Strategic Design Report

Italia Road Intersection Upgrade

Boral Resources (NSW) Pty Ltd

06 November 2024

→ **The Power of Commitment**

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1. Introduction

1.1 Background and project overview

Boral Resources (NSW) Pty Ltd (Boral), collaborating with Eagleton Rock Syndicate (ERS) and Australian Resource Development Group Pty Limited (ARDG) (collectively referred to as the 'quarry operators') is submitting a development application (DA) to Port Stephens Council (Council), pursuant to Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), for proposed upgrades to the Italia Road and Pacific Highway intersection.

The proposed development involves safety upgrades to the intersection of Italia Road and Pacific Highway, including the following:

– Construction of a dedicated left-turn northbound acceleration lane from Italia Road onto the Pacific Highway.
– Widening of the existing bridge over the Balickera Canal (to accommodate the northbound acceleration lane).
– Lengthening of the northbound deceleration lane into Italia Road.

All works are proposed to be undertaken within the existing road reserve.

The project site is approximately 40 km north of Newcastle via the Pacific Highway A1. Refer to Figure 1.1 below for the project location.

Figure 1.1 Site Overview

1.2 Related development

Transport for NSW (TfNSW) has identified the need for safety upgrades to the intersection to meet the future predicted traffic growth of the area. The need to bring forward the safety upgrades to the Italia Road / Pacific Highway intersection is in direct response to the vehicle movements predicted to be generated by the proposed developments on three quarry sites. Consequently, the quarry operators have been working closely with TfNSW since 2020 to prepare a design for the intersection upgrades.

In-principle support was provided by TfNSW for a concept design in June 2022 on the basis that the quarry operators agreed to jointly fund all costs associated with the approval and construction of the required upgrades. The concept agreed comprised of a left-in left-out restriction at the intersection of Italia Road and Pacific Highway for quarry trucks, with acceleration and deceleration lanes. No other works were identified or agreed. A commercial agreement between the quarry operators is proposed (subject to approvals) and construction of the intersection is expected to be finalised and operational within the last quarter of 2025.

The strategic concept design has been further developed to meet the requirements of TfNSW, Port Stephens Council and Hunter Water Corporation (HWC) and this refined design informs the development application.

1.3 Purpose of this report

GHD was engaged to produce a strategic level concept design for the proposed upgrade of the existing intersection of the Pacific Highway and Italia Road at Balickera, NSW.

This report was prepared to define the design requirements and specifications required for the Strategic Concept Design phase of the project. These design criteria and specifications may be amended and will be agreed with TfNSW during detail design phase. The specific project elements that are the subject of this report:

- Left in/Left out Intersection arrangement between Italia Road and the Pacific Highway
- Description of potential property impacts
- Description of existing utilities within the project area
- Road design criteria
- Bridge design criteria (as they pertain to the strategic concept design)

1.4 Scope and limitations

This report has been prepared by GHD for Boral Resources (NSW) Pty Ltd and may only be used and relied on by Boral Resources (NSW) Pty Ltd for the purpose agreed between GHD and Boral Resources (NSW) Pty Ltd as set out in Section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Boral Resources (NSW) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Boral Resources (NSW) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Project description

2.1 Site location

Boral's Seaham Quarry is located on the southern side of Italia Road in Balickera, to the east of the township of Seaham and to the north of Newcastle. The Seaham Quarry is a primary source of hard rock for aggregate products used in the Hunter and Port Stephens regions of NSW.

The area to the south of the Seaham Quarry is proposed by ERS to be developed as a quarry known as the 'Eagleton Quarry'. On the northern side of Italia Road is the Wallaroo State Forrest, a portion of which is proposed to be developed into a new quarry by ARDG, the 'Stone Ridge Quarry'. In addition to these proposed quarries, the site is surrounded by a recreational motorway and a paintball facility. The nearest residential lots are located approximately 1 km to the northwest of the site on Italia Road, as well as approximately 1.5 km to the southeast of the site adjacent to the Pacific Highway. Each of these lots are low density semi-rural in nature.

The Seaham Quarry and both proposed quarries are accessed from Italia Road, which connects to Pacific Highway.

An aerial view of the site is provided below in Figure 2.1, illustrating the location of the quarries in relation to the external road network.

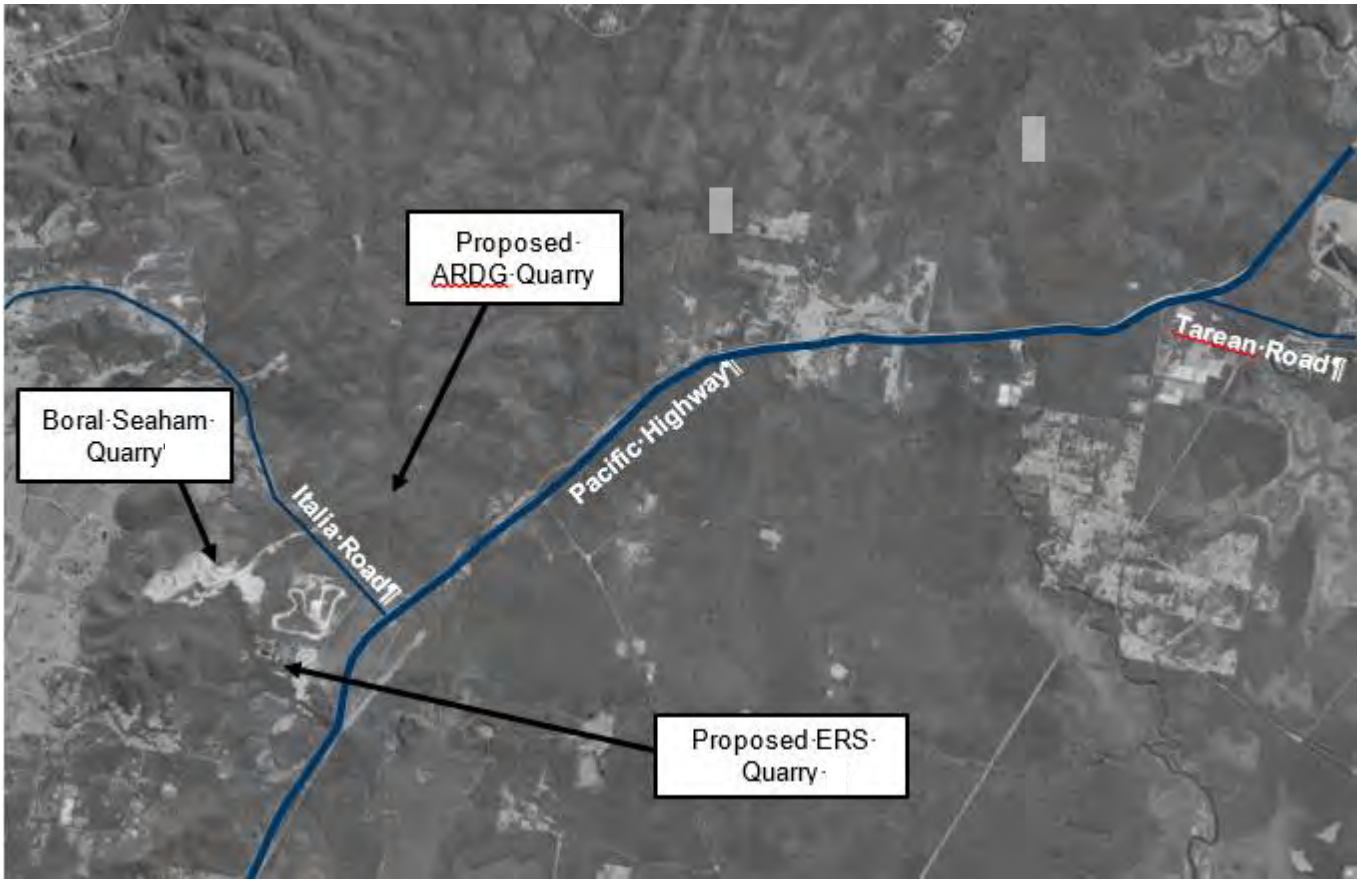


Figure 2.1 Existing Site

Image source: MetroMap, accessed June 2022

2.2 Existing road network

2.2.1 Pacific Highway

The Pacific Highway is an arterial road generally aligned north-south, which runs along the east coast of Australia between Sydney and Brisbane. The Pacific Highway is a strategic freight corridor along the east coast and is accordingly approved for use by vehicles including 25/26 m B-doubles without specific permit conditions.

The key features of the Pacific Highway (Figure 2.2 and Figure 2.3) within proximity to the intersections of interest are outlined in Table 2.1.

Table 2.1 Pacific Highway features

Feature	Description
Carriageway	A divided carriageway with two travel lanes in either direction and additional short turning lanes at key intersections
Parking	No dedicated facilities
Speed Limit	100 km/h in arterial road configuration (for 110 km/h in a motorway configuration)
Pedestrian Facilities	No dedicated facilities
Bicycle Facilities	No dedicated facilities, riders could potentially cycle in shoulders (approximately 2.5 m wide)
Public Transport	No dedicated facilities

Figure 2.2 Pacific Highway north of Italia Road

2.2.2 Italia Road

Italia Road is a rural local road and key features are detailed in Table 2.2.

Italia Road provides access to Boral's Seaham Quarry, and several other businesses.

Table 2.2 Italia Road Key Features

Feature	Description
Carriageway	Painted line markings and a single travel lane in either direction
Parking	No dedicated facilities
Speed Limit	90 km/h
Pedestrian Facilities	No dedicated facilities
Bicycle Facilities	No dedicated facilities
Public Transport	No dedicated facilities

Figure 2.3 Italia Road west of the Pacific Highway

2.2.3 Existing Italia Road intersection

The Italia Road / Pacific Highway intersection is a seagull type intersection, with short right turn and left turn deceleration lanes. The intersection features a long acceleration lane for southbound vehicles turning right onto the Pacific Highway, which forms a third lane on the Highway until it merges approximately 1.2 km downstream of the intersection. This allows right turning vehicles to enter Pacific Highway giving way to traffic in the northbound direction and vehicles turning into Italia Road heading southbound only. While not at technical capacity, TfNSW has articulated ongoing safety concerns at the intersection, with sight distance to the south for vehicles existing the intersection noted as a concern by TfNSW. Figure 2.4 below shows the existing Italia Road intersection arrangement.

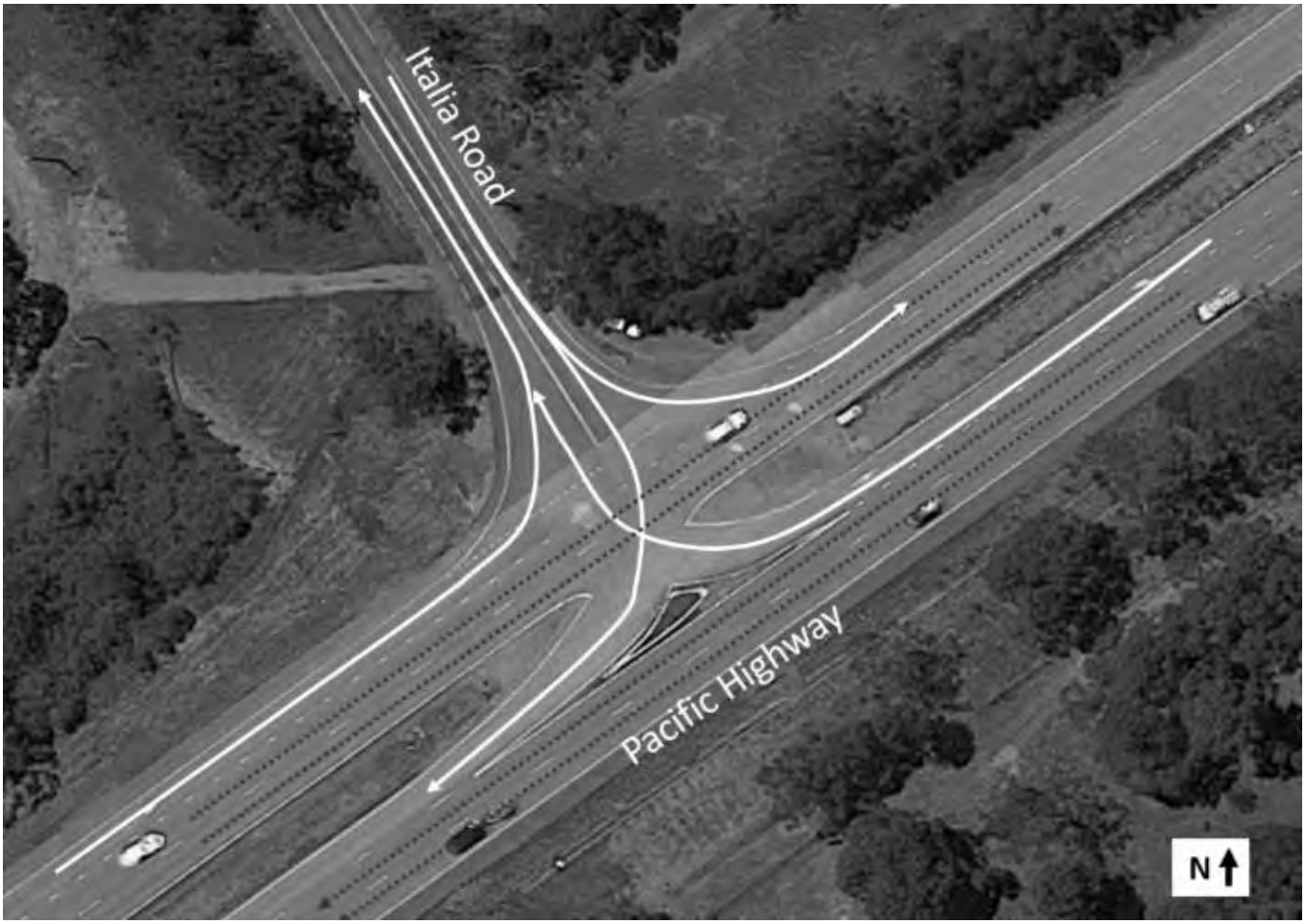


Figure 2.4 Pacific Highway and Italia Road Intersection Configuration

2.3 Modification of existing Italia Road and Pacific Highway intersection

As part of the project, it is proposed that the existing Italia Road intersection will be modified to improve the left-in and left-out facilities for truck movements. This will allow heavy vehicles to travel northbound on the Pacific Highway and utilise the Tarean Road interchange at Karuah to return to markets south of Italia Road. Features of the proposed left-in/left-out upgrade include:

– Upgrade of existing Auxiliary left-in (AUL) treatment from the Pacific Highway to Italia Road to a channelised left-in treatment (CHL), similar to that recently implemented at The Bucketts Way/Pacific Highway Intersection. The length of the existing deceleration lane appears to be compliant with the requirements of AGRD04A for an AUL, however it has been lengthened to 235 m in this concept design to suit the proposed CHL treatment.
– Upgrade of existing left-out treatment from Italia Road to the Pacific Highway to include a CHL treatment and a dedicated acceleration lane for northbound vehicles. The approximate length of the acceleration lane required is 435 m (including 110 m merge). The governing criteria in accordance with AGRD04A Table 5.5 is light vehicles requiring 435 m to achieve the sign posted speed of 100 km/h. In comparison using the truck acceleration distance calculated using Austroads AP-R211 to allow heavy vehicles (535 hp 50.5 T as advised by Boral) to accelerate to 80 km/h (20 km/h less than the mean through speed) was calculated to be 435 m. This requires widening (deck stitch) of the northbound bridge over the Balickera Canal to accommodate the additional acceleration lane as the bridge is located approximately 300 m north of Italia Road.
– Existing right-in seagull movement to remain for all vehicles.
– Existing right-out seagull movement to remain for light vehicles.
– Heavy vehicles from the surrounding existing and proposed quarries to be banned from using the right out from Italia Road.
– Cyclist amenity through the intersection has been provided similar to that recently implemented at Failford Road/Pacific Highway Intersection, west of Foster. TfNSW advised GHD that this was the preferred treatment for this upgrade.

3. Design requirements

This section outlines the technical design standards and key design criteria to be used in the development of the strategic concept design.

3.1 Design standards

The design will be developed in accordance with the following Austroads design guide standards, including TfNSW supplements:

- AGRD03-16 Guide to Road Design Part 3 Geometric Design.
- AGRD04-17 Guide to Road Design Part 4 Intersections and Crossing General.
- AGRD04A-17 Guide to Road Design Part 4A Unsignalised and Signalised Intersections.
- Austroads AP-R211 Geometric Design for Trucks method for heavy vehicle acceleration calculations.
- AGRD05A-13 Guide to Road Design Part 5A Drainage – Road surface, Networks, Basins and Subsurface.
- AGRD05B-13 Guide to Road Design Part 5A Drainage – Drainage, Open Channels, Culverts and Floodways.
- AGRD06-10 Guide to Road Design Part 6 Roadside Design, Safety and Barriers.
- NSW Dept of Planning and Environment – Managing Urban Stormwater: Soils and Construction (Blue Book).
- Australian Rainfall and Runoff Guidelines 2019.
- Compliance with Neutral or beneficial Impact NorBE requirements for water quality within drinking water catchment.
- Austroads Safety barrier Technical Conditions of use manuals.
- Australian Standard AS1742.

This list is not exhaustive and additional Austroads design guides may be utilised through the design process. GHD notes that although a newer version of AGRD06 exists, at the time of writing it is yet to be adopted by TfNSW. As such, GHD will develop the strategic concept using the 2010 version.

3.2 Site survey

A detailed site survey has been conducted by ADW Johnson using MGA Z56 co-ordinate system based on GDA2020, which was issued to GHD on 22 May 2023. The strategic concept design is based on this survey within the road reserve with LIDAR data being used for survey outside the limits of the road reserve.

A copy of the ADW Johnson survey data can be found in Appendix B.

3.3 Limit of works

The limit of works has been further refined during the strategic design process. Previous high-level design completed by GHD indicated that the limit of works for the project along the existing road network are as follows:

- Pacific Highway northbound (North of Italia Road), approximately 461 m north of the existing Italia Road Intersection.
- Italia Road, approximately 80 m west of the Pacific Highway.
- Pacific Highway northbound (South of Italia Road), approximately 290 m south of the existing Italia Road Intersection.

The current strategic concept design is fully contained within the existing TfNSW road reserve.

3.4 Road design

The adopted horizontal and vertical geometry depicted in this strategic concept design is in accordance with the requirements of Austroads guide to road design part 3. Refer to Appendix A for strategic concept design drawings.

3.4.1 Basis of Design

The design criteria utilised in the development of the strategic concept design are listed in Table 3.1 below:

Table 3.1 Key design criteria

Area	Element	Typical Value	Reference
Speed	Posted Speed (Italia Road)	90 km/h	Existing condition on Italia Rd in vicinity of Pacific Highway
	Design Speed (Italia Road)	100 km/h	AGRD03 Table 3.2
	Posted Speed (Pacific Hwy)	100 km/h	Existing Condition
	Design Speed (Pacific Hwy)	110 km/h	AGRD03 Table 3.2, TfNSW standard design speed for Pacific Highway.
Vehicles	Design Vehicle	19 m Semi Trailer	AGRD04 Table 5.1
	Check Vehicle	26 m B- Double	AGRD04 Table 5.1
Cross Section	Lane Width	3.5 m	AGRD03 Table 4.3, 4.4, 4.6
	Shoulder Width (Italia Road)	1.0 m	AGRD03 Table 4.7
	Shoulder Width (Pacific Hwy)	2.5 m	AGRD03 Table 4.6, match existing conditions
	Verge Width	1.0 m	AGRD03 Table 4.9
	Verge Rounding	1 m:1 m	AGRD03 Table 4.10
	Typical Crossfall	3%	AGRD03 Table 4.2
	Maximum super-elevation	6%	AGRD03 Table 7.8
	Curve widening	Varies	AGRD03 Table 7.13
Earthworks	Maximum fill batter slope	6(H):1(V) – desirable 4(H):1(V) – minimum without barriers 2(H):1(V) – minimum with barriers	AGRD03 Table 4.11
	Maximum cut batter slope	2(H):1(V)	AGRD03 Table 4.11
Roadside design	Clear Zone (Italia Road) - Cut	5.5 m	AGRD06 Table 4.1
	Clear Zone (Italia Road) - Fill	9.0 m	AGRD06 Table 4.1
	Clear Zone (Pacific Highway) - Cut	7.5 m	AGRD06 Table 4.1
	Clear Zone (Pacific Highway) - Fill	14.0 m	AGRD06 Table 4.1

3.4.2 Left-in to Italia Road

Based on the requirements of Austroads and previous discussions with TfNSW, a CHL intersection treatment has been implemented for vehicle movements from the Pacific Highway into Italia Road to improve safety of the intersection. The upgrade to a CHL will improve safety for a number of turning movements, including:

– Left-in to Italia Road
– Right-in to Italia Road
– Right-out of Italia Road

The left-in CHL has been designed in accordance with the requirements of AGRD04A. The existing AUL deceleration lane is required to be lengthened to 235 m in accordance with the requirements of the CHL treatment. Additional modification to the alignment of the lane was required near the Italia Road intersection to provide a sufficient width of painted island for the CHL treatment requiring localised pavement widening. A give way line has been provided at the termination of the CHL deceleration lane to require vehicles to give way to vehicles turning right into Italia Road from the Pacific Highway.

3.4.3 Left-out to the Pacific Highway

Similar to the left-in movement, a CHL treatment has been documented for the left-out movement. The dedicated left turn lane provided by the CHL treatment will provide a free-flow entry from Italia Road onto the Pacific Highway acceleration lane, improving both safety and capacity of the intersection. The design will be based on Figure A35: Rural CHL treatment with an acceleration lane, from Appendix A of AGRD04.

Construction of the dedicated left turn lane will require road widening for approximately 90 m prior to the Pacific Highway intersection along Italia Road to allow for sufficient deceleration length prior to the curve.

3.4.4 Acceleration lane

Calculations to determine the required acceleration lane length have been carried out in accordance with the requirements of AGRD-04A, Section 5.4, Table 5.5 and Commentary 4). Acceleration lengths were calculated for both heavy vehicles achieving a speed of 80 km/h (20 km/h under the signposted speed) and light vehicles achieving the sign posted speed of 100 km/h.

The method defined in Austroads AP-R211 “Geometric Design for Trucks” to calculate the required length of acceleration for heavy vehicles has been used. Based on a startup speed of 25 km/h on entry to the acceleration lane (calculated using AGRD horizontal curve formula) and a conservative horse power rating of 535 hp along with existing surface level supplied by the detailed site survey to estimate the required distance to accelerate to 80 km/h. The findings of these calculations indicate that a length of approximately 435 m is required to accelerate from 25 km/h to 80 km/h. Refer to Appendix C for calculations.

For light vehicles Table 5.5 of AGRD04A was used to calculate the distance to acceleration to 100 km/h from 20 km/h. The length advised in Table 5.5 is also 435 m.

Based on the most onerous requirements the length of the strategic concept design acceleration lane has been set to 435 m including taper.

3.4.5 Sediment and erosion design

Sediment and erosion plans were developed in accordance with the NSW Government “Blue Book” – Managing Urban Stormwater: Soils and Construction. The following summarises the sediment and erosion plan:

– Off-site water diversion drains were not required to divert flows external to the works as the existing site drains away from the proposed works with the exception of a small section on the southern side of Italia Road. Due to the small catchment and spatial limitations due to property boundary this catchment has been allowed to enter the proposed table drain formation which is treated using sediment control fences and periodic straw bale filters.
– Dirty water runoff was managed using geofabric sediment control fences and straw bale sediment filters.

Final sediment and erosion control plans will be developed by the contractor prior to construction to suit their specific construction methodology and requirements. Particular attention will be given to water quality near the Balickera Canal to meet Hunter Water requirements.

3.4.6 Roadside furniture

Roadside furniture, signage, and line marking is provided on the drawing set as per TfNSW and Australian Standards. Proposed signage includes but is not limited to:

– Cyclists crossing ahead warning signs
– Cyclist crossing advisory signs
– Give way and Stop signs
– Advance warning speed reduction, stop ahead and tipping truck warning signage
– Keep left regulatory signs
– Merge lane warning signage

In addition to the standard signage nominated on the strategic concept design drawings, the existing heavy vehicle turning signage and radar heavy vehicle detectors located at the intersection of Italia Road will need to be relocated and recalibrated by TfNSW for the new location. This relocation is required due to the exiting location being impacted by the proposed formation and interface batters. The existing flashing sign at the crest of the Pacific Highway, triggered by the detector pole is not affected by the works and does not require adjustment.

3.4.7 Pavement design

For the purposes of the strategic concept design a strategic level pavement plan has been produced. The proposed pavement types and locations are based on the recent upgrade of The Bucketts Way intersection with the Pacific Highway. The proposed pavements consist of:

– New asphalt pavement in verges and through the intersection throat.
– New concrete pavement to the acceleration lane, over the bridge deck and through to the northern tie in.

Pavement thickness designs will be carried out following geotechnical investigations during the WAD concept design phase.

3.4.8 Design non-conformances

The following upgrade road design non-conformances are noted with the proposed strategic concept design.

Table 3.2 Design non-conformances

Location	Non-Conformance
NIL	NIL

Note, no consideration has been made for any existing non-conformances that may exist with the southbound carriage way including deceleration lane length on the southbound carriageway of the Pacific Highway.

3.5 Structures

To accommodate the acceleration lane, a widening of the existing northbound bridge over the Balickera Canal via a deck stitch will be required. The minimum bridge width required will be 14.0 m between bridge barriers, to accommodate:

– Two 3.5 m through lanes
– One 3.5 m acceleration lane
– 1.0 m shoulder on the right side of the right through lane to match existing shoulder width
– 2.5 m shoulder on the left side of the acceleration lane to match existing shoulder width

The widened road formation also requires lengthening of the existing three cell cast in place box culvert located just south of the Balickera Canal Bridge.

3.5.1 Bridge widening

The total widening required is approximately 3.5 m, with the deck stitch widening to be constructed on the western side. Figure 3.1 below shows a street view image of the existing northbound bridge, taken from the southbound carriageway.

Figure 3.1 Existing northbound bridge over Balickera Canal (Google Maps, 2022)

At this early stage of project development, it is thought that construction of the deck stitch widening could be constructed with the bridge operating under traffic with reduced speed limit and narrowed lanes and shoulders. Select closures, or partial closures of the bridge under nightworks may be required to complete major lifts and other critical construction tasks. In this scenario, traffic would be temporarily diverted onto the southbound carriageway in contraflow.

The existing northbound bridge is a 3 span composite RC- deck unit bridge built circa 1999 and was designed to Austroads 1992 and RTA standards. The existing bridge has been designed for T54 truck-, L54- lane and HLP320 design vehicle loading. The proposed bridge widening concept design has been designed to AS5100-2017 Bridge Design Code and TfNSW Standards using SM1600 and HLP400 design vehicle loadings. The final design criteria and configuration will be agreed with TfNSW.

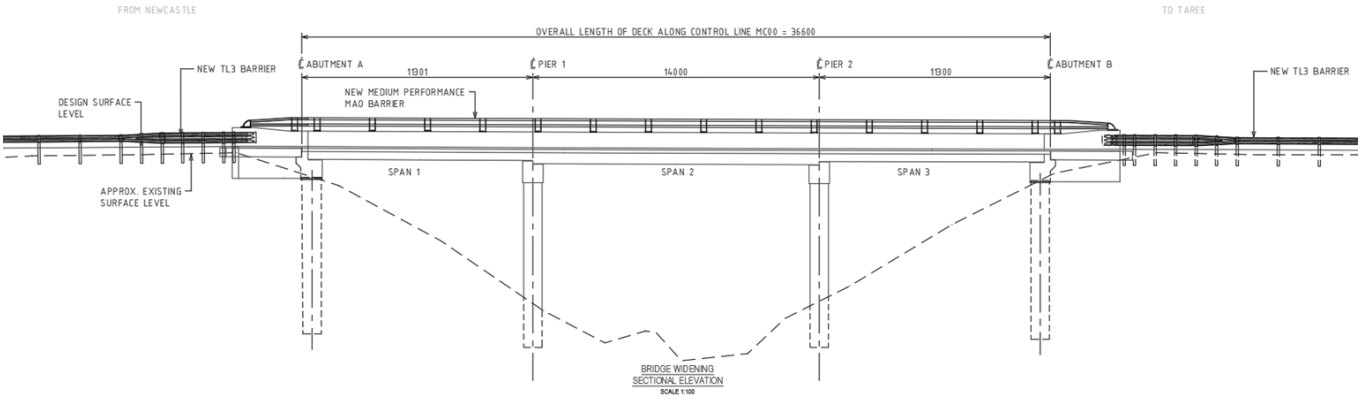


Figure 3.2 Sectional elevation of bridge widening

The bridge widening deck units have a similar depth to the existing units but the cast in place deck has been thickened to 210 mm to increase structural capacity and to meet updated concrete cover requirements. The articulation of the bridge widening matches the existing and no longitudinal joint is required. The RC deck tapers across the bridge widening interface to facilitate a gradual increase in transverse superstructure stiffness between the older and newer structural systems. Single bored piles have been proposed for both the pier and abutment substructure. It is the intent of the design to align the supporting columns and abutment headstocks with the existing structure columns and headstocks.

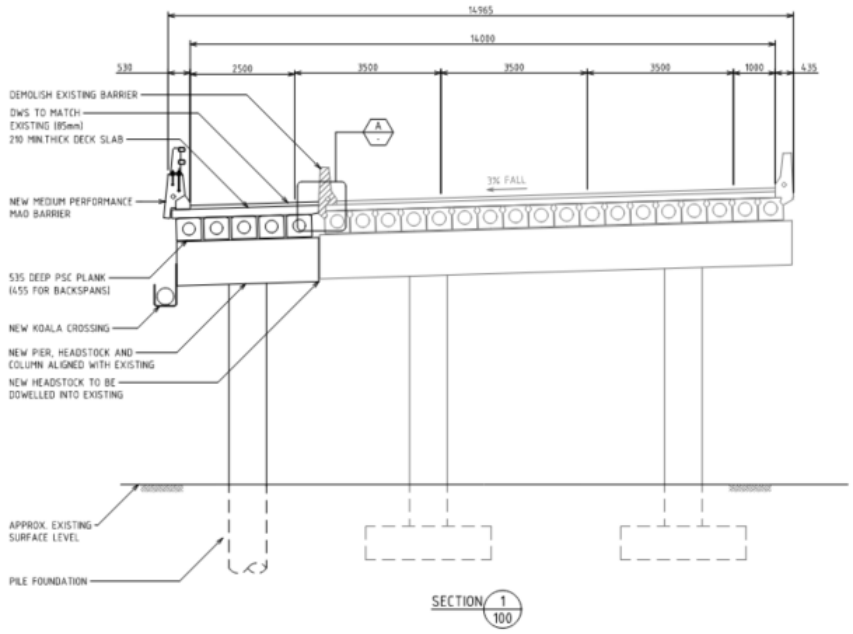


Figure 3.3 Typical bridge widening cross section

The AS5100 bridge barrier assessment has resulted in a medium performance barrier being specified (refer to Appendix E). While a TL3 high containment barrier is provided on the approach and departure side of the bridge barrier.

Further geotechnical investigation and structural design will be required during the WAD Concept Design phase to ascertain foundation and structural details of the bridge deck stitch.

3.5.2 Culvert lengthening

The existing three cell cast in place culvert located at approximate chainage 560 is to be widened using precast RCBC units of similar sizes to best match the existing structure. The existing culvert structure does not have an apron slab and the wingwalls are supported on independent spread footings. The proposed culvert lengthening requires the introduction of an RC integral apron / base slab dowelled into the existing culvert base slab. The wingwall wall foundations will be integrated into the apron slab.

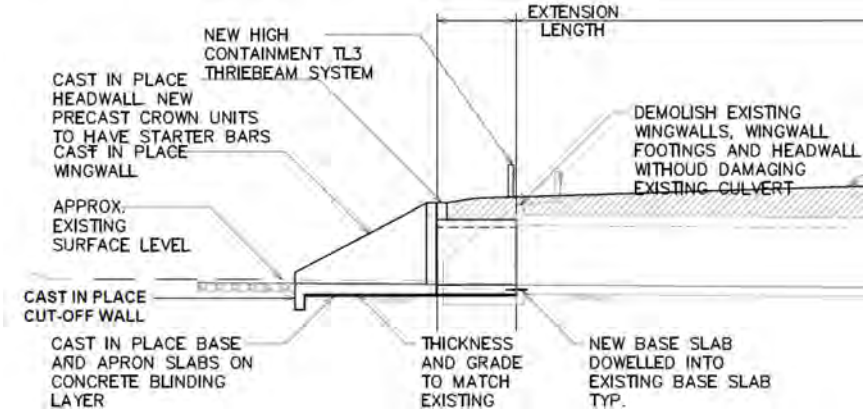


Figure 3.4 Typical culvert lengthening cross section

The walls of the existing culvert cells will be prepared, and grout or epoxy widened to provide a smooth hydraulic interface between the two structures. Further geotechnical investigations and structural design will be required during the WAD Concept design phase to determine foundation and culvert extension design.

3.5.3 Retaining walls

L-shape concrete retaining walls are required for the project. One wall with TL5 extruded barrier off-structure is required on the northern side of Italia Road on approach to the Pacific Highway, with a second L-shape concrete retaining wall with off-structure TL3 high performance barrier. Locations of proposed retaining walls and their heights are shown on the civil road drawings in Appendix A. The following details are noted:

– A retaining wall is required on the left-hand side of Italia Road on approach to the Pacific Highway intersection. This wall is located between CH 30 and CH 50 of Italia Road on the kerb return and has a maximum height of approximately 1.1 m (approximately 8 m^2).
– A second retaining wall is required to support proposed acceleration lane on the northbound carriageway of the Pacific Highway. The proposed wall located between CH 450 and CH 550 interfacing with the proposed triple cell culvert widening inlet structure. This wall has a maximum height of approximately 1.8 m (approximately 112 m^2).

Further geotechnical investigations and structural design will be required for the retaining structures during the WAD concept design process to define footing and wall details including the interaction of proposed barrier systems and formation. During discussions with Hunter Water to eliminate diversion of stormwater from the southern side of Balickera Canal from bypassing the southern culvert a permeable a high containment w-beam barrier system has now been nominated adjacent to the retaining wall located at CH 450 to 550, maintaining existing stormwater flow regime.

3.6 Hydrology and drainage

3.6.1 Existing drainage and flooding

There are three (3) existing culverts within the project limits, with two of them requiring extensions:

- The 450 mm dia RCP pipe culvert south of Italia Road intersection (at chainage 260) is required to extent by a single unit length (2.44 m).
- The 3 x 1.8 m RCBC box culvert at approximate chainage 560 is required to extent by a single unit length (2.44 m).
- The existing culvert at approximate chainage 700 is to be retained with no extension in length required.
- The hydrology and hydraulics assessment for the upgrade of the box culverts to the south of Balickera Canal has been undertaken using the flood model prepared by GHD based on the strategic concept design. The model prepared by GHD has been developed with flows calculated using a separate hydrologic model developed using the DRAINS software package.
- The hydraulic model, developed using the TUFLOW software package, includes survey of the culverts and surrounding topographic features at the culvert modifications, along with design information generated using the 12d modelling software. Rainfall events for the 1% Annual Exceedance Probability (AEP) have been modelled to determine peak-median design flood events.
- Detailed description of the modelling undertaken, along with mapping of the results of the flood modelling has been included in Section 3.6.1.1 and Appendix F.
- The Italia Road Intersection Upgrade is located within the catchment area of Grahamstown Reservoir, a drinking water catchment owned and managed by Hunter Water.
- Water quality measures, including soil and water management will be incorporated into the construction phase of the intersection upgrade.
- The operational impacts on water quality have been assessed using the Water NSW *Neutral or Beneficial Effect (NorBE) on Water Quality Assessment Guideline 2022* and by modelling using the MUSICX water quality modelling software package in accordance with the "Using MUSIC in the Sydney Drinking Water Catchment" (Water NSW 2019) guide.
- External catchments and landform were modelled using public available LiDAR stitched into the detail survey within the road corridor.
- The outcomes of the NorBE assessment are that the upgrade is not likely to have a negative impact on water quality during operation.

3.6.1.1 Flood design overview

The alignment of the Italia Road Intersection Upgrade crosses the main channel of Balickera Canal, which is an artificial channel receiving flows pumped from Hunter Water's pump station on the Williams River at Seaham, draining by gravity under the Pacific Highway to Grahamstown Reservoir. The canal is hydraulically separated from the local catchments.

Two local catchments drain to the Italia Road Intersection Upgrade. The northern catchment, draining to a two cell culvert (1.2 w x 1.8 h) to the north of the Balickera Canal bridge has a catchment area of approximately 0.55 km^2. The southern catchment, drains to a large, three cell culvert (3 m x 1.8 m) located between the intersection of Italia Road and the Balickera Canal bridge has a catchment area of approximately 1.66 km^2.

Key hydrology and hydraulic considerations included:

- Construction of the new slipway embankment combined with culvert extension to maintain flood immunity in line with existing conditions. The minimum flood immunity maintained for this project is the 1 in 100 (1%) Annual Exceedance Probability (AEP) flood event.
- Maintain overflow points across the road for large to extreme flood events.
- Scour immunity of 1% AEP for bridge sized culverts.

Design flood events for structural design are in accordance with AS5100 – Bridge Design, and are as follows:

– Serviceability limit state: 1% AEP.
– The modelling carried out for the Italia Road Intersection upgrade project developed hydrologic models in order to determine the design, peak-median, storm events for sub catchments draining to the highway for use in the TUFLOW modelling.
– All catchments and sub-catchments draining to the two culverts were delineated manually, shown in Figure 3.5.

