb 2024	Henry Morgan RPEQ 11950	28 Feb 2024	Henry Morgan RPEQ 11950	29 Feb 2024

This investigation and report has been authorised by Mr Henry Morgan, a Director of Morgan Consulting Engineers Pty Ltd.

Henry J Morgan RPEQ 11950

Thursday, 29 February 2024

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1 INTRODUCTION

This Site Based Stormwater Management Plan (SBSMP) has been prepared for the proposed Operational Works at Lot 4 Euroa Circuit, Gladstone.

This SBSMP has been prepared to investigate the effects the proposed bulk earthworks will have on stormwater quantity and quality.

The objective of this SBSMP is to ensure that there is no adverse impact by the development on the environmental value of the receiving waters during the construction and operational phases of the development. This SBSMP will also provide recommendations to ensure that the post-development peak outflow conditions are not greater than the pre-development peak outflow conditions.

In order to achieve this objective, this SBSMP:

1. Describes the environmental setting of the development site and precinct;
2. Describes the nature of the proposed development as it relates to stormwater quality;
3. Calculates the peak flows for both pre and post-development conditions;
4. Calculates the detention volume required to achieve the pre-development outflow in the post-development state; and
5. Identifies potential sources of contaminants and describes the management techniques designed to be employed on the site to achieve the water quality objectives.

The proposed development has been assessed against the following guidelines and planning documents:

1. State Planning Policy 2017 (SPP 2017);
2. Urban Stormwater Quality Planning Guidelines 2010;
3. The Queensland Urban Drainage Manual (QUDM);
4. Capricorn Municipal Development Guidelines; and
5. Gladstone Regional Council (GRC) Engineering Design Planning Scheme Policy.

2 EXISTING SITE

2.1 The Site

The subject site, comprised of a portion of land to the rear of Lot 4 on SP 245936, is approximately 6800m² (0.68ha) in area and is part of a previously completed development on the same lot (refer to OPW/10/2022 and AP2021/006). The subject site contains existing underground stormwater and greywater reticulation infrastructure, but is otherwise vacant.

The subject site generally slopes from the southeast (with an approximate height of 65.00m AHD) towards the north-western corner of the site. Access to the overall lot is currently provided from Euroa Circuit, east of the subject site.

Refer to Figure 2.1 for a Locality Plan and **Appendix A** for the Detailed Site Survey.



Figure 2.1 - Locality Plan of Site and Surrounding Area

2.2 Surrounding Area

The site is located within the limits of the GRC region and is classified as a Special Purpose zone. The site is part of the previously developed portion of the lot to the east (refer to OPW/10/2022 and AP2021/006) and otherwise surrounded by vacant land. The Rio Tinto Alcan Red Mud Repository lies further south. Gladstone Mount Larcom Road lies further east.

3 PROPOSED DEVELOPMENT

The proposed Operational Works primarily involve:

1. The creation of a level earthworks pad located in the southern part of the site, adjacent to the western edge of existing concrete hardstand;
2. Reshaping of the balance of the site to direct stormwater towards the existing Legal Point of Discharge.

4 EXISTING DRAINAGE PATTERNS

4.1 Existing Infrastructure

Information obtained from the detailed site survey and GRC's Online Mapping database indicates the following existing stormwater infrastructure:

1. An existing swale drain along the south-western boundary of the site, collecting runoff from the adjacent earthworks pads south of the site;
2. An existing stormwater pit and pipe system starting in the south-eastern corner of the site conveying stormwater from the abovementioned swale along the north-western edge of the site towards a headwall located along the north-western boundary of the site;
3. An existing natural drainage invert within Lot 6 SP245936, northeast of the subject site, which drains to an existing pond within EMT A SP245936, northwest of the subject site;
4. An existing natural drainage invert within Lot 4 SP245936, northwest of the subject site.
5. An existing stormwater pit and pipe system located within the adjacent site collecting runoff from the adjacent concrete hardstand and roofs, and conveying stormwater towards the existing bioretention/detention basins along the northern boundary.

Refer to Figure 4.1 for the existing stormwater infrastructure and drainage patterns and Appendix A for the detailed site survey.

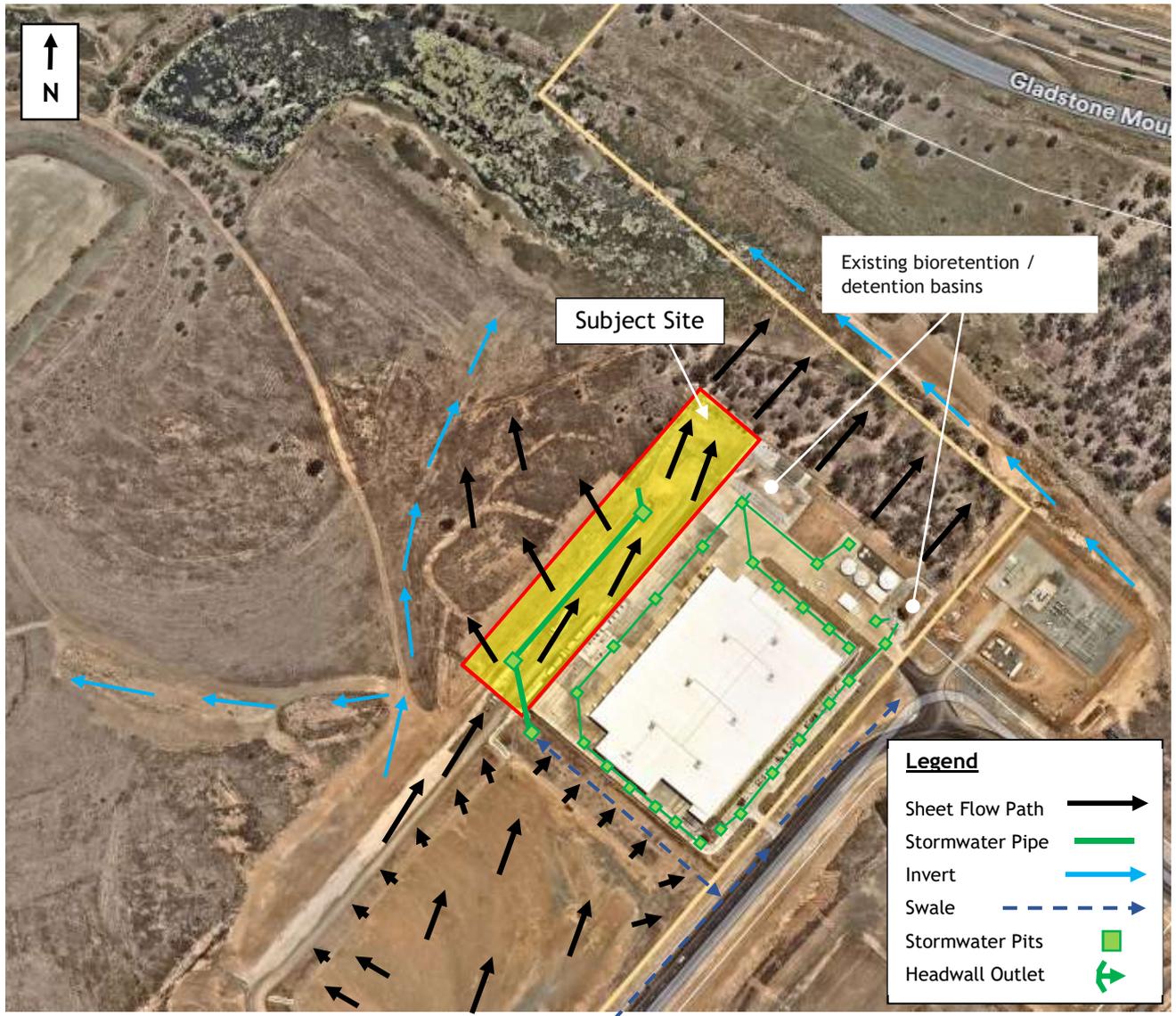


Figure 4.1 - Existing Drainage Paths & Infrastructure

4.2 Existing Drainage Patterns

Data obtained from as constructed drawings of the adjacent development, GRC's ArcGIS database and the detailed site survey plan indicate that the site has the following drainage patterns:

Surface Runoff

1. Surface runoff from the south-eastern part of the subject site partly sheet flows towards existing stormwater pits and is conveyed to a headwall northwest of the site from where it is discharged towards the Lawful Point of Discharge northwest of the site.
2. The remaining surface runoff from the south-eastern part of the subject site sheet flows to the northern boundary from where it flows via the existing natural drainage invert north of the site to the Lawful Point of Discharge northwest of the site.
3. Surface runoff from the north-western part of the subject site sheet flows towards the natural drainage invert northwest of the site from where it drains to the Lawful Point of Discharge.

External Catchment

1. Surface runoff from the localised external ground catchment south of the subject site is collected by a swale drain located along the southwestern boundary of the site, where it is directed to the stormwater pit located at the southwestern corner of the site and conveyed to the Lawful Point of Discharge northwest of the site.

Refer to Figure 4.1 for a drainage schematic and **Appendix A** for the detailed site survey plan.

4.3 Lawful Point of Discharge

If the proposed development maintains pre-development flow conditions, the lawful point of discharge (LPD) is the existing natural drainage invert north of the site.

In consideration of the site characteristics, surrounding topology and stormwater drainage infrastructure, the aforementioned proposed lawful point of discharge is considered to be compliant with the criteria for lawful point of discharge outlined in Section 3.9.1. of QUDM 2017 as per below:

- i) The location of the proposed discharge point is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received.
- ii) The post development discharge will not cause an actionable nuisance, nor environmental or property damage, as it is intended to implement measures to account for any change to the existing flow characteristics.
- iii) Authority to discharge over affected properties will not be required as the proposed development will discharge directly into the existing waterway and will be maintained as per existing drainage conditions.

Refer to **Section 5** outlining the Stormwater Quantity aspects of this site.

5 STORMWATER QUANTITY

A roof and allotment drainage system is to be designed to comply with:

1. AS/NZS 3500.3:2015 - Plumbing and Drainage Part 3: Stormwater Drainage;
2. The Queensland Urban Drainage Manual (QUDM);
3. Capricorn Municipal Development Guidelines D5 Stormwater Design Specification, and;
4. Engineering Design Planning Scheme Policy.

5.1 Rational Method Assessment

The Rational Method has been used to calculate the peak discharges from the site under the existing (pre-development) and proposed (post-development) conditions.

5.1.1 Design Storms

As defined in the GRC Planning Scheme Policies the following design storms were adopted:

1. Minor Drainage System: 2 year ARI statistical flood (Q_2 storm);
2. Major Drainage System: 100 year ARI statistical flood (Q_{100} storm).

5.1.2 Rainfall Intensity

Rainfall intensities for this study were obtained from the Australian Bureau of Meteorology.

5.1.3 Times of Concentration

Times of concentration (t_c) were calculated as defined in the QUDM. Refer to Table 5-1 for the adopted t_c 's and **Appendix B** for t_c calculations.

Table 5-1 - Adopted t_c values

Pre development t_c (mins)	Post development t_c (mins)
12.1	12.7

5.1.4 Runoff Coefficients

The 10 year runoff coefficient's (C_{10}) were determined as defined in the QUDM. Refer to Table 5-2 below for the adopted C_{10} values.

Table 5-2 - Adopted C_{10} Values

Property State	C_{10}
Pre-development	0.58
Post-development	0.58

5.1.5 Peak Flows

Refer to Table 5-3 for a summary of the predicted minor and major discharge rates for pre and post development conditions and **Appendix B** for the Rational Method calculations.

Table 5-3 - Pre and Post Development Peak Flows

Property State	Q ₁ (m ³ /s)	Q ₂ (m ³ /s)	Q ₅ (m ³ /s)	Q ₁₀ (m ³ /s)	Q ₂₀ (m ³ /s)	Q ₅₀ (m ³ /s)	Q ₁₀₀ (m ³ /s)
Pre development	0.078	0.092	0.137	0.168	0.200	0.254	0.292
Post development	0.076	0.091	0.134	0.164	0.196	0.249	0.287

As shown in Table 5-3, there will be a reduction in peak stormwater runoff from the site due to the proposed operational works, therefore mitigation is not required.

Refer to **Appendix B** for the Stormwater Quantity Calculations.

5.2 Proposed Drainage Patterns

The proposed drainage patterns are as follows (refer to **Appendix C** for Bulk Earthworks Plans):

Ground Catchment:

1. Surface runoff from the site will sheet flow towards the north-western boundary of the site and continue towards the natural drainage invert northwest of the site, from where it drains to the Lawful Point of Discharge.

External Catchment:

1. As per-predeveloped conditions, surface runoff from the localised external ground catchment south of the subject site will be collected by the swale drain located along the southern boundary of the site, where it will be directed via the proposed extension of the swale drain and the existing pit and pipe system to the Lawful Point of Discharge northwest of the site. Refer to **Appendix C** for the External Catchment Plans and **Appendix E** for the Channel Capacity Analysis.

6 STORMWATER QUALITY

The following section of the report will outline the potential contaminants and proposed solutions to be incorporated during the construction and operational phases of the proposed development.

6.1 Construction Phase

Erosion and Sediment Control (ESC) Measures such as silt fences, diversion drains, drainage structure protection and dust control (clearing) will be implemented during the construction of the bulk earthworks. Silt fences are to be erected along the boundary of the site and around the construction area. These fences are to be cleaned by the contractor when the capacity is reduced by 25%. Where possible, disturbance to the existing surface is to be limited to the immediate work area. The existing ground cover is not to be stripped until the contractor is ready for earthworks to begin.

Stockpiles and construction materials are not permitted to be stored within the road reserve and should be contained using silt fences. Diversion drains are to be provided at upstream catchments to reduce flows to earthworks areas. In any areas where flows could enter adjacent properties temporary stabilisation is to be provided.

All ESC measures are to be provided as soon as earthworks have commenced and staged to suit construction. The contractor is responsible for this action. A temporary construction exit is to be located at the north eastern entry to the site and will be determined based on the stage of works being completed. The contractor is to ensure all dust tracked onto surrounding roads is immediately swept to remove silt/dust.

All new stormwater pits are to be protected from sediment infiltration by wrapping new pits and grates in geofabric or covering appropriately with timber board. Silt fences are to remain in place during the maintenance period until the site is established (80% ground cover).

Potential sources of contaminants identified for the construction phase of the development are outlined in Table 6-1 together with proposed stormwater quality improvement devices, management and maintenance procedures.

Table 6-1 - Potential Contaminants and Proposed Treatments

Pollutant	Potential Source	Management / Maintenance Procedures	Proposed Treatment Device and Maintenance Procedure
Sediment & Eroded material	Excavated material, fill material, exposed ground, stockpiles of material.	Provision of sediment and silt barriers to the site drainage entry and exit points.	Sand filled filter socks. Removal of excess sand/silt build-up at regular intervals and after every storm.
Dust	Stockpiles of material, exposed ground.	Covering the material or wetting it down at regular intervals.	Coverage of material with plastic, geotextile, surface binding agents or regular watering.
Litter	Refuse generated by staff.	Construction waste is to be cleaned off the site area and disposed of into an industrial bin then removed by a refuse collection contractor.	Industrial bin is to be provided within the construction area - to be emptied on at least a weekly basis.
Concrete	Washing of concrete trucks/tools to remove wet/unused concrete.	Provision of a closed area onsite for washing off of concrete slurries.	Liquids to be removed by a waste collection contractor. Solids to be placed into a refuse bin.
Surfactants (detergents)	Washing down operations on hardstand area using detergents.	No cleaning of vehicles will be permitted on site.	Monitoring & prevention
Chemical (Paints, thinners etc.)	Typically this may occur due to spillage of product.	Where spills occur, the containment area is to stop escape. The material is to be treated (as required) and removed and cleaned by a licensed contractor. Minor spillage outside this area shall be cleaned up with cloths and disposed of to waste via the industrial bin.	A temporary containment area. This is to be impermeable and of a size to permit mixing/transfer, and with a storage volume of twice the largest container used. Treatment of spills is to occur on site. No discharge of treated water to the stormwater system is to occur without council approval. Incidents are to be reported to the EPA.
Wastewater	Spillage from the relocation of the existing sewerage reticulation.	A licensed contractor shall remove any residue sewage from unused pipes and contaminated soils are to be disposed of via the industrial bin.	No leakage is to be permitted to enter the groundwater or discharge to the stormwater system.