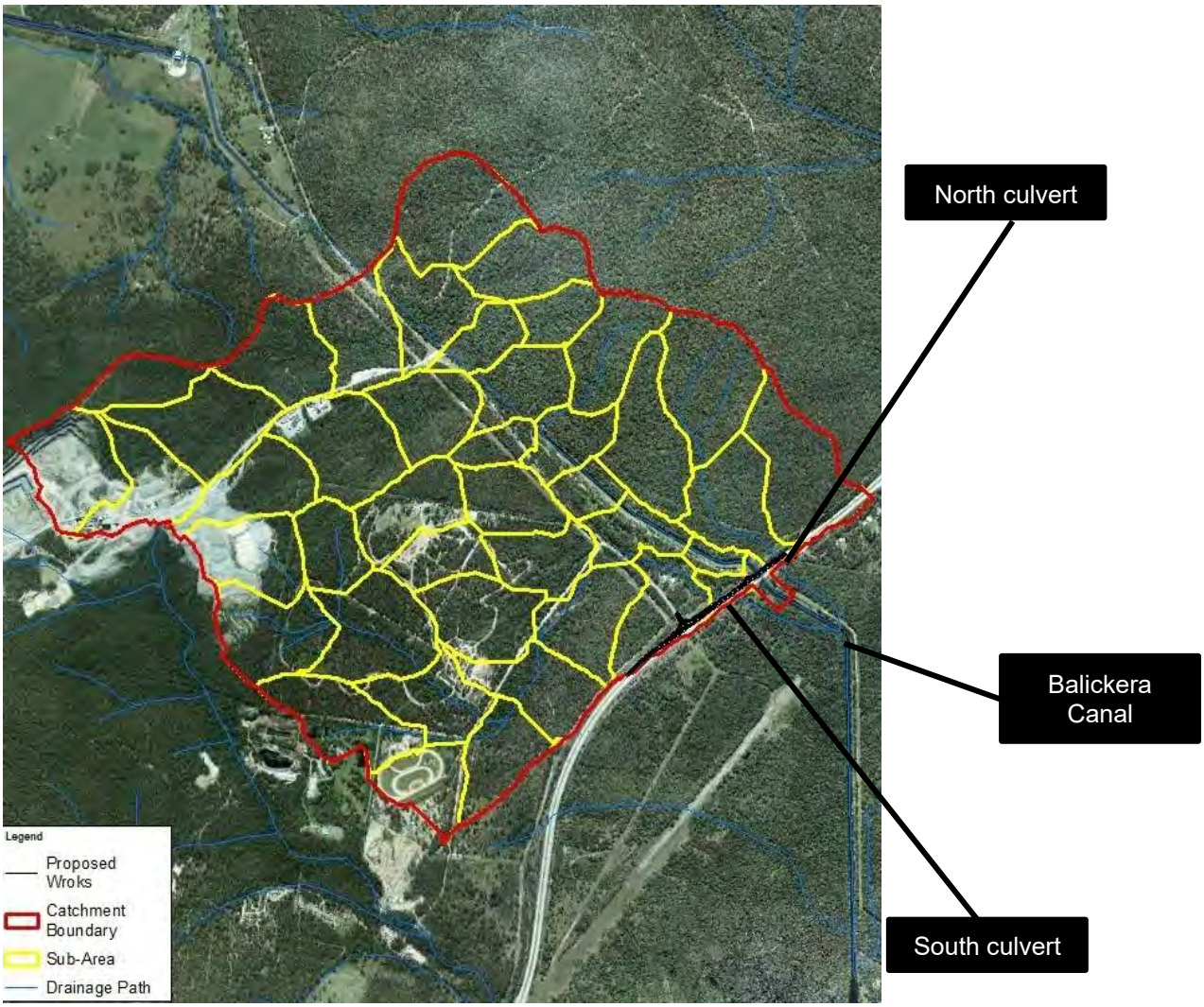


Figure 3.5 Balickera Canal local catchment, showing XP-RAFTS sub-catchments

The catchments to the north and south of Balickera Canal was mapped, with sub-catchments delineated in at confluences and cross drainage culverts based on the design and LiDAR sourced through https://elevation.fsdf.org.au/ from the NSW LPI Newcastle201306-LID1 dataset. In addition to the LiDAR catchment data, ground survey obtained for the project, along with survey of the existing culverts has been incorporated into the modelling. The LiDAR data has been manually modified for the purposes of this preliminary flood investigation to provide a more accurate representation of the Balickera Canal and ground surface below the bridge, and to allow free drainage at the downstream end as surveyed culvert levels were below LiDAR ground surface levels.

These culverts were incorporated into the model, with peak flow rates for the two catchments reported at these culverts. Downstream levels within Balickera Canal were obtained from Hunter Water advice on 21 June 2023.

– Normal operating level – 12.6 mAHD based on Balickera pump cut-out levels (0.2 m below spillway crest).
– Full operating level – 12.8 mAHD based on spillway crest of dam.
– 1 in 100 year level – 13.27 mAHD excluding pumped inflows from Campvale advised as having a minimal impact on the resulting water level.

3.6.1.2 Hydraulic design parameters

Peak design parameters from the flooding assessment of the culverts to the north and south of Balickera Canal are presented in Table 3.3.

Table 3.3 Peak hydraulic design parameters

Parameter	1% AEP (north culvert)	1% AEP (south culvert)
Discharge (m^3/s)	12.2	37.3
Velocity (m/s)	2.9	2.3
Upstream Flood Level (mAHD)	18.9	19.6
Downstream Flood Level (mAHD)	17.6	18.8

3.6.1.3 Flood mapping

Flood mapping has been prepared for existing and design conditions and is provided in Appendix F.

The results of the modelling indicate that in existing and design conditions, flows from the catchment upstream of the southern culvert pond onto the northbound carriageway in the 1% AEP event, with the southbound carriageway free of flooding.

There are minor increases in flooding upstream of the highway resulting from the design at southern culverts. These increases are generally localised at the culvert entrances, with very minor increases (10-25 mm) extending upstream approximately 300 metres of the southern culvert. This increase is within the area flooded in existing conditions and is within the published acceptable impacts for major transport infrastructure of 50 mm for residential receivers (Retallick and Babister, 2018).

There are minor increases modelled under the existing and design Balickera Canal bridge and surrounds as a result of the design. These increases are localised under the bridges and surrounds and are a result of earthworks modifications, not increased flood flows. During detailed design the inlet structure of the southern culvert will be reviewed to ensure that any increases in efficiency that are possible are incorporated into the design to assist in

Flooding at the highway culverts and upstream is not altered by operating levels within the Balickera Canal, with minor decreases within the canal resulting from the altered flow patterns modelled for the design.

The flood mapping indicates that the Italia Road Intersection Upgrade would not result in material increases in flooding upstream downstream or in surrounding properties.

We note that the flood levels for both the pre and post development scenarios are based on a combination of LiDAR and detailed survey as stated above. Flood levels outside the extents of detail survey (outside the road corridor) would gain better resolution if permission to carry out more detailed survey in private property can be obtained during the detail design process.

3.6.2 Water quality overview

During completion of the MUSICX model GHD carried out liaison with Hunter Water. Reference to discussions with Hunter Water and their preference of design outcome can be found in Appendix G.

The Italia Road Intersection Upgrade is located within the catchment area of Grahamstown Reservoir, a drinking water catchment owned and managed by Hunter Water. GHD acknowledges the requirements of Hunter Water regarding developments having a Neutral or Beneficial Effect (NorBE) on water quality in drinking water catchments. Given the proximity of this project to Balickera Canal, which flows directly into Grahamstown Dam, the requirements of NorBE apply. In addition to the importance of Hunter Water's NorBE requirements, Port Stephens Shire Council's (PSC) Development Control Plan (DCP) also has water quality requirements.

Key water quality impacts for consideration in the assessment include:

– Construction of the new fill embankment combined with extension of the pavement to the edge of formation, effectively paving the unpaved road verge for the creating of the widened slip lane.
– Culvert extensions on the upstream end of the culverts to the north and south of Balickera Canal, taking flows from the local catchments to the west, to the east of the Pacific Highway, where they drain to Grahamstown Reservoir.
– Existing waterway and ponded depression located immediately upstream of the culverts under the Pacific Highway. These areas will not be impacted by the proposal during the operation phase.
– Construction phase management measures may include dewatering of the existing depressions, soil and erosion management measures for all earthworks, particularly topsoils, along with measures for construction machinery spill management. Construction measures will be outlined in the construction environmental management plan required under the TfNSW Deed of Agreement (WAD).

The proposed design has been modelled using the MUSICX water quality conceptual model in accordance with Water NSW *Neutral or Beneficial Effect on Water Quality Assessment Guideline 2022*, and in accordance with the "Using MUSIC in the Sydney Drinking Water Catchment" (Water NSW 2019) guide.

In preparing the MUSICX model, the relevant catchments were considered and are depicted in the Post Development (design) scenario in Figure 3.6 below.

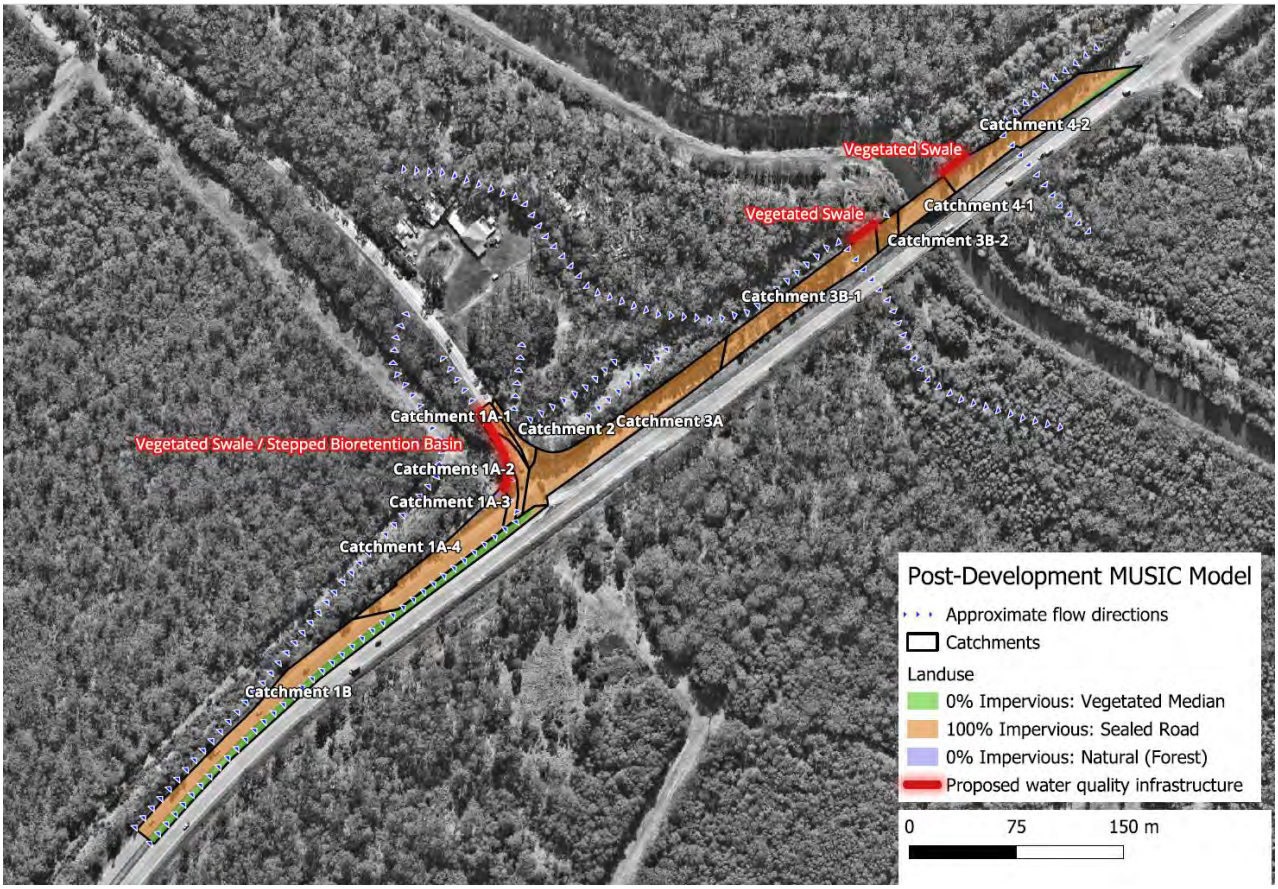


Figure 3.6 Post Development MUSICX sub-catchments

The MUSICX model considers:

– The upstream catchments draining to the highway culverts north and south of the highway bridge over Balickera Channel.
– Existing and proposed design scenarios with two options for treatment,
  - Option 1 - vegetated swales
  - Option 2 - vegetated swales + bioretention on southern kerb return table drain.

– The model has been developed using Port Stephen Council's MUSIC-Link feature, with all associated pollutant and treatment parameters.
– The existing scenario includes an area of hardstand verge material adjacent to the concrete pavement shoulder and a large section of northbound concrete pavement and grassed median.
– The design scenario for the southern culvert incorporates the additional paved surface included in the intersection design and also incorporates a vegetated swale with stepped bio-retention in its base along with a vegetated swale on the southern side of Balickera Canal.
– The design scenario for the northern existing culvert incorporates the additional paved surface of the bridge deck and acceleration lane merge taper and also incorporates a vegetated swale on the northern side of Balickera Canal.
– The proposed vegetated bio retention swale details are shown in in Figure 3.7 below and on the Strategic Design Drawings located in Appendix A.

The results of the MUSIC modelling are presented in Table 3.4.

Table 3.4 MUSICX NorBE water quality analysis Option 1

Parameter	Pre Development	Option 1		Total Discharge	
		Before Treatment	Post Treatment	% Reduction	NorBE satisfied
Total Suspended Solids (kg/yr)	3,924.7 kg/yr	4,655.9 kg/yr	2,884.7 kg/yr	26.5%	Y
Total Phosphorus (kg/yr)	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	16.3%	Y
Total Nitrogen (kg/yr)	27.8 kg/yr	32.6 kg/yr	30.2 kg/yr	8.5% increase	N
Gross Pollutants (kg/yr)	274.2 kg/yr	327.4 kg/yr	181.4 kg/yr	33.8%	Y

Table 3.5 MUSICX NorBE water quality analysis Option 2

Parameter	Pre Development	Option 2		Total Discharge	
		Before Treatment	Post Treatment	% Reduction	NorBE satisfied
Total Suspended Solids (kg/yr)	3,924.7 kg/yr	4,629.1 kg/yr	2,935.5 kg/yr	25.2%	Y
Total Phosphorus (kg/yr)	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	15.6%	Y
Total Nitrogen (kg/yr)	27.8 kg/yr	32.6 kg/yr	27.2 kg/yr	2.4%	N
Gross Pollutants (kg/yr)	274.2 kg/yr	327.4 kg/yr	174.3 kg/yr	36.4%	Y

As shown in Table 3.4, Option 1 (vegetated swales) results in an 8.5% increase in Total Nitrogen post-development, which does not meet the NorBE requirement of a 10% reduction. Table 3.5 Option 2 (vegetated swales with bio-retention and check dams) on the Sothern kerb return of the intersection achieves a 2.4% reduction in Total Nitrogen, still falling short of the 10% reduction target, however still a beneficial reduction. All other reduction criteria (Total Suspended Solids, Total Phosphorus, and Gross Pollutants) are well below the 10% reduction target for both options.

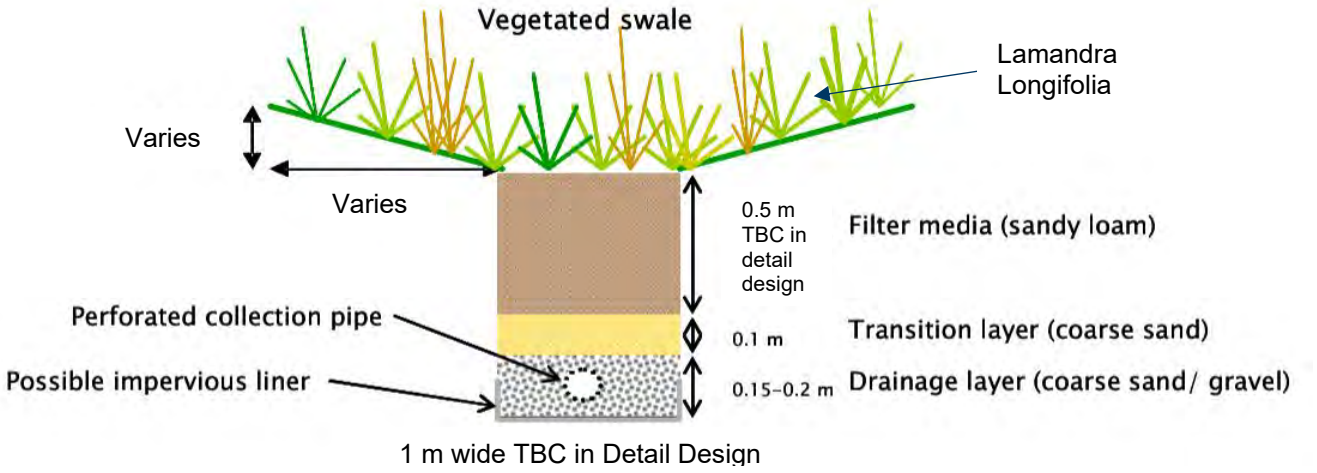


Figure 3.7 Bio-retention in Vegetated Swale detail (details to be confirmed in detail design)

Hunter Water's correspondence dated 30 October 2024 (Refer to Appendix G for details) indicates a preference for Option 2 over Option 1. Due to environmental and boundary constraints, the feasibility and extent of the swales will be further considered during detailed design to maximise water quality treatment to the greatest practicable extent.

Regarding the PSC water quality targets, the PSC DCP aims to retain the post-development water quality load by comparing post-development scenarios without controls to those with controls. This approach necessitates an efficient water quality treatment train and does not consider the pre-development baseline, which in this case is a significantly developed national highway road reserve. Conversely, NorBE targets generally require a neutral or improved mass loading, comparing pre-development to post-development conditions (i.e., the kg/yr of Total Nitrogen (TN) must be lower post-development than pre-development).

Our proposed treatment methodology focuses on improving water quality for a portion of the existing northbound lane compared to pre-development conditions. Due to spatial limitations and other constraints, we cannot achieve the high treatment efficiency targeted by PSC guidelines. In essence, our system treats a larger volume of stormwater, including areas outside the development zone, to offset impacts rather than achieving very high-quality treatment solely within the development area

3.6.3 Scour protection

3.6.3.1 Culvert scour protection

Scour protection to the triple cell culvert inlet will be required as part of the culver extension works. Details of the required treatment will be considered during the WAD concept design phase once geotechnical parameters are known and structural interfaces are finalised.

3.6.3.2 Bridge scour protection

The Balickera Canal is hydraulically separate from the design and does not require scour protection.

No bridge scour protection is required for this design.

3.6.4 Aquaplaning

No aquaplaning calculations have been carried out at this stage of the design. Aquaplane calculations will be carried out during the WAD concept design phase.

3.6.5 Subsurface drainage

At this early stage of the design sub surface drainage has not been shown. If required sub surface drainage will be documented following pavement investigations and edge detailing for pavements during the WAD concept design phase.

3.6.6 Non-conformances

NorBE requirements for a 10% reduction in Total Nitrogen cannot be achieved, however the design seeks to maximise water quality treatment to the greatest practicable extent. Further discussions between Hunter Water and TfNSW during detail design in spill containment may bring further opportunities to reduce Total Nitrogen loads, however this is outside the scope of this development application.

3.7 Existing utilities

A dial before you dig (DBYD) was conducted in conjunction with a site visit to identify the presence of utilities within the project area. The following utilities are noted and where indicated may require relocation:

– An overhead power line, running parallel to the northbound carriageway of the Pacific Highway and crossing Italia Road. There is a pole for this line on the northern side of Italia Road that will be impacted by the addition of the dedicated left turn lane from Italia Road to the Pacific Highway. This will result in the relocation of the northern pole, and potentially the need for an intermediatory post on the southern side of Italia Road, pending electrical design. Refer to Figure 3..

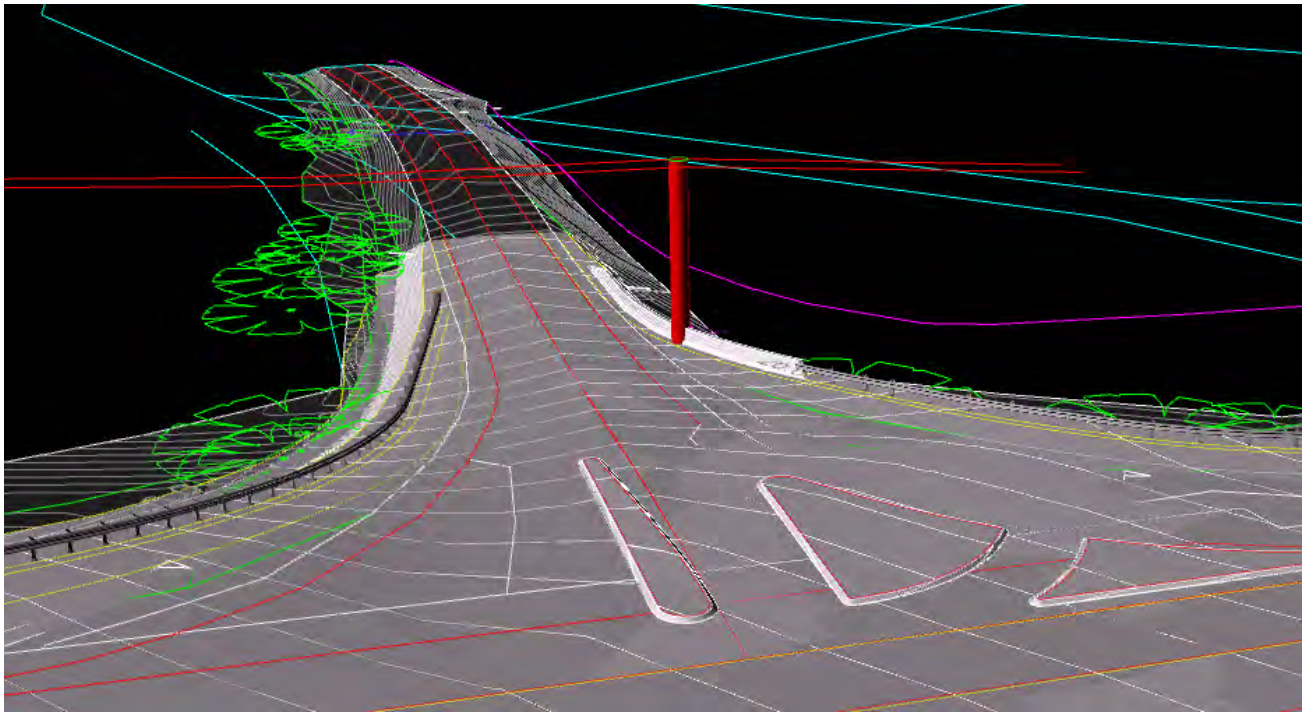


Figure 3.8 Barrier clash with existing power pole

– Hunter Water owned high voltage lines cross the Pacific Highway south of Italia Road and travels parallel to Italia Road. Survey assessment of existing poles and wires initially indicate that the proposed works do not impact this infrastructure with a clearance from proposed road levels to overhead wire being 9.8 m. Refer to Figure 3..

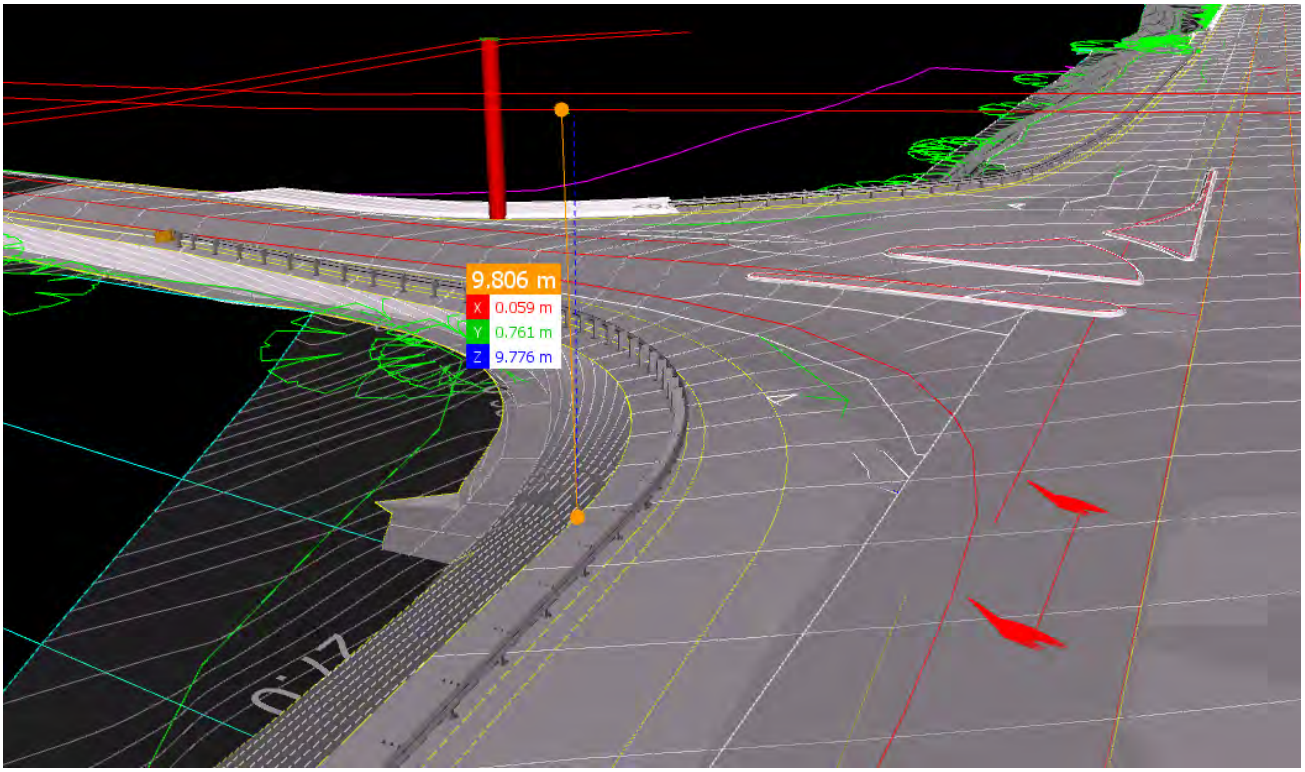


Figure 3.9 Clearance from design formation to Hunter Water High Voltage cables

– An underground Telstra fibre optic cable on the northern side of Italia Road appears to be close to the proposed formation. Marker poles and survey data created by ADW Johnson indicate that the proposed works may be clear of the infrastructure, however further investigation to include pot holing at targeted locations during the WAD concept design phase will be required.
– Other Telstra assets cross the Pacific Highway within the area of the proposed acceleration lane widening and will also require further investigation during the WAD concept design phase.

3.8 Property impacts

The intersection upgrade has been designed such that property acquisition is not required. This has been achieved by the introduction of retaining wall structures to limit the footprint of the design. It has been assumed that the Ausgrid owned power pole (KQ80013 HV power) relocation can occur without the need for any additional easements given the existing wires already cross over private property. The proposed relocation location would be within the existing road reserve pending electrical services design.

3.9 Safety in Design (SiD)

3.9.1 Background

Safety in Design (SiD) is a strategy aimed at preventing injuries by considering hazards as early as possible in the planning and design process, enhancing safety through choices in the design process. A safety in design approach considers the safety of those who construct, operate, maintain, clean, repair and demolish an asset (includes building, structure, plant or equipment). Parties involved in the planning and design stage of a project are in a position to reduce the risks that arise during the life cycle of the asset.

At each design stage “designers” can make a significant contribution by identifying and eliminating hazards and reducing likely risks from hazards where elimination is not possible. Often the most cost effective and practical approach is to avoid introducing a hazard to the workplace in the first place, by eliminating hazards at the design stage.

The definition of “designers” not only affects the actual designer but also those who are connected with the design (e.g. during construction), including parties where the end product is to be used, or could reasonably be expected to be used, as or at a workplace (e.g. during end use, inspection, operation, cleaning, maintenance, and demolition). Furthermore, the “designers” must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to be without risks to the health and safety of where the design is for the purposes of a workplace.

It is therefore reasonable to consider the wider practical definition of “stakeholders” to include:

– Design professionals, such as architects, civil, building services, electrical, acoustic, environmental, mechanical and structural engineers, landscape architects, interior designers, drafters and industrial designers.
– Head contractors, developers, builders, owners, project managers, purchasers, clients, end-users, and workers.
– Quantity surveyors, insurers, quality assurance staff, work safety professionals and ergonomics practitioners.
– Suppliers including manufacturers, importers, those who hire plant, constructors, installers and trades and maintenance people.

GHD was engaged to provide a concept road design for a DA. As such, GHD has undertaken a component of the designer role in this project. In this role a number of potential risks was identified and mitigated within the limitations of our scope, in consultation with the broader design team.

In accordance with our safety in design obligations in NSW, GHD prepared a safety in design risk assessment. This document embraces our scope of works for the particular design phase. A summary of the risks identified unique to this type of work on this site will be supplied with each major GHD submission (i.e. In addition to the types of risks that would typically be present on a construction site undertaking similar projects of this type).

The SiD process will be facilitated with the use of a SiD risk register. This is a live document that is updated during the design phase.

The following steps briefly outline the safety in design process to be applied to this project:

– The hazard and risk are identified, and the likelihood and consequence of this risk are used to determine an initial risk rating.
– This initial risk rating will be classed as acceptable or unacceptable and determine if controls must be implemented.
– If controls are implemented, the risk is then reassessed, and a residual risk rating is determined.
– For risks relating to subsequent design, construction and operational phases of this project have been identified, these risks will be passed onto the client and the construction contractor to control/mitigate and manage.

3.9.2 Internal SiD workshop

An internal SiD workshop was carried out by GHD's design team on 26 June 2023. A copy of potential safety issues and design mitigations can be found in the SiD register located in Appendix D of this report.

At the request of Hunter Water following their review of this design report, additional SiD risks items 10 and 11 have been added to the SiD register in consideration of construction and operational risks relating to safe access to Hunter Water's access road.

3.10 Road Safety Audit

As part of the strategic concept design a Strategic Level Road Safety Audit has been completed based on a drive through site inspection carried out on 27 June 2023 and an assessment of the Strategic Concept Design drawings. A summary of the findings in this audit and preliminary corrective actions proposed are shown below in Table 3.6.

Table 3.6 Summary of road safety audit findings

Finding	Road safety category	Likelihood	Severity	Risk	Designer corrective action proposal*
Finding no. 1	Speed zoning	Rare	Fatal	High	Additional advanced warning signage added to approach of intersection in the proposed upgrade.
Finding no. 2	Traffic signs	Rare	Serious	Medium	Hold line and signage adjusted accordingly.
Finding no. 3	Traffic signs & delineation	Rare	Moderate	Low	Consider additional heavy vehicle directional signage during design phase. Other directional signage observations to be referred to TfNSW.
Finding no. 4	Roadside hazard	Rare	Moderate	Low	Barrier extended to included W-Beam and transition to three-beam terminating treatment.
Finding no. 5	Road alignment and cross section	Rare	Fatal	High	Advise TfNSW of observation, however proposal will reduce potential traffic conflict in this intersection with heavy vehicles diverting to the north. Long term planning by TfNSW for intersections upgrade.
Finding no. 6	Road alignment and cross section	Rare	Fatal	High	Advise TfNSW of observation.
Finding no. 7	Network effects	Rare	Fatal	High	Advise TfNSW of observation. Potential for operational plans for quarries to consider heavy vehicle movements.

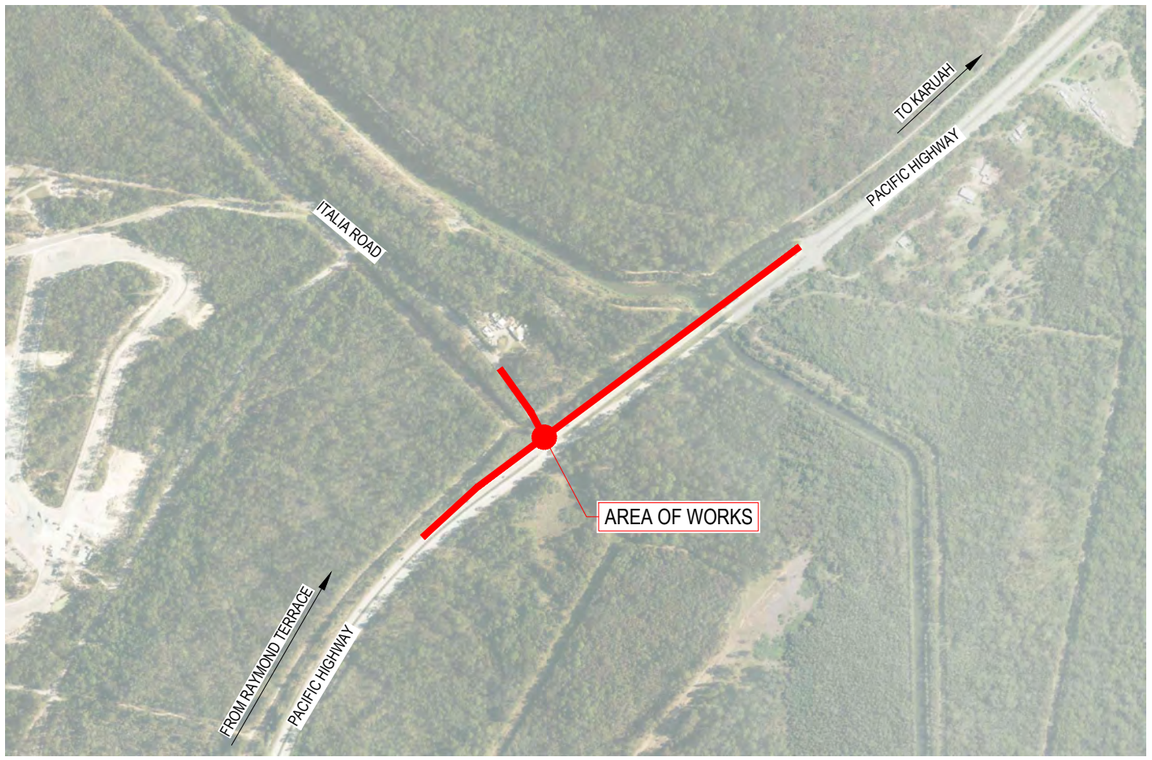
* Corrective actions proposed are preliminary and to be addressed during subsequent phases. Actions informing TfNSW as road asset owner are recommended to be communicated to TfNSW.