6.2 Operational Phase

As the proposed operational works will have no material changes to the impervious area of the site, it is expected that there would be no material increase in pollutants generated from pre-development. Therefore, tertiary stormwater quality treatment is not warranted for this development.

Should operational requirements change, this plan is required to be amended to suit. Substantial changes may require resubmission to the local authority. Following completion of construction, this plan is to be incorporated into the total-site management practices.

7 FLOODING

A Flood Hazard Overlay Map was obtained from Gladstone Regional Council's Online Mapping database confirming that the site is unaffected by river, creek/waterway and overland flow flooding.

Refer to **Appendix G** for the GRC Flood Map.

8 CONCLUSION

The proposed Operational Works at Lot 4 Euroa Circuit, Gladstone has been assessed for its impact on the quantity and quality of stormwater drainage.

The lawful point of discharge is the existing natural drainage invert north of the site.

Onsite detention is not warranted for the site.

Sediment generated during the construction phase shall be dealt with in accordance with an Erosion and Sediment Control Plan to be kept on site during the construction phase.

As the proposed operational works will have no material changes to the impervious area of the site, tertiary stormwater quality treatment is not warranted for this development.

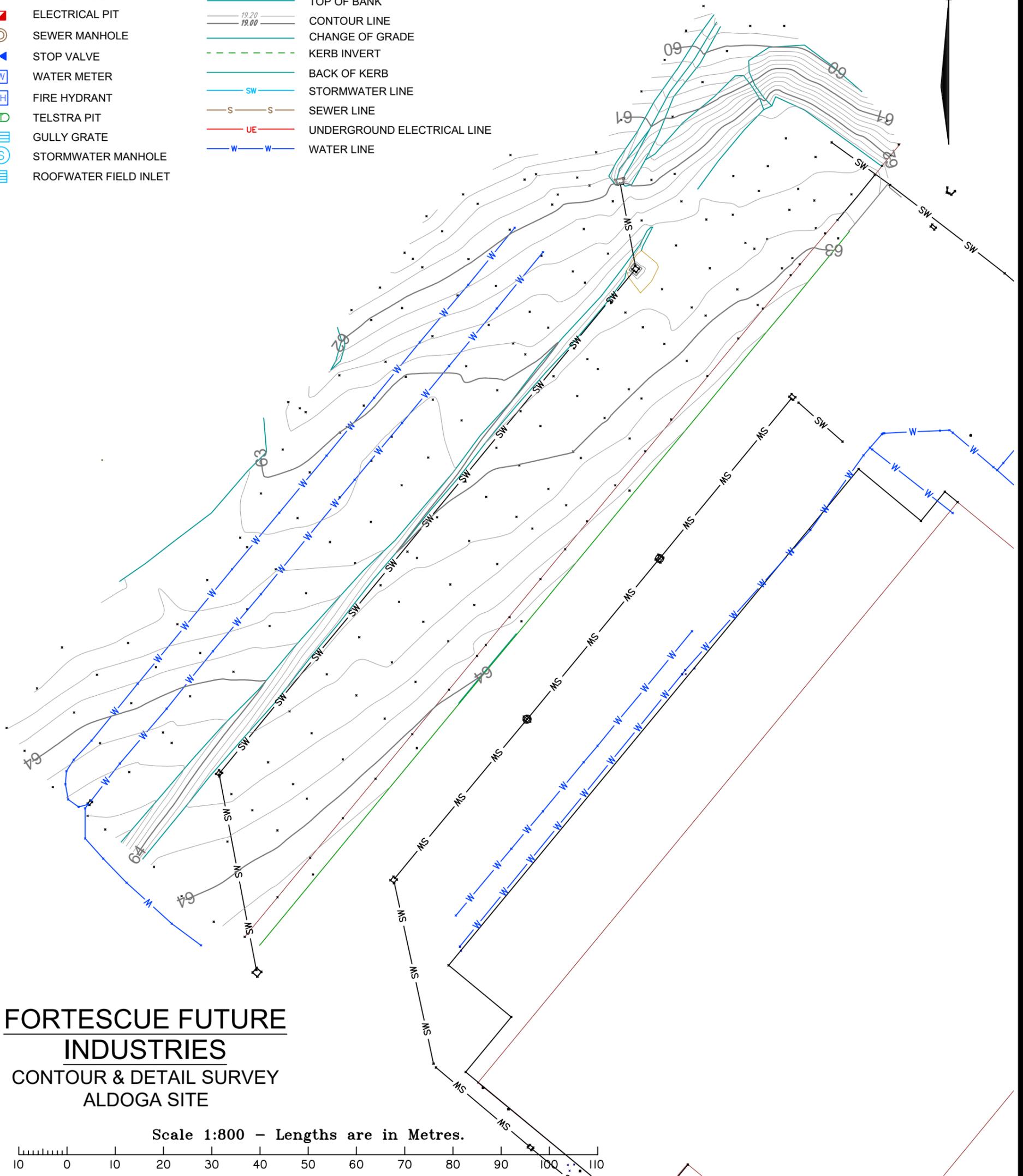
The subject site is unaffected by flooding.

APPENDIX A

DETAILED SITE SURVEY PLAN

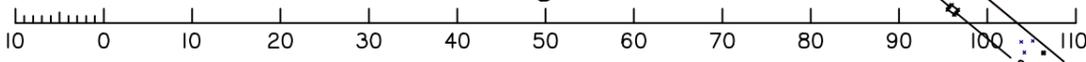
LEGEND

- ▲ TEMPORARY BENCH MARK
- LP LIGHT POLE
- PP POWER POLE
- ELECTRICAL PIT
- SEWER MANHOLE
- ✕ STOP VALVE
- W WATER METER
- FH FIRE HYDRANT
- T TELSTRA PIT
- ≡ GULLY GRATE
- S STORMWATER MANHOLE
- ≡ ROOFWATER FIELD INLET
- //— FENCE
- BOTTOM OF BANK
- TOP OF BANK
- 19.20
— 19.00 CONTOUR LINE
- CHANGE OF GRADE
- - - KERB INVERT
- BACK OF KERB
- SW STORMWATER LINE
- S S SEWER LINE
- UE UNDERGROUND ELECTRICAL LINE
- W W WATER LINE



FORTESCUE FUTURE INDUSTRIES
CONTOUR & DETAIL SURVEY
ALDOGA SITE

Scale 1:800 - Lengths are in Metres.



NOTES:

Datum: MGA94 z56 Scale 1/AHD

Survey Date: 15/01/2024



Airlie Beach | Mackay | Townsville | Rockhampton | Brisbane | Gold Coast

E : admin@visionsurveysqld.com.au

P : 13000VISION

Scale: 1 : 800 @ A3

DWG No: 23851-SK05

Surveyed: SEM/VISION

Sheet: 1 of 1

Drawn: SEM

Revision: A

APPENDIX B

RATIONAL METHOD CALCULATIONS

Rational Method Peak Flow Calculations

Job No: 24011
 Job Type: Proposed Operational Works - Testing Facility
 Address: Lot 4 Euroa Circuit, Gladstone
 Council: GRC

MORGAN CONSULTING
 ENGINEERS PTY LTD
 1 GREAT GEORGE STREET
 PADDINGTON QLD 4064

IFD Data: 23.8375 (S),151.0875 (E)
¹I₁₀ 62mm/hr

Minor Storm: Q2
 Major Storm: Q10

Designed: IW
 Checked: HM

Pre-Development

Time of Concentration

Standard Inlet Time

Standard Inlet Time mins

Sheet Flow (Friends Equation)

Sheet flow length (L)	40	m
roughness (n)	0.02	bare soil
Fall of NSL	1	m
Slope of Surface (S)	2.5	%
total	6.1	mins

Concentrated Overland Flow

Flow distance	130	m
fall	0.75	m
mins	3.0	mins (from chart Figure 4.5 QUDM)
Surface type multiplier	2.0	
total	6.0	mins

Pipe Flow

Flow distance	15	m
Fall of channel	0.1	m
Flow Velocity	2.5	m/s
total	0.1	mins

Total t_c mins

Post-Development

Standard Inlet Time

Standard Inlet Time mins

Sheet Flow (Friends Equation)

Sheet flow length (L)	175	m
roughness (n)	0.02	bare soil
Fall of NSL	1.3	m
Slope of Surface (S)	0.7	%
total	12.7	mins

Concentrated Overland Flow

Flow distance	"/>m	
fall	0.25	m
mins	"/>mins	
Surface type multiplier	"/>m/s	
total	0.0	mins

Pipe Flow

Flow distance	"/>m
Fall of channel	"/>m
Flow Velocity	"/>m/s
total	"/>mins

Total t_c mins

Runoff Volume Calculations

Name	Area (ha)	t _c	f _i	C ₁₀
	0.6871		0.00	0.58
Total	0.687	12.1		0.58

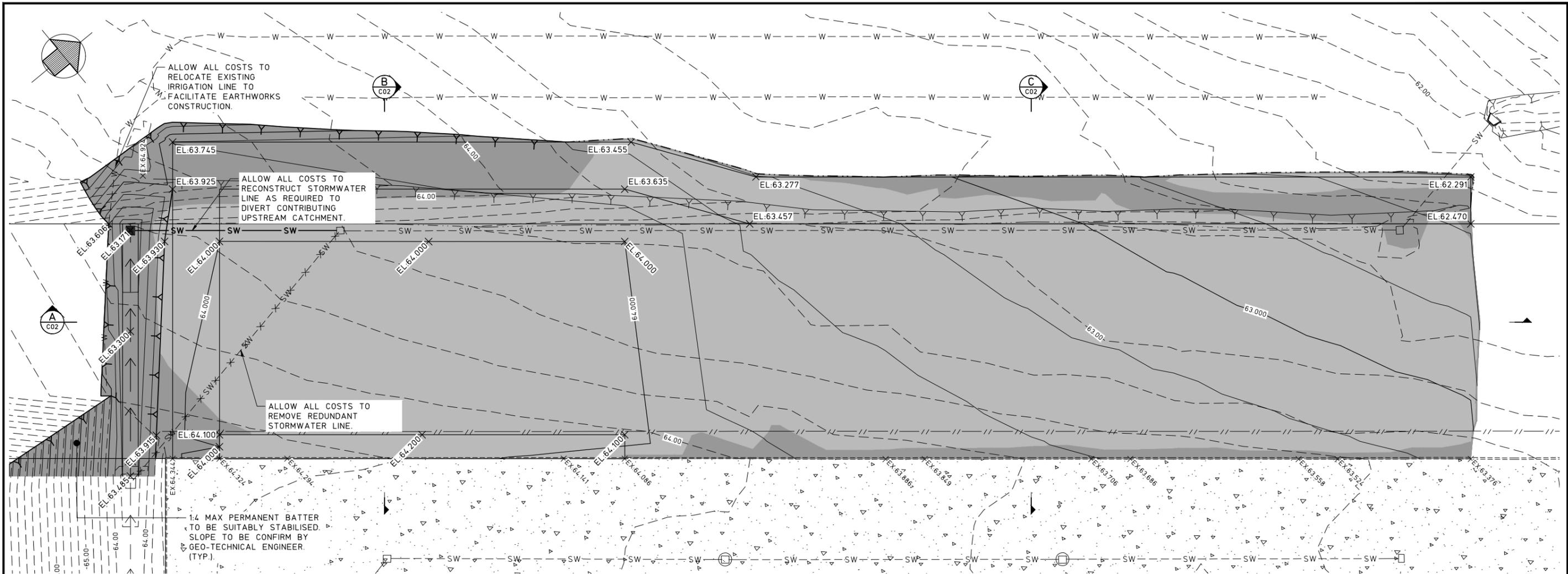
Name	Area (ha)	t _c	f _i	C ₁₀
	0.6871		0.00	0.58
Total	0.687	12.7		0.58

ARI (years)	Frequency Factor (F _y)	C _y (F _y *C ₁₀)	ly (mm/h)	A (Ha)	Q _y (m ³ /s)
3 mth					0.039
1	0.800	0.466	88	0.687	0.078
2	0.850	0.495	98	0.687	0.092
5	0.950	0.553	130	0.687	0.137
10	1.000	0.582	151	0.687	0.168
20	1.050	0.611	172	0.687	0.200
50	1.150	0.669	199	0.687	0.254
100	1.200	0.699	219	0.687	0.292

ARI (years)	Frequency Factor (F _y)	C _y (F _y *C ₁₀)	ly (mm/h)	A (Ha)	Q _y (m ³ /s)	
3 mth					0.038	-2%
1	0.800	0.466	86	0.687	0.076	-2%
2	0.850	0.495	96	0.687	0.091	-2%
5	0.950	0.553	127	0.687	0.134	-2%
10	1.000	0.582	148	0.687	0.164	-2%
20	1.050	0.611	168	0.687	0.196	-2%
50	1.150	0.669	195	0.687	0.249	-2%
100	1.200	0.699	215	0.687	0.287	-2%

APPENDIX C

BULK EARTHWORKS PLANS



EXISTING

- ===== KERB AND CHANNEL
- LOT BOUNDARY
- 10.0 ----- CONTOUR MAJOR (1.0m INTERVAL)
- CONTOUR MINOR (0.25m INTERVAL)
- SW ----- STORMWATER
- S ----- SEWER
- W ----- WATER
- T ----- TELECOMMUNICATION
- U/G - E ----- UNDERGROUND ELECTRICITY
- O/H - E ----- OVERHEAD ELECTRICITY

PROPOSED

- 31.0 ----- CONTOUR MAJOR (1.00m INTERVAL)
- CONTOUR MINOR (0.25m INTERVAL)
- >>----- SWALE
- CUT AREA
- FILL AREA

EARTHWORKS QUANTITIES

SURFACE FROM	SURFACE TO	CUT m ³	FILL m ³	BALANCE m ³
EXISTING	STRIPPED 150mm	-1,031	0	-1,031
STRIPPED 150mm	EARTHWORKS	-309	+1,714	+1,405

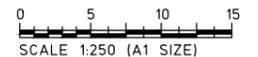
EARTHWORKS QUANTITIES NOTES

1. EARTHWORKS QUANTITIES DO NOT INCLUDE EXCAVATIONS FOR PIPE TRENCHES, STORMWATER STRUCTURES OR UNDERGROUND DETENTION.
2. ALLOWANCES SHOULD BE MADE FOR REPLACEMENT OF UNSUITABLE MATERIAL.
3. QUANTITIES ARE IN-SITU AND DO NOT ACCOUNT FOR BULKING FACTORS.