Appendices

Appendix A

Design Drawings

BORAL RESOURCES (NSW) PTY LTD
BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
12599191



LOCALITY
N.T.S

DRAWING INDEX	
DRAWING No.	DRAWING TITLE
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12599191-GHD-00-00-DRG-CI-01031	TYPICAL SECTIONS - SHEET 1 OF 1
12599191-GHD-00-00-DRG-CI-01051	OVERVIEW PLAN
12599191-GHD-00-00-DRG-CI-01101	DETAIL PLAN - SHEET 1 OF 3
12599191-GHD-00-00-DRG-CI-01102	DETAIL PLAN - SHEET 2 OF 3
12599191-GHD-00-00-DRG-CI-01103	DETAIL PLAN - SHEET 3 OF 3
12599191-GHD-00-00-DRG-CI-01111	LONGITUDINAL SECTIONS - SHEET 1 OF 4
12599191-GHD-00-00-DRG-CI-01112	LONGITUDINAL SECTIONS - SHEET 2 OF 4
12599191-GHD-00-00-DRG-CI-01113	LONGITUDINAL SECTIONS - SHEET 3 OF 4
12599191-GHD-00-00-DRG-CI-01114	LONGITUDINAL SECTIONS - SHEET 4 OF 4
12599191-GHD-00-00-DRG-CI-01301	ROADSIDE FURNITURE AND PAVEMENT PLAN - SHEET 1 OF 3
12599191-GHD-00-00-DRG-CI-01302	ROADSIDE FURNITURE AND PAVEMENT PLAN - SHEET 2 OF 3
12599191-GHD-00-00-DRG-CI-01303	ROADSIDE FURNITURE AND PAVEMENT PLAN - SHEET 3 OF 3
12599191-GHD-00-00-DRG-CI-01401	TURNING PATHS
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12599191-GHD-00-00-DRG-CI-01502	EROSION AND SEDIMENT CONTROL PLAN - SHEET 2 OF 3
12599191-GHD-00-00-DRG-CI-01503	EROSION AND SEDIMENT CONTROL PLAN - SHEET 3 OF 3
12599191-GHD-00-00-DRG-CI-01511	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
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12599191-GHD-00-00-DRG-CI-01606	CROSS SECTION - SHEET 6 OF 6
12599191-GHD-00-00-DRG-CI-01701	RETAINING WALL LOCATIONS AND PROFILES - SHEET 1 OF 1

Rev	Description	Checked	Approved	Date
E	CONCEPT DESIGN FOR DA APPROVAL	AS	GW	18.06.24
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW **Drafting Check** C.PURDON
Designer C.BARTLEY **Design Check** N.HINCKS

N

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title COVERSHEET, LOCALITY AND DRAWINGS INDEX

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01001

Rev E

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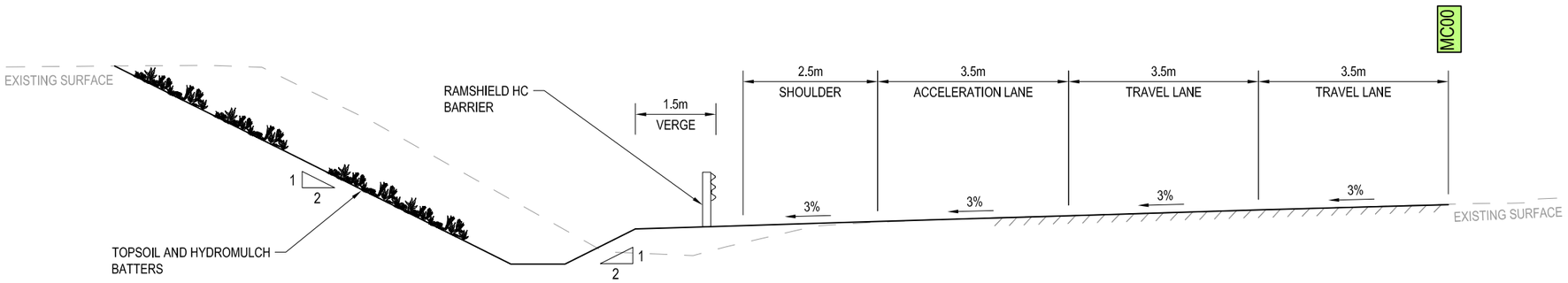

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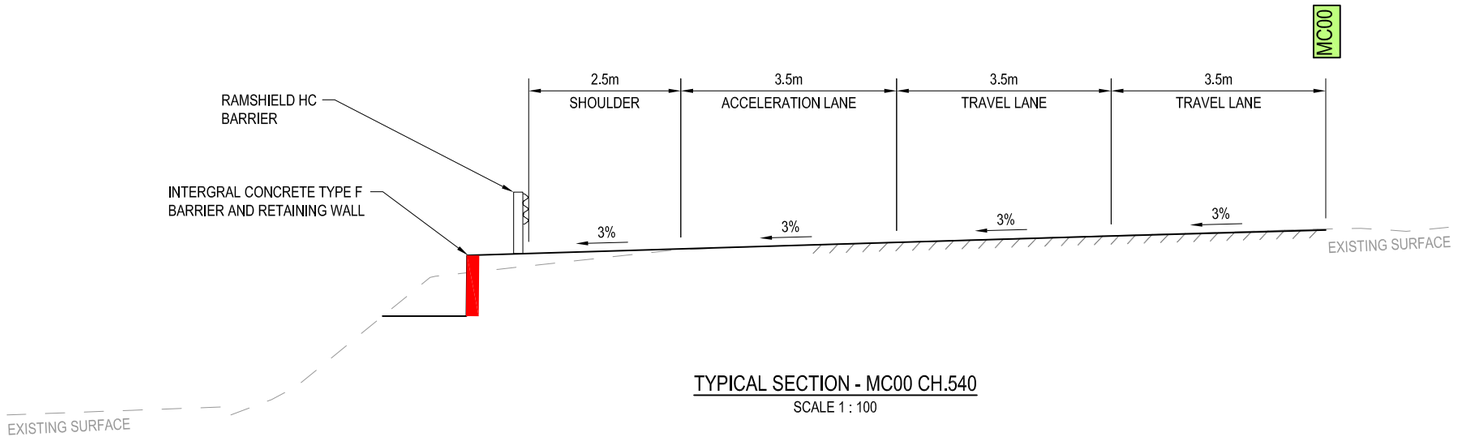

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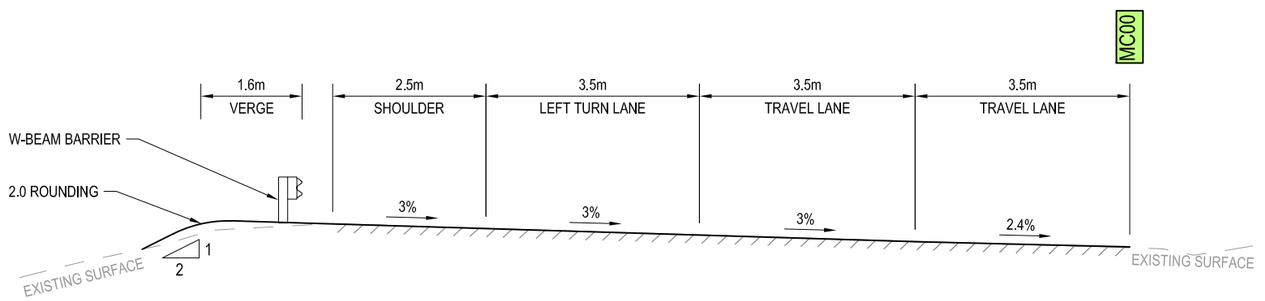

TYPICAL SECTION - MC00 CH.100

SCALE 1 : 100

Rev	Description	Author	Checked	Approved	Date
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D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.		27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL				26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION				13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION				09.06.23

Author B.DREW Drafting Check C.PURDON

Designer C.BARTLEY Design Check N.HINCKS

0 1 2 3m

SCALE 1:100 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title TYPICAL SECTIONS

SHEET 1 OF 1

Drawing No. 12599191-GHD-00-00-DRG-CI-01031

Size A3

Rev E

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PLAN
SCALE 1:5000

GENERAL

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT CONTRACT,SCOPE OF WORKS AND SPECIFICATIONS, INCLUDING THE RELEVANT TfNSW AND AUSTRALIAN STANDARDS UNLESS NOTED OTHERWISE.
2. PROVISION OF TRAFFIC CONTROL DURING CONSTRUCTION TO BE IN ACCORDANCE WITH THE CURRENT TfNSW SPECIFICATION G10 AND TfNSW PUBLICATION "TRAFFIC CONTROL AT WORK SITES".
3. ALL LOCATIONS, ORIENTATIONS AND LEVELS TO BE VERIFIED ON SITE BEFORE COMMENCING ANY WORK. REFER DISCREPANCIES TO THE PRINCIPAL. DO NOT OBTAIN DIMENSIONS FROM SCALING. NATURAL SURFACE LEVELS ON THE DRAWINGS ARE INDICATIVE ONLY.

ALIGNMENT SETOUT CONTROL PLANS AND TABLES

1. SURVEY HEIGHT DATUM IS AHD.
2. SURVEY COORDINATE GRID IS MGA2020, ZONE 56.
3. SURVEY MARKS ARE NOT TO BE DISTURBED BEFORE ASSESSMENT BY SURVEYOR.
4. THE CONTRACTOR SHALL CHECK SUSTAINABILITY OF THE STATED COORDINATES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
5. ANY SURVEY PMs OR SSMs THAT ARE DESTROYED ARE TO BE REPLACED WITH ANOTHER PM OR SSM TO LANDS DEPARTMENT STANDARDS. IT ALSO SHOULD BE DOCUMENTED AND CO-ORDINATED TO EQUIVALENT LANDS DEPARTMENT STANDARDS.
6. REFER TfNSW SPECIFICATION G71 FOR SURVEY REQUIREMENTS FOR SPATIAL TOLERANCES AND QUALITY ASSURANCE REQUIREMENTS
7. REFER TfNSW STANDARD DRAWINGS R0400-01 AND R0400-02 FOR SETTING OUT DIAGRAMS FOR ROADS

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING AND PROPOSED SERVICES MUST BE OBTAINED PRIOR TO CONSTRUCTION. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES, AND ANY CONFLICTS TO BE RAISED WITH THE PRINCIPAL.
2. THE CONTRACTOR MUST FOLLOW ALL UTILITY AUTHORITIES "DUTY OF CARE" WHEN WORKING IN THE VICINITY OF SERVICES. ANY DAMAGE TO THE EXISTING SERVICES SHALL BE RECTIFIED AND VERIFIED WITH THE AUTHORITY REPRESENTATIVE AT THE CONTRACTORS EXPENSE.

ROADSIDE FURNITURE AND DELINEATION

1. PAVEMENT MARKING AND SIGNAGE TO BE IN ACCORDANCE WITH TfNSW SPECIFICATIONS, GUIDELINES AND STANDARDS.
2. SIGNAGE TO BE LOCATED IN ACCORDANCE WITH AS1742.
3. MOUNTED HEIGHT FOR SIGNS TO BE 1.5m MIN.
4. THE CONTRACTOR IS TO ENSURE THAT SIGN FOOTINGS DO NOT CLASH WITH UNDERGROUND UTILITIES. SHOULD SIGN LOCATIONS NEED TO BE MOVED, APPROVAL IS REQUIRED FROM THE PRINCIPAL.
5. ALL SIGN SUPPORT STRUCTURES ARE TO BE GRADE C320LO IN ACCORDANCE WITH TfNSW SPECIFICATION R143 UNLESS NOTED OTHERWISE.
6. RAISED REFLECTIVE PAVEMENT MARKERS TO BE INSTALLED IN ACCORDANCE WITH THE SPACINGS SPECIFIED IN THE TfNSW DELINEATION GUIDELINES.
7. REUSE OF ANY EXISTING SIGN FACES AND SUPPORT STRUCTURES REQUIRE APPROVAL FROM THE PRINCIPAL.
8. CONTRACTOR TO ENSURE SAFETY BARRIER FOOTINGS DO NOT CLASH WITH UNDERGROUND UTILITIES.
9. CONTRACTOR TO INSTALL GUIDE POSTS IN ACCORDANCE WITH TfNSW DELINEATION GUIDE SECTION 16 - GUIDE POSTS AND DELINEATION OF SAFETY BARRIERS.

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Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 50 100 150m
SCALE 1:5000 AT ORIGINAL SIZE

N

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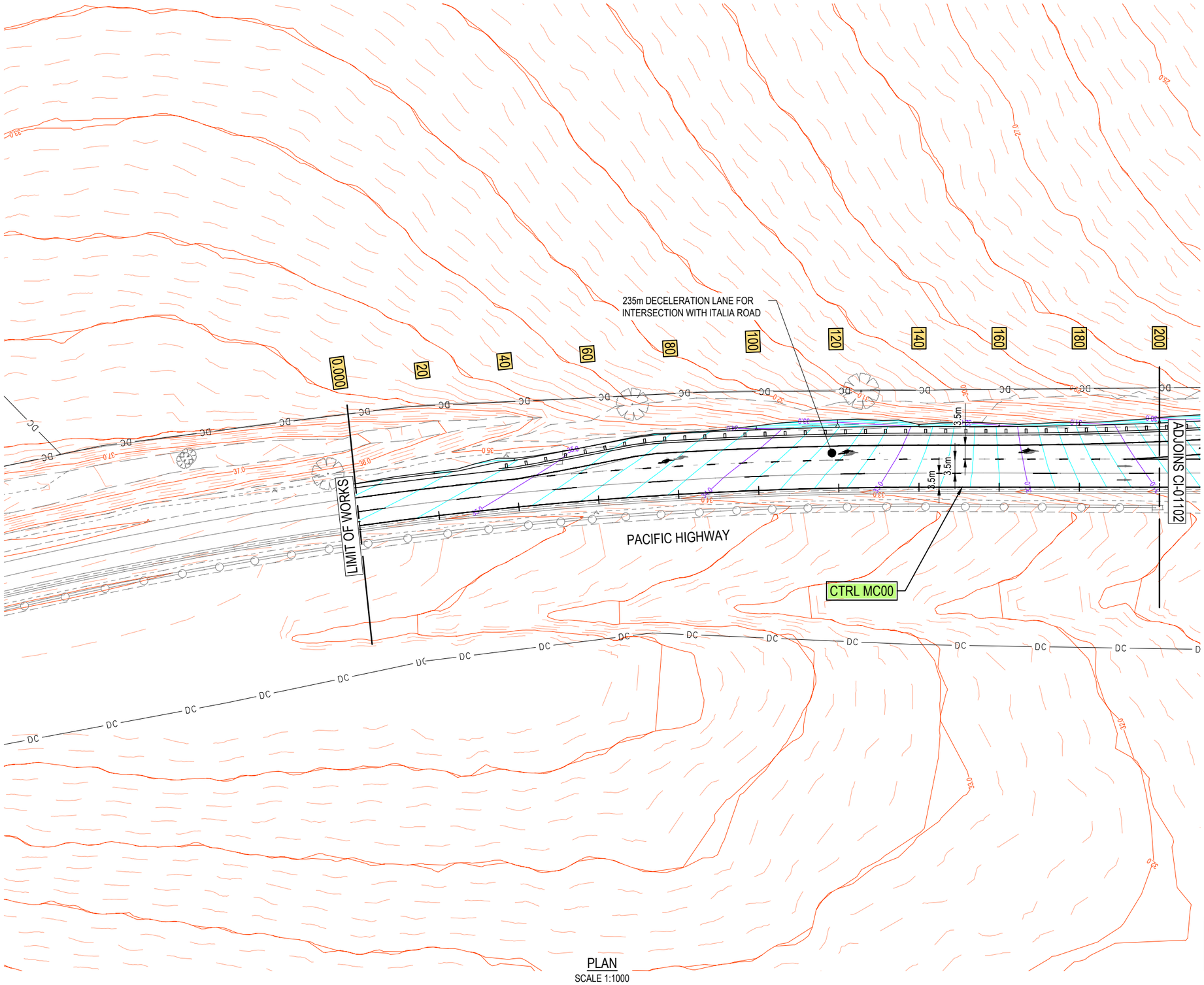
Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title OVERVIEW PLAN AND GENERAL NOTES
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01051
Rev D

Plot Date: 4 November 2024 - 4:07 PM Plotted by: Blake Drew
File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01050.dwg



PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- EXISTING BRIDGE DECK
- PROPOSED BRIDGE DECK
- EZYGUARD 4 (OR SIMILAR) BARRIER
- RETAINING WALL WITH TYPE F BARRIER
- BIO-RETENTION VEGETATED SWALE

ROAD GEOMETRY & ALIGNMENT

- MASTER CONTROL LINE

DRAINAGE

- NEW STORMWATER PIPE
- PIPE SIZE AND FLOW DIRECTION
- NEW STORMWATER PIT; KERB INLET PIT
- SUB SURFACE PIPE

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS
4. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01301 TO 12599191-GHD-00-00-DRG-CI-01303 FOR ROADSIDE FURNITURE AND PAVEMENT PLANS

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Rev	Description	Checked	Approved	Date
F	CONCEPT DESIGN FOR DA APPROVAL	AS	GW	18.06.24
E	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
D	CONCEPT DESIGN FOR DA APPROVAL			30.06.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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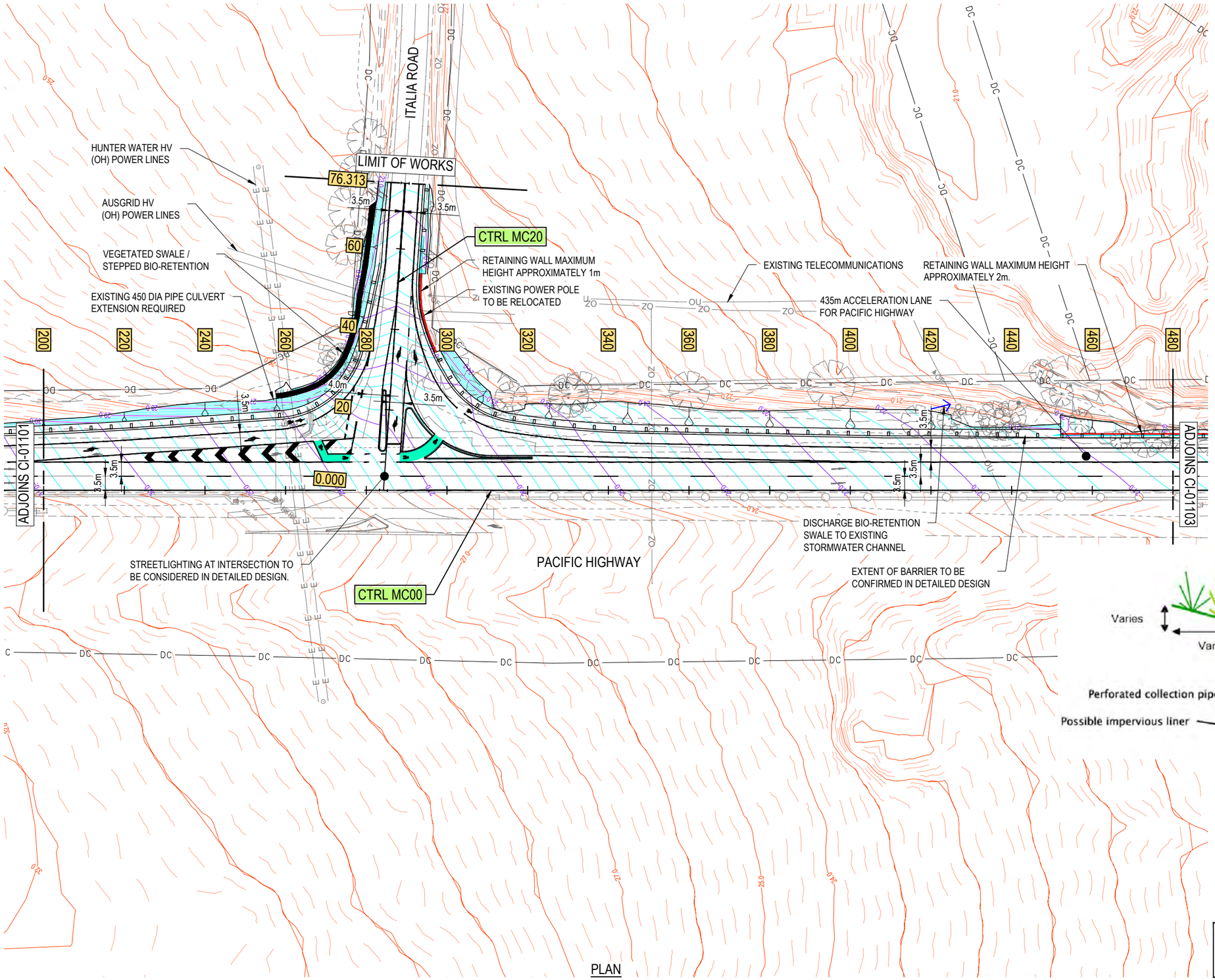
Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title DETAIL PLAN
SHEET 1 OF 3
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01101
Rev F

Plot Date: 4 November 2024 - 4:07 PM Plotted by: Blake Drew
File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01100.dwg



PLAN
SCALE 1:1000

LEGEND

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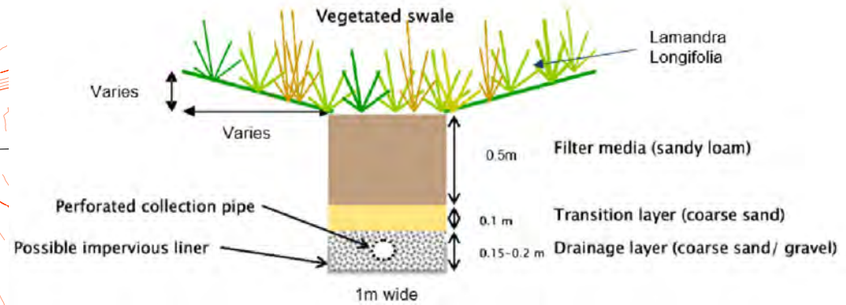
- RETAINING WALL WITH TYPE F BARRIER
- BIO-RETENTION VEGETATED SWALE

ROAD GEOMETRY & ALIGNMENT

- MASTER CONTROL LINE

DRAINAGE

- NEW STORMWATER PIPE
- PIPE SIZE AND FLOW DIRECTION
- NEW STORMWATER PIT; KERB INLET PIT
- SUB SURFACE PIPE



DETAIL
N.T.S.

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS
4. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01301 TO 12599191-GHD-00-00-DRG-CI-01303 FOR ROADSIDE FURNITURE AND PAVEMENT PLANS

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Rev	Description	Checked	Approved	Date
A	WATER QUALITY AMENDED FOR DA	A.S.	G.W.	04.11.24

Author A.SNEDDON | Drafting Check C.PURDON
Designer C.BARTLEY | Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title DETAIL PLAN
SHEET 2 OF 3

Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01102
Rev G

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew
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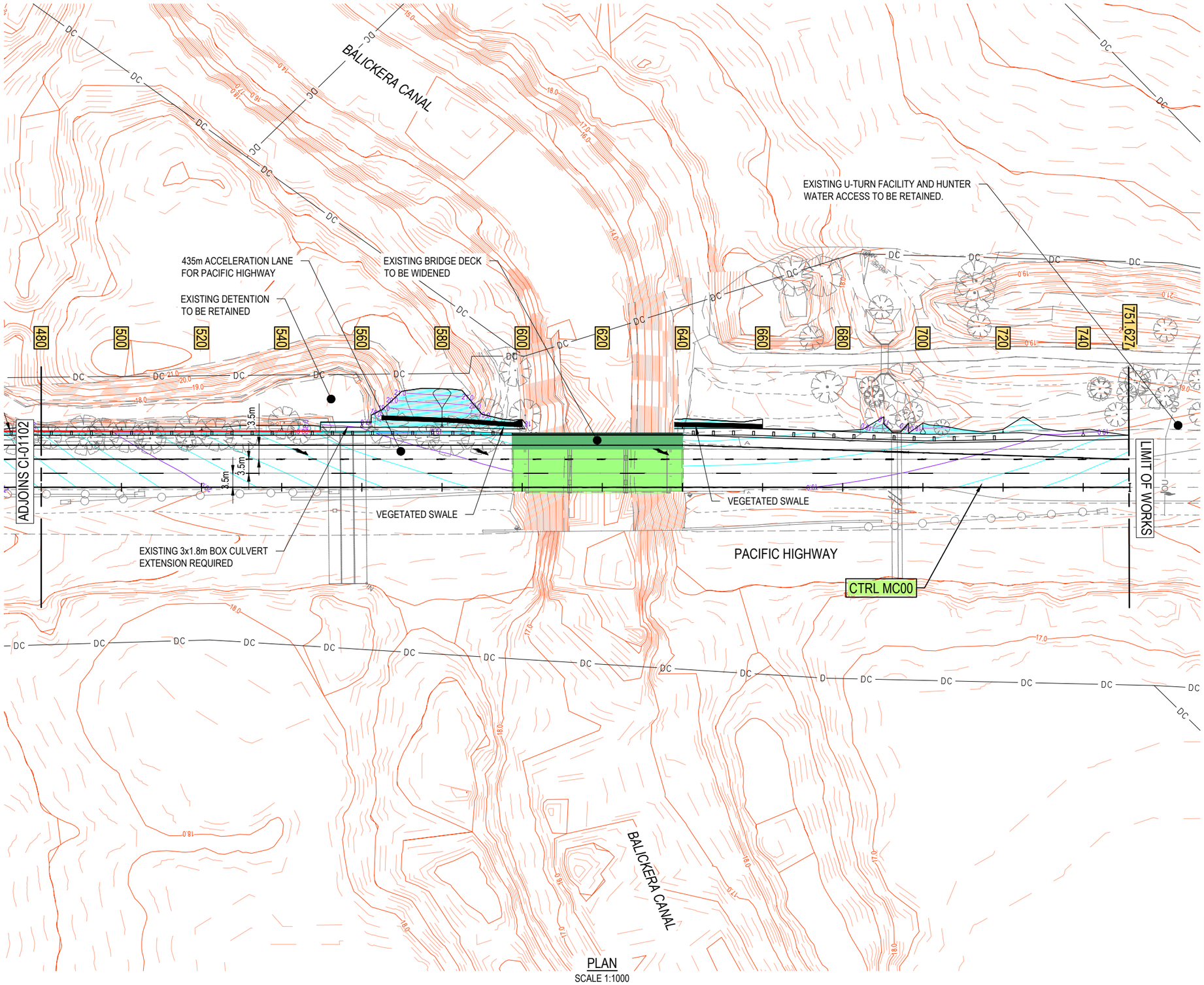

PLAN
SCALE 1:1000

LEGEND

GENERAL

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ROAD GEOMETRY & ALIGNMENT

- MASTER CONTROL LINE

DRAINAGE

- NEW STORMWATER PIPE
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3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS
4. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01301 TO 12599191-GHD-00-00-DRG-CI-01303 FOR ROADSIDE FURNITURE AND PAVEMENT PLANS

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Rev	Description	Checked	Approved	Date
G	WATER QUALITY AMENDED FOR DA	A.S.	G.W.	04.11.24

Author A.SNEDDON | Drafting Check C.PURDON
Designer C.BARTLEY | Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title DETAIL PLAN
SHEET 3 OF 3
Drawing No. 12599191-GHD-00-00-DRG-CI-01103
Size A3
Rev G

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew
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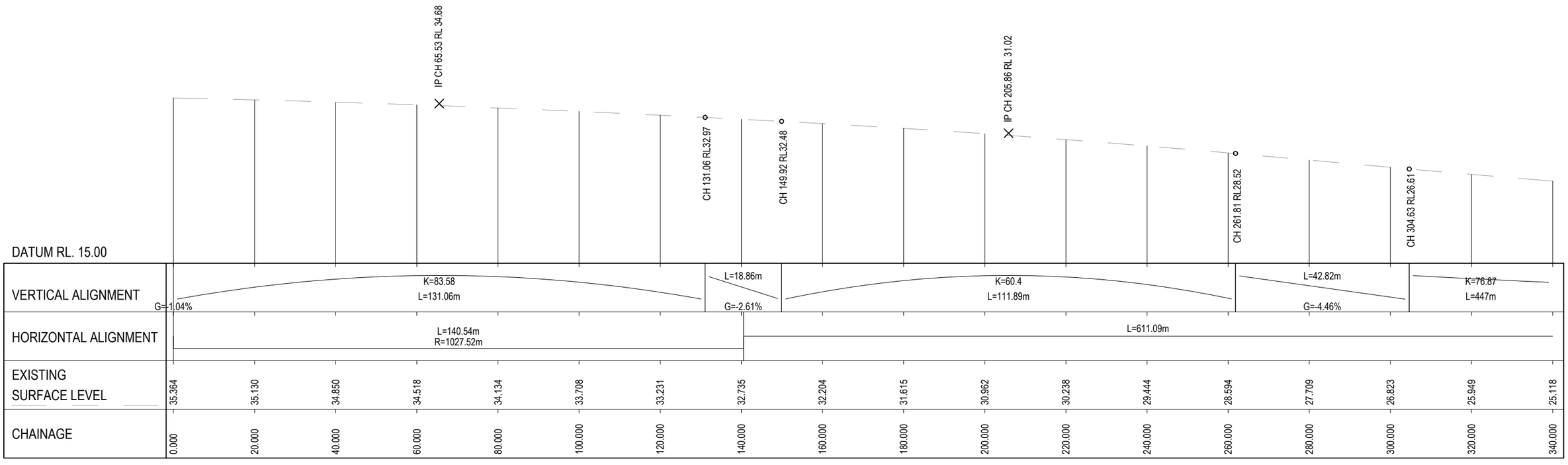
NOTES

1. ROAD GEOMETRY ESTIMATED BASED ON EXISTING SURFACE SURVEY.
   VERTICAL AND HORIZONTAL ALIGNMENT TO MATCH EXISTING.



LONGITUDINAL SECTION - MC00

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

VERTICAL SCALE 1:500 AT ORIGINAL SIZE 0 5 10 15m
HORIZONTAL SCALE 1:1000 AT ORIGINAL SIZE 0 10 20 30m

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Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title LONGITUDINAL SECTIONS
SHEET 1 OF 4
Drawing No. 12599191-GHD-00-00-DRG-CI-01111
Size A3
Rev D

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew
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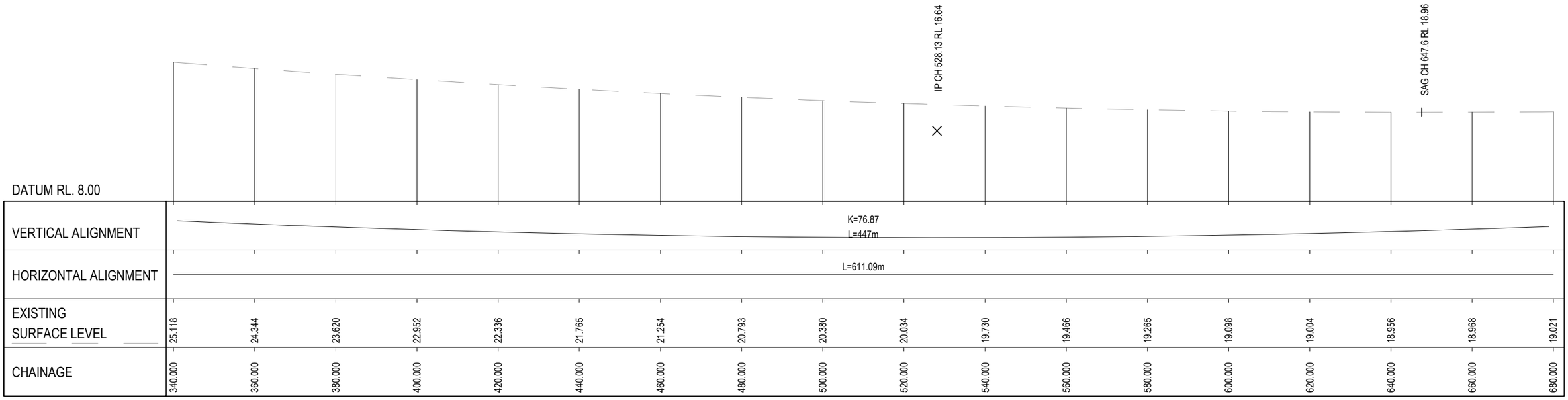
1. ROAD GEOMETRY ESTIMATED BASED ON EXISTING SURFACE SURVEY. VERTICAL AND HORIZONTAL ALIGNMENT TO MATCH EXISTING.



LONGITUDINAL SECTION - MC00

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
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Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

VERTICAL SCALE 1:500 AT ORIGINAL SIZE
HORIZONTAL SCALE 1:1000 AT ORIGINAL SIZE
0 5 10 15m
0 10 20 30m

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title LONGITUDINAL SECTIONS
SHEET 2 OF 4
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01112
Rev D

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew
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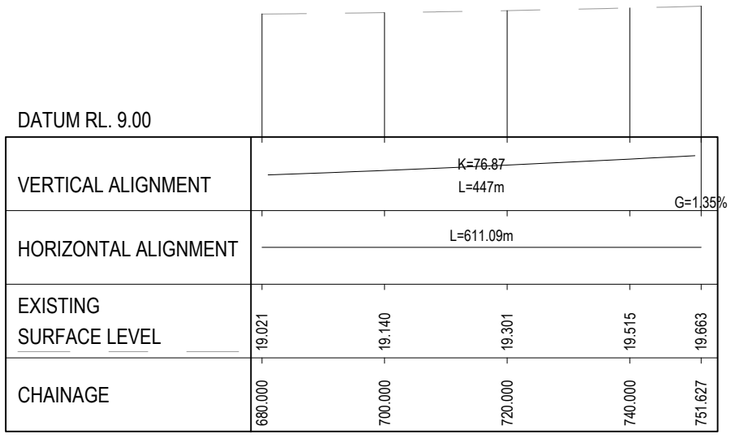
1. ROAD GEOMETRY ESTIMATED BASED ON EXISTING SURFACE SURVEY.
   VERTICAL AND HORIZONTAL ALIGNMENT TO MATCH EXISTING.



LONGITUDINAL SECTION - MC00

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
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Author B.DREW **Drafting Check** C.PURDON
Designer C.BARTLEY **Design Check** N.HINCKS

VERTICAL SCALE 1:500 AT ORIGINAL SIZE
0 5 10 15m
HORIZONTAL SCALE 1:1000 AT ORIGINAL SIZE
0 10 20 30m

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Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title LONGITUDINAL SECTIONS

SHEET 3 OF 4

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01113

Rev D

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew

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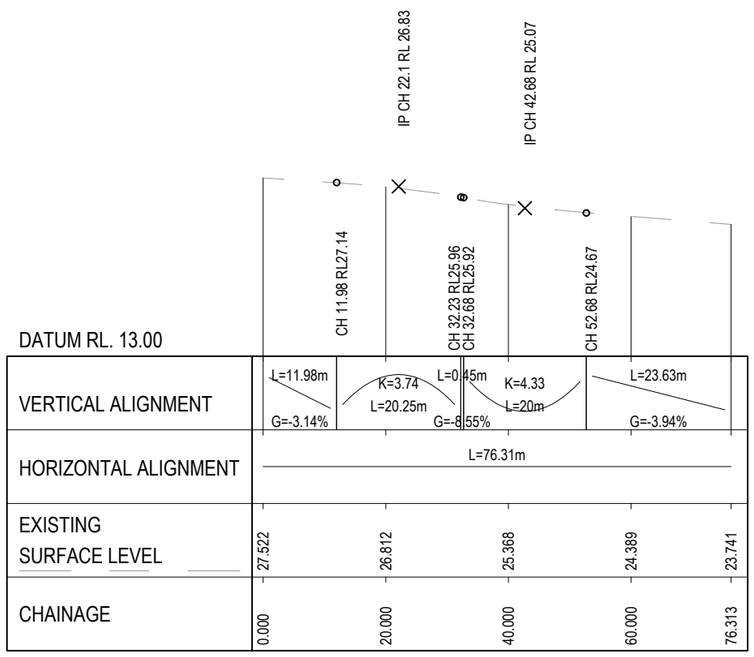
1. ROAD GEOMETRY ESTIMATED BASED ON EXISTING SURFACE SURVEY. VERTICAL AND HORIZONTAL ALIGNMENT TO MATCH EXISTING.