EARTHWORKS NOTES

1. EARTHWORKS NOTES ARE TO BE READ IN CONJUNCTION WITH THE GENERAL AND COORDINATION NOTES ON DRAWING 24011/C00.
2. EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH PROCEDURES SET DOWN IN AS3798 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
3. BULK EARTHWORKS INCLUDING CLEARING, FILLING AND TESTING, ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS.
4. BULK EARTHWORKS LEVELS SHALL BE DETERMINED RELATIVE TO THE FINISHED SURFACE LEVELS. REFER ARCHITECTURAL DRAWINGS FOR SLAB LEVELS, TO THE STRUCTURAL ENGINEERS DRAWINGS FOR BUILDING AND PATH SLAB THICKNESS AND TO THE CIVIL ENGINEERS DRAWINGS FOR EXTERNAL FINISHED SURFACE LEVELS AND EXTERNAL PAVEMENT THICKNESSES.
5. CONTRACTOR TO REFER TO SOIL SURVEYS GEOTECHNICAL INVESTIGATION ENGINEERS REPORT PROJECT NO. 1-25370 DATED JUNE 2022, PRIOR TO CONSTRUCTION.
6. TOPSOIL SHALL BE STOCKPILED AS DIRECTED BY THE SUPERINTENDENT ON SITE.
7. PRIOR TO PLACEMENT OF ANY FILLING OR BUILDING WORKS ALL TOPSOIL AND ORGANIC MATERIAL IS TO BE REMOVED AND THE SUBGRADE SHALL BE UNIFORMLY COMPACTED TO THE MINIMUM DRY DENSITY RATIOS SHOWN IN NOTE 9. ANY SOFT SPOTS REVEALED BY COMPACTION SHALL BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND BACKFILLED WITH COMPACTED SELECT FILL.
8. MOISTURE CONTENT OF COMPACTED FILL SHOULD BE MAINTAINED WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
9. FILL SHALL BE COMPACTED IN MAXIMUM 200mm THICK LAYERS (LOOSE THICKNESS) TO THE FOLLOWING MINIMUM DRY DENSITY RATIOS (STANDARD COMPACTION A.S.1289.5-1).
 - 9.A. UPPER 0.3m OF PAVEMENT SUBGRADE = 100%;
 - 9.B. UNDER BUILDINGS = 98%;
 - 9.C. GENERAL FILL = 95%.
10. ALL FILL MATERIAL PLACED ON THE SITE SHALL COMPRISE ONLY NATURAL EARTH AND ROCK, AND IS TO BE FREE OF CONTAMINANTS (AS DEFINED BY SECTION 11 OF THE ENVIRONMENTAL PROTECTION ACT 1994), NOXIOUS, HAZARDOUS, DELETERIOUS AND ORGANIC MATERIALS. NO DEMOLITION MATERIAL IS TO BE USED. SUITABLE FILL MATERIAL IS DEEMED TO COMPLY WITH THE REQUIREMENTS OF CLAUSE 4.3 OF AS3798, 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
11. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING:
 - 11.A. SOAKED CBR = MINIMUM OF 8%;
 - 11.B. LIQUID LIMIT = 30% MAX;
 - 11.C. PLASTICITY INDEX = 15% MAX;
 - 11.D. MAXIMUM AGGREGATE SIZE = 75mm;
 - 11.E. PASSING 0.075mm SIEVE = 30% MAX;
 - 11.F. SHRINK/SWELL INDEX = 1.0% MAX.
12. THE CONTRACTOR IS TO ENGAGE, AT THEIR EXPENSE, AN APPROVED NATA REGISTERED LABORATORY TO CARRY OUT SITE CONTROL TO 'LEVEL 1' STANDARD AS SET OUT IN APPENDIX B OF AS3798-2007 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS' AND PROVIDE A 'LEVEL 1' REPORT ON COMPLETION OF EARTHWORKS.

PRELIMINARY



CODE	REVISION	DATE	BY	CODE	REVISION	DATE	BY
A	PRELIMINARY ISSUE	29.02.24	LW				

Client
FORTESCUE

MORGAN
CONSULTING ENGINEERS
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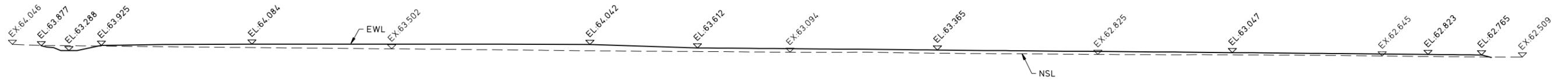
•STRUCTURAL•CIVIL•HOUSING•FORENSIC•
1 GREAT GEORGE STREET
PADDINGTON QLD 4064

P: (07) 3369 8411
F: (07) 3369 1893
E: mail@morgance.com.au

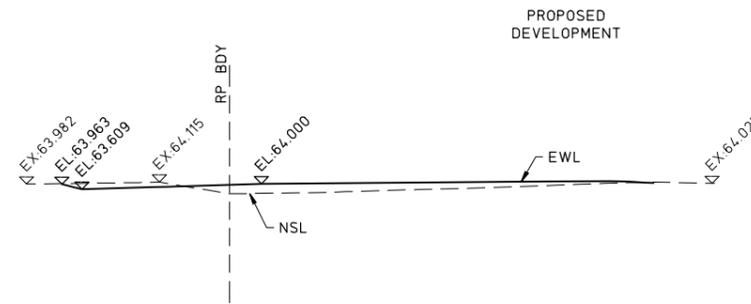
Scales (at A1) AS SHOWN	
Designed IW	Checked HM
Drawn DH	Date FEB 24
Authorised RPEQ	

Project
PROPOSED INDUSTRIAL DEVELOPMENT
Address
EUROA CIRCUIT, GLADSTONE

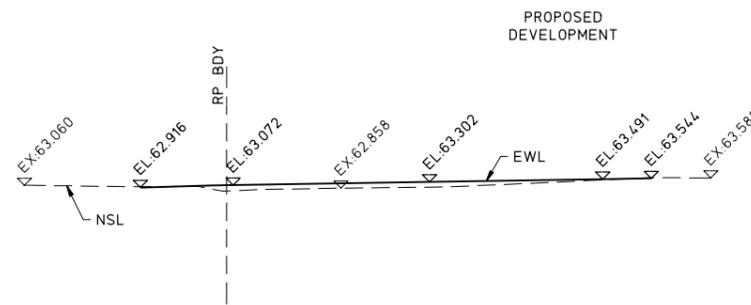
Drawing title BULK EARTHWORKS PLAN	
Drawing No 24011/C01	Revision Code A