LONGITUDINAL SECTION - MC20

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
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Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

VERTICAL SCALE 1:500 AT ORIGINAL SIZE 0 5 10 15m
HORIZONTAL SCALE 1:1000 AT ORIGINAL SIZE 0 10 20 30m

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title LONGITUDINAL SECTIONS

SHEET 4 OF 4

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01114

Rev D

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew

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LEGEND

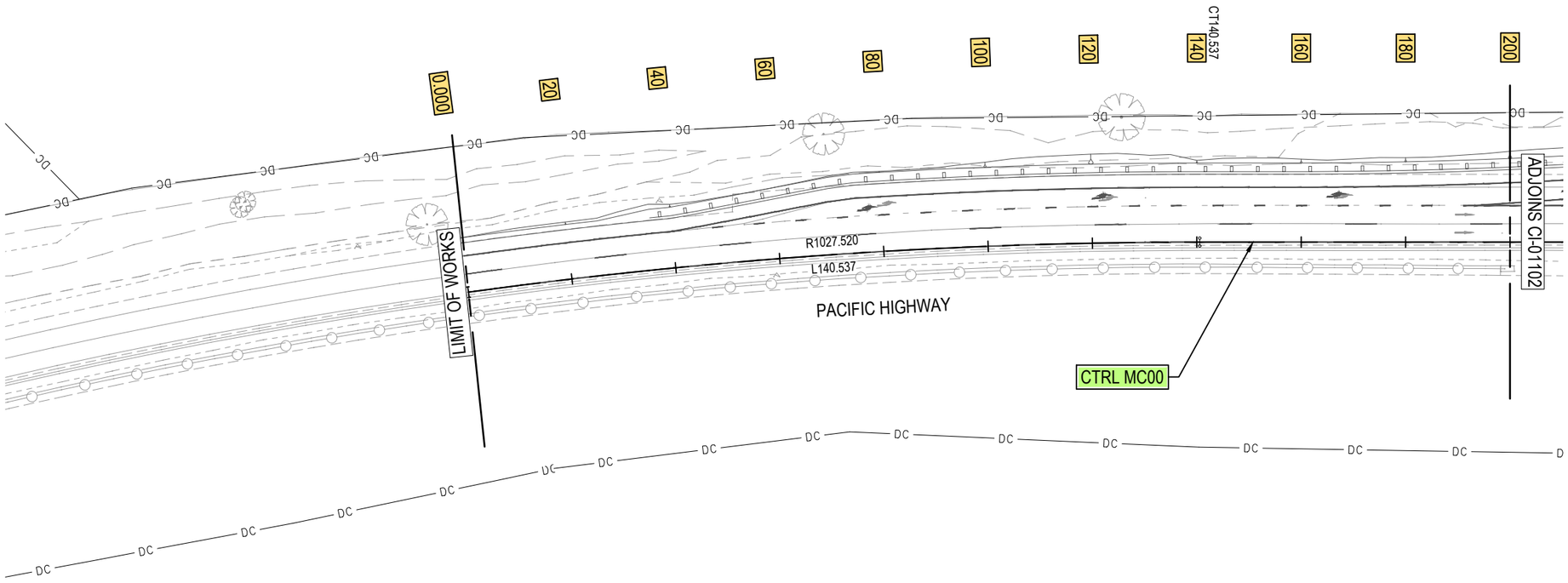
GENERAL

DESIGN

SURVEY

ROAD GEOMETRY & ALIGNMENT

40 – 60 MASTER CONTROL LINE



PLAN

SCALE 1:1000

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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UR	UNDER REVISION - FOR INTERNAL USE ONLY			

Author B.DREW Drafting Check

Designer C.BARTLEY Design Check

0 10 20 30m

SCALE 1:1000 AT ORIGINAL SIZE

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Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status PRELIMINARY

Drawing Title SETOUT PLAN

SHEET 1 OF 3

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01201

Rev UR

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew

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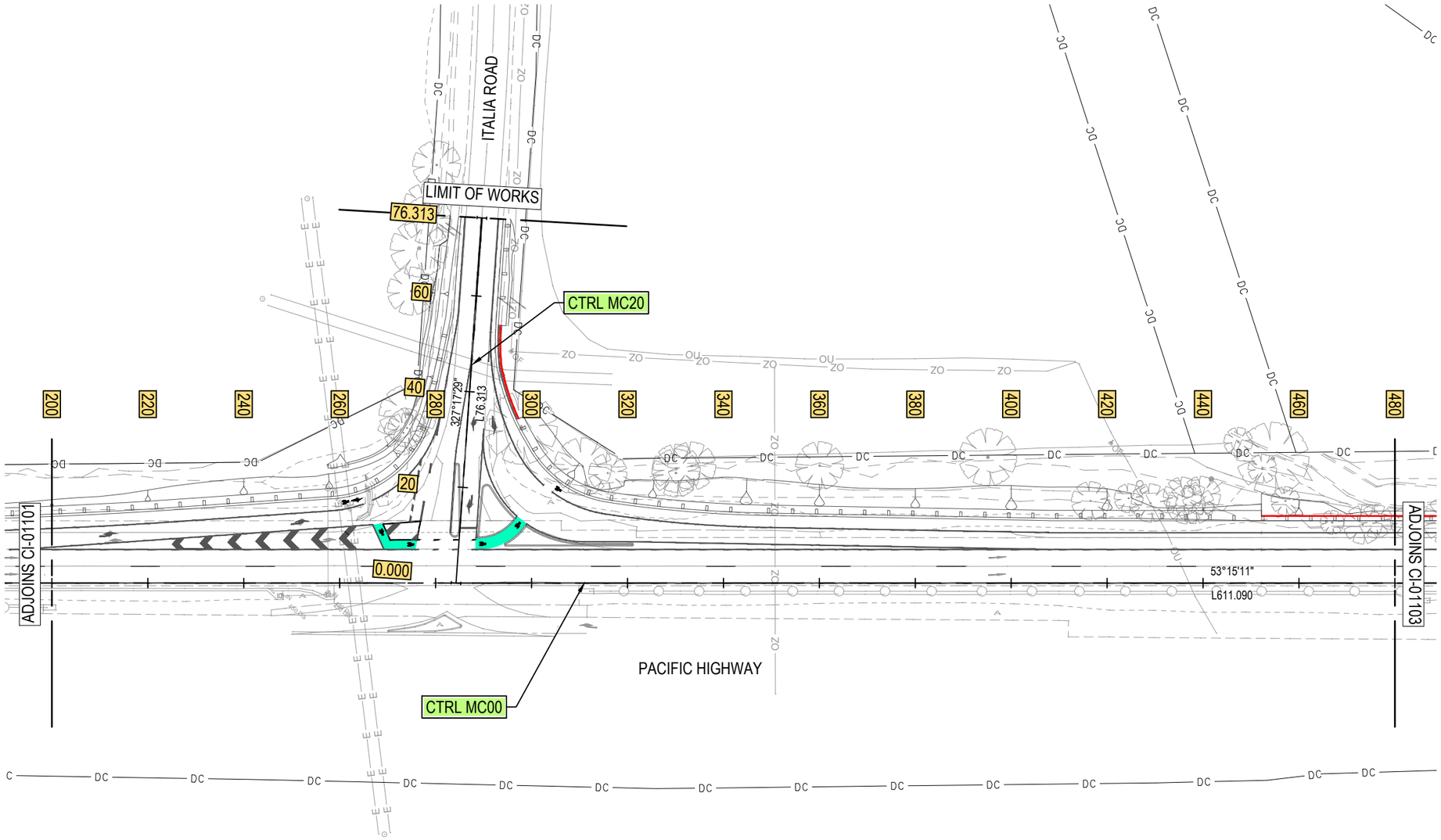

LEGEND

GENERAL

- DESIGN
- SURVEY

ROAD GEOMETRY & ALIGNMENT

- 40 / 60 — MASTER CONTROL LINE

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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PLAN
SCALE 1:1000

UR UNDER REVISION - FOR INTERNAL USE ONLY

Rev	Description	Checked	Approved	Date

Author B.DREW Drafting Check
Designer C.BARTLEY Design Check

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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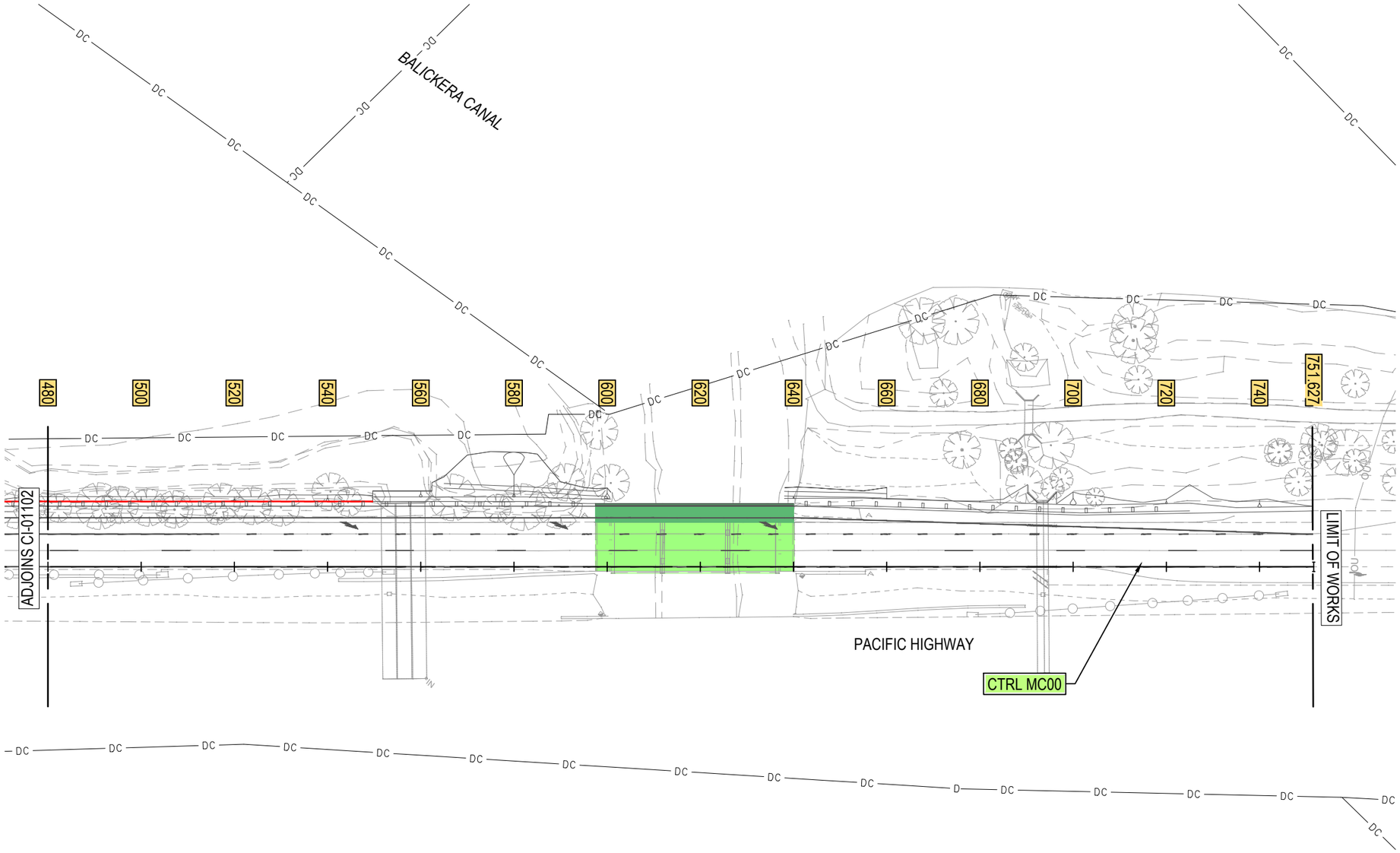
Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status PRELIMINARY

Drawing Title SETOUT PLAN
SHEET 2 OF 3
Drawing No. 12599191-GHD-00-00-DRG-CI-01202
Size A3
Rev UR

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew
File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01200.dwg



LEGEND

GENERAL

- DESIGN
- SURVEY

ROAD GEOMETRY & ALIGNMENT

- 40 – 60 MASTER CONTROL LINE

PLAN

SCALE 1:1000

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status PRELIMINARY

Drawing Title SETOUT PLAN

SHEET 3 OF 3

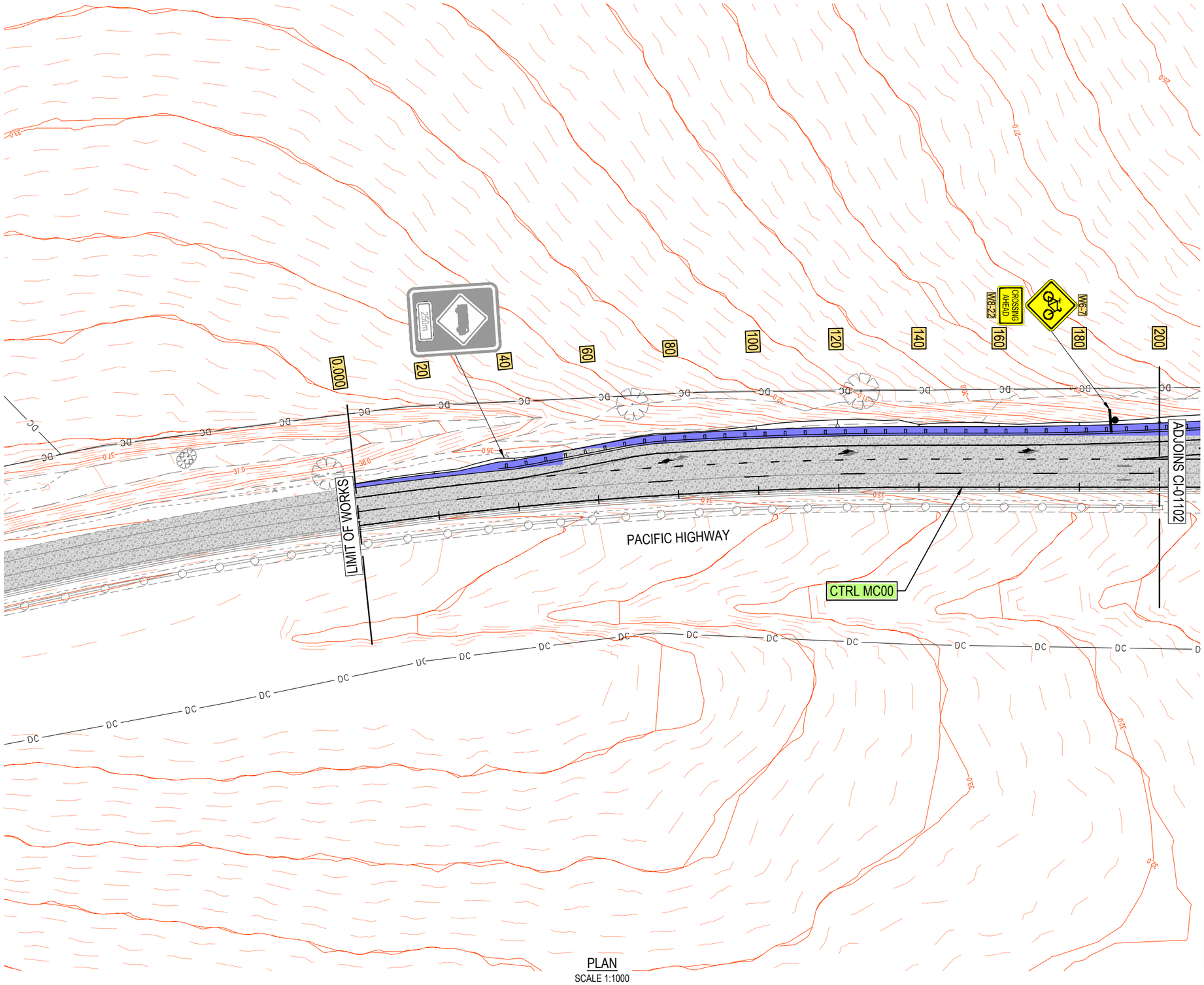
Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01203

Rev UR

Plot Date: 4 November 2024 - 4:08 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01200.dwg



PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- EXISTING BRIDGE DECK
- PROPOSED BRIDGE DECK
- EZYGUARD 4 (OR SIMILAR) BARRIER
- RETAINING WALL WITH TYPE F BARRIER
- XX01 — BARRIER I.D. CALL UP

ROAD GEOMETRY & ALIGNMENT

- 40 — 60 — MASTER CONTROL LINE

ROADSIDE FURNITURE

- NEW SIGN LOCATION
- 60 / R4-1A — NEW SIGN (NOT TO SCALE); SIGN SIZE (WHERE APPLICABLE) SIGN NUMBER
- 60 — EXISTING SIGN (NOT TO SCALE)

DELINEATION

- 60 — NEW PAVEMENT MARKINGS

PAVEMENT

- PT1 - NEW CONCRETE PAVEMENT
- PT2 - NEW ASPHALT PAVEMENT.
- PT3 - NEW CONCRETE MEDIAN
- EXISTING CONCRETE PAVEMENT
- EXISTING FLEXIBLE PAVEMENT

NOTE

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2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
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Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title ROADSIDE FURNITURE AND PAVEMENT PLAN SHEET 1 OF 3
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01301
Rev D

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew
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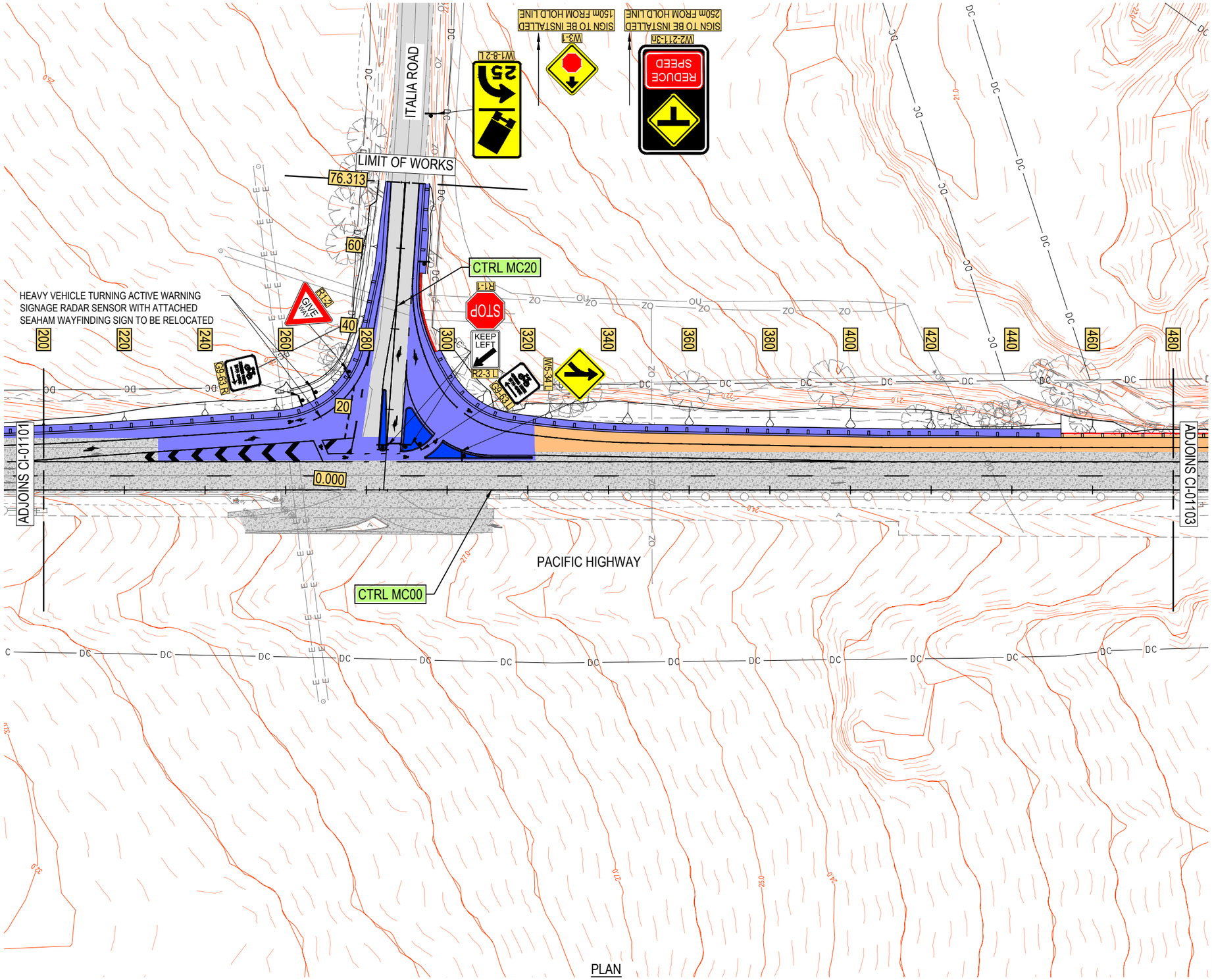

PLAN
SCALE 1:1000

LEGEND

GENERAL

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- PROPOSED BRIDGE DECK
- EZYGUARD 4 (OR SIMILAR) BARRIER
- RETAINING WALL WITH TYPE F BARRIER
- XX01 — BARRIER I.D. CALL UP

ROAD GEOMETRY & ALIGNMENT

- 40 – 60 — MASTER CONTROL LINE

ROADSIDE FURNITURE

- NEW SIGN LOCATION
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DELINEATION

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3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

Rev	Description	Checked	Approved	Date
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A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title ROADSIDE FURNITURE AND PAVEMENT PLAN SHEET 2 OF 3
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01302
Rev D

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew
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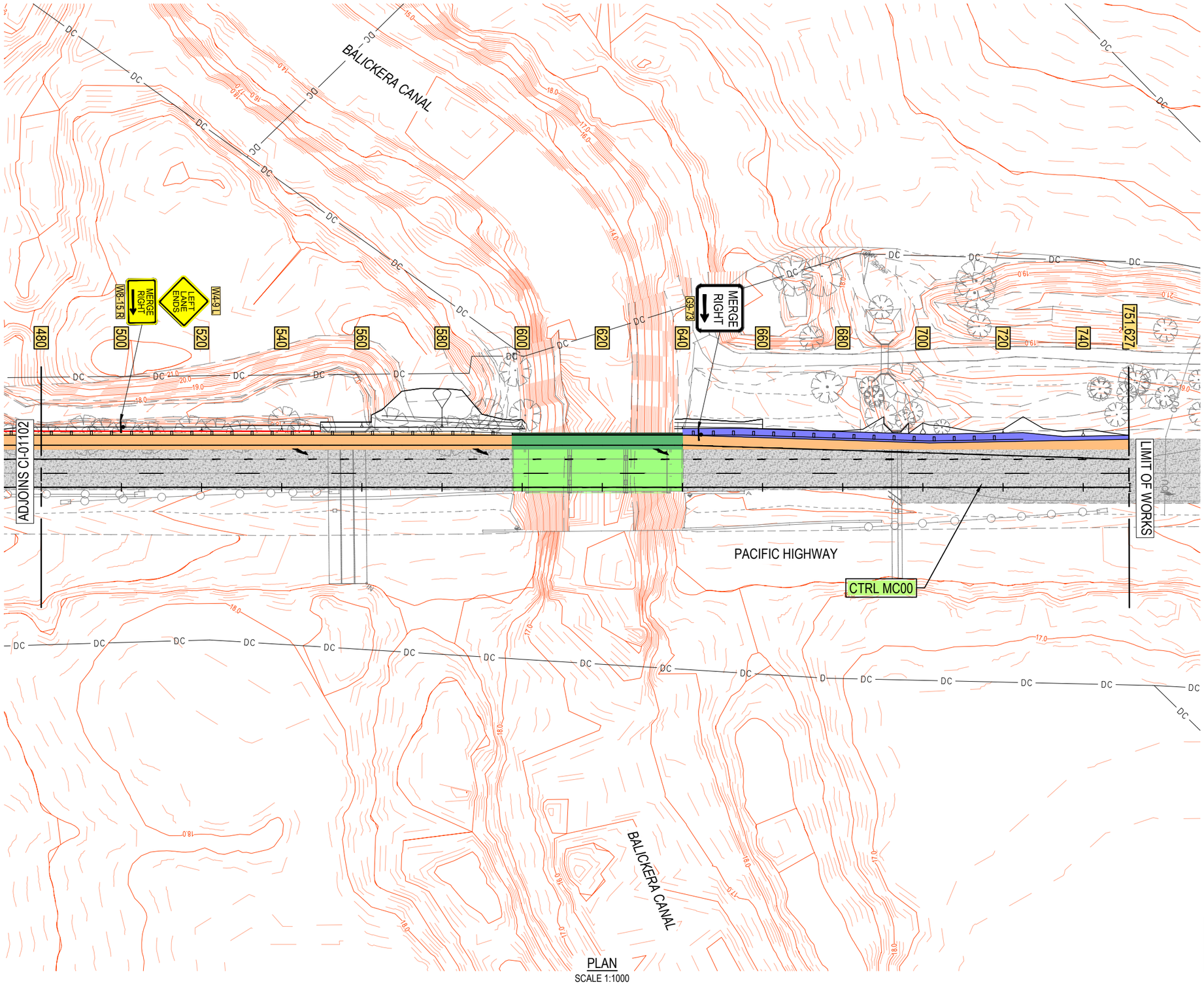

PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- EXISTING BRIDGE DECK
- PROPOSED BRIDGE DECK
- EZYGUARD 4 (OR SIMILAR) BARRIER
- RETAINING WALL WITH TYPE F BARRIER
- XX01 — BARRIER I.D. CALL UP

ROAD GEOMETRY & ALIGNMENT

- 40 — 60 — MASTER CONTROL LINE

ROADSIDE FURNITURE

- NEW SIGN LOCATION
- 60 / R4-1A — NEW SIGN (NOT TO SCALE)
- SIGN SIZE (WHERE APPLICABLE) SIGN NUMBER
- 60 — EXISTING SIGN (NOT TO SCALE)

DELINEATION

- 60 — NEW PAVEMENT MARKINGS

PAVEMENT

- PT1 - NEW CONCRETE PAVEMENT
- PT2 - NEW ASPHALT PAVEMENT.
- PT3 - NEW CONCRETE MEDIAN
- EXISTING CONCRETE PAVEMENT
- EXISTING FLEXIBLE PAVEMENT

NOTE

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2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title ROADSIDE FURNITURE AND PAVEMENT PLAN SHEET 3 OF 3
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01303
Rev D

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew
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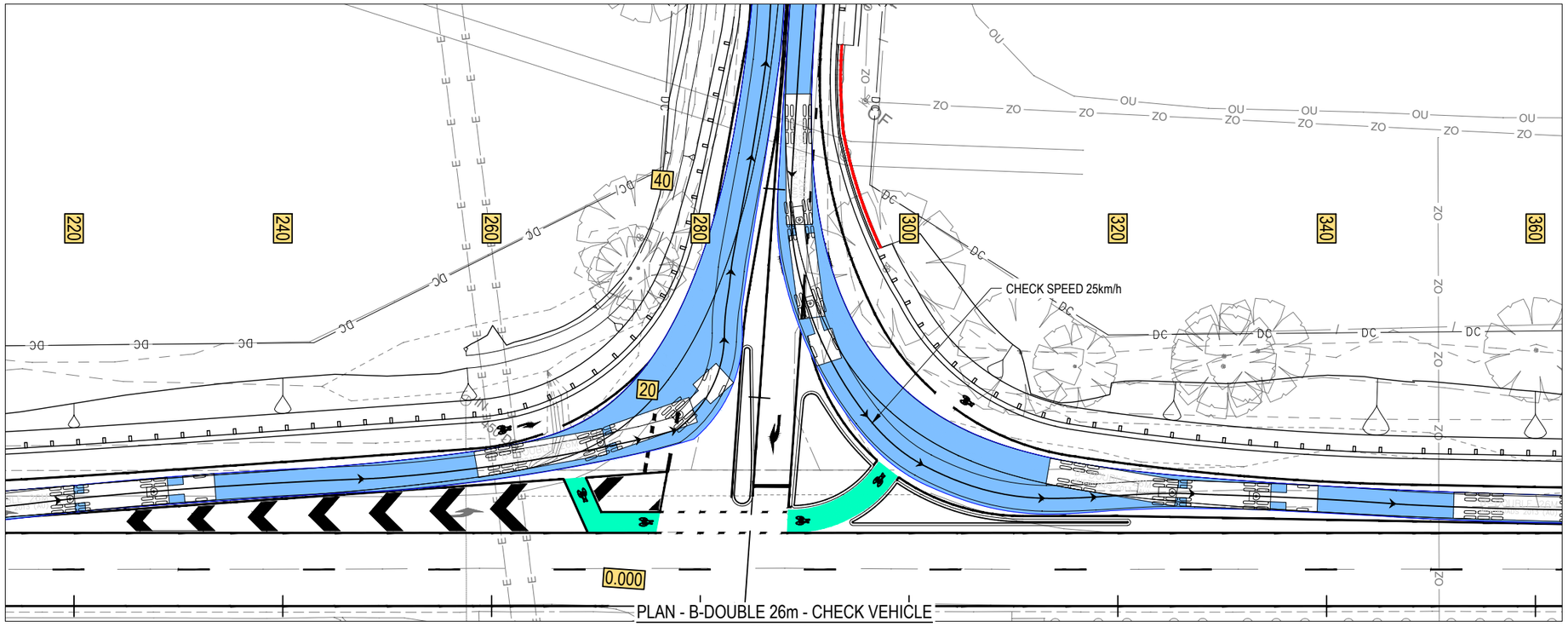
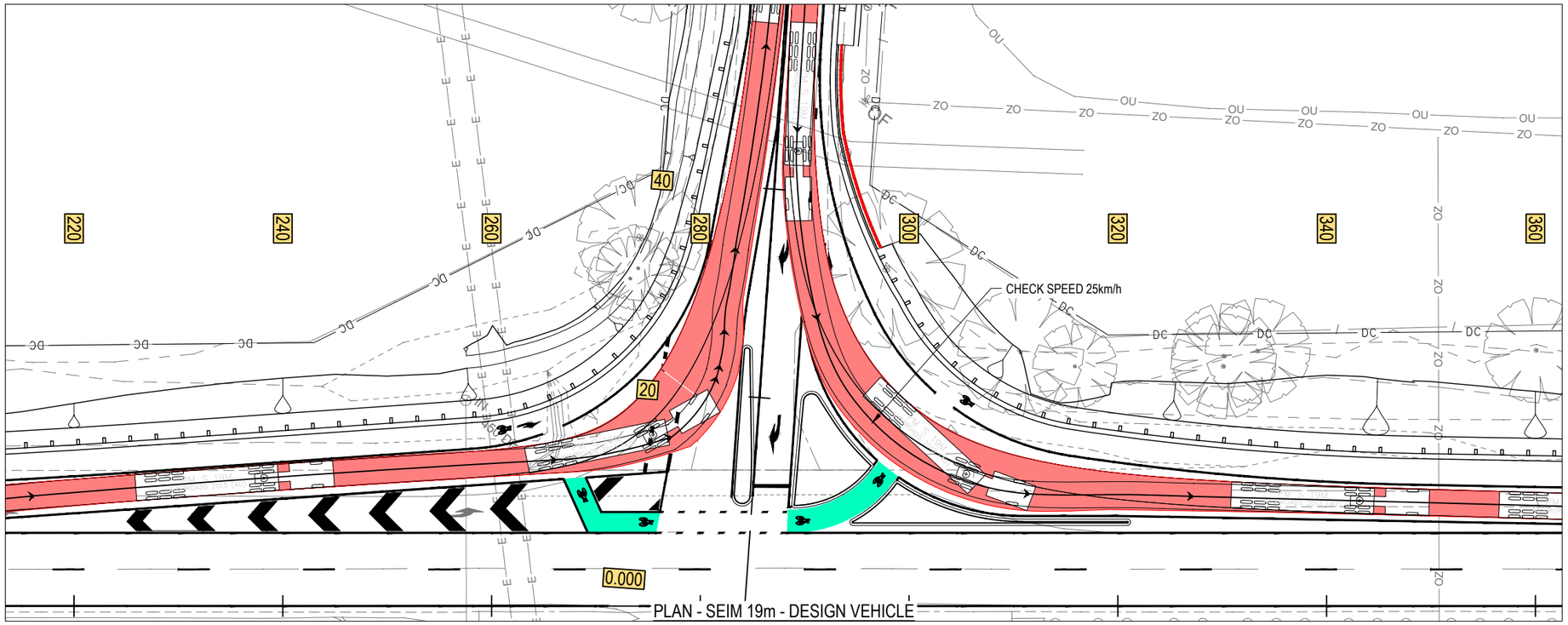


PLAN - B-DOUBLE 26m - CHECK VEHICLE

SCALE 1:1000



PLAN - SEIM 19m - DESIGN VEHICLE

SCALE 1:1000

LEGEND

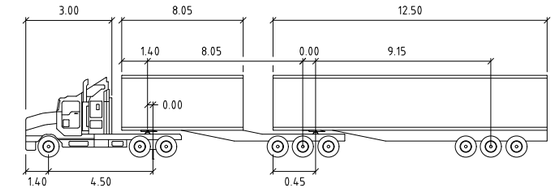
GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- EZYGUARD 4 (OR SIMILAR) BARRIER

ROAD GEOMETRY & ALIGNMENT

- MASTER CONTROL LINE

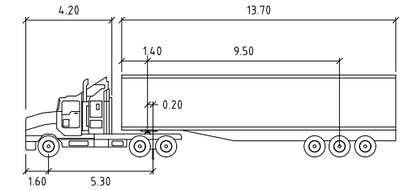
CHECK VEHICLES



B-DOUBLE 26M

meters

Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 23.4
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		



PM S 19M

meters

Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
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Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
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Author B.DREW **Drafting Check** C.PURDON

Designer C.BARTLEY **Design Check** N.HINCKS

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title TURNING PATHS

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01401

Rev D

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew

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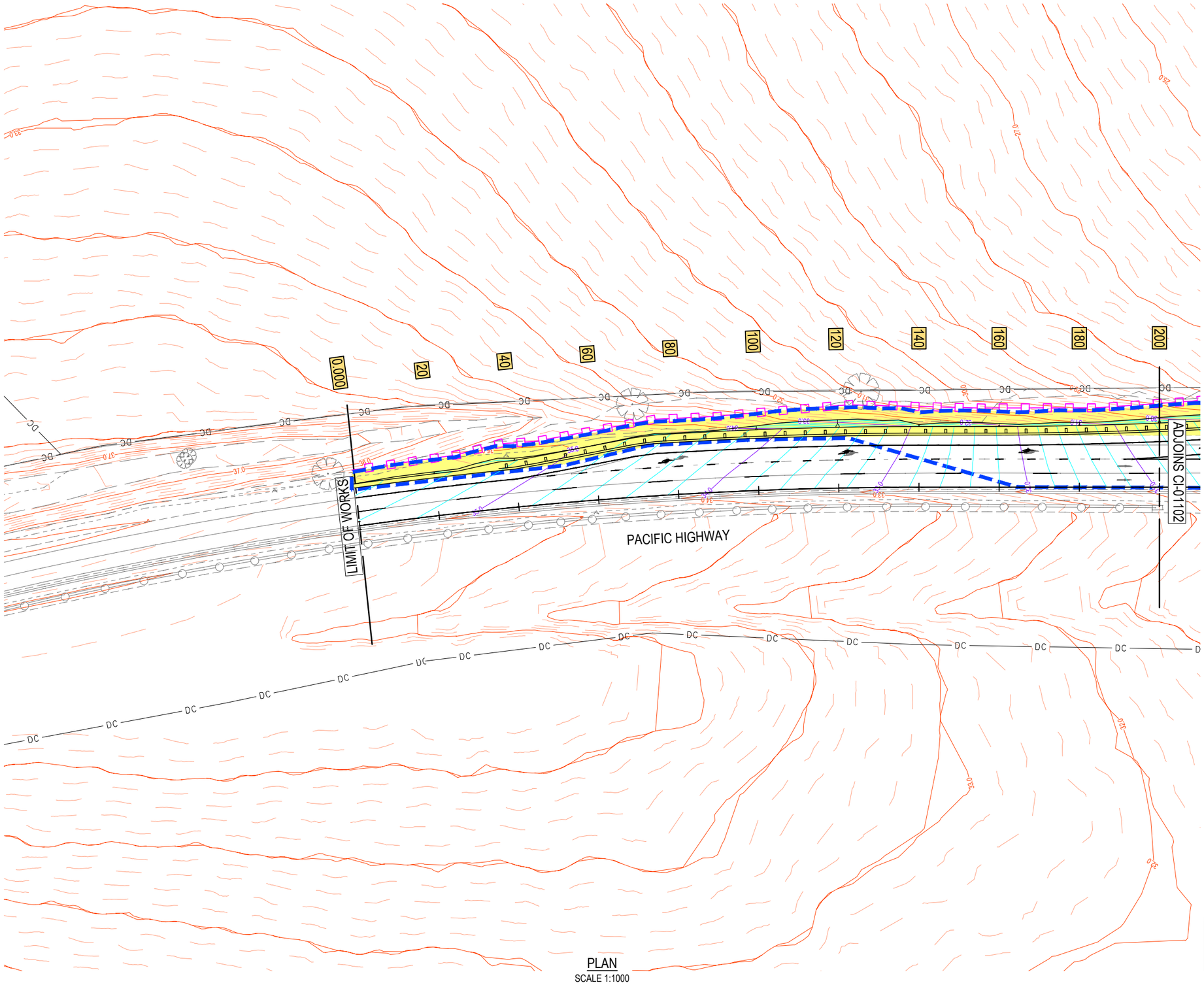

PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- BIO-RETENTION VEGETATED SWALE

EROSION AND SEDIMENT CONTROL

- CATCHMENT BOUNDARY
- GEOFABRIC SILT FENCE
- CLEAN WATER FLOW PATH
- TABLE DRAIN DIVERSION
- STRAW BALE SEDIMENT FILTER
- DISTURBANCE AREA

NOTE

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Rev	Description	Checked	Approved	Date
F	CONCEPT DESIGN FOR DA APPROVAL	AS	GW	18.06.24
E	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
D	CONCEPT DESIGN FOR DA APPROVAL			30.06.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title EROSION AND SEDIMENT CONTROL PLAN
SHEET 1 OF 3

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01501

Rev F

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew

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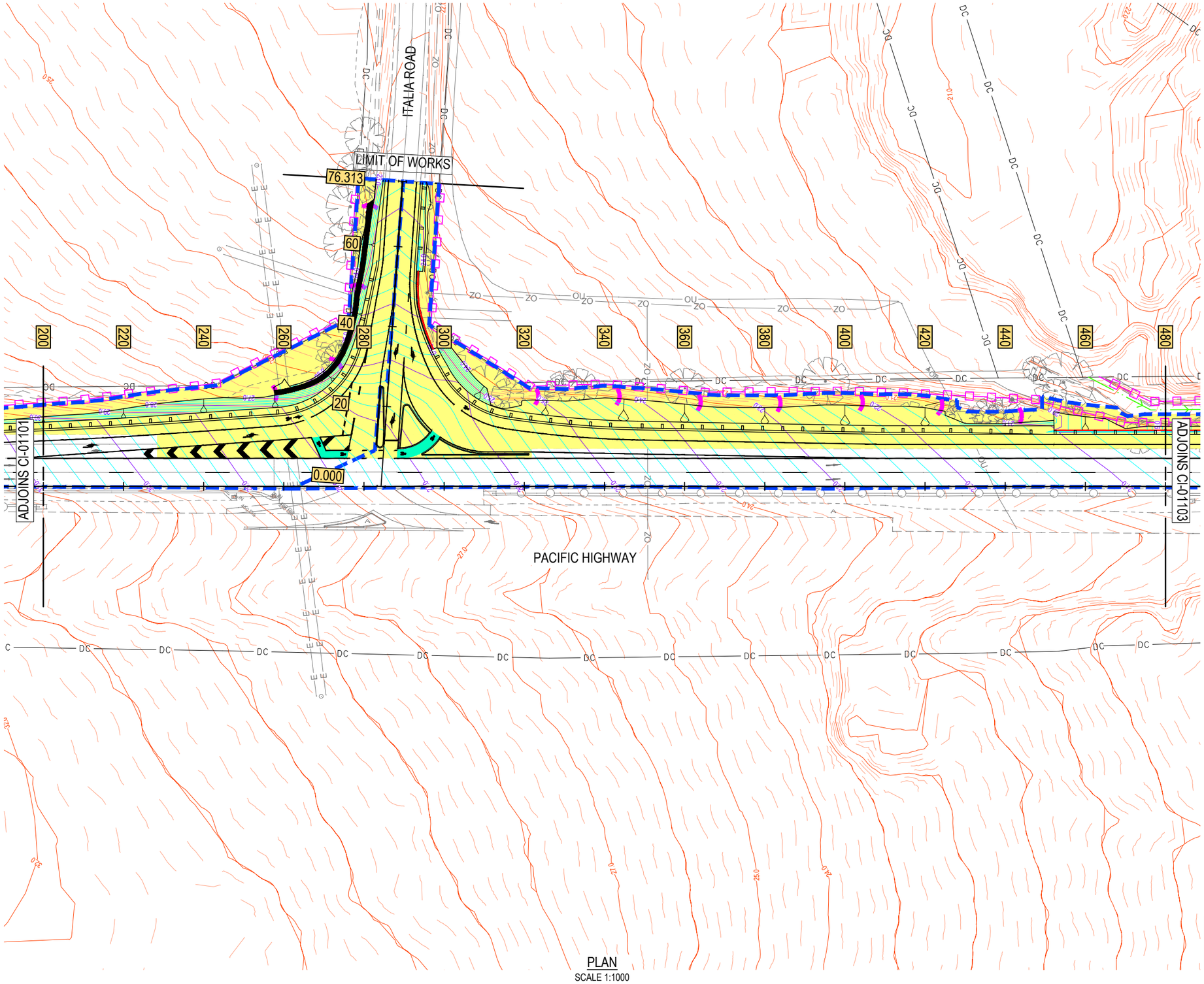

PLAN
SCALE 1:1000

LEGEND

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3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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UTILITY INFORMATION SHOWN ON THESE PLANS DOES NOT DEPICT ANY MORE THAN THE PRESENCE OF A SERVICE, BASED ON AVAILABLE DOCUMENTARY EVIDENCE. RELEVANT UTILITY PLANS ARE TO BE OBTAINED FROM BEFORE YOU DIG AUSTRALIA AND THE PRESENCE OF A UTILITY SERVICE, SIZE AND LOCATION TO BE CONFIRMED BY FIELD INSPECTION PRIOR TO THE COMMENCEMENT OF WORKS. CAUTION SHOULD BE EXERCISED WHEN WORKING IN THE VICINITY OF ALL UTILITY SERVICES.

Rev	Description	Checked	Approved	Date
G	SWALES ADDED FOR DA	A.S.	G.W.	04.11.24

Author A.SNEDDON | Drafting Check C.PURDON
Designer C.BARTLEY | Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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www.ghd.com

Project No. 12599191

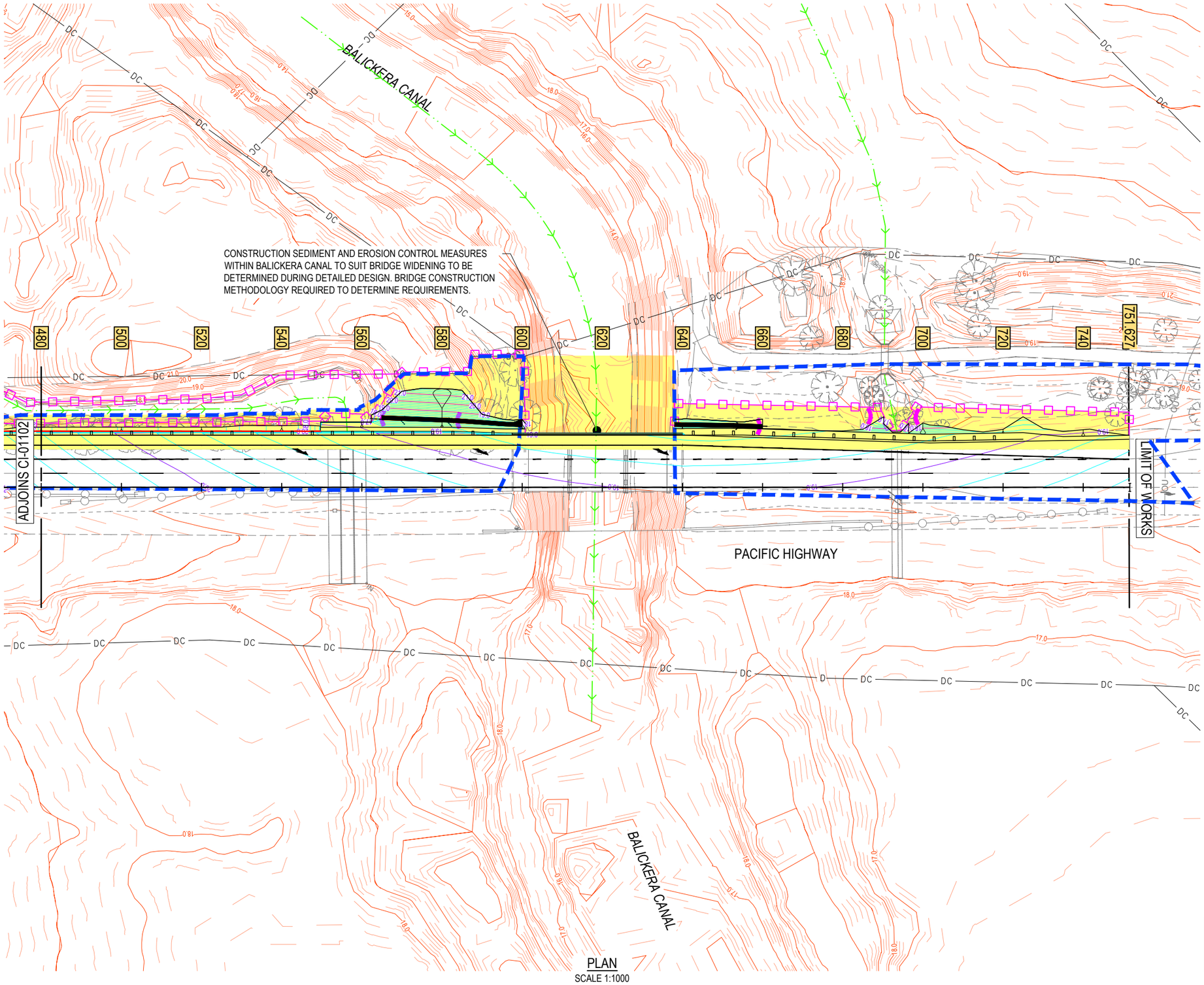
Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title EROSION AND SEDIMENT CONTROL PLAN
SHEET 2 OF 3

Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01502
Rev G

Plot Date: 4 November 2024 - 4:09 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01500.dwg



PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- BIO-RETENTION VEGETATED SWALE

EROSION AND SEDIMENT CONTROL

- CATCHMENT BOUNDARY
- GEOFABRIC SILT FENCE
- CLEAN WATER FLOW PATH
- TABLE DRAIN DIVERSION
- STRAW BALE SEDIMENT FILTER
- DISTURBANCE AREA

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title EROSION AND SEDIMENT CONTROL PLAN SHEET 3 OF 3

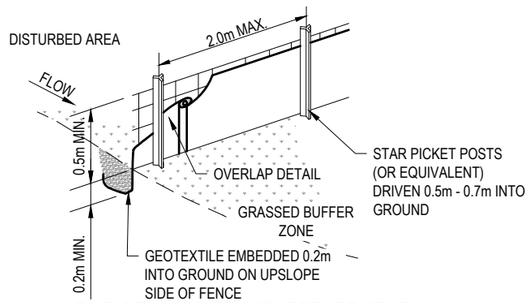
Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01503

Rev G

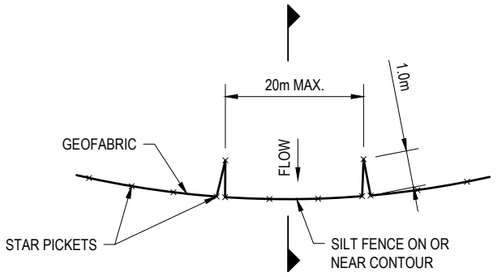
Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01500.dwg



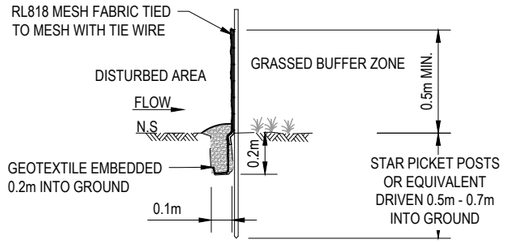
GEOFABRIC SILT FENCE - PERSPECTIVE

NOT TO SCALE



GEOFABRIC SILT FENCE - PLAN

NOT TO SCALE



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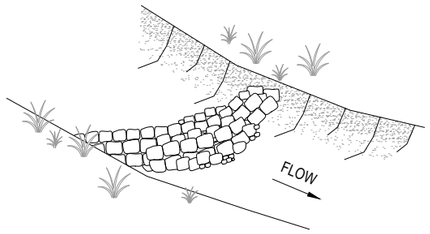
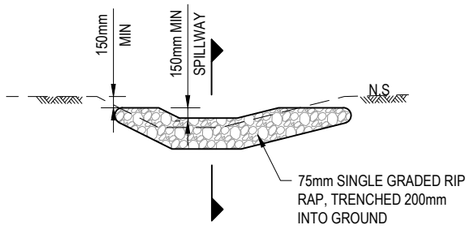


CHECK DAM - PERSPECTIVE

NOT TO SCALE



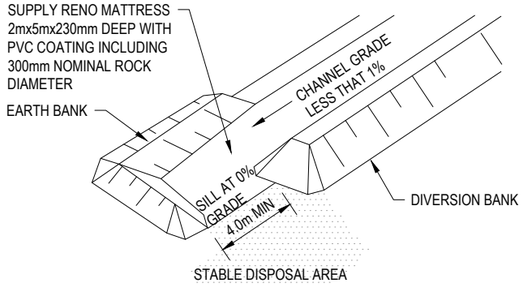
CHECK DAM - ELEVATION

NOT TO SCALE

SPACING OF CHECK DAMS ALONG CENTRELINE AND SCOUR PROTECTION BELOW EACH CHECK DAM TO BE SPECIFIED ON CONSTRUCTORS SWMP/ESCP.

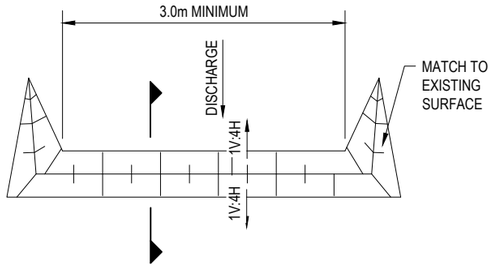
CHECK DAM - SECTION

NOT TO SCALE



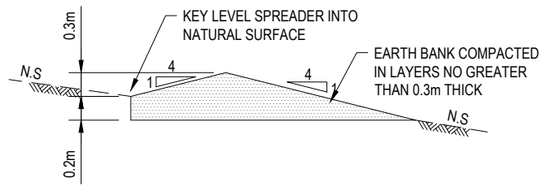
LEVEL SPREADER - PERSPECTIVE

NOT TO SCALE



LEVEL SPREADER DETAIL - PLAN

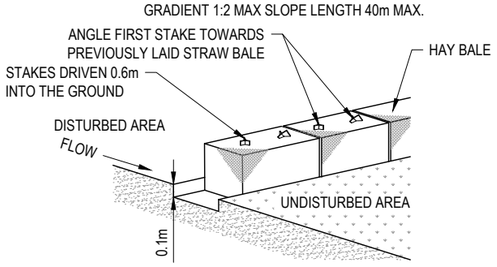
NOT TO SCALE



LEVEL SPREADER - SECTION

NOT TO SCALE

DRAINAGE AREA 0.4ha MAX. SLOPE
GRADIENT 1:2 MAX SLOPE LENGTH 40m MAX.



STRAW BALE SEDIMENT FILTER DETAIL

NOT TO SCALE

SEDIMENT AND EROSION CONTROL NOTES:

1. DRAWINGS ARE ISSUED AS EXAMPLE ONLY. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE 'BLUE BOOK', SOILS AND CONSTRUCTION LANDCOM 2004 VOLUME 1 AND DEC VOLUME 2D AND OTHER ENVIRONMENTAL PRACTICES.
2. DETAILS ON THESE PRELIMINARY EROSION AND SEDIMENT CONTROL PLANS (ESCP) ARE SCHEMATIC ONLY. ADDITIONAL CONTROLS AND CHANGES TO THIS PLAN WILL BE NECESSARY DURING THE PROCESS OF IMPLEMENTATION OF THE ESCP. IN CONJUNCTION WITH THE CONSTRUCTION STAGING PLANS AND SPECIFIC ON SITE CONSTRUCTION METHODOLOGY THE CONTRACTOR SHALL PREPARE PROGRESSIVE ESCP. THE ESCP IDENTIFY THE EROSION AND SEDIMENT CONTROLS NEEDED ON SITE, BUT ARE NOT CONSTRUCTION DRAWINGS AND ARE ISSUED FOR INFORMATION ONLY. ALTERNATIVE APPROVED PRIMARY EROSION SEDIMENT CONTROLS CAN BE USED TO SUIT THE METHOD AND SEQUENCE OF CONSTRUCTION.
3. FOR ADDITIONAL EROSION AND SEDIMENT CONTROL DETAILS REFER TO THE BLUE BOOK STANDARD DRAWINGS AS NOMINATED
4. THE SEQUENCE OF CONSTRUCTION SHALL BE AS FOLLOWS
   - 4.1. IDENTIFY LOCATION OF ALL YOUR NEW EROSION AND SEDIMENT CONTROL MEASURES.
   - 4.2. INSTALLATION OF BARRIER AND SEDIMENT FENCES.
   - 4.3. INSTALLATION OF TEMPORARY SEDIMENT BASIN AND ENERGY DISSIPATER AT OUTLET WITH SEDIMENT FENCES AT DOWN SLOPE.
   - 4.4. INSTALLATION OF ALL DIVERSION DRAINS AND LEVEL SPREADERS.
   - 4.5. INSTALLATION OF ALL REMAINING EROSION AND SEDIMENT CONTROLS.
   - 4.6. CLEARING AND REGRADING OF SITE FOR CONSTRUCTION.
5. REFER TO THE TFNSW TYPICAL DRAWINGS R0100-01 TO R0100-12 AND THE 2008 'BLUE BOOK' TYPICAL DETAILS SD 4-1 TO SD 6-15.
6. LOCATION OF TOPSOIL STOCKPILES TO BE DETERMINED BY THE CONTRACTOR AND STABILISED IN ACCORDANCE WITH SD4.1 AND SD6.8.
7. AFTER REGRADING THE SITE, SEDIMENT FENCES SHALL BE LAID ALONG THE CONTOURS AT INTERVALS NOT EXCEEDING 80m. THIS INTERVAL SHALL BE REDUCED TO 20m ON BATTERS STEEPER THAN H.V=4.1.
8. ALL DISTURBED AND REGRADED AREAS SHALL BE REHABILITATED WITHIN 20 DAYS POST CONSTRUCTION IN ACCORDANCE WITH REQUIREMENTS OF THE BLUE BOOK.
9. NEW OR EXISTING INFRASTRUCTURE USED TO CONVEY SITE RUNOFF DURING CONSTRUCTION SHALL BE FLUSHED CLEAN OF SEDIMENT AT COMPLETION OF THE PROJECT.
10. FIELD INSPECTIONS ARE TO BE UNDERTAKEN FOR ALL OPEN TRENCHES ON SITE TO ENSURE THAT ADEQUATE PROTECTION AGAINST EROSION IS PROVIDED AND THAT SAFETY MEASURES ARE ALSO PROVIDED IN PLACE AT THE END OF EACH DAY.
11. LOCATION OF ALL SERVICES TO BE CONFIRMED PRIOR TO COMMENCING WORK AND MANAGE THE COORDINATION OF TEMPORARY DRAINAGE AND OTHER EROSION AND SEDIMENT CONTROLS WITH THE EXISTING AND NEW UTILITIES.
12. ANY WORKS TO INSTALL UTILITIES OUTSIDE OF THE CONSTRUCTION AREAS SHOWN ON THESE PLANS ARE TO IMPLEMENT LOCAL EROSION AND SEDIMENT CONTROLS TO ENSURE ADEQUATE PROTECTION.
13. THE PROVISION OF ALL EROSION AND SEDIMENT CONTROL MEASURES REQUIRED FOR THE INSTALLATION OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH VOLUME 2A 'INSTALLATION OF SERVICES" OF THE BLUE BOOK.
14. DIVERSION DRAINS MUST BE FULLY OPERATIONAL PRIOR TO ANY DISTURBANCE ON SITE.
15. TEMPORARY DIVERSION DRAINS SHOULD BE CONSTRUCTED TO AVOID TREES AND FENCES.
16. USE WOVEN POLYPROPYLENE AND COTTON/GEOTEXTILE THREAD WITH A FLOW RATE OF 15 L/s/m^2 TO AUSTRALIAN STANDARD AS 3706.9 WHEN INSTALLING SEDIMENT FENCES.
17. ALL BARRIER FENCES (PARAWEBBING) ARE TO BE INSTALLED TO AVOID SOIL DISTURBANCE OUTSIDE THE CONSTRUCTION AREA.

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title EROSION AND SEDIMENT CONTROL
NOTES AND DETAILS

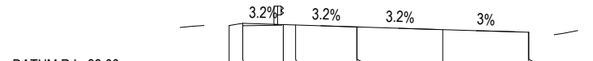
Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01511

Rev D

Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01510.dwg



DATUM R.L. 33.00													
DESIGN SURFACE LEVEL	35.121	35.213	35.161	35.145	35.065	35.065	34.953		34.848	34.848			
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.10	0.02	0.00	-0.00	-0.00	-0.00		-0.00	-0.00			
EXISTING SURFACE LEVEL	35.12	35.11	35.14	35.14	35.06	35.06	34.95		34.85	34.85			
OFFSET FROM CONTROL LINE	-12.210	-11.653	-10.003	-9.503	-7.003	-7.000	-3.500		0.000	0.000			

CH 40

DATUM R.L. 32.00													
DESIGN SURFACE LEVEL	33.684	34.161	34.111	34.096	34.020		33.913	33.806		33.721	33.721		
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.22	0.04	-0.00	-0.00		-0.00	-0.00		0.01	0.01		
EXISTING SURFACE LEVEL	33.68	33.94	34.07	34.10	34.02		33.91	33.81		33.71	33.71		
OFFSET FROM CONTROL LINE	-16.104	-15.150	-13.500	-13.000	-10.500		-7.000	-3.500		0.000	0.000		

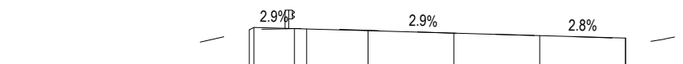
CH 100

DATUM R.L. 30.00													
DESIGN SURFACE LEVEL	32.631	32.908	32.888	32.882	32.851		32.808		32.765		32.721	32.721	
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.08	-0.01	-0.01	-0.02		0.00		0.00		0.00	0.00	
EXISTING SURFACE LEVEL	32.63	32.83	32.90	32.89	32.87		32.81		32.77		32.72	32.72	
OFFSET FROM CONTROL LINE	-15.704	-15.150	-13.500	-13.000	-10.500		-7.000		-3.500		0.000	0.000	

CH 141

DATUM R.L. 34.00													
DESIGN SURFACE LEVEL	35.383	35.463	35.430		35.349		35.236		35.128	35.128			
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.06	0.00		-0.00		-0.00		-0.00	-0.00			
EXISTING SURFACE LEVEL	35.38	35.40	35.43		35.35		35.24		35.13	35.13			
OFFSET FROM CONTROL LINE	-10.980	-10.500	-9.500		-7.000		-3.500		0.000	0.000			

CH 20

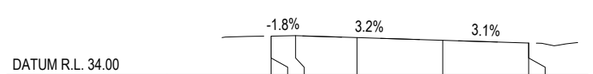


DATUM R.L. 32.00													
DESIGN SURFACE LEVEL	34.481	34.576	34.529	34.515	34.443		34.343	34.243		34.145	34.145		
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.08	-0.00	-0.02	-0.02		0.00	-0.00		0.01	0.01		
EXISTING SURFACE LEVEL	34.48	34.50	34.53	34.54	34.46		34.34	34.24		34.13	34.13		
OFFSET FROM CONTROL LINE	-15.341	-15.150	-13.500	-13.000	-10.500		-7.000	-3.500		0.000	0.000		

CH 80

DATUM R.L. 30.00													
DESIGN SURFACE LEVEL	32.672	32.928	32.907	32.901	32.869		32.825		32.781		32.735	32.735	
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.08	-0.01	-0.01	-0.02		-0.00		-0.00		0.00	0.00	
EXISTING SURFACE LEVEL	32.67	32.85	32.92	32.91	32.89		32.82		32.78		32.74	32.74	
OFFSET FROM CONTROL LINE	-15.662	-15.150	-13.500	-13.000	-10.500		-7.000		-3.500		0.000	0.000	

CH 140

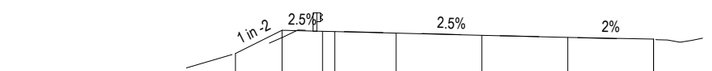


DATUM R.L. 34.00													
DESIGN SURFACE LEVEL	35.641	35.641	35.659		35.580		35.469		35.361	35.361			
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	0.00		0.00		0.00		-0.00	-0.00			
EXISTING SURFACE LEVEL	35.64	35.64	35.65		35.58		35.47		35.36	35.36			
OFFSET FROM CONTROL LINE	-10.500	-10.500	-9.500		-7.000		-3.500		0.000	0.000			

CH 0

DATUM R.L. 33.00													
DESIGN SURFACE LEVEL	34.903	34.913	34.865	34.851	34.780		34.723	34.622		34.521	34.521		
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.01	-0.02	-0.02	-0.02		-0.00	-0.00		0.00	0.00		
EXISTING SURFACE LEVEL	34.90	34.90	34.89	34.87	34.80		34.72	34.62		34.52	34.52		
OFFSET FROM CONTROL LINE	-13.671	-13.643	-11.993	-11.493	-8.993		-7.000	-3.500		0.000	0.000		

CH 60



DATUM R.L. 31.00													
DESIGN SURFACE LEVEL	32.664	33.612	33.571	33.558	33.495		33.407		33.319		33.250	33.250	
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.30	-0.01	-0.01	-0.01		-0.00		-0.00		0.02	0.02	
EXISTING SURFACE LEVEL	32.66	33.31	33.59	33.57	33.51		33.41		33.32		33.23	33.23	
OFFSET FROM CONTROL LINE	-17.047	-15.150	-13.500	-13.000	-10.500		-7.000		-3.500		0.000	0.000	

CH 120

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
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Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 2.5 5.0 7.5m
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Project No. 12599191

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Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title CROSS SECTIONS

SHEET 1 OF 6

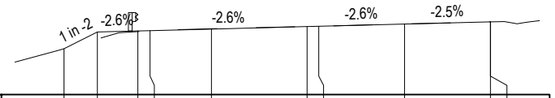
Drawing No. 12599191-GHD-00-00-DRG-CI-01601

Size A3

Rev D

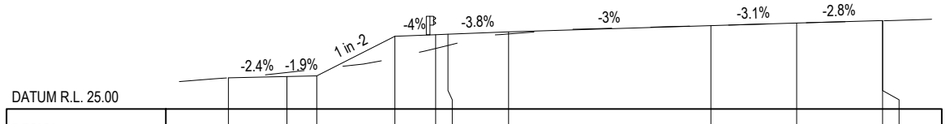
Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg



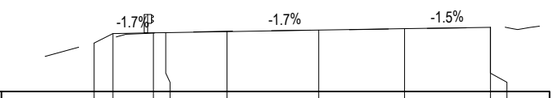
DATUM R.L. 28.00															
DESIGN SURFACE LEVEL	29.867	30.548	30.591	30.604	30.669	30.771	30.784	30.875	30.962	30.962					
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.28	0.03	0.01	-0.01	-0.00	0.00	0.00	-0.00	-0.00					
EXISTING SURFACE LEVEL	29.87	30.26	30.56	30.59	30.68	30.77	30.78	30.88	30.96	30.96					
OFFSET FROM CONTROL LINE	-17.387	-16.027	-14.377	-13.877	-11.377	-7.477	-7.000	-3.500	0.000	0.000					

CH 200



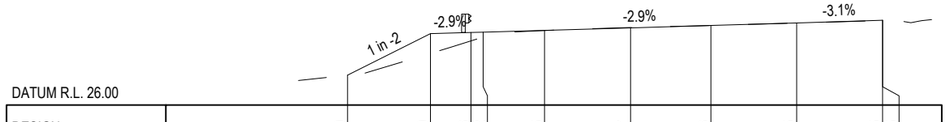
DATUM R.L. 25.00															
DESIGN SURFACE LEVEL	26.267	26.324	26.346	27.961	28.029	28.048	28.143	28.394	28.502	28.601	28.601				
LEVEL DIFFERENCE CUT - / FILL +	0.00	-0.16	-0.28	0.87	0.56	0.46	0.09	0.00	0.00	0.01	0.01				
EXISTING SURFACE LEVEL	26.27	26.49	26.62	27.09	27.47	27.59	28.06	28.39	28.50	28.59	28.59				
OFFSET FROM CONTROL LINE	-26.672	-24.284	-23.066	-19.884	-18.221	-17.719	-15.247	-7.000	-3.500	0.000	0.000				

CH 260



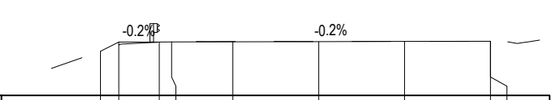
DATUM R.L. 29.00															
DESIGN SURFACE LEVEL	30.978	31.364	31.391	31.400	31.442	31.505	31.563	31.617	31.617						
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.17	0.01	-0.01	-0.02	0.00	0.00	0.00	0.00						
EXISTING SURFACE LEVEL	30.98	31.19	31.38	31.41	31.46	31.50	31.56	31.61	31.61						
OFFSET FROM CONTROL LINE	-16.160	-15.389	-13.739	-13.239	-10.739	-7.000	-3.500	0.000	0.000						

CH 180



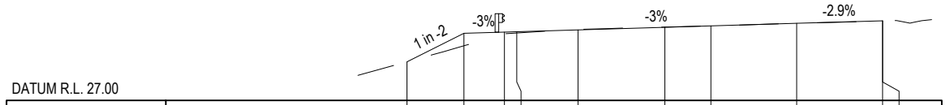
DATUM R.L. 26.00															
DESIGN SURFACE LEVEL	27.219	28.909	28.958	28.972	29.045	29.147	29.243	29.345	29.455	29.455					
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.80	0.34	0.21	0.01	-0.01	0.00	0.00	0.01	0.01					
EXISTING SURFACE LEVEL	27.22	28.11	28.62	28.77	29.04	29.16	29.24	29.35	29.44	29.44					
OFFSET FROM CONTROL LINE	-21.814	-18.433	-16.783	-16.283	-13.783	-10.274	-7.000	-3.500	0.000	0.000					

CH 240



DATUM R.L. 30.00															
DESIGN SURFACE LEVEL	31.799	32.171	32.175	32.177	32.183	32.191	32.200	32.205	32.205						
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.11	0.01	-0.02	-0.01	0.00	0.00	0.00	0.00						
EXISTING SURFACE LEVEL	31.80	32.06	32.17	32.19	32.20	32.19	32.20	32.20	32.20						
OFFSET FROM CONTROL LINE	-15.897	-15.152	-13.502	-13.002	-10.502	-7.000	-3.500	0.000	0.000						

CH 160



DATUM R.L. 27.00															
DESIGN SURFACE LEVEL	28.571	29.734	29.784	29.799	29.874	29.980	30.036	30.141	30.242	30.242					
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.51	0.08	0.05	-0.02	-0.01	0.00	0.00	0.00	0.00					
EXISTING SURFACE LEVEL	28.57	29.22	29.70	29.75	29.89	29.99	30.04	30.14	30.24	30.24					
OFFSET FROM CONTROL LINE	-19.392	-17.066	-15.416	-14.916	-12.416	-8.876	-7.000	-3.500	0.000	0.000					

CH 220

Rev	Description		Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.		G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL				26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION				13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION				09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 2.5 5.0 7.5m
SCALE 1:250 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title CROSS SECTIONS
SHEET 2 OF 6
Drawing No. 12599191-GHD-00-00-DRG-CI-01602
Size A3
Rev D

Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew
File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg

DATUM R.L. 23.00

DESIGN SURFACE LEVEL	24.078	25.683	25.907	25.964	26.137	26.494	26.523	26.621	26.620	26.718	26.718	26.618	26.588	26.607	26.722	26.817	26.817
LEVEL DIFFERENCE CUT - / FILL +	0.00	1.60	1.00	0.83	0.00	0.00	0.03	0.12	0.12	0.14	0.13	0.03	0.00	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	24.08	24.08	24.90	25.14	26.13	26.49	26.49	26.50	26.50	26.58	26.58	26.59	26.59	26.61	26.72	26.82	26.82
OFFSET FROM CONTROL LINE	-35.264	-31.527	-28.201	-27.226	-22.988	-11.323	-11.312	-11.126	-11.044	-7.955	-7.885	-7.725	-7.715	-7.000	-3.500	0.000	0.000

CH 300

DATUM R.L. 22.00

DESIGN SURFACE LEVEL	23.315	23.278	23.644	24.854	25.150	25.319	25.855	27.514	27.617	27.709	27.709
LEVEL DIFFERENCE CUT - / FILL +	0.03	-0.04	-0.02	0.68	0.15	0.11	-0.11	0.00	0.00	0.00	0.00
EXISTING SURFACE LEVEL	23.29	23.32	23.66	24.18	25.00	25.21	25.97	27.51	27.62	27.71	27.71
OFFSET FROM CONTROL LINE	-63.567	-62.311	-53.538	-45.431	-40.600	-38.184	-31.579	-7.000	-3.500	0.000	0.000

CH 280

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW **Drafting Check** C.PURDON
Designer C.BARTLEY **Design Check** N.HINCKS

0 2.5 5.0 7.5m
SCALE 1:250 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

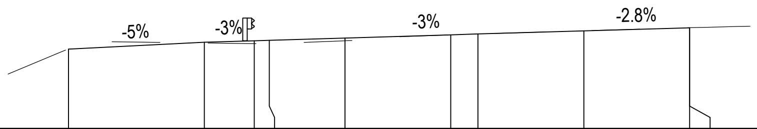
Drawing Title CROSS SECTIONS

SHEET 3 OF 6

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01603 Rev D

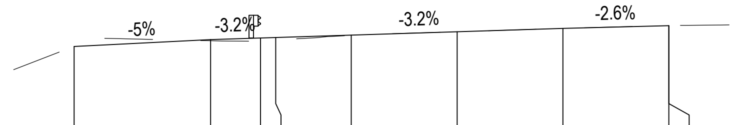
Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg



DATUM R.L. 21.00

DESIGN SURFACE LEVEL	23.638	23.863	23.913	23.928	24.003	24.109	24.136	24.241	24.340	24.340
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.03	0.10	0.12	0.09	0.00	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	23.64	23.84	23.81	23.81	23.91	24.11	24.14	24.24	24.34	24.34
OFFSET FROM CONTROL LINE	-20.545	-16.050	-14.400	-13.900	-11.400	-7.900	-7.000	-3.500	0.000	0.000

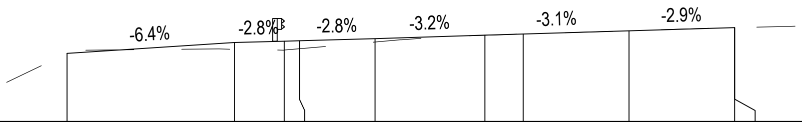
CH 360



DATUM R.L. 19.00

DESIGN SURFACE LEVEL	21.643	21.869	21.921	21.937	22.016	22.127	22.238	22.329	22.329
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.04	0.09	0.08	0.01	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	21.64	21.83	21.83	21.86	22.00	22.13	22.24	22.34	22.34
OFFSET FROM CONTROL LINE	-19.668	-15.150	-13.500	-13.000	-10.500	-7.000	-3.500	0.000	0.000

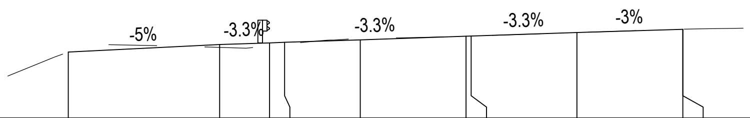
CH 420



DATUM R.L. 22.00

DESIGN SURFACE LEVEL	24.263	24.620	24.666	24.680	24.750	24.865	24.904	25.011	25.114	25.114
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.22	0.29	0.26	0.11	0.00	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	24.27	24.40	24.37	24.42	24.64	24.86	24.90	25.01	25.12	25.12
OFFSET FROM CONTROL LINE	-22.092	-16.560	-14.908	-14.407	-11.904	-8.267	-7.000	-3.500	0.000	0.000

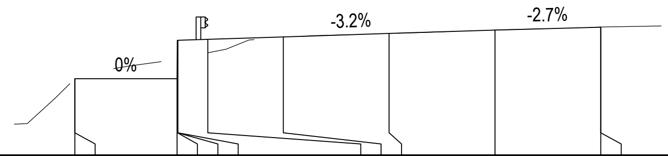
CH 340



DATUM R.L. 20.00

DESIGN SURFACE LEVEL	22.195	22.445	22.501	22.517	22.601	22.718	22.724	22.841	22.947	22.947
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.09	0.10	0.06	-0.05	-0.00	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	22.19	22.35	22.40	22.45	22.65	22.72	22.72	22.84	22.95	22.95
OFFSET FROM CONTROL LINE	-20.324	-15.317	-13.667	-13.167	-10.667	-7.167	-7.000	-3.500	0.000	0.000

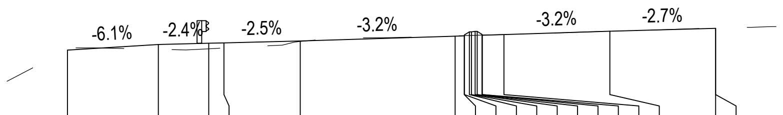
CH 400



DATUM R.L. 17.00

DESIGN SURFACE LEVEL	19.542	19.542	19.542	20.817	20.817	20.817	20.848	20.929	21.042	21.155	21.249	21.249
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	-0.65	0.62	0.62	0.61	0.45	0.02	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	19.54	19.54	20.20	20.20	20.20	20.20	20.40	20.91	21.04	21.16	21.25	21.25
OFFSET FROM CONTROL LINE	-17.396	-17.396	-14.015	-14.005	-13.995	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

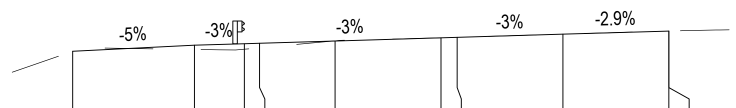
CH 460



DATUM R.L. 23.00

DESIGN SURFACE LEVEL	25.223	25.405	25.446	25.458	25.520	25.682	25.692	25.722	25.822	25.822	25.841	25.841	25.741	25.711	25.734	25.844	25.940	25.940
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.16	0.18	0.17	0.02	-0.01	-0.01	0.02	0.12	0.12	0.13	0.13	0.02	-0.01	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	25.22	25.25	25.27	25.29	25.50	25.69	25.70	25.70	25.70	25.71	25.71	25.71	25.72	25.72	25.73	25.84	25.95	25.95
OFFSET FROM CONTROL LINE	-21.435	-18.431	-16.766	-16.261	-13.739	-8.617	-8.317	-8.307	-8.147	-8.077	-7.957	-7.887	-7.727	-7.717	-7.000	-3.500	0.000	0.000

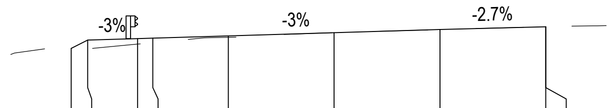
CH 320



DATUM R.L. 21.00

DESIGN SURFACE LEVEL	22.950	23.152	23.201	23.216	23.291	23.395	23.411	23.516	23.617	23.617
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.14	0.18	0.15	-0.01	-0.00	-0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	22.95	23.01	23.02	23.07	23.30	23.40	23.41	23.52	23.62	23.62
OFFSET FROM CONTROL LINE	-19.713	-15.684	-14.034	-13.534	-11.034	-7.534	-7.000	-3.500	0.000	0.000

CH 380



DATUM R.L. 19.00

DESIGN SURFACE LEVEL	21.049	21.321	21.371	21.386	21.460	21.565	21.669	21.763	21.763
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.29	0.18	0.15	0.05	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	21.05	21.04	21.19	21.23	21.41	21.56	21.67	21.77	21.77
OFFSET FROM CONTROL LINE	-15.695	-15.150	-13.500	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 440

Rev	Description	Checked	Approved	Date
E	BARRIER SYSTEM AMENDED	A.S.	G.W.	29.10.24
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 2.5 5.0 7.5m
SCALE 1:250 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION

Status FOR APPROVAL

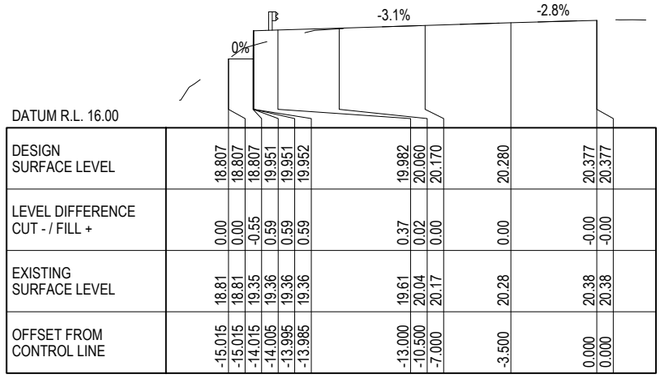
Drawing Title CROSS SECTIONS

SHEET 4 OF 6

Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01604 Rev E

Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg



DATUM R.L. 16.00

DESIGN SURFACE LEVEL	18.807	18.807	18.807	19.951	19.951	19.952	19.982	20.060	20.170	20.280	20.377	20.377
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	-0.55	0.59	0.59	0.59	0.37	0.02	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	18.81	18.81	19.35	19.36	19.36	19.36	19.61	20.04	20.17	20.28	20.38	20.38
OFFSET FROM CONTROL LINE	-15.015	-15.015	-14.015	-14.005	-13.995	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 500

DATUM R.L. 15.00

DESIGN SURFACE LEVEL	18.308	18.309	18.309	19.300	19.300	19.300	19.330	19.405	19.510	19.616	19.713	19.713
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	-0.71	0.28	0.28	0.28	0.20	0.01	0.00	0.00	-0.02	-0.02
EXISTING SURFACE LEVEL	18.31	18.31	19.02	19.02	19.02	19.02	19.13	19.39	19.51	19.62	19.73	19.73
OFFSET FROM CONTROL LINE	-15.383	-15.383	-14.015	-14.005	-13.995	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 540

DATUM R.L. 17.00

DESIGN SURFACE LEVEL	21.814	18.162	18.162	18.810	18.841	18.871	18.947	19.054	19.160	19.257	19.257
LEVEL DIFFERENCE CUT - / FILL +	0.00	-1.19	-0.63	0.45	0.52	0.32	0.01	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	21.81	19.35	18.79	18.36	18.32	18.55	18.93	19.05	19.16	19.27	19.27
OFFSET FROM CONTROL LINE	-24.583	-17.280	-16.280	-14.985	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 580

DATUM R.L. 16.00

DESIGN SURFACE LEVEL	18.688	18.688	18.688	20.382	20.382	20.382	20.412	20.484	20.584	20.685	20.787	20.787
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	-1.07	0.61	0.60	0.59	0.33	0.05	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	18.69	18.69	19.76	19.77	19.78	19.80	20.08	20.43	20.58	20.68	20.79	20.79
OFFSET FROM CONTROL LINE	-15.015	-15.015	-14.015	-14.005	-13.995	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 480