SECTION A
SCALE 1:250

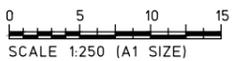


SECTION B
SCALE 1:250



SECTION C
SCALE 1:250

PRELIMINARY



CODE	REVISION	DATE	BY	CODE	REVISION	DATE	BY
A	PRELIMINARY ISSUE	29.02.24	LW				

Client
FORTESCUE



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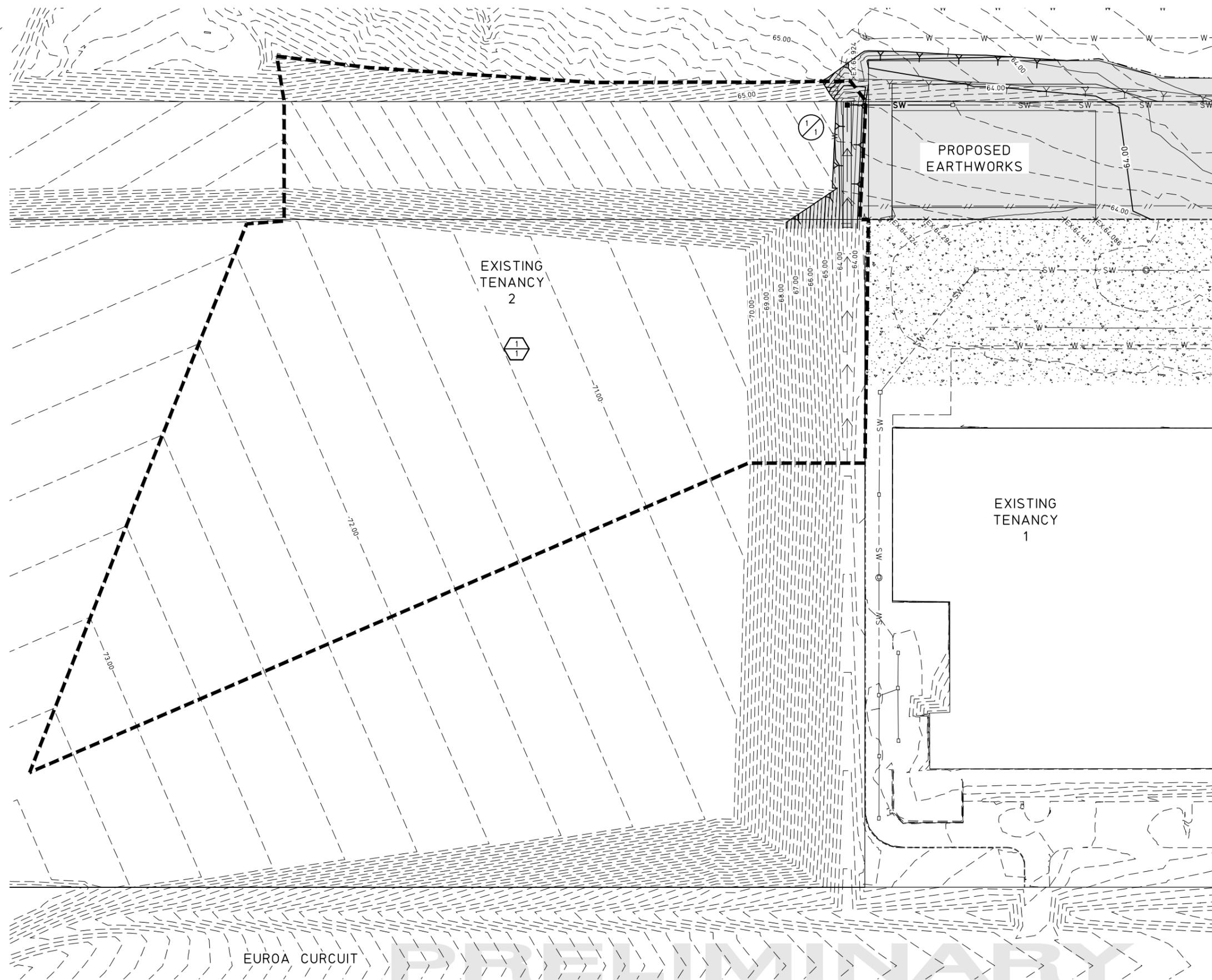
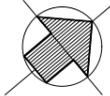
Scales (at A1)	
AS SHOWN	
Designed IW	Checked HM
Drawn DH	Date FEB 24
Authorized	
RPEQ	

Project
PROPOSED INDUSTRIAL DEVELOPMENT
Address
EUROA CIRCUIT, GLADSTONE

Drawing title BULK EARTHWORKS SECTIONS	
Drawing No 24011/C02	Revision Code A

APPENDIX D

EXTERNAL CATCHMENT PLANS



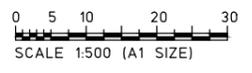
EXISTING

- BUILDING EXTENT
- KERB AND CHANNEL
- LOT BOUNDARY
- CONTOUR MAJOR (1.00m INTERVAL)
- CONTOUR MINOR (0.25m INTERVAL)
- STORMWATER
- WATER
- TELSTRA
- UNDERGROUND ELECTRICITY
- DRAINAGE STRUCTURE ID

PROPOSED

- BUILDING EXTENT
- LOT BOUNDARY
- CONTOUR MAJOR (1.00m INTERVAL)
- CONTOUR MINOR (0.25m INTERVAL)
- STORMWATER
- KERB. REFER DRAWINGS 22011/C21-C22 FOR TYPE AND LOCATION.
- CONCRETE PAVEMENT
- CONCRETE FOOTPATH/DRIVEWAY CROSSOVER
- CATCHMENT ID
- DRAINAGE STRUCTURE ID
- CATCHMENT BOUNDARY

CATCHMENT NAME	CATCHMENT AREA (HA)
1/1	2.190



EUROA CURCUIT

PRELIMINARY

CODE	REVISION	DATE	BY	CODE	REVISION	DATE	BY
A	PRELIMINARY ISSUE	29.02.24	LW				

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Scales (at A1)	
AS SHOWN	
Designed IW	Checked HM
Drawn DH	Date FEB 24
Authorised	
RPEQ	

Project
PROPOSED INDUSTRIAL DEVELOPMENT
Address
EUROA CIRCUIT, GLADSTONE

Drawing title STORMWATER CATCHMENT PLAN	
Drawing No 24011/C20	Revision Code A

APPENDIX E

CHANNEL CAPACITY ANALYSIS

Rational Method Peak Flow Calculations

Job No: 24011
 Job Type: Proposed Operational Works
 Address: Euroa Circuit, Gladstone
 Council: GRC

MORGAN CONSULTING
 ENGINEERS PTY LTD
 1 GREAT GEORGE STREET
 PADDINGTON QLD 4064

IFD Data: 23.8375 (S),151.0875 (E)
¹I₁₀: 62mm/hr

Minor Storm: Q10
 Major Storm: Q100

Designed: IW
 Checked: HM

Post Dev to swale extension between Tenancy 1 & 2

Standard Inlet Time

Standard Inlet Time mins

Sheet Flow (Friends Equation)

Sheet flow length (L) 230 m
 roughness (n) 0.02 bare soil
 Fall of NSL 8.5 m
 Slope of Surface (S) 3.7 %
 total 10.1 mins

Concentrated Overland Flow

Flow distance m
 velocity 2.0 m/s
 mins 0.0 mins
 Surface type multiplier 1.0 natural channel
 total 0.0 mins

Total t_c 10.1 mins

Name	Area (ha)	t _c	f _i	C ₁₀
	2.096		0.00	0.58
Total	2.096	10.1		0.58

ARI (years)	Frequency Factor (F _y)	C _y (F _y *C ₁₀)	l _y (mm/h)	A (Ha)	Q _y (m ³ /s)
3 mth					0.126
1	0.800	0.466	93	2.096	0.253
2	0.850	0.495	104	2.096	0.299
5	0.950	0.553	138	2.096	0.443
10	1.000	0.582	161	2.096	0.544
20	1.050	0.611	182	2.096	0.649
50	1.150	0.669	211	2.096	0.824
100	1.200	0.699	233	2.096	0.949

Job No: 24011
 Job Type: Proposed Operational Works
 Address: Euroa Circuit, Gladstone
 Council: GRC

MORGAN CONSULTING
 ENGINEERS PTY LTD
 1 GREAT GEORGE STREET
 PADDINGTON QLD 4064

Description : Channel Assessment swale extension capturing runoff from tenancy 2

Comments : Channel Capacity For Q100

Width of Channel 5.62
 Bottom Width 2.00
 Batter Width 1.81
 Batter Slope 0.250276243
 Height of Channel Batter 0.453

Designer : IW
 Checked : HM

RL of road channel 63.37 depth (m)
 water lev 63.67 0.303
 slope 0.010 avg A 0.97 B 4.42 P 4.50 R 0.22 AR2/3 PR5/3
 man n (const) 0.03 0.34925004 0.34942853
 V 1.20
 V*d 0.36 m2/s
 Q uniform 1.164 m3/s SIMPLE, UNIFORM FLOW (n constant)
 Q compound 1.246 m3/s COMPOUND CROSS SECTION (ARR 1987, 4.38) (n varies)
 Freeboard (m) 0.150

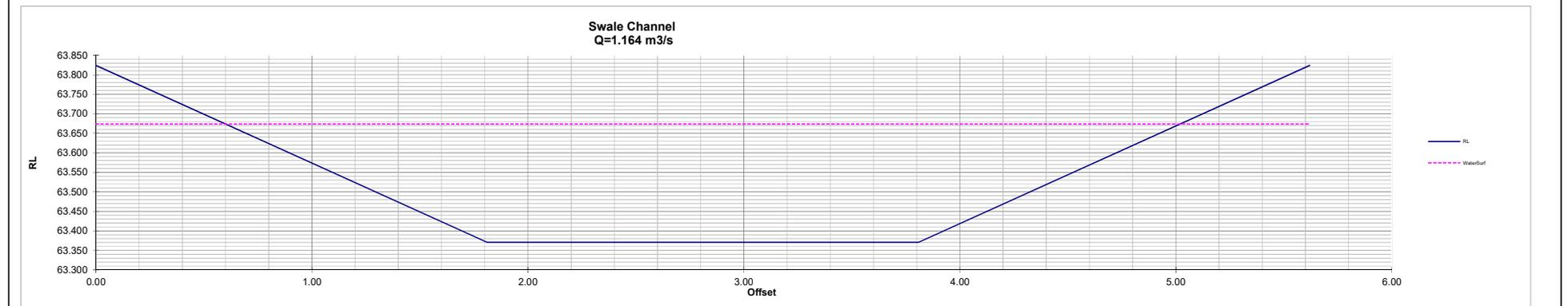
Summation 0.60 0.37 12.47 12.46 1.16
 K

Pt	location	Offset	RL	n	Z	area	perimeter	Pn ^{1.5}	B	R	A ^{5/3} / p ^{2/3}	A ^{5/3} / (n ^{5/3} P ^{2/3})	K= A.R ^{2/3} /n	PR ^{5/3} /n	Q-sect (uniform)	Q-sect (compound)	v	Water RL
1	top of channel	0.00	63.824	0.030	-25.0%	0.18	1.25	0.006	1.21	0.15	0.05	1.70	1.702	1.703	0.159	0.17	0.93	63.67
2	base of channel	1.81	63.371	0.030	0.0%	0.60	2.00	0.010	2.00	0.30	0.27	9.06	9.059	9.063	0.846	0.91	1.50	63.67
3	base of channel	3.81	63.371	0.030	25.0%	0.18	1.25	0.006	1.21	0.15	0.05	1.70	1.702	1.703	0.159	0.17	0.93	63.67
5	top of channel	5.62	63.824	0.030														63.67
6																		
7																		
8																		

(insert new lines above this termination line)

Qdes
 Freeboard @ A (m): 0.150

Composite n values	0.024	0.030	0.032
Horton n=		Carroll n=	Lotter n=
(ARR87 4.30)		(QUDM 8.03)	(ARR87 4.31)



APPENDIX F

BOM INTENSITY FREQUENCY DISTRIBUTION DATA

IFD Design Rainfall Intensity (mm/h)

Issued: 26-Feb-24

Location Label:

Requested Latitude -23.842 Longitude 151.077

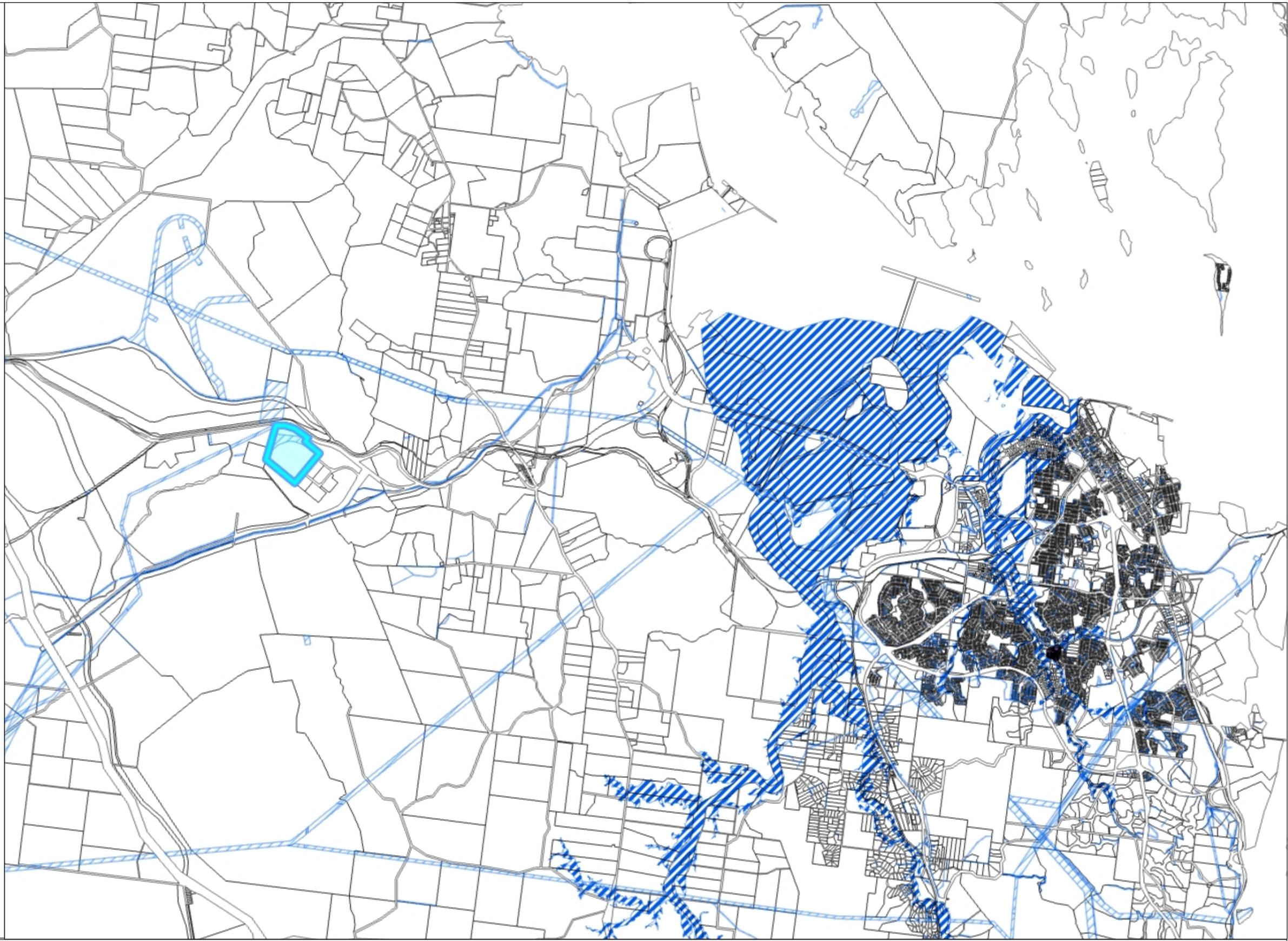
Nearest gri Latitude 23.8375 (S) Longitude 151.0875 (E)

Duration	Duration in min	Annual Exceedance Probability (AEP)						
		63.20%	50%	20%	10%	5%	2%	1%
1 min	1	154	171	227	264	300	348	384
2 min	2	124	138	182	213	241	279	308
3 min	3	118	132	174	203	230	266	294
4 min	4	114	128	169	196	223	258	285
5 min	5	111	124	163	190	216	250	276
10 min	10	93.4	104	138	161	183	212	234
15 min	15	79.8	89	118	137	156	181	199
20 min	20	69.5	77.5	103	119	136	157	174
25 min	25	61.6	68.8	90.9	106	121	140	154
30 min	30	55.5	61.9	81.8	95.4	109	126	139
45 min	45	43	48	63.6	74.2	84.5	98.3	109
1 hour	60	35.5	39.6	52.6	61.5	70.2	81.8	90.8
1.5 hour	90	26.8	30	40.1	47	53.8	63	70.2
2 hour	120	22	24.6	33.1	38.9	44.7	52.6	58.8
3 hour	180	16.6	18.7	25.4	30.1	34.8	41.2	46.3
4.5 hour	270	12.7	14.3	19.7	23.6	27.5	32.9	37.2
6 hour	360	10.5	11.9	16.7	20.1	23.6	28.4	32.3
9 hour	540	8.13	9.33	13.3	16.2	19.2	23.4	26.8
12 hour	720	6.81	7.87	11.4	14	16.8	20.6	23.7
18 hour	1080	5.32	6.2	9.21	11.5	13.9	17.3	20
24 hour	1440	4.46	5.23	7.9	9.94	12.1	15.2	17.7
30 hour	1800	3.87	4.56	6.98	8.85	10.9	13.7	16
36 hour	2160	3.44	4.07	6.29	8.02	9.89	12.5	14.7
48 hour	2880	2.84	3.37	5.27	6.78	8.42	10.7	12.6
72 hour	4320	2.12	2.53	4	5.18	6.48	8.3	9.82
96 hour	5760	1.69	2.02	3.21	4.16	5.22	6.7	7.95
120 hour	7200	1.41	1.68	2.66	3.44	4.33	5.56	6.6
144 hour	8640	1.21	1.44	2.26	2.9	3.66	4.7	5.59
168 hour	10080	1.06	1.25	1.95	2.49	3.14	4.03	4.8