DATUM R.L. 16.00

DESIGN SURFACE LEVEL	18.562	18.562	18.562	19.587	19.587	19.587	19.617	19.698	19.811	19.924	20.019	20.019
LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	-0.43	0.60	0.60	0.59	0.42	0.01	0.00	0.00	-0.02	-0.02
EXISTING SURFACE LEVEL	18.56	18.56	18.99	18.99	18.99	18.99	19.20	19.69	19.81	19.92	20.03	20.03
OFFSET FROM CONTROL LINE	-15.015	-15.015	-14.015	-14.005	-13.995	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 520

DATUM R.L. 15.00

DESIGN SURFACE LEVEL	16.561	16.561	18.877	18.993	19.025	19.055	19.136	19.248	19.361	19.459	19.459
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.00	2.32	2.51	2.59	0.10	0.02	0.00	0.00	-0.01	-0.01
EXISTING SURFACE LEVEL	16.56	16.56	16.56	16.49	16.43	18.96	19.12	19.25	19.36	19.47	19.47
OFFSET FROM CONTROL LINE	-16.285	-16.285	-16.185	-14.985	-13.985	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 560

Rev	Description	Checked	Approved	Date
E	BARRIER SYSTEM AMENDED	A.S.	G.W.	29.10.24
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW **Drafting Check** C.PURDON
Designer C.BARTLEY **Design Check** N.HINCKS

0 2.5 5.0 7.5m
SCALE 1:250 AT ORIGINAL SIZE

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E ntlmail@ghd.com **W** www.ghd.com
www.ghd.com

Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title CROSS SECTIONS

SHEET 5 OF 6

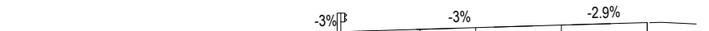
Size **A3**

Drawing No. 12599191-GHD-00-00-DRG-CI-01605

Rev E

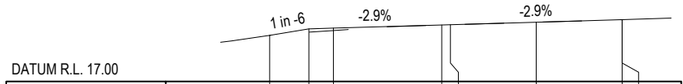
Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg



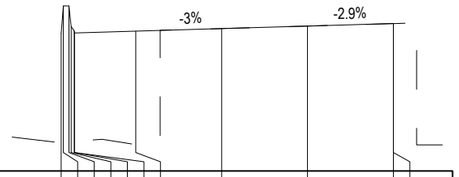
DATUM R.L. 17.00								
DESIGN SURFACE LEVEL	18.532	18.616	18.665	18.680	18.754	18.821	18.925	19.028	19.028
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.07	0.03	0.02	0.00	0.00	0.00	0.01	0.01
EXISTING SURFACE LEVEL	18.53	18.54	18.64	18.66	18.75	18.82	18.93	19.02	19.02
OFFSET FROM CONTROL LINE	-14.080	-13.911	-12.261	-11.761	-9.261	-7.000	-3.500	0.000	0.000

CH 680



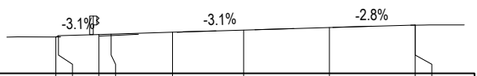
DATUM R.L. 17.00								
DESIGN SURFACE LEVEL	18.874	19.141	19.170	19.299	19.310	19.412	19.515	19.515
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.13	0.10	0.00	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	18.87	19.01	19.07	19.30	19.31	19.41	19.52	19.52
OFFSET FROM CONTROL LINE	-14.371	-12.770	-11.770	-7.351	-7.000	-3.500	0.000	0.000

CH 740



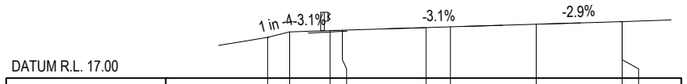
DATUM R.L. 13.00									
DESIGN SURFACE LEVEL	18.605	19.725	19.725	18.885	18.705	18.625	18.699	18.802	18.906	19.009	19.009
LEVEL DIFFERENCE CUT - / FILL +	4.43	5.54	5.53	4.68	4.49	4.41	4.62	0.00	-0.00	0.01	0.01
EXISTING SURFACE LEVEL	14.18	14.18	14.20	14.20	14.21	14.21	14.08	18.80	18.91	19.00	19.00
OFFSET FROM CONTROL LINE	-13.545	-13.455	-13.225	-13.135	-13.010	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 620



DATUM R.L. 17.00									
DESIGN SURFACE LEVEL	18.483	18.535	18.586	18.601	18.677	18.766	18.873	18.970	18.970
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.05	0.06	0.06	0.01	0.00	0.00	0.00	0.00
EXISTING SURFACE LEVEL	18.48	18.48	18.52	18.54	18.66	18.77	18.87	18.97	18.97
OFFSET FROM CONTROL LINE	-14.652	-14.548	-12.898	-12.398	-9.898	-7.000	-3.500	0.000	0.000

CH 660

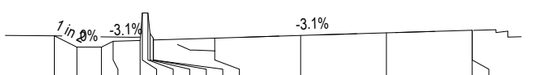


DATUM R.L. 17.00									
DESIGN SURFACE LEVEL	18.660	18.884	18.936	18.951	19.058	19.089	19.198	19.301	19.301
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.08	0.06	0.04	0.00	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	18.66	18.80	18.88	18.91	19.06	19.09	19.20	19.30	19.30
OFFSET FROM CONTROL LINE	-14.455	-13.556	-11.906	-11.406	-7.988	-7.000	-3.500	0.000	0.000

CH 720

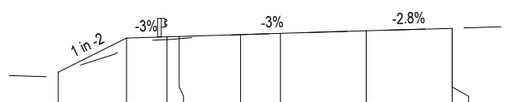
DATUM R.L. 17.00											
DESIGN SURFACE LEVEL	18.387	18.387	18.387	18.654	18.685	19.805	19.805	18.965	18.785	18.705	18.782	18.889	18.997	19.107	19.107
LEVEL DIFFERENCE CUT - / FILL +	-0.00	-0.00	0.08	0.37	0.44	1.56	1.57	0.74	0.56	0.48	0.63	0.00	0.00	0.01	0.01
EXISTING SURFACE LEVEL	18.39	18.39	18.31	18.29	18.25	18.24	18.23	18.23	18.22	18.22	18.15	18.89	19.00	19.10	19.10
OFFSET FROM CONTROL LINE	-16.921	-16.921	-15.080	-14.545	-13.545	-13.455	-13.225	-13.135	-13.010	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 600



DATUM R.L. 17.00															
DESIGN SURFACE LEVEL	18.733	18.273	18.273	18.511	18.544	19.664	19.664	18.824	18.644	18.564	18.641	18.748	18.855	18.963	18.963
LEVEL DIFFERENCE CUT - / FILL +	0.00	-0.45	-0.42	-0.17	-0.14	0.98	0.98	0.14	-0.04	-0.13	0.52	0.00	0.00	0.01	0.01
EXISTING SURFACE LEVEL	18.73	18.73	18.69	18.69	18.68	18.68	18.69	18.69	18.69	18.69	18.12	18.75	18.86	18.96	18.96
OFFSET FROM CONTROL LINE	-17.041	-16.121	-15.121	-14.645	-13.545	-13.455	-13.225	-13.135	-13.010	-13.000	-10.500	-7.000	-3.500	0.000	0.000

CH 640



DATUM R.L. 16.00									
DESIGN SURFACE LEVEL	17.351	18.743	18.793	18.808	18.884	18.933	19.039	19.138	19.138
LEVEL DIFFERENCE CUT - / FILL +	-0.00	0.34	0.11	0.09	0.00	0.00	0.00	-0.00	-0.00
EXISTING SURFACE LEVEL	17.35	18.41	18.68	18.72	18.88	18.93	19.04	19.14	19.14
OFFSET FROM CONTROL LINE	-16.059	-13.275	-11.625	-11.125	-8.625	-7.000	-3.500	0.000	0.000

CH 700

Rev	Description	Checked	Approved	Date
D	CONCEPT DESIGN FOR DA APPROVAL	A.S.	G.W.	27.07.23
C	CONCEPT DESIGN FOR DA APPROVAL			26.06.23
B	PRELIMINARY ISSUE FOR DISCUSSION			13.06.23
A	PRELIMINARY ISSUE FOR DISCUSSION			09.06.23

Author B.DREW **Drafting Check** C.PURDON
Designer C.BARTLEY **Design Check** N.HINCKS

0 2.5 5.0 7.5m
SCALE 1:250 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title CROSS SECTIONS

SHEET 6 OF 6

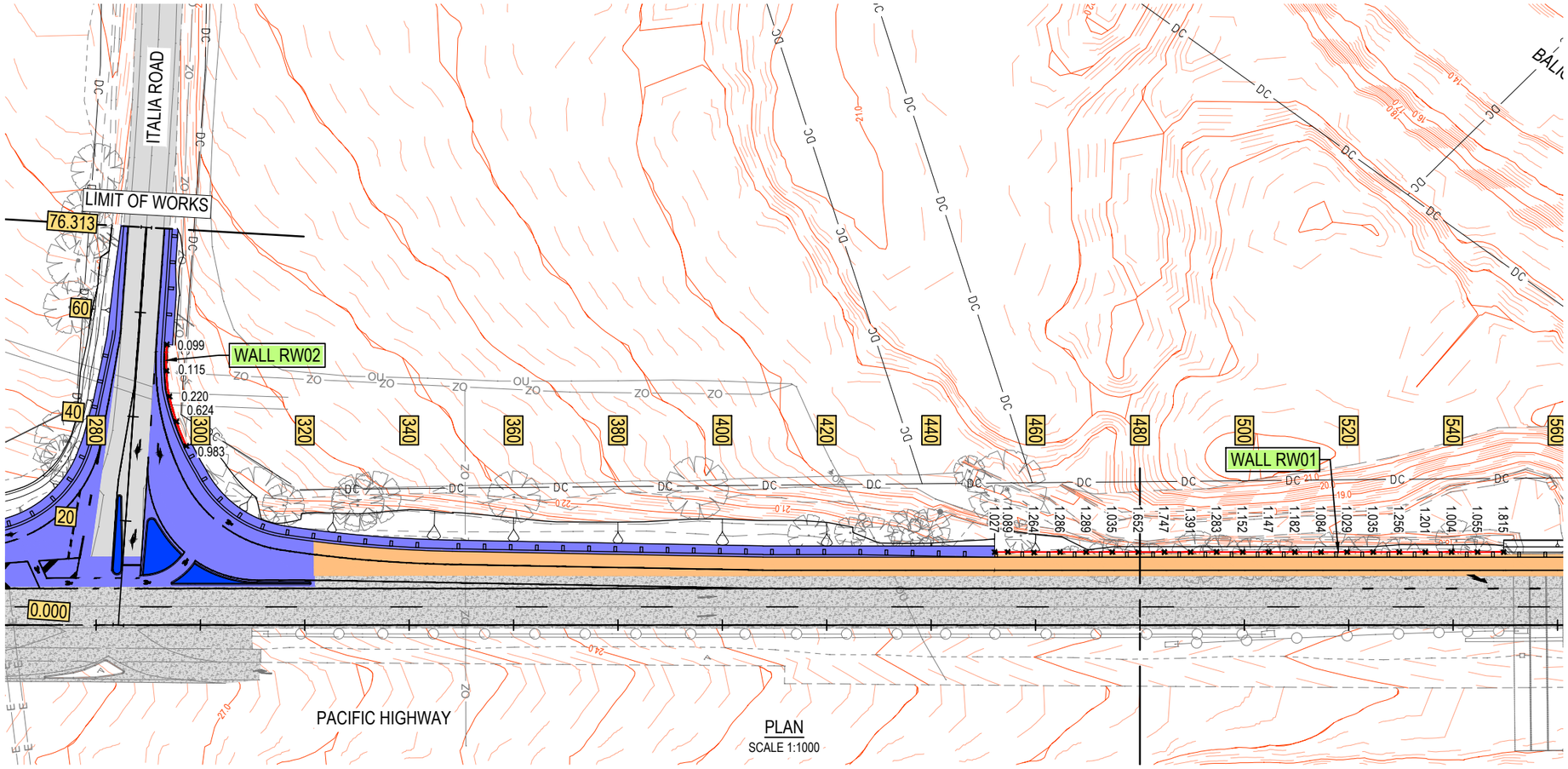
Size A3

Drawing No. 12599191-GHD-00-00-DRG-CI-01606

Rev D

Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01600.dwg



PLAN
SCALE 1:1000

LEGEND

GENERAL

- EXISTING CONTOUR MAJOR (1.0m)
- EXISTING CONTOUR MINOR (0.2m)
- DESIGN CONTOUR MAJOR (1.0m)
- DESIGN CONTOUR MINOR (0.2m)
- SURVEY
- DESIGN STRINGS
- DIGITAL CADASTRE
- EXISTING BRIDGE DECK
- PROPOSED BRIDGE DECK
- EZYGUARD 4 (OR SIMILAR) BARRIER
- RETAINING WALL
- RETAINING WALL SPOT HEIGHT (m)

ROAD GEOMETRY & ALIGNMENT

- MASTER CONTROL LINE

PAVEMENT

- PT1 - NEW CONCRETE PAVEMENT
- PT2 - NEW ASPHALT PAVEMENT.
- PT3 - NEW CONCRETE MEDIAN
- EXISTING CONCRETE PAVEMENT
- EXISTING FLEXIBLE PAVEMENT

NOTE

1. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01051 FOR OVERVIEW PLAN
2. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01111 FOR MC00 LONGITUDINAL SECTION
3. REFER TO DRAWINGS 12599191-GHD-00-00-DRG-CI-01601 TO 12599191-GHD-00-00-DRG-CI-01606 FOR MC00 CROSS SECTIONS

DATUM RL. 14.00

DESIGN TOP OF WALL SURFACE LEVEL	25.496	25.186	24.915	24.677	24.612
DESIGN TOE OF WALL SURFACE LEVEL	24.513	24.562	24.695	24.562	24.513
EXISTING SURFACE LEVEL	24.345	24.590	24.714	24.584	24.531
HEIGHT OF WALL	0.983	0.624	0.220	0.115	0.099
CHAINAGE	0.000	5.000	10.000	15.000	15.353

LONGITUDINAL SECTION - RW02 TOP

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

DATUM RL. 7.00

DESIGN TOP OF WALL SURFACE LEVEL	19.169	19.241	19.304	19.368	19.441	19.515	19.592	19.672	19.768	19.863	19.957	20.056	20.171	20.282	20.388	20.493	20.602	20.712	20.825	20.950	21.021			
DESIGN TOE OF WALL SURFACE LEVEL	17.354	18.186	18.300	18.167	18.185	18.480	18.563	18.588	18.586	18.716	18.805	18.773	18.780	18.535	18.736	19.458	19.313	19.426	19.561	19.861	19.994			
EXISTING SURFACE LEVEL	18.867	18.978	19.023	18.922	18.883	18.969	18.989	19.016	19.037	19.242	19.357	19.318	19.420	19.421	19.830	19.733	19.530	19.791	20.230	20.515	20.627			
HEIGHT OF WALL	1.815	1.055	1.004	1.201	1.256	1.035	1.029	1.084	1.182	1.147	1.152	1.283	1.391	1.747	1.652	1.035	1.289	1.286	1.264	1.089	1.027			
CHAINAGE	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	97.520			

LONGITUDINAL SECTION - RW01 TOP

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:500

Rev	Description	Checked	Approved	Date
A	CONCEPT DESIGN FOR DA APPROVAL	AS	GW	18.06.24

Author C.BARTLEY Drafting Check C.PURDON
Designer C.BARTLEY Design Check N.HINCKS

0 10 20 30m
SCALE 1:1000 AT ORIGINAL SIZE

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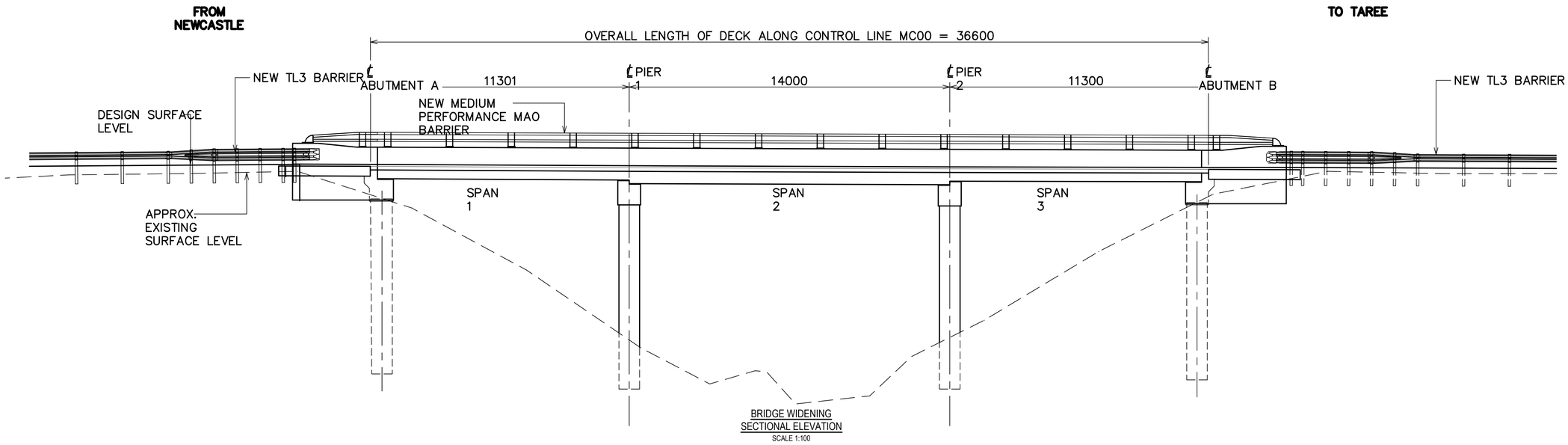
Project No. 12599191

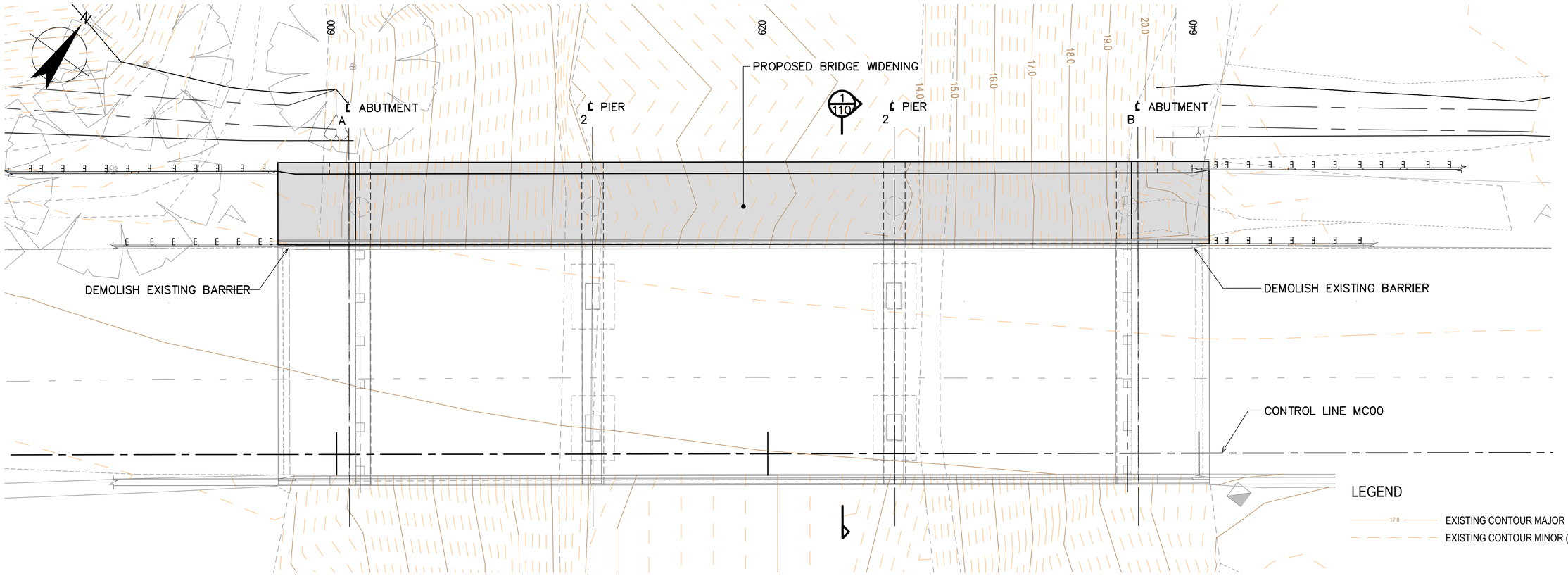
Client BORAL RESOURCES (NSW) PTY LTD
Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION
Status FOR APPROVAL

Drawing Title RETAINING WALL LOCATIONS AND PROFILES SHEET 1 OF 1
Size A3
Drawing No. 12599191-GHD-00-00-DRG-CI-01701
Rev A

Plot Date: 4 November 2024 - 4:10 PM Plotted by: Blake Drew
File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-CI-01700.dwg



BRIDGE WIDENING
SECTIONAL ELEVATION
SCALE 1:100



Rev	Description	Checked	Approved	Date
C	BARRIER SYSTEM AMENDED			29.10.24
B	CONCEPT DESIGN FOR DA APPROVAL			23.06.23
A	PRELIMINARY FOR DISCUSSION			13.06.23

Author C.GARDINER **Drafting Check**

Designer B.GELLATLY **Design Check**

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title BRIDGE WIDENING

GENERAL ARRANGEMENT

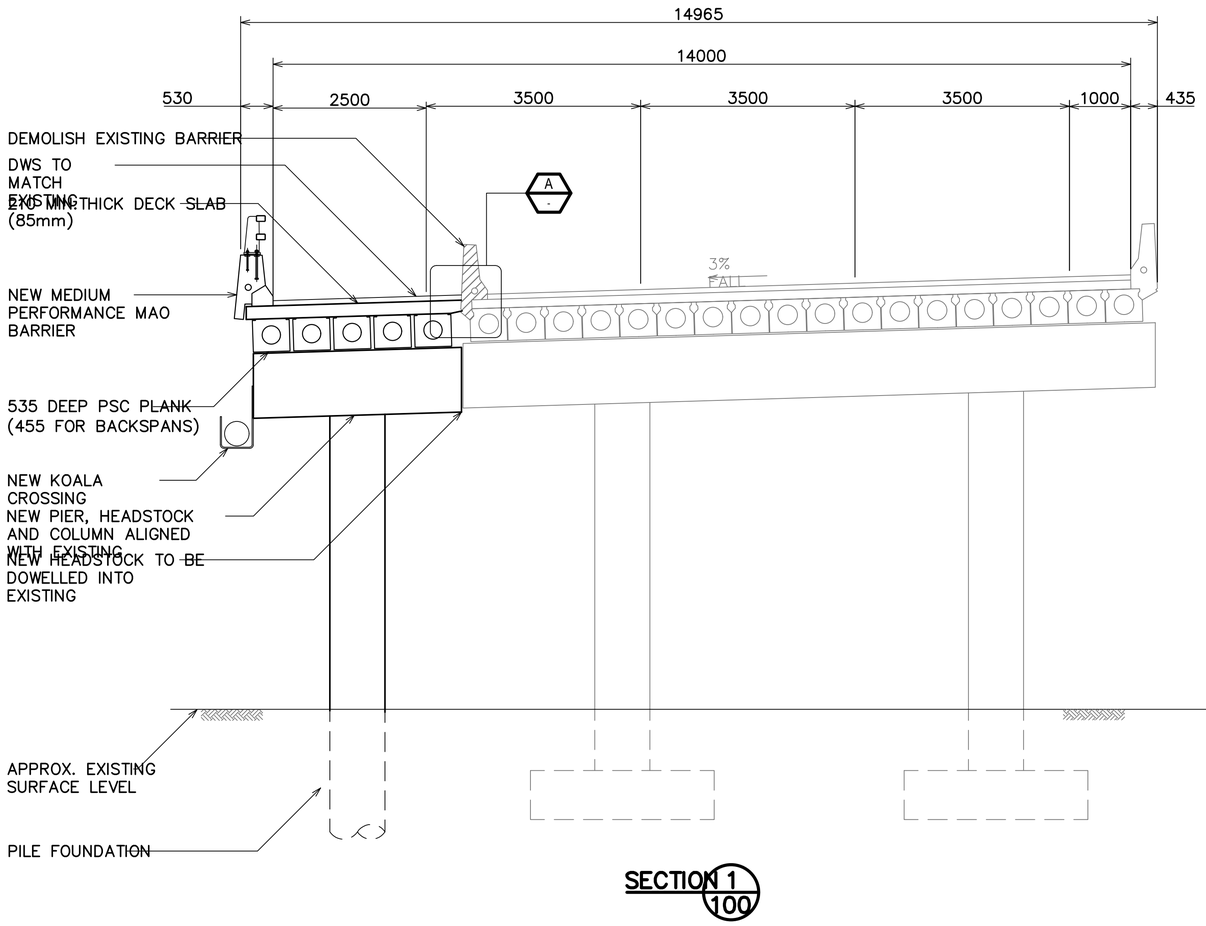
Size A1

Drawing No. 12599191-GHD-00-00-DRG-ST-00100

Rev C

Plot Date: 4 November 2024 - 5:21 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-ST-00100.dwg



SECTION 1
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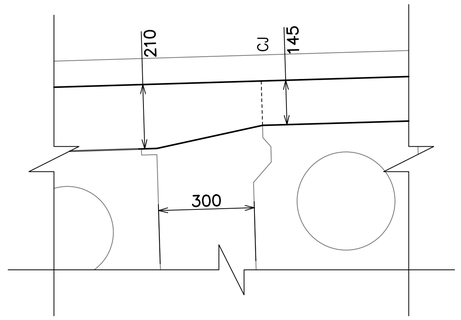

RC DECK SLAB TRANSITION / TAPER

A DETAIL
SCALE 1 :10

Rev	Description	Checked	Approved	Date
B	CONCEPT DESIGN FOR DA APPROVAL			23.06.23
A	PRELIMINARY FOR DISCUSSION			19.06.23

Author C.GARDINER **Drafting Check**

Designer B.GELLATLY **Design Check**

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

0 0.1 0.2 0.3 0.4 0.5m
SCALE 1:10 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title BRIDGE WIDENING

SECTION AND DETAILS

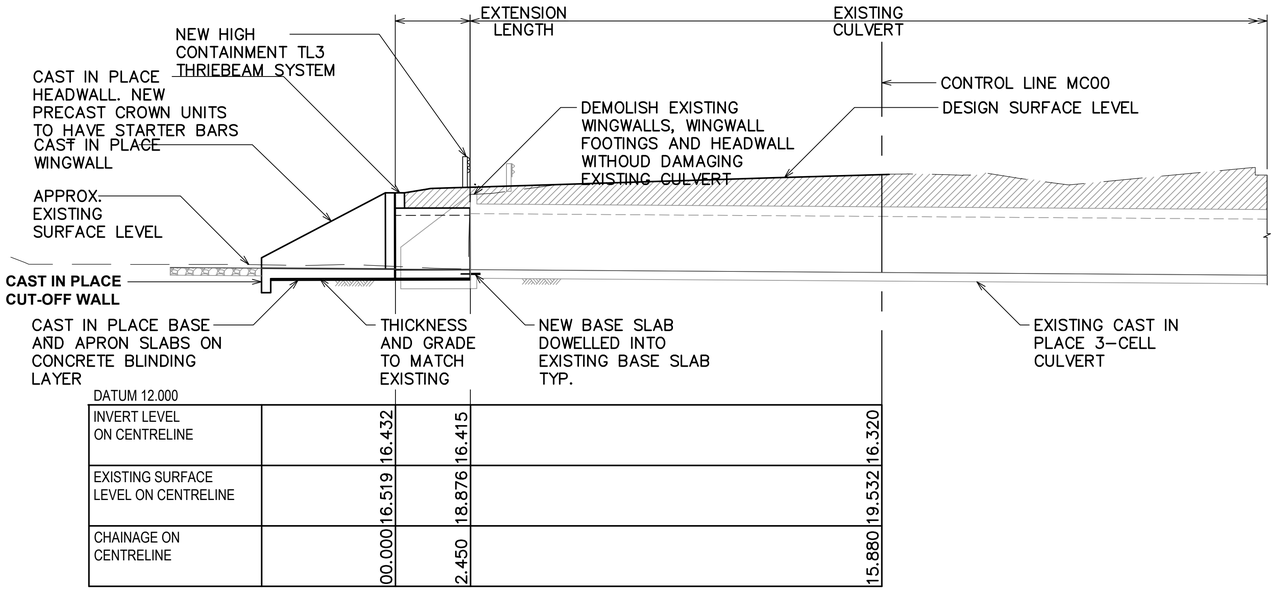
Size A1

Drawing No. 12599191-GHD-00-00-DRG-ST-00110

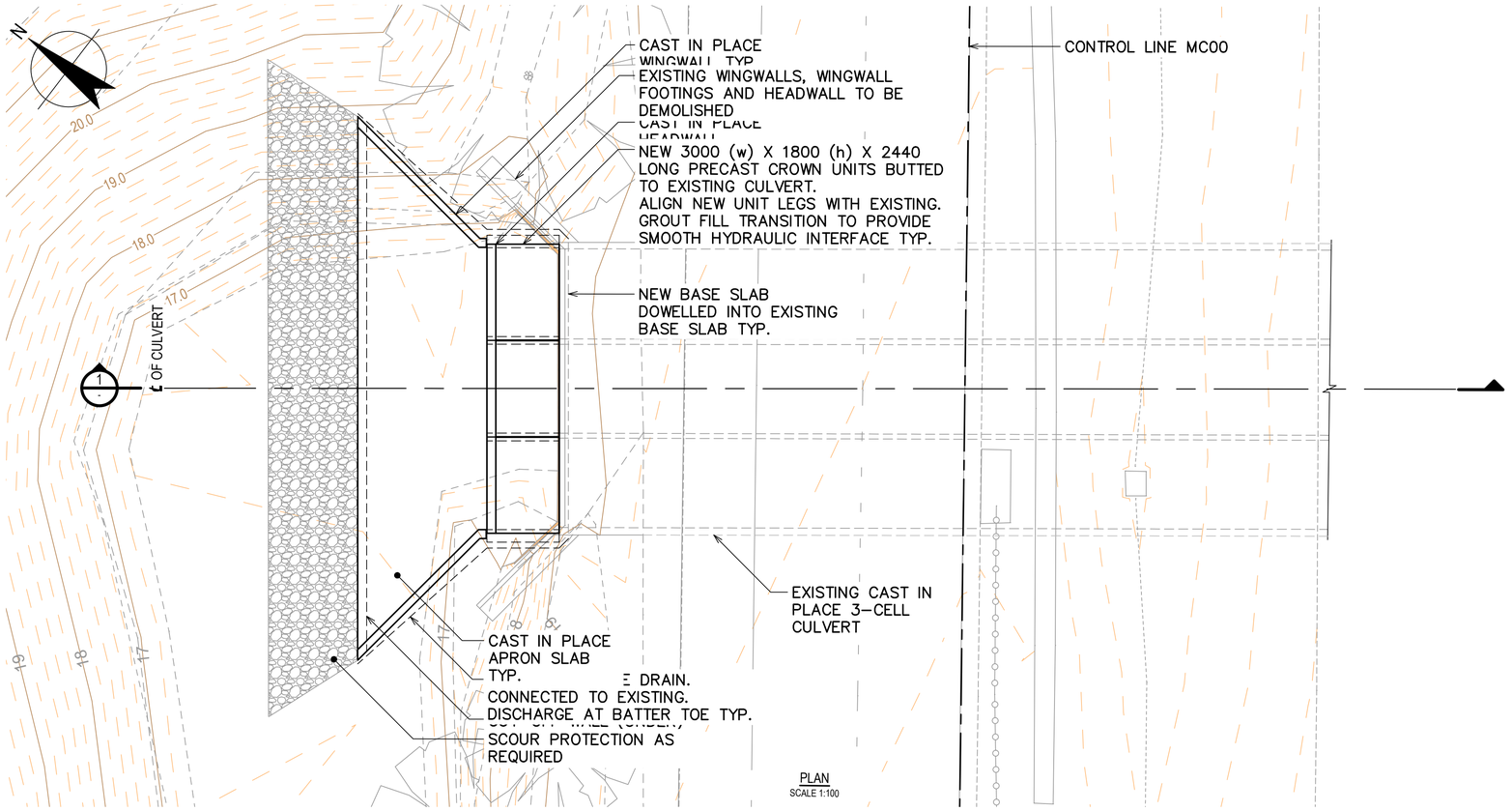
Rev B

Plot Date: 4 November 2024 - 5:21 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-ST-00110.dwg



SECTION 1
SCALE 1 : 100



PLAN
SCALE 1:100

LEGEND

17.0 EXISTING CONTOUR MAJOR

EXISTING CONTOUR MINOR (0.2m)

Rev	Description	Checked	Approved	Date
C	BARRIER SYSTEM AMENDED			29.10.24
B	CONCEPT DESIGN FOR DA APPROVAL			23.06.23
A	PRELIMINARY FOR DISCUSSION			19.06.23

Author C.GARDINER **Drafting Check**

Designer B.GELLATLY **Design Check**

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title CULVERT EXTENSION

GENERAL ARRANGEMENT SHEET A

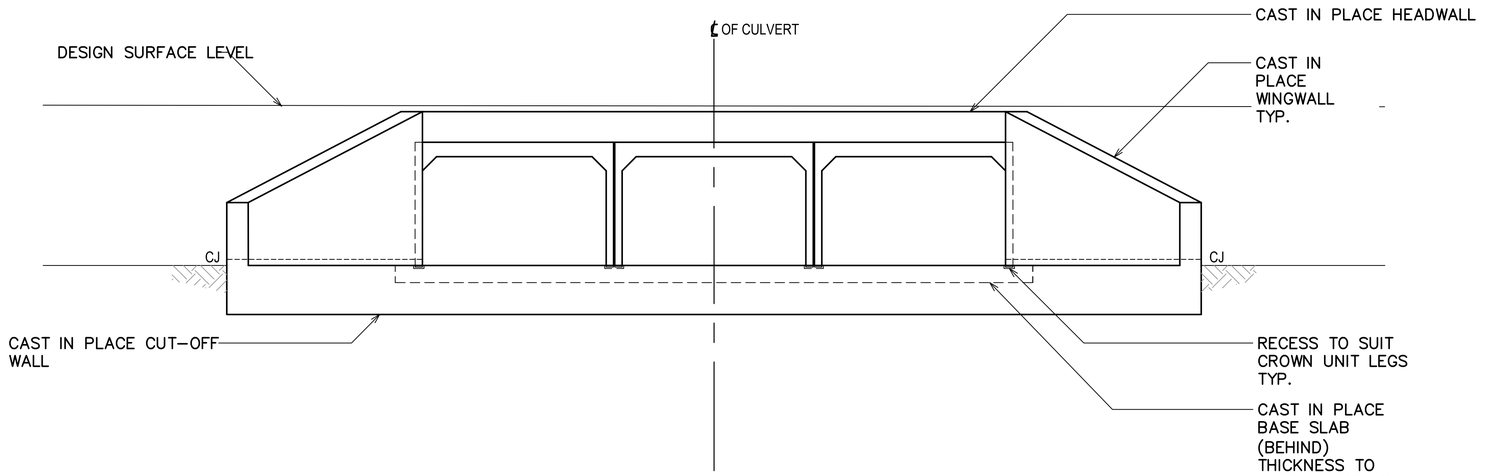
Drawing No. 12599191-GHD-00-00-DRG-ST-00200

Size A1

Rev B

Plot Date: 4 November 2024 - 5:22 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-ST-00200.dwg



ELEVATION
SCALE 1:50

Rev	Description	Checked	Approved	Date
B	CONCEPT DESIGN FOR DA APPROVAL			23.06.23
A	PRELIMINARY FOR DISCUSSION			19.06.23

Author C.GARDINER **Drafting Check**
Designer B.GELLATLY **Design Check**

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

GHD

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Project No. 12599191

Client BORAL RESOURCES (NSW) PTY LTD

Project BORAL QUARRY SEAHAM
ITALIA ROAD INTERSECTION

Status FOR APPROVAL

Drawing Title CULVERT EXTENSION

GENERAL ARRANGEMENT
SHEET B

Drawing No 12599191-GHD-00-00-DRG-ST-00201

Size A1

Rev B

Plot Date: 4 November 2024 - 5:22 PM Plotted by: Blake Drew

File Name: C:\12d\SW\data\P-00-12D-001\22-12599191 - Boral Quarry - Italia Rd Int_2538\CADD\Drawings\DRG\12599191-GHD-00-00-DRG-ST-00200.dwg

Appendix B

Survey

SURVEY MARK AUDIT SCHEDULE ("20230517")

PROJECT NAME / LOCATION: 190893/ITALIA ROAD INTERSECTION

Job ID:	**190893**	**Signed:**	
Version:	**1**	**Name:**	Dan Kitchener
Date:	**17/05/2023**	**Designation:**	Surveyor

Phase 1 - Investigation																		Phase 2 - Proposed Impact			Phase 3 - Work As Executed		
Project Mark ID	SCIMS Mark ID	Type	Origin	Coordinates					GDA			AHD				Desktop Search		Pre-Construction Field Audit			Post-Construction Field Audit		
				Datum	Easting	Northing	Zone	Coord Source	Class	PU	LU	RL	Class	PU	LU	Mark Status	Search Date	Mark Status	Project Impact	Inspection Date	Mark Impact	Inspection Date	SCIMS Notified
130330	SS 130330	SSM	SCIMS	GDA2020	388643.008	6383140.032	56	SCIMS	C	0.04	0.04	35.808	LC	N/A	N/A	Found	24/04/2023						
PM 7792	PM 7792	PM	SCIMS	GDA2020	388772	6383230	56	SCIMS	U	N/A	N/A	34.917	LA	N/A	N/A	Not Found	24/04/2023						
27963	PM 27963	PM	SCIMS	GDA2020	388842.261	6383330.734	56	SCIMS	C	0.03	0.04	26.000	U	N/A	N/A	Found	24/04/2023						
27964	PM 27964	PM	SCIMS	GDA2020	388877.631	6383272.313	56	SCIMS	C	0.03	0.03	29.568	LC	N/A	N/A	Found	24/04/2023						
PM 104294	PM 104294	PM	SCIMS	GDA2020	388653.954	6383135.084	56	SCIMS	C	0.03	0.03	36.253	LC	N/A	N/A	Not Found	24/04/2023						
PM 104295	PM 104295	PM	SCIMS	GDA2020	389122.021	6383490.109	56	SCIMS	C	0.03	0.03	18.887	LC	N/A	N/A	Destroyed	24/04/2023						
33698	PM 33698	PM	SCIMS	GDA2020	389155.806	6383591.282	56	SCIMS	C	0.03	0.03	21.144	LC	N/A	N/A	Found	24/04/2023						
130331	SS 130331	SSM	SCIMS	GDA2020	389455.56	6383767.633	56	SCIMS	C	0.03	0.05	23.690	LC	N/A	N/A	Found	24/04/2023						
SS 22071	SS 22071	SSM	SCIMS	GDA2020	389468	6383785	56	SCIMS	U	N/A	N/A	26.000	U	N/A	N/A	Not Found	24/04/2023						
SS 17047	SS 17047	SSM	SCIMS	GDA2020	389493.65	6383809.209	56	SCIMS	C	0.04	0.04	28.000	U	N/A	N/A	Not Found	24/04/2023						
GIP 1		RMGIP	CP23360-1603	GDA2021	388852.4	6383352.7	56	Traverse								Found	24/04/2023						
GIP 2		RMGIP	CP23360-1603	GDA2022	388817	6383407.9	56	Traverse								Found	24/04/2023						
GIP 3		RMGIP	CP23360-1603	GDA2023	388693.8	6383546.2	56	Traverse								Found	24/04/2023						
GIP 4		RMGIP	CP23360-1603	GDA2024	388658.3	6383574.5	56	Traverse								Found	24/04/2023						
GIP 5		RMGIP	DP206272	GDA2025	388666.2	6383592.9	56	Calculated								Not Found	24/04/2023						
IRON SPIKE 1		RMSPIKE	DP245116	GDA2026	388896.3	6383364.9	56	Calculated								Not Found	24/04/2023						
CB 1		RMCB	DP245116	GDA2027	388991.4	6383436.8	56	Calculated								Not Found	24/04/2023						
CB 2		RMCB	DP245116	GDA2028	389106.2	6383524.7	56	Calculated								Not Found	24/04/2023						
GIP 6		RMGIP	CP6418-1497	GDA2029	389118	6383539.4	56	Calculated								Not Found	24/04/2023						
CB3		RMCB	DP248927	GDA2030	389307.7	6383691	56	Traverse								Found	24/04/2023						
TREE 1		RMTREE	CP6418-1497	GDA2031	389271.7	6383669	56	Calculated								Not Found	24/04/2023						
CB 4		RMCB	DP248927	GDA2032	389418.2	6383777.7	56	Calculated								Not Found	24/04/2023						
TREE 2		RMTREE	CP5875-1497	GDA2033	389615.4	6383965.4	56	Calculated								Not Found	24/04/2023						

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LEGEND

- E BDGE Abutment Bottom
- E BDGE Deck
- E BDGE Expansion Joint
- E BDGE Headstock
- E BDGE Pier–Column
- E BDYS DP Overlay (Accuracy 0_1m)
- E BDYS Digital Cadastre (Accuracy 1_0m)
- E BDYS Digitising Extent (Photo)
- E BUIL Concrete Slab at Ground Level
- E COMM Optical Fibre – Digitised
- E COMM Optical Fibre – Underground
- E COMM Optical Fibre Cable Marker
- E COMM Telephone Single Concrete Pit
- E CONT Contour – Aux {Decimetre}
- E CONT Contour – Aux {Whole Metre}
- E CONT Contour – Aux {Whole Metre}
- E CULT Fence
- E CULT Fence Post–Guide Post
- E CULT Gate
- E CULT Large Sign
- E CULT Sign Post
- E DRAI Box Culvert – 600 High
- E DRAI Box Culvert – 1800 High
- E DRAI Dish Drain
- E DRAI Drain–Table Drain
- E DRAI Drainage Pit
- E DRAI Headwall Bottom
- E DRAI Headwall Top
- E DRAI Pipe – 375 Dia
- E DRAI Pipe – 450 Dia
- E ELEC Line – Major Transmission
- E ELEC Line – Minor Transmission
- E ELEC Pole – Power
- E LNMK Arrow – Left Turn
- E LNMK Arrow – Right Turn
- E LNMK Arrow – Straight Ahead
- E LNMK Continuity (1x3)
- E LNMK Double Barrier
- E LNMK Giveway–Turn
- E LNMK Lane (3x9)
- 90 E LNMK Speed Zone – 90kmh
- E LNMK Unbroken
- E MISC Pole (Unidentified)
- E ROAD Back of Kerb
- E ROAD Edge of Formation
- E ROAD Edge of Pavement
- E ROAD Gutter Flow Line
- E ROAD Offset Crown–Crown
- E ROAD Safety Barrier Guard Fence
- E ROAD Safety Barrier Type F
- E ROAD Safety Barrier Wire Rope
- E ROAD Top of Median
- E TOPO Bottom of Bank
- E TOPO Natural Surface
- E TOPO Rock Area
- E TOPO Timber or Scrub (Medium)
- E TOPO Top of Bank
- E TOPO Tree Foliage
- E TOPO Timber or Scrub (Medium)
- BITUMEN SURFACE
- CONCRETE SURFACE
- SSM/PM
- SS SURVEY STATION

N

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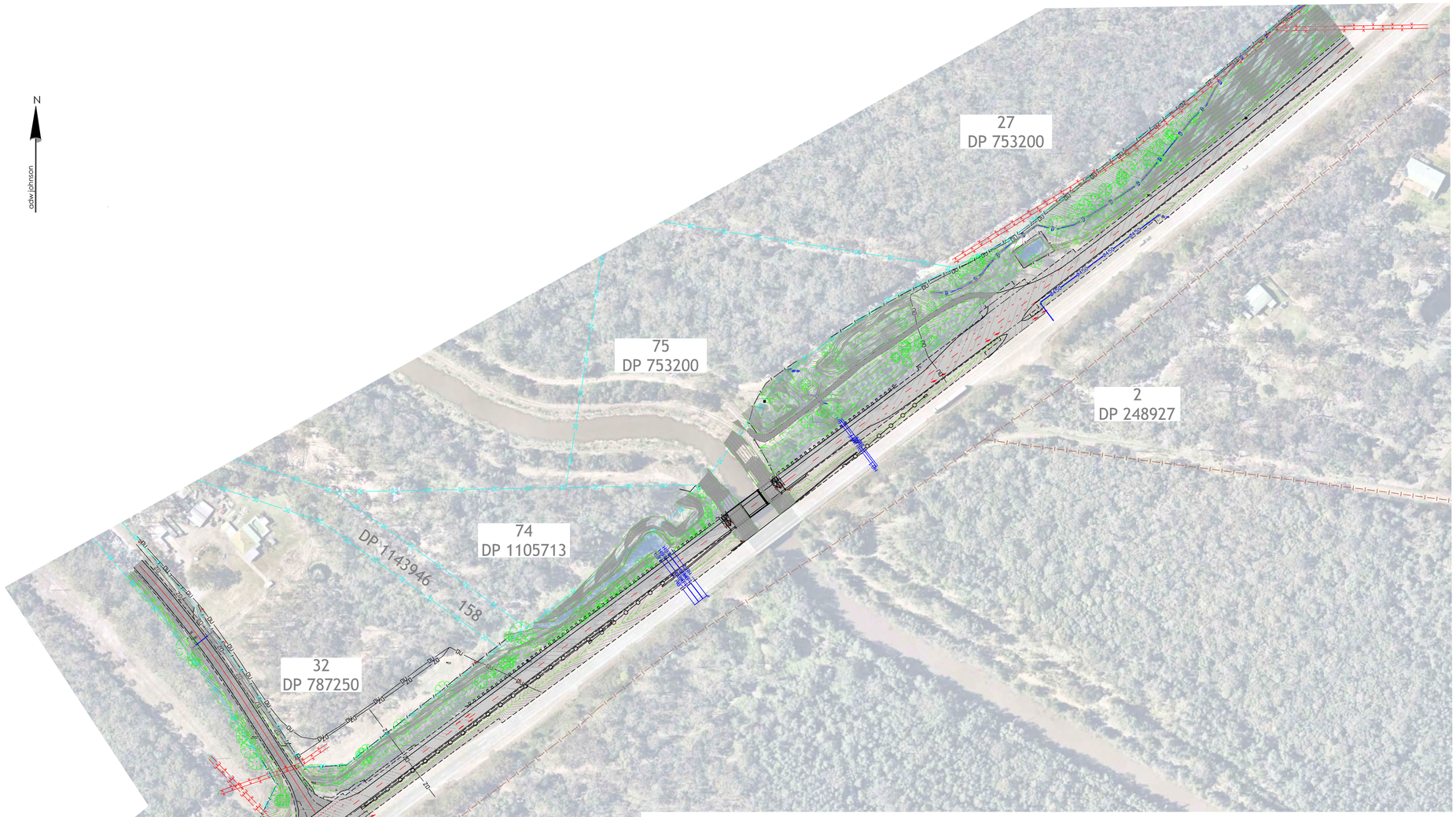

NOTES:-

1. PLEASE REFER TO AS5488-2013-CLASSIFICATION OF SUBSURFACE UTILITY INFORMATION (SUI) FOR THE DEFINITION OF SERVICE LOCATION ACCURACIES SHOWN IN THIS PLAN.
2. UNDERGROUND SERVICES SHOWN ON THIS PLAN HAVE BEEN LOCATED USING A COMBINATION OF ELECTRONIC DETECTION AND BY ESTIMATION BASED UPON SUPPLIED BYDA INFORMATION PLANS. THE ALIGNMENT OF ALL UNDERGROUND SERVICES SHOULD BE CONFIRMED THROUGH POTHOLING OR SERVICE TRENCHING PRIOR TO ANY DESIGN, SETOUT, CONSTRUCTION OR GROUND DISTURBANCE. ADDITIONAL SERVICES MAY EXIST WHICH ARE NOT SHOWN ON THIS PLAN.
3. ROAD BOUNDARIES HAVE BEEN DETERMINED BY TITLE PLAN DIMENSIONS ONLY AND HAVE NOT BEEN SURVEYED. ALL BEARINGS AND DISTANCES ARE SUBJECT TO FURTHER SURVEY. ALL OTHER BOUNDARIES ARE BASED ON DIGITAL CADASTRAL DATABASE BOUNDARIES (DCDB) AND ARE APPROXIMATE ONLY.
4. NO EASEMENTS OR ENCUMBRANCES HAVE BEEN INVESTIGATED OR SHOWN ON ADJOINING PROPERTIES.
5. UNDERGROUND SERVICE DEPTHS ARE AVAILABLE IN THE ELECTRONIC VERSION OF THE PLAN.
6. SPOT LEVELS AND CONTOURS SHOWN HEREON ARE FOR DESIGN PURPOSES ONLY AND ARE TO BE CONFIRMED ON SITE PRIOR TO ANY EXCAVATION OR CONSTRUCTION.
7. SOME SPOT LEVELS HAVE BEEN REMOVED FROM THE FACE OF THIS PLAN FOR CLARITY. SPOT LEVELS CAN BE ACCESSED ON THE ELECTRONIC COPY OF THIS PLAN FOR MORE DETAILED DESIGN WORKS.
8. THIS PLAN HAS BEEN PREPARED FOR THE PURPOSE OF DESIGN AND SHOULD NOT BE USED FOR ANYTHING OTHER THAN THAT PURPOSE.
9. ONLY TREES WITH A TRUNK DBH GREATER THAN 0.3 METRES HAVE BEEN SURVEYED.
10. ALL SURVEY IS BASED ON GRID DISTANCES USING A COMBINED SCALE FACTOR OF 0.999744 ADOPTING P.M.27963 AS THE ORIGIN OF COORDINATES AND P.M.27964 AS THE ORIGIN OF HEIGHTS.

SUBSURFACE UTILITY INVESTIGATION (SUI) QUALITY LEVEL
LABELLING UTILITY INFORMATION BY A CLASSIFICATION CODE ALLOWS THE USER OF THIS INFORMATION TO UNDERSTAND CLEARLY HOW THE INFORMATION WAS COLLECTED AND THEN PLACE AN APPROPRIATE AMOUNT OF RELIANCE ON IT. PROJECT RISKS RELATED TO UNDERGROUND UTILITIES CAN THEN BE PROPERLY MANAGED.

QL - 'A': INFORMATION IS THE HIGHEST POSSIBLE LEVEL OF ACCURACY AND IS OBTAINED BY EXPOSING THE UNDERGROUND UTILITY USING A NON-DESTRUCTIVE EXCAVATION (POTHOLING) TECHNIQUE. THE VERTICAL INFORMATION FOR THIS LOCATING METHOD IS TO THE TOP OR SHALLOWEST PART OF THE LOCATED SERVICE. THE 3D LOCATION IS RECORDED BY SURVEY AS AN X, Y, Z COORDINATE.

QL - 'B': INFORMATION IS COLLECTED BY DESIGNATING THE HORIZONTAL AND VERTICAL LOCATION OF UNDERGROUND UTILITIES BY USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS, SONDES OR FLEXI-TRACE EQUIPMENT. THIS IS THE MOST COMMON FORM OF UTILITY LOCATING AND ALTHOUGH AN X, Y AND Z AXIS CAN BE ESTABLISHED IT IS NOT ALWAYS ENTIRELY ACCURATE DUE TO DIFFERING ELECTROMAGNETIC FIELDS, SOIL CONDITIONS AND MULTIPLE BANKS OF CABLES AFFECTING THE LOCATING SIGNAL.

QL - 'C': INFORMATION IS COLLECTED BY CORRELATING THE SURVEY OF VISIBLE UTILITY SURFACE FEATURES SUCH AS MARKER PLATES OR WATER HYDRANTS AND ACQUIRED DIAL-BEFORE-YOU-DIG PLANS TO "DRAW" A STRING WHICH SHOWS THE APPROXIMATE POSITION OF SERVICES. THIS METHOD DOES NOT USUALLY SHOW MULTIPLE BANKS OF CABLES AND DOES NOT ALWAYS SHOW THREE DIMENSIONAL INFORMATION.

QL - 'D': INFORMATION IS THE MOST BASIC LEVEL OF UTILITY LOCATIONS USING ONLY INFORMATION BASED ON EXISTING DIAL-BEFORE-YOU-DIG PLANS AND BY MEASURING BOUNDARY OFFSETS AS WELL AS ASSISTANCE VIA GROUND PENETRATING RADAR ETC. THIS METHOD OF UTILITY LOCATIONS SHOULD ALWAYS BE TREATED AS AN INDICATION OF THE PRESENCE OF A SERVICE ONLY AND SHOULD NOT BE USED FOR DESIGN.

ALL UTILITIES ARE QL - 'D' UNLESS OTHERWISE NOTED

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co-ordinate information
CO-ORDINATE SYSTEM: MGA Z56
ORIGIN OF CO-ORDINATES: P.M.27963
DATE OF SURVEY 12.05.23

level information
DATUM: A.H.D.
ORIGIN OF LEVELS: P.M.27964
CONTOUR INTERVAL: 0.1m

scale (A1 original size)
0 30 60 75m
SCALE: 1:1500 (FULL)

page
01 OF 11

GDA2020

drawing title:
BORAL QUARRY
SEAHAM, ITALIA
ROAD INTERSECTION

location: INTERSECTION OF ITALIA RD & PACIFIC HWY, BALICKERA
council: PORT STEPHENS
dwg ref: 190893-DET-001
client: GHD

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A	17.05.23	INITIAL ISSUE	CG & BO	MB	DK	DK	CO-ORDINATE SYSTEM: MGA Z56 ORIGIN OF CO-ORDINATES: P.M.27963 DATE OF SURVEY 12.05.23	DATUM: A.H.D. ORIGIN OF LEVELS: P.M.27964 CONTOUR INTERVAL: 0.1m	0 5.0 10.0 12.5m SCALE: 1:250 (FULL)	02 OF 11

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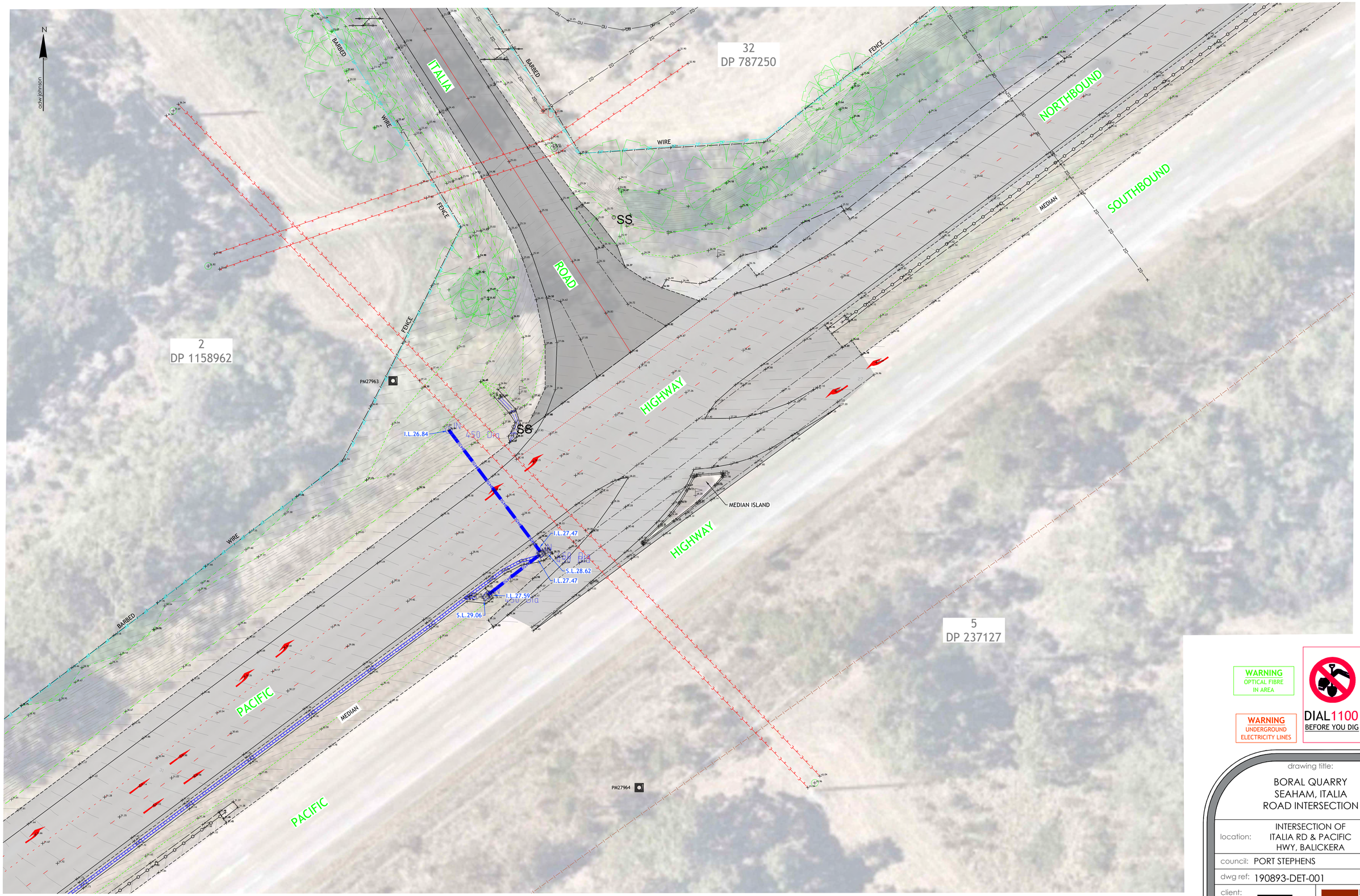

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page: 04 OF 11

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page: 05 OF 11

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06 OF 11

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page: 07 OF 11

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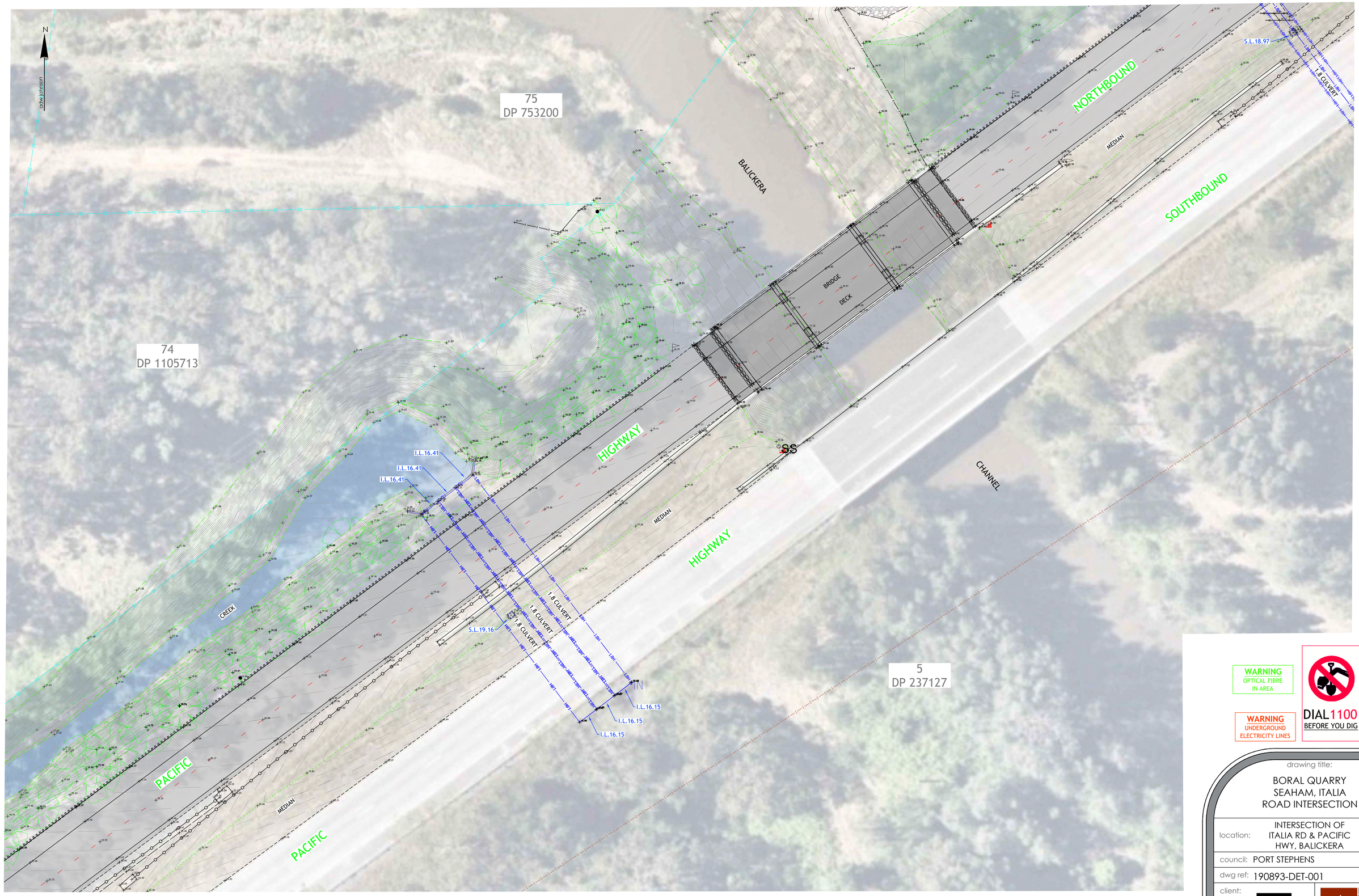
Plotted By: Dan Kitchener Plot Date: 19/05/2023 Cad File: S:\190893\DWG\Survey\DET\190893-DET-001-A.dwg

This plan includes coloured information. If you have a black and white copy you do not have all the information. This note is coloured RED.



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page: 08 OF 11

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co-ordinate information: CO-ORDINATE SYSTEM: MGA Z56; ORIGIN OF CO-ORDINATES: P.M.27963; DATE OF SURVEY 12.05.23

level information: DATUM: A.H.D.; ORIGIN OF LEVELS: P.M.27964; CONTOUR INTERVAL: 0.1m

scale (A1 original size): 0 5.0 10.0 12.5m; SCALE: 1:250 (FULL)

page: 09 OF 11

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ROAD INTERSECTION

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council: PORT STEPHENS

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FENCE
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NORTHBOUND
SOUTHBOUND
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I.L.21.88
CHAINLINK
TRACK
ACCESS
GRAVEL
INVERT LEVELS
INACCESIBLE
S.L.21.02
INDICATIVE ONLY.
(INVERT NOT SURVEYED)
PACIFIC

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DATUM: A.H.D.
ORIGIN OF LEVELS: P.M.27964
CONTOUR INTERVAL: 0.1m

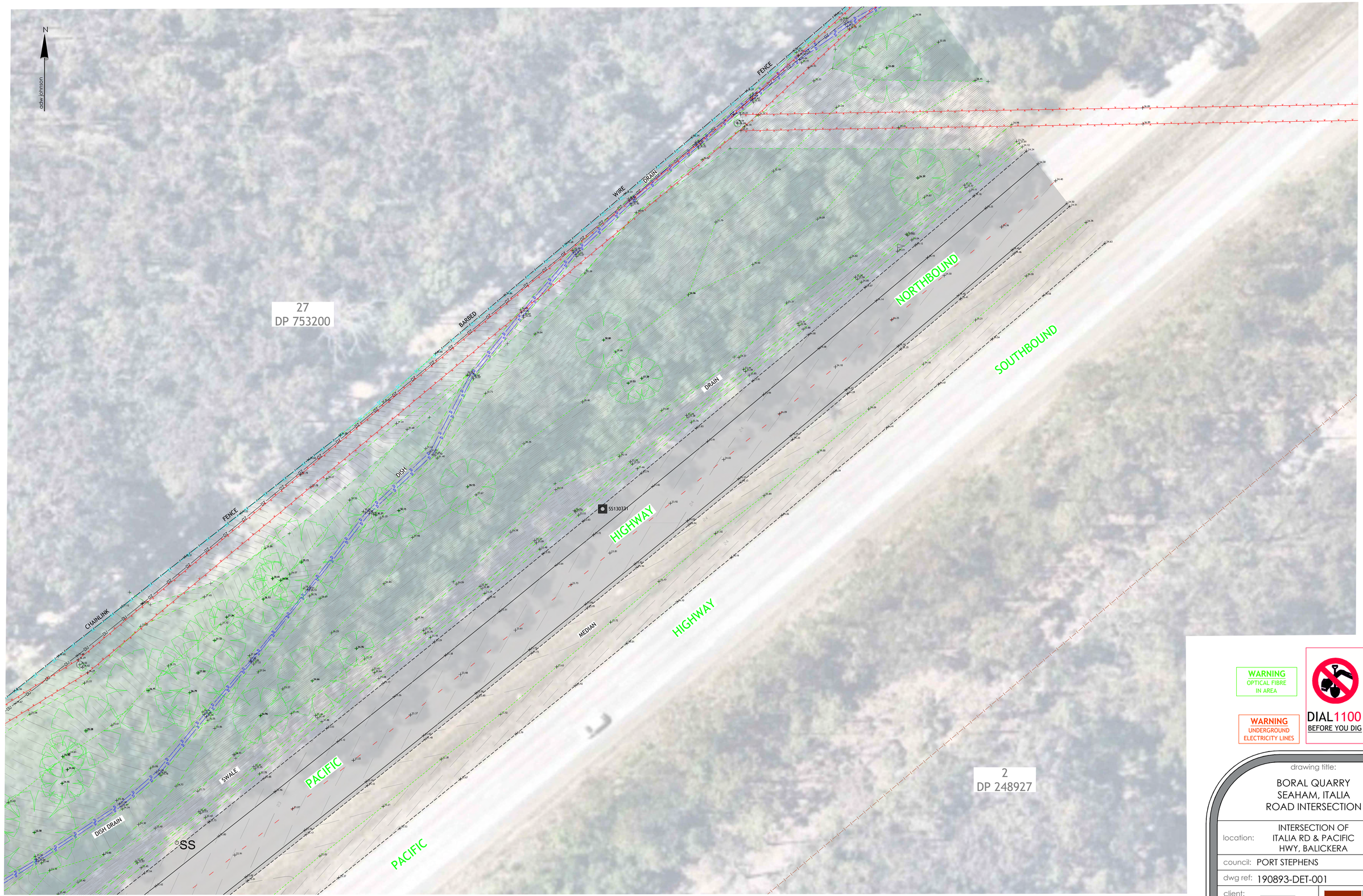
scale (A1 original size)
0 5.0 10.0 12.5m
SCALE: 1:250 (FULL)

page
10 OF 11

REFER TO SHEET 1 FOR ALL RELEVANT SITE NOTES AND SERVICES CLASSIFICATIONS.

GDA2020

• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design



WARNING
OPTICAL FIBRE
IN AREA

WARNING
UNDERGROUND
ELECTRICITY LINES

DIAL1100
BEFORE YOU DIG

drawing title:

BORAL QUARRY
SEAHAM, ITALIA
ROAD INTERSECTION

location: INTERSECTION OF ITALIA RD & PACIFIC HWY, BALICKERA

council: PORT STEPHENS

dwg ref: 190893-DET-001

client: GHD

adw johnson

ver.	date	comment	surveyed	drawn	checked	pm
A	17.05.23	INITIAL ISSUE	CG & BO	MB	DK	DK

co-ordinate information		level information			scale (A1 original size)	page
CO-ORDINATE SYSTEM:	MGA Z56	DATUM:	A.H.D.	CONTOUR INTERVAL:	0 5.0 10.0 12.5m	11 OF 11
ORIGIN OF CO-ORDINATES:	P.M.27963	ORIGIN OF LEVELS:	P.M.27964	0.1m	SCALE: 1:250 (FULL)	
DATE OF SURVEY	12.05.23					

REFER TO SHEET 1 FOR ALL RELEVANT SITE NOTES AND SERVICES CLASSIFICATIONS.

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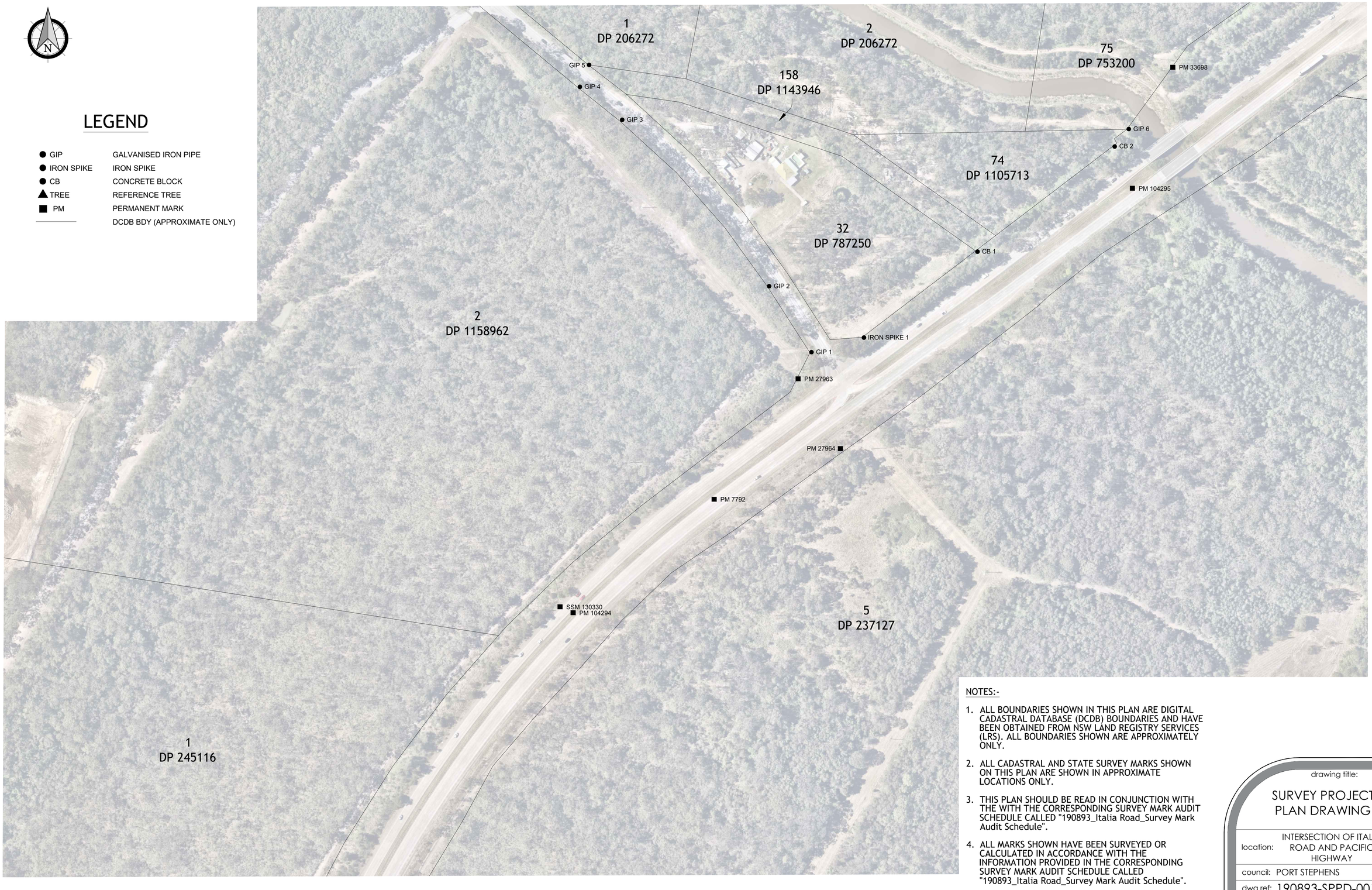
190893-SPPD-001-A



LEGEND

● GIP	GALVANISED IRON PIPE
● IRON SPIKE	IRON SPIKE
● CB	CONCRETE BLOCK
▲ TREE	REFERENCE TREE
■ PM	PERMANENT MARK
———	DCDB BDY (APPROXIMATE ONLY)

NOTES:-

1. ALL BOUNDARIES SHOWN IN THIS PLAN ARE DIGITAL CADASTRAL DATABASE (DCDB) BOUNDARIES AND HAVE BEEN OBTAINED FROM NSW LAND REGISTRY SERVICES (LRS). ALL BOUNDARIES SHOWN ARE APPROXIMATELY ONLY.
2. ALL CADASTRAL AND STATE SURVEY MARKS SHOWN ON THIS PLAN ARE SHOWN IN APPROXIMATE LOCATIONS ONLY.
3. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH THE WITH THE CORRESPONDING SURVEY MARK AUDIT SCHEDULE CALLED "190893_Italia Road_Survey Mark Audit Schedule".
4. ALL MARKS SHOWN HAVE BEEN SURVEYED OR CALCULATED IN ACCORDANCE WITH THE INFORMATION PROVIDED IN THE CORRESPONDING SURVEY MARK AUDIT SCHEDULE CALLED "190893_Italia Road_Survey Mark Audit Schedule".
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ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	17.05.2023	INITIAL ISSUE	DK	DK	DATUM: N/A CONTOUR INTERVAL: N/A	0 30 60 75m SCALE: 1:1500 (FULL)	

drawing title:

SURVEY PROJECT PLAN DRAWING

location: INTERSECTION OF ITALIA ROAD AND PACIFIC HIGHWAY

council: PORT STEPHENS

dwg ref: 190893-SPPD-001

client: GHD

adw johnson
central coast office ph: (02) 4305 4300
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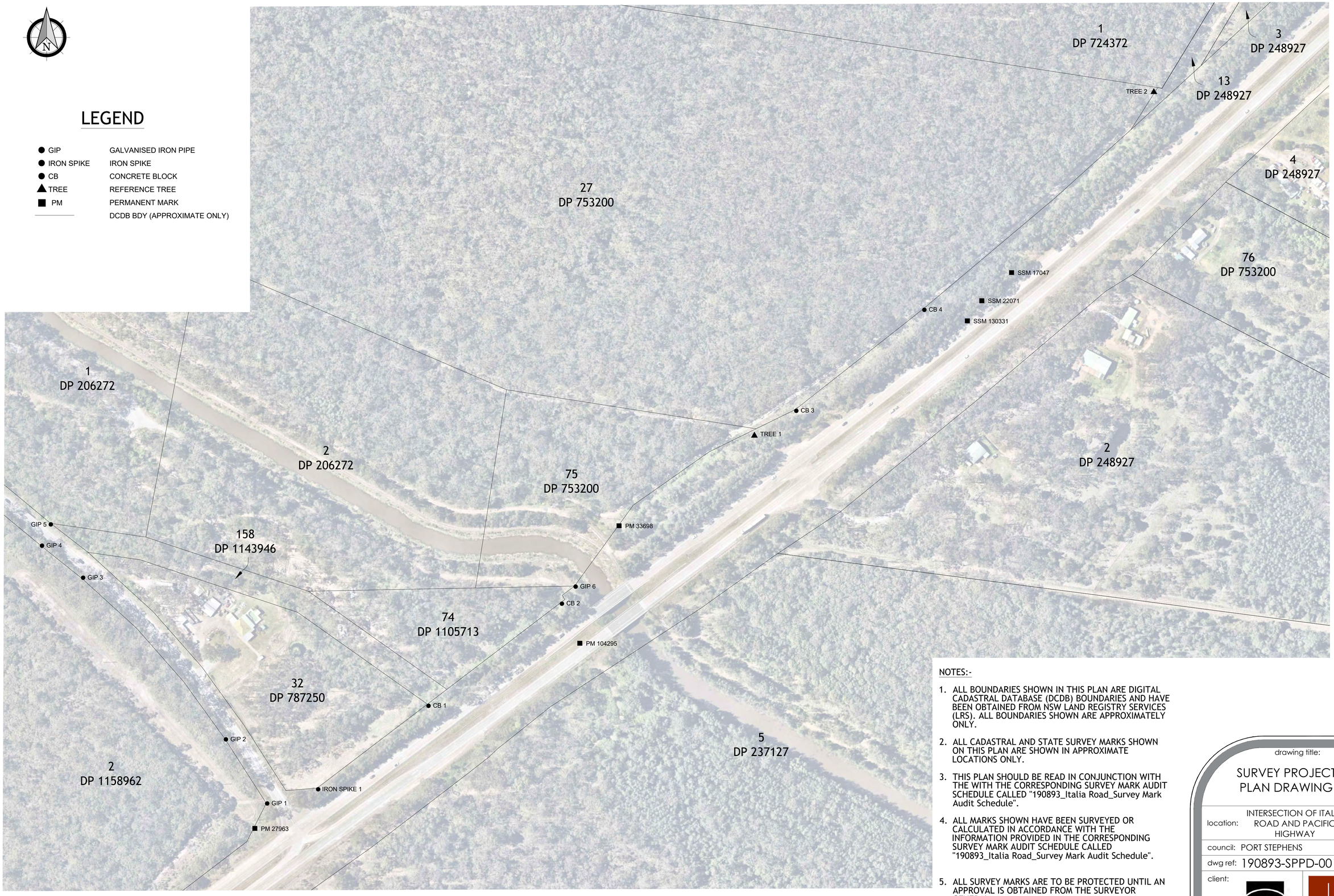
190893-SPPD-001-A