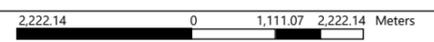
APPENDIX G

GRC FLOOD MAP

- Road Centrelines
- Easement
- Base Parcel
- Base Point
- Auckland Creek Q100
- Awoonga Country DA07_0049
- Boyne River Q100
- CalliopeRiverQ100
- River Downs 5ADA04_0389
- Flood Hazard Investigation Area

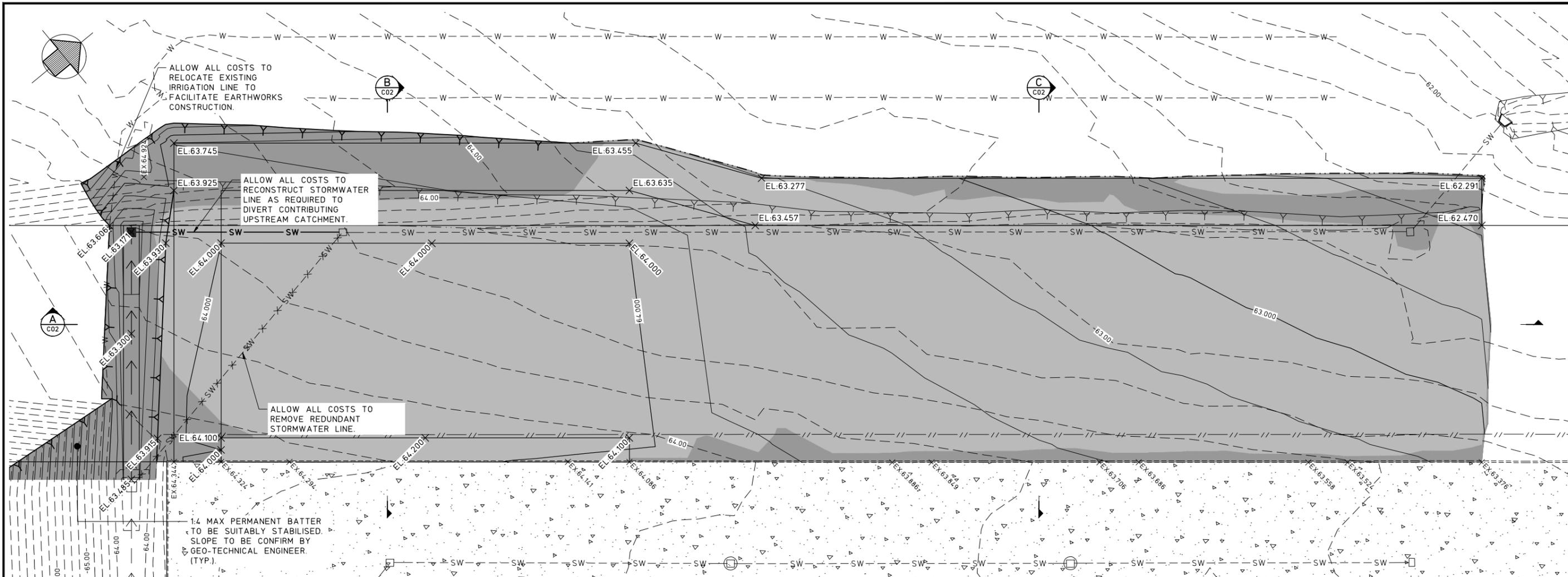


Map Title



Printed: 23-Mar-2022
 Map Scale 1: 88,885
 Original Size: A3

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- CONTOUR MINOR (0.25m INTERVAL)
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- U/G - E ----- UNDERGROUND ELECTRICITY
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PROPOSED

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- CONTOUR MINOR (0.25m INTERVAL)
- >>----- SWALE
- CUT AREA
- FILL AREA

EARTHWORKS QUANTITIES

SURFACE FROM	SURFACE TO	CUT m ³	FILL m ³	BALANCE m ³
EXISTING	STRIPPED 150mm	-1,031	0	-1,031
STRIPPED 150mm	EARTHWORKS	-309	+1,714	+1,405

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 - 9.B. UNDER BUILDINGS = 98%;
 - 9.C. GENERAL FILL = 95%.
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 - 11.B. LIQUID LIMIT = 30% MAX;
 - 11.C. PLASTICITY INDEX = 15% MAX;
 - 11.D. MAXIMUM AGGREGATE SIZE = 75mm;
 - 11.E. PASSING 0.075mm SIEVE = 30% MAX;
 - 11.F. SHRINK/SWELL INDEX = 1.0% MAX.
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PRELIMINARY



CODE	REVISION	DATE	BY	CODE	REVISION	DATE	BY
A	PRELIMINARY ISSUE	29.02.24	LW				

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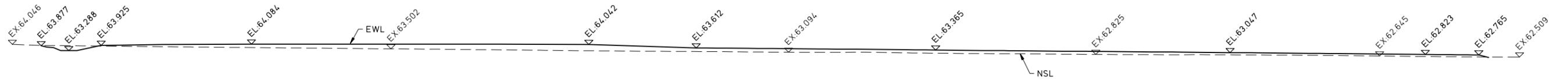
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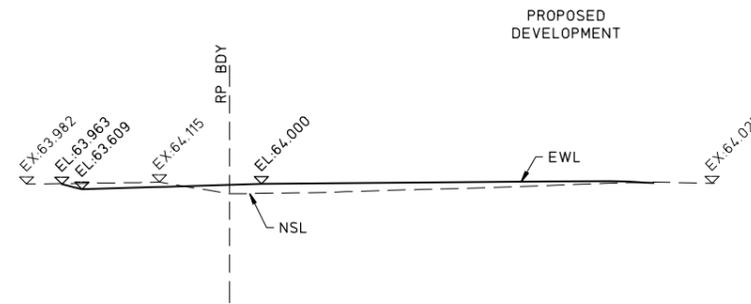
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Project
PROPOSED INDUSTRIAL DEVELOPMENT
Address
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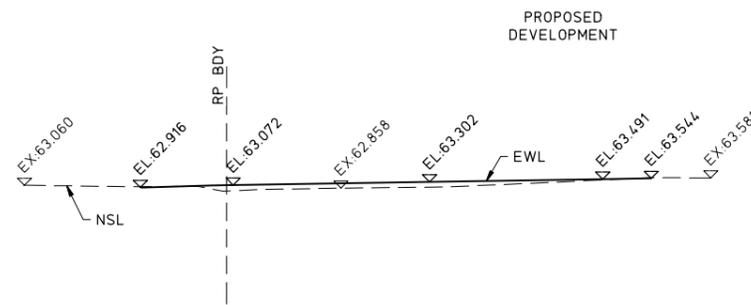
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Drawing No 24011/C01	Revision Code A



SECTION A
SCALE 1:250

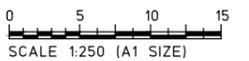


SECTION B
SCALE 1:250



SECTION C
SCALE 1:250

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