LEGEND

● GIP	GALVANISED IRON PIPE
● IRON SPIKE	IRON SPIKE
● CB	CONCRETE BLOCK
▲ TREE	REFERENCE TREE
■ PM	PERMANENT MARK
———	DCDB BDY (APPROXIMATE ONLY)



NOTES:-

1. ALL BOUNDARIES SHOWN IN THIS PLAN ARE DIGITAL CADASTRAL DATABASE (DCDB) BOUNDARIES AND HAVE BEEN OBTAINED FROM NSW LAND REGISTRY SERVICES (LRS). ALL BOUNDARIES SHOWN ARE APPROXIMATELY ONLY.
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ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	17.05.2023	INITIAL ISSUE ■ PM 7792	DK	DK	DATUM: N/A CONTOUR INTERVAL: N/A	0 30 60 75m SCALE: 1:1500 (FULL)	

drawing title:

SURVEY PROJECT PLAN DRAWING

location: INTERSECTION OF ITALIA ROAD AND PACIFIC HIGHWAY

council: PORT STEPHENS

dwg ref: 190893-SPPD-001

client: GHD

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Appendix C

Design Calculations

CL Chainage	CL X	CL Y	CL Z	a-Increment	V-Increment (m/s)	V-Increment (km/h)
0	388916.1	6383348	25.729	1.45	6.944444444	25
5	388920.1	6383351	25.521	1.45	7.919931101	25
10	388924.1	6383354	25.317	1.45	8.787793161	30
15	388928.2	6383357	25.115	1.4	9.577333065	30
20	388932.2	6383360	24.917	1.4	10.2822813	35
25	388936.2	6383363	24.722	1.35	10.94190608	35
30	388940.2	6383366	24.53	1.35	11.54232683	40
35	388944.2	6383369	24.341	1.3	12.11302228	40
40	388948.2	6383372	24.156	1.3	12.63824785	45
45	388952.2	6383375	23.974	1.25	13.14250009	45
50	388956.2	6383378	23.795	1.25	13.6097505	45
55	388960.2	6383381	23.62	1.25	14.06148316	50
60	388964.2	6383384	23.447	1.2	14.49914855	50
65	388968.2	6383387	23.278	1.2	14.90722337	50
70	388972.2	6383390	23.112	1.2	15.30442121	55
75	388976.2	6383393	22.95	1.15	15.69156807	55
80	388980.2	6383396	22.79	1.15	16.05382536	55
85	388984.2	6383399	22.634	1.15	16.40808668	55
90	388988.2	6383402	22.481	1.15	16.75485925	60
95	388992.3	6383405	22.332	1	17.09459881	60
100	388996.3	6383408	22.185	1	17.38462852	60
105	389000.3	6383411	22.042	1	17.66989838	60
110	389004.3	6383414	21.902	1	17.95063533	60
115	389008.3	6383417	21.766	1	18.22704882	65
120	389012.3	6383420	21.632	0.95	18.49933265	65
125	389016.3	6383423	21.502	0.95	18.75434106	65
130	389020.3	6383426	21.375	0.95	19.00592825	65
135	389024.3	6383429	21.251	0.95	19.25422833	65
140	389028.3	6383432	21.131	0.95	19.49936688	70
145	389032.3	6383435	21.014	0.9	19.74146166	70
150	389036.3	6383438	20.9	0.9	19.96810729	70
155	389040.3	6383441	20.789	0.9	20.19220911	70
160	389044.3	6383444	20.682	0.9	20.4138509	70
165	389048.3	6383447	20.577	0.9	20.63311195	70
170	389052.3	6383450	20.476	0.9	20.85006735	75
175	389056.3	6383453	20.379	0.85	21.06478836	75
180	389060.4	6383456	20.284	0.85	21.26558978	75
185	389064.4	6383459	20.193	0.85	21.46451277	75
190	389068.4	6383462	20.105	0.85	21.6616091	75
195	389072.4	6383465	20.02	0.85	21.85692816	75
200	389076.4	6383468	19.939	0.85	22.0505172	75
205	389080.4	6383471	19.86	0.85	22.24242138	80
210	389084.4	6383474	19.785	0.8	22.43268394	80
215	389088.4	6383477	19.714	0.8	22.6102921	80
220	389092.4	6383480	19.645	0.8	22.78651594	80
225	389096.4	6383483	19.58	0.8	22.96138734	80
230	389100.4	6383486	19.518	0.8	23.13493697	80
235	389104.4	6383489	19.459	0.8	23.30719435	80
240	389108.4	6383492	19.404	0.8	23.47818793	80
245	389112.4	6383495	19.351	0.8	23.64794513	85
250	389116.4	6383498	19.302	0.75	23.81649237	85
255	389120.4	6383501	19.256	0.75	23.97342922	85
260	389124.5	6383504	19.214	0.75	24.12934538	85
265	389128.5	6383507	19.174	0.75	24.28426051	85
270	389132.5	6383510	19.138	0.75	24.43819365	85
275	389136.5	6383513	19.106	0.75	24.59116322	85
280	389140.5	6383516	19.076	0.75	24.74318712	85
285	389144.5	6383519	19.05	0.75	24.89428265	85
290	389148.5	6383522	19.026	0.75	25.04446663	90
295	389152.5	6383525	19.007	0.7	25.19375535	90
300	389156.5	6383528	18.99	0.7	25.33229774	90
305	389160.5	6383531	18.977	0.7	25.47008655	90
310	389164.5	6383534	18.966	0.7	25.60713394	90
315	389168.5	6383537	18.96	0.7	25.74345176	90
320	389172.5	6383540	18.956	0.7	25.87905154	90
325	389176.5	6383543	18.956	0.7	26.0139445	90
330	389180.5	6383546	18.958	0.7	26.14814159	90
335	389184.5	6383549	18.965	0.7	26.28165346	90
340	389188.6	6383552	18.974	0.7	26.41449051	95
345	389192.6	6383555	18.986	0.65	26.54666285	95
350	389196.6	6383558	19.002	0.65	26.66880778	95
355	389200.6	6383561	19.021	0.65	26.79039583	95
360	389204.6	6383564	19.044	0.65	26.91143453	95
365	389208.6	6383567	19.069	0.65	27.03193128	95
370	389212.6	6383570	19.098	0.65	27.15189328	95
375	389216.6	6383573	19.13	0.65	27.27132759	95
380	389220.6	6383576	19.165	0.65	27.39024112	95
385	389224.6	6383579	19.204	0.65	27.50864062	95
390	389228.6	6383582	19.246	0.65	27.62653269	95
395	389232.6	6383585	19.291	0.65	27.74392381	95
400	389236.6	6383588	19.339	0.65	27.86082032	100

Initial Speed (km/h)	25.00
Chainage Interval (m)	5

$Vf^2 = Vi^2 + 2ax$

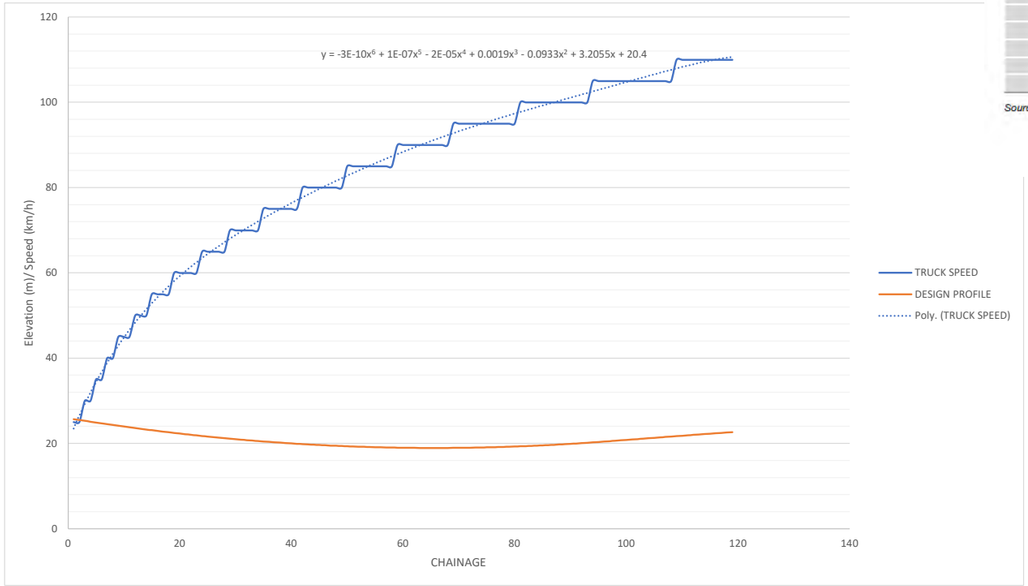


Table C2 1 provides acceleration rates for a typical passenger car (Roads and Traffic Authority 1999) that may be of interest to road designers.

Table C2 1: Acceleration rates of a typical passenger car

Travel speed		Acceleration rate	
(km/h)	(m/s)	(km/h/s)	(m/s^2)
40	11.11	4.7	1.3
50	13.88	4.3	1.2
60	16.66	3.6	1.0
70	19.44	3.2	0.9
80	22.22	2.9	0.8
90	25.00	2.5	0.7
100	27.77	2.1	0.6
110	30.55	1.8	0.5

Source: Roads and Traffic Authority (1999).

[Back to body text]

Speed	A-rate
15	1.55
20	1.5
25	1.45
30	1.4
35	1.35
40	1.3
45	1.25
50	1.2
55	1.15
60	1
65	0.95
70	0.9
75	0.85
80	0.8
85	0.75
90	0.7
95	0.65
100	0.6
105	0.55
110	0.5

Use conservative Austroads figure of 435m from Table 5.5 Austroads Part04A

CL Chainage	CL X	CL Y	CL Z	Slope (m/m)	Dv/Dt (m/s2)	V-Increment (m/s)	V-Increment (km/h)
0	388896.1	6383333	26.817			6.944444444	25.000
5	388900.1	6383336	26.594	-0.0446	1.473804706	7.934945224	28.566
10	388904.1	6383339	26.373	-0.0442	1.326893514	8.731110516	31.432
15	388908.1	6383342	26.155	-0.0436	1.229336616	9.408807417	33.872
20	388912.1	6383345	25.94	-0.043	1.157458728	10.00501096	36.019
25	388916.1	6383348	25.729	-0.0422	1.098803901	10.53984266	37.944
30	388920.2	6383351	25.521	-0.0416	1.052117159	11.0276677	39.700
35	388924.2	6383354	25.316	-0.041	1.012372225	11.47750744	41.320
40	388928.2	6383357	25.114	-0.0404	0.977733471	11.89581909	42.825
45	388932.2	6383360	24.915	-0.0398	0.946991129	12.28740913	44.235
50	388936.2	6383363	24.72	-0.039	0.917346875	12.65519229	45.559
55	388940.2	6383366	24.528	-0.0384	0.892163846	13.00290469	46.811
60	388944.2	6383369	24.34	-0.0376	0.867027335	13.33213425	47.996
65	388948.2	6383372	24.154	-0.0372	0.847521471	13.64628222	49.127
70	388952.2	6383375	23.972	-0.0364	0.825466855	13.94545399	50.204
75	388956.2	6383378	23.793	-0.0358	0.806610587	14.23171784	51.235
80	388960.2	6383381	23.617	-0.0352	0.788791583	14.50619553	52.223
85	388964.2	6383384	23.445	-0.0344	0.769913949	14.76918576	53.170
90	388968.2	6383387	23.276	-0.0338	0.753816722	15.02221739	54.080
95	388972.2	6383390	23.11	-0.0332	0.738417945	15.26601437	54.958
100	388976.2	6383393	22.947	-0.0326	0.723640779	15.50121294	55.805
105	388980.2	6383396	22.788	-0.0318	0.707458037	15.727752	56.620
110	388984.3	6383399	22.632	-0.0312	0.693759208	15.94677946	57.409
115	388988.3	6383402	22.479	-0.0306	0.680511229	16.15874028	58.172
120	388992.3	6383405	22.329	-0.03	0.667672752	16.36403419	58.911
125	388996.3	6383408	22.183	-0.0292	0.653245722	16.56242953	59.625
130	389000.3	6383411	22.039	-0.0288	0.643102896	16.75544989	60.320
135	389004.3	6383414	21.9	-0.0278	0.627368942	16.94162892	60.990
140	389008.3	6383417	21.763	-0.0274	0.61784487	17.12300322	61.643
145	389012.3	6383420	21.63	-0.0266	0.604645221	17.29866155	62.276
150	389016.3	6383423	21.499	-0.0262	0.595632773	17.46997479	62.892
155	389020.3	6383426	21.372	-0.0254	0.582908973	17.63601737	63.490
160	389024.3	6383429	21.249	-0.0246	0.570414473	17.79700125	64.070
165	389028.3	6383432	21.128	-0.0242	0.56205787	17.95421489	64.636
170	389032.3	6383435	21.011	-0.0234	0.549947869	18.10672005	65.185
175	389036.3	6383438	20.897	-0.0228	0.539988856	18.2552239	65.719
180	389040.3	6383441	20.787	-0.022	0.528231229	18.39933455	66.238
185	389044.3	6383444	20.679	-0.0216	0.520565223	18.54025793	66.745
190	389048.4	6383447	20.575	-0.0208	0.509106253	18.6770508	67.238
195	389052.4	6383450	20.474	-0.0202	0.499759691	18.81036479	67.718
200	389056.4	6383453	20.377	-0.0194	0.488580408	18.93978953	68.184
205	389060.4	6383456	20.282	-0.019	0.481460414	19.06646878	68.640
210	389064.4	6383459	20.191	-0.0182	0.470519782	19.18946142	69.083
215	389068.4	6383462	20.103	-0.0176	0.461664111	19.30937779	69.514
220	389072.4	6383465	20.019	-0.0168	0.450951345	19.42579687	69.933
225	389076.4	6383468	19.937	-0.0164	0.444274489	19.53981394	70.344
230	389080.4	6383471	19.859	-0.0156	0.433756997	19.65049361	70.742
235	389084.4	6383474	19.784	-0.015	0.425304324	19.75841447	71.131
240	389088.4	6383477	19.713	-0.0142	0.41497662	19.86314951	71.508
245	389092.4	6383480	19.644	-0.0138	0.408667445	19.96575525	71.877
250	389096.4	6383483	19.579	-0.013	0.398502791	20.06530365	72.236
255	389100.4	6383486	19.517	-0.0124	0.390387801	20.16234829	72.585
260	389104.4	6383489	19.459	-0.0116	0.380384259	20.256459	72.924
265	389108.5	6383492	19.404	-0.011	0.372424026	20.34817858	73.254
270	389112.5	6383495	19.351	-0.0106	0.36649356	20.4380358	73.577
275	389116.5	6383498	19.303	-0.0096	0.354732047	20.52463465	73.889
280	389120.5	6383501	19.257	-0.0092	0.348940421	20.60946462	74.195
285	389124.5	6383504	19.215	-0.0084	0.339275262	20.69161145	74.490
290	389128.5	6383507	19.176	-0.0078	0.331641044	20.77159587	74.778
295	389132.5	6383510	19.14	-0.0072	0.324063546	20.84945636	75.059
300	389136.5	6383513	19.107	-0.0066	0.316540979	20.92522975	75.331
305	389140.5	6383516	19.078	-0.0058	0.307109652	20.99848415	75.595
310	389144.5	6383519	19.052	-0.0052	0.299701646	21.06972599	75.852
315	389148.5	6383522	19.029	-0.0046	0.292343553	21.13898741	76.101
320	389152.5	6383525	19.009	-0.004	0.285033952	21.20629926	76.343
325	389156.5	6383528	18.993	-0.0032	0.275809499	21.27122994	76.577
330	389160.5	6383531	18.98	-0.0026	0.268602278	21.33427397	76.804
335	389164.5	6383534	18.97	-0.002	0.261439532	21.39545843	77.024
340	389168.5	6383537	18.963	-0.0014	0.254320122	21.45480931	77.238
345	389172.6	6383540	18.96	-0.0006	0.245280969	21.5118956	77.443
350	389176.6	6383543	18.96	0	0.23825414	21.5672018	77.642
355	389180.6	6383546	18.963	0.0006	0.231267403	21.62075086	77.835
360	389184.6	6383549	18.97	0.0014	0.222357839	21.67211217	78.020
365	389188.6	6383552	18.979	0.0018	0.217419498	21.72221538	78.200
370	389192.6	6383555	18.992	0.0026	0.20858561	21.77017449	78.373
375	389196.6	6383558	19.009	0.0034	0.199797223	21.81601406	78.538
380	389200.6	6383561	19.028	0.0038	0.194977402	21.86065514	78.699
385	389204.6	6383564	19.051	0.0046	0.186259806	21.90321532	78.852
390	389208.6	6383567	19.077	0.0052	0.179547304	21.94416356	78.999
395	389212.6	6383570	19.106	0.0058	0.172868449	21.98351653	79.141
400	389216.6	6383573	19.138	0.0064	0.166222633	22.02129027	79.277
405	389220.6	6383576	19.174	0.0072	0.157647281	22.05705552	79.406
410	389224.6	6383579	19.213	0.0078	0.151074374	22.09127524	79.529
415	389228.6	6383582	19.255	0.0084	0.144532754	22.12396369	79.647
420	389232.7	6383585	19.301	0.0092	0.136059928	22.1546918	79.757
425	389236.7	6383588	19.349	0.0096	0.131549865	22.18436087	79.864
430	389240.7	6383591	19.401	0.0104	0.123137182	22.21209668	79.964
435	389244.7	6383594	19.456	0.011	0.116724341	22.23835611	80.059
440	389248.7	6383597	19.515	0.0118	0.108378471	22.26271024	80.146

Initial Speed (km/h)	25.00
Chainage Interval (m)	5

Pdr (W)	398949.00
M (kg)	50500.00
p (kg/m3)	1.22
Cd	0.65
A (m2)	8.50
Cr	0.01
v (m/s)	6.94
g (m/s2)	9.81

$$Vf^2 = Vi^2 + 2ax$$

	Vehicle Type	Mass (kg)	Power (Hp)	P/M	W
	Semi-Trailer	42500	600/880	6.1	259250
MACK Triton 535hp	Boral Quad Dog	50500	535		398949
	B-Double	62500	600/880	4.8	300000
	B-Tripple	90500	600/880		

Truck speed analysis

The truck speed curves provided in AGRD are noted as being conservative, so to better simulate truck performance the Austroads AP-R211 method was adopted and Equation 1 was used (*McLean 1989, Watanatada et al 1987)*.

The acceleration performance equation is,

$$dv/dt = P_{DR}/(Mv) - 0.5\rho C_D A v^2/M - (C_R + \theta)g \qquad \text{(Equation 1)}$$

where:

P_{DR} = power delivered to the drive wheels (W)

M = mass of the vehicle (kg) = 42,500 (semi-trailer); 62,500 (b-double);

ρ = air density (1.22 kg/m3)

C_D = aerodynamic drag coefficient = 0.65 for articulated truck

A = projected frontal area (m^2) = 8.5 for articulated truck

C_R = coefficient of rolling resistance = 0.010

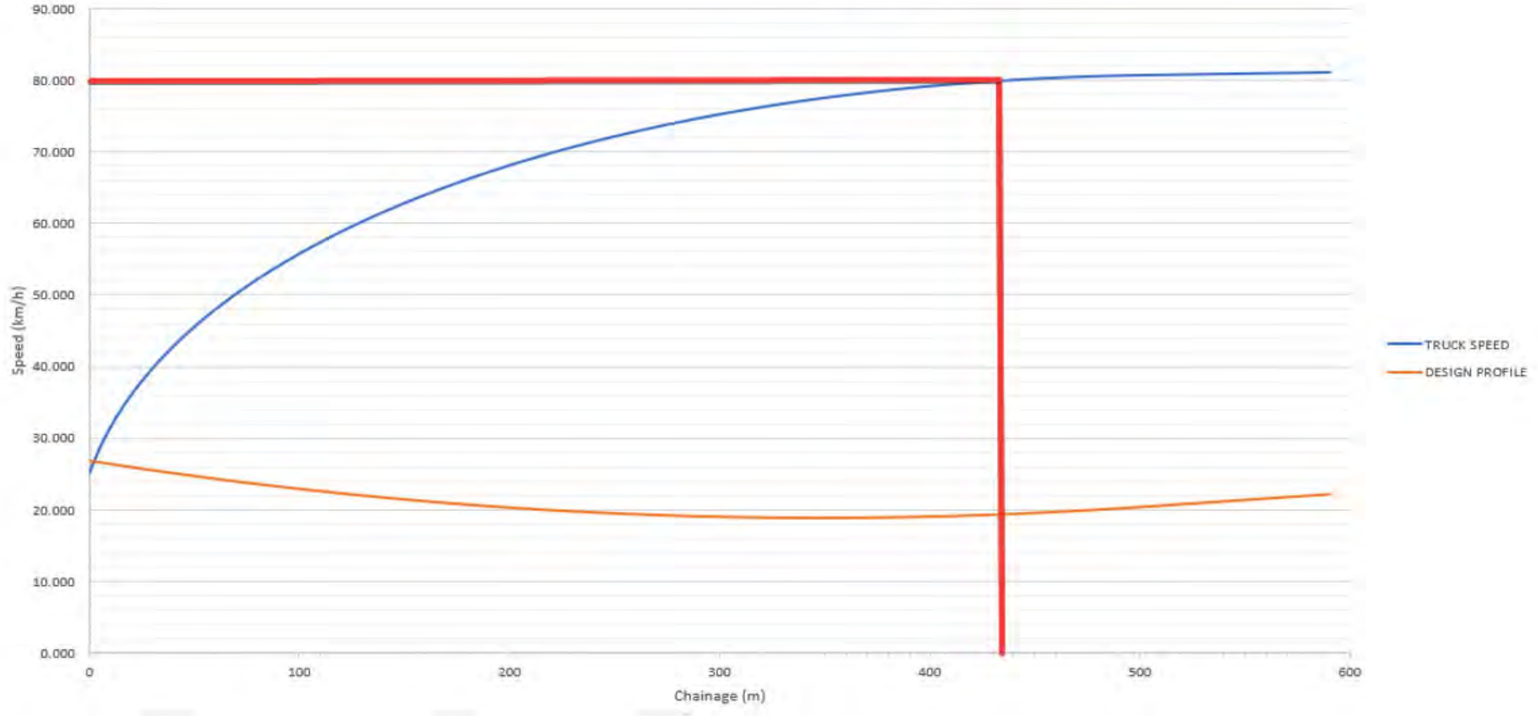
θ = gradient (m/m) = variable as per vertical alignment

v = current speed, calculated for each chainage interval

g = acceleration due to gravity (9.8 m/s^2)

Truck power

Research indicated 600 horsepower (hp) is currently a common truck used for long hauls. We understand that some 700 hp+ trucks are operating, and in time would become the common standard for long haul vehicles, however, the adoption of 600 hp was considered representative of current vehicles.



Appendix D

SiD Assessment

HSE040 Safety in Design Risk Assessment

Notes: *Designs with significant quantities of dangerous goods may require detailed risk assessments under Dangerous Goods or Major Hazard legislation
* Most industrial processes will require an industry specific assessment, e.g. HAZOP and/or Quantitative Risk Assessment for facilities that have chemical or high-pressure processes under Dangerous Goods or Major Hazard legislation.

Design Life Cycle:	Investigation and Design	Setup, Construction and Commissioning	Operation	Maintenance	Disposal		Date:	26/06/2023	Revision No:	B
Job Name:	Boral - Italia Road Intersection Upgrade		Job No:	12599191	Client	Boral	Design:	Strategic Concept Design for DA Approval		
People involved in Risk Assessment:	Adam Sneddon, Nick Hincks, Callum Bartley									

Design Ref	Design Life Cycle Stage (Select from Drop Down Box)	Hazards What could cause injury or ill health, damage to property or damage to the environment	Risk What could go wrong and what might happen as a result	Existing Control Measures	Initial Risk Rating C	Initial Risk Rating L	Initial Risk Rating RR	Potential Control Measures (Consider Hierarchy of Control - Elimination, Substitution, Isolation, Engineering Controls, Administrative Controls, PPE)	Responsibility	By When	Decision / Status	Residual Risk Rating C	Residual Risk Rating L	Residual Risk Rating RR	Comments
1	Investigation and Design	Steep drop off to creek, batter slopes	vehicular roll over and potential injury / death	Roadside barriers	D - Critical	2 - Unlikely	Moderate	Installation of barriers	GHD	Completion of strategic concept design	Incorporated	D - Critical	1 - Very Unlikely	Moderate	Closed
2	Investigation and Design	Non-compliant deceleration lane length	Inability to slow down in sufficient time to take corner at a safe speed	Non-compliant decelleration lane length	D - Critical	3 - Possible	Significant	Increased the length of decl lane to ensure compliance	GHD	Completion of strategic concept design	Incorporated	D - Critical	1 - Very Unlikely	Moderate	Closed
3	Operation	Presence of overhead power utils during operation	Striking overhead power during operation	Existing situation has appropriate clearance to the Pacific Highway	D - Critical	2 - Unlikely	Moderate	Sufficient clearance maintained (9.8m)	GHD	Completion of strategic concept design	Incorporated	D - Critical	1 - Very Unlikely	Moderate	Closed
4	Setup, Construction and Commissioning	Utils during construction	Impacting existing utilities with potential to cause physical harm to construction workers	Utilities identified in survey and shown on drawings	D - Critical	3 - Possible	Significant	Strategic Concept design identifies known impacts due to design. Impacts to be resolved in WAD Cooncept Design. Contractor to complete utility clearance survey assessment prior to excavation or ground penetration	Construction Contractor	During Conctruction	Pass residual risk to Contractor	D - Critical	2 - Unlikely	Moderate	Open
5	Investigation and Design	Inadequate cyclist provision	Injury or death to cylist due to interaction with vehicles	None	D - Critical	4 - Likely	Significant	Signage and linemarking at intersection consistent with TfNSW direction,Continuation of 2.5m shoulder through works	GHD	Completion of strategic concept design	Incorporated	D - Critical	2 - Unlikely	Moderate	Closed
6	Investigation and Design	Heavy vehicles pulling out into live traffic at significantly lower speed than through traffic	vehicular accident and possible injury / death	None	D - Critical	3 - Possible	Significant	Allowance for design heavy vehicle to reach 20km/h less than through signposted speed in accordance with Austraods requirements. Allowance for light vehilce to merge at mean free speed.	GHD	Completion of strategic concept design	Incorporated	D - Critical	2 - Unlikely	Moderate	Closed
7	Investigation and Design	Right Turn into Italia has insufficient decelleration length	Potential rear end accident	Existing lane is non-conforming and proposed development does not impact existing scenario	D - Critical	3 - Possible	Significant	None	TfNSW	Ongoing	TfNSW to monitor and adjust if required	D - Critical	3 - Possible	Significant	Open - Risk passed to TfNSW

Design Ref	Design Life Cycle Stage (Select from Drop Down Box)	Hazards What could cause injury or ill health, damage to property or damage to the environment	Risk What could go wrong and what might happen as a result	Existing Control Measures	Initial Risk Rating			Potential Control Measures (Consider Hierarchy of Control - Elimination, Substitution, Isolation, Engineering Controls, Administrative Controls, PPE)	Responsibility	By When	Decision / Status	Residual Risk Rating			Comments
					C	L	RR					C	L	RR	
8	Investigation and Design	Water quality impacts (NorBE requirements)	Potential impact to drinking water quality in Grahamstown Dam duiring construction	Existing water quality ponds	C- Severe	2 - Unlikely	Low	Simplified bridge footing design, undertaken NorBE assessment, contractor to implement sediment and erosino measures in accordance with HWC requirements	GHD / WAD Designer /Contractor	NorBE assessment completed in Strategic Concept Design. Construction control measures to be confirmed during future design phases, with Contractor to incoporate ESC in accordance with the Deed with Hunter Water	Incorporated and for future action	C- Severe	2 - Unlikely	Low	Future action by WAD designer and Conctruction contractor
9	Investigation and Design	Existing Italia Rd Intersection has no streetlighting	Lack of lighting may cause driver confusion at night causing vehicular accident with potential injury or death	None	C- Severe	3 - Possible	Moderate	Street lighting requirements to be confirmed with TfNSW during WAD design phase and incorporated into design as required	TfNSW / WAD Designer	Deatiled design	Future action	C- Severe	3 - Possible	Moderate	Future action by WAD designer following TfNSW direction
10	Setup, Construction, Commissioning and Operation	Hunterwater access (construction)	Not allowing Hunter Water to their maintainance tracks or access to their northern access to Balickera Canal off the Pacific Highway may cause issues with their infrastructure, Mainitaining Hunter Water access to their infrastructure 24/7 is non negotiable.	None	B - Major	3 - Possible	Low	A TMP will need to be developed by the Construction contractor and a Hunter Water Deed entered into during the WAD Concept design phase	Construction Contractor / Boral / WAD Designer	Construction	Future action by Conctruction Contractor	B - Major	2 - Unlikely	Negligible	Open
11	Operation	Hunterwater access (operation)	Maintining Hunter Water access 24/7 is non negotiable	None	B - Major	2 - Unlikely	Negligible	The strategic concept design has allowes for HW access to be mainted	GHD	Completion of strategic concept design	Incorporated	B - Major	1 - Very Unlikely	Negligible	Closed
12	Investigation and Design	Site compound potentially located within clear zone of existing highway on northern side of bridge	Errant vehicle impacts construction compound	None	D - Critical	3 - Possible	Significant	Relocate compound	GHD	Completion of strategic concept design	Incorporated	D - Critical	1 - Very Unlikely	Moderate	Closed
13	Investigation and Design	Maintaining truck sesnsors (active warning sign) to be retained	TfNSW have installed a truck sensor system and warning signage south of the intersection to assist in early warning of heavy vehicles at the intersection of italia Road. This system must be retained to maintain intersection safety.	System in place	D - Critical	2 - Unlikely	Moderate	Strategic Concept design identifies the need to relocate the sensor pole and will require recalibration by TfNSW	GHD /TfNSW / WAD Designer	Completion of strategic concept design and in WAD Concept Design	Incorporated in Strategic Concept design, to be further developed by the WAD Deigner	D - Critical	2 - Unlikely	Moderate	TfNSW will need to be consulted to calibrate the sensor on relocation
14	Investigation and Design	Appropriate intersection warning signage	Signage is required to warn drivers of the intersection	existing signage in place	D - Critical	3 - Possible	Significant	Stragteic Concept design to install new warning signage for intersection and cyclists	GHD	Completion of strategic concept design	Incorporated	D - Critical	2 - Unlikely	Moderate	Closed
15	Investigation and Design	Barrier systems on bridge sufficent (MAO)	The provision of appropriate barrier systems is required to protect vehilces and drivers from drop from heigh on the proposed bridge widening	Existing bridge barrier was previously designed by others to old standards	D - Critical	2 - Unlikely	Moderate	Stragteic Concept design caters for current bridge loading designs and barrier treatments in accordnace with TfNSW design standards	GHD	Completion of strategic concept design	Incorporated	D - Critical	1 - Very Unlikely	Moderate	Closed
16	Setup, Construction and Commissioning	Non alignment of piers and abutments in Balickera Canal may cause issues with Hunter Waters asset	Hunter Waters assets may not function as required if miss alignment of piers and abutments created	Design caters for new piers in alignment with existing and abutments in alignment with existing. Refer Structural Drawings.	D - Critical	3 - Possible	Significant	Contractor to construct piers and abutlents in accordance with TfNSW approved IFC documentation and confirm by WAE drawings	Construction Contractor	Construction	Future action by Conctruction Contractor	D - Critical	2 - Unlikely	Moderate	Open

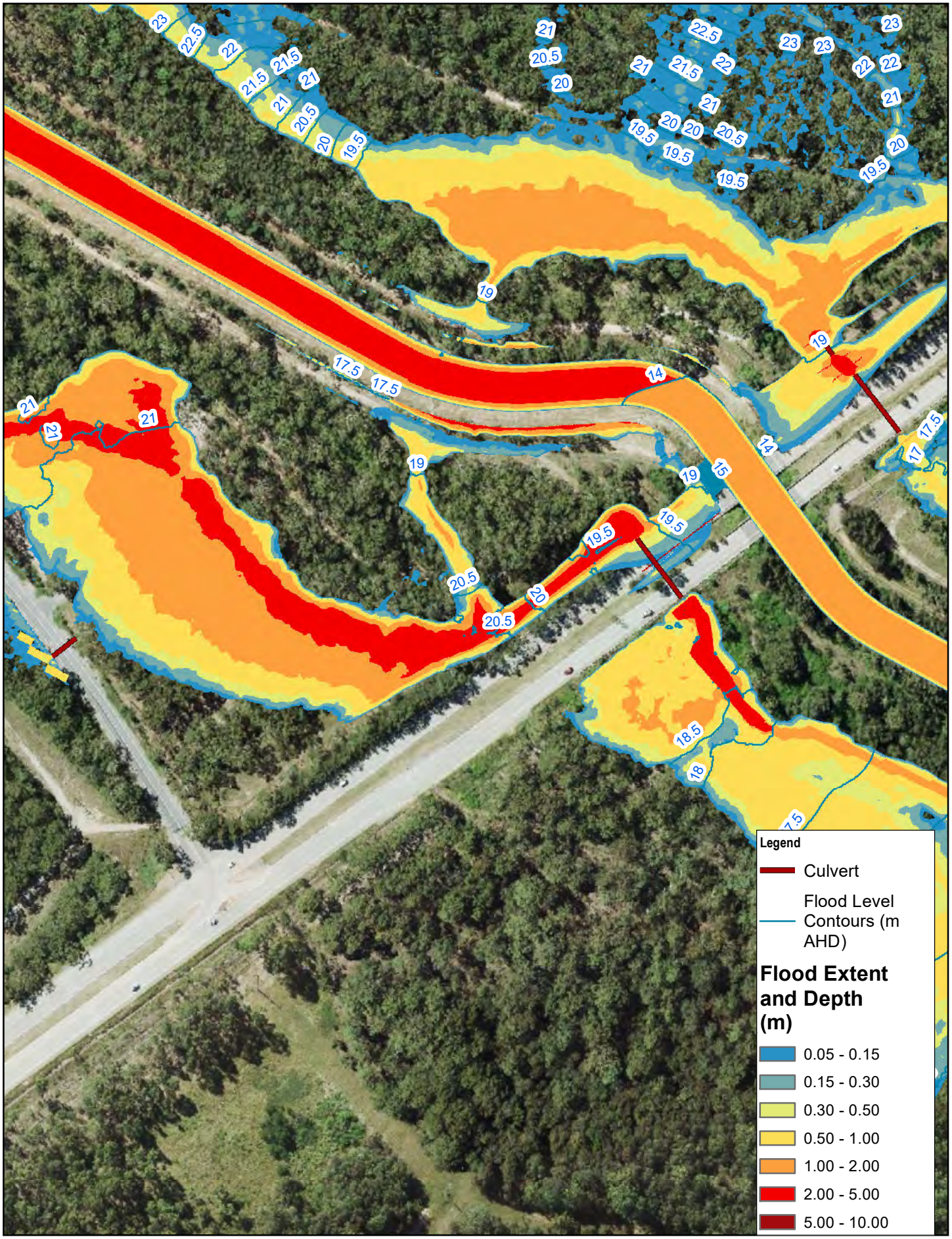
Appendix E

Bridge barrier risk assessment

Barrier Risk Assessment			
Project	Italia Rd Intersection Upgrade		
Description	Barrier risk assessment for Bridge over Balickera Canal		
AS5100.1 Barrier Risk Assessment Criteria			
Bridge No.			Bridge over Balickera Canal
Bridge Name			0
AADT			16000
% Heavy		%	13%
Design Speed		km/h	110
Barrier Rail Offset		m	1.2
Road Type			One Way
Road Type Adjustment Factor (RT)			2
Down grade in direction of traffic		%	0.4%
Road Grade Adjustment Factor (GD)			1
Horizontal Radius		m	10000
Road Curvature Adjustment Factor (CU)			1
Understructure Occupancy			High
Deck Height above Understructure		m	5.5
Understructure Adjustment Factor (US)			1.37
Adjusted AADT			43705.60
Low-Regular Barrier Threshold			2229.91
Regular-Medium Barrier Threshold			34896.84
Barrier Required			**Medium**

Appendix F

Flood mapping assessment



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition 1in100 AEP Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-1

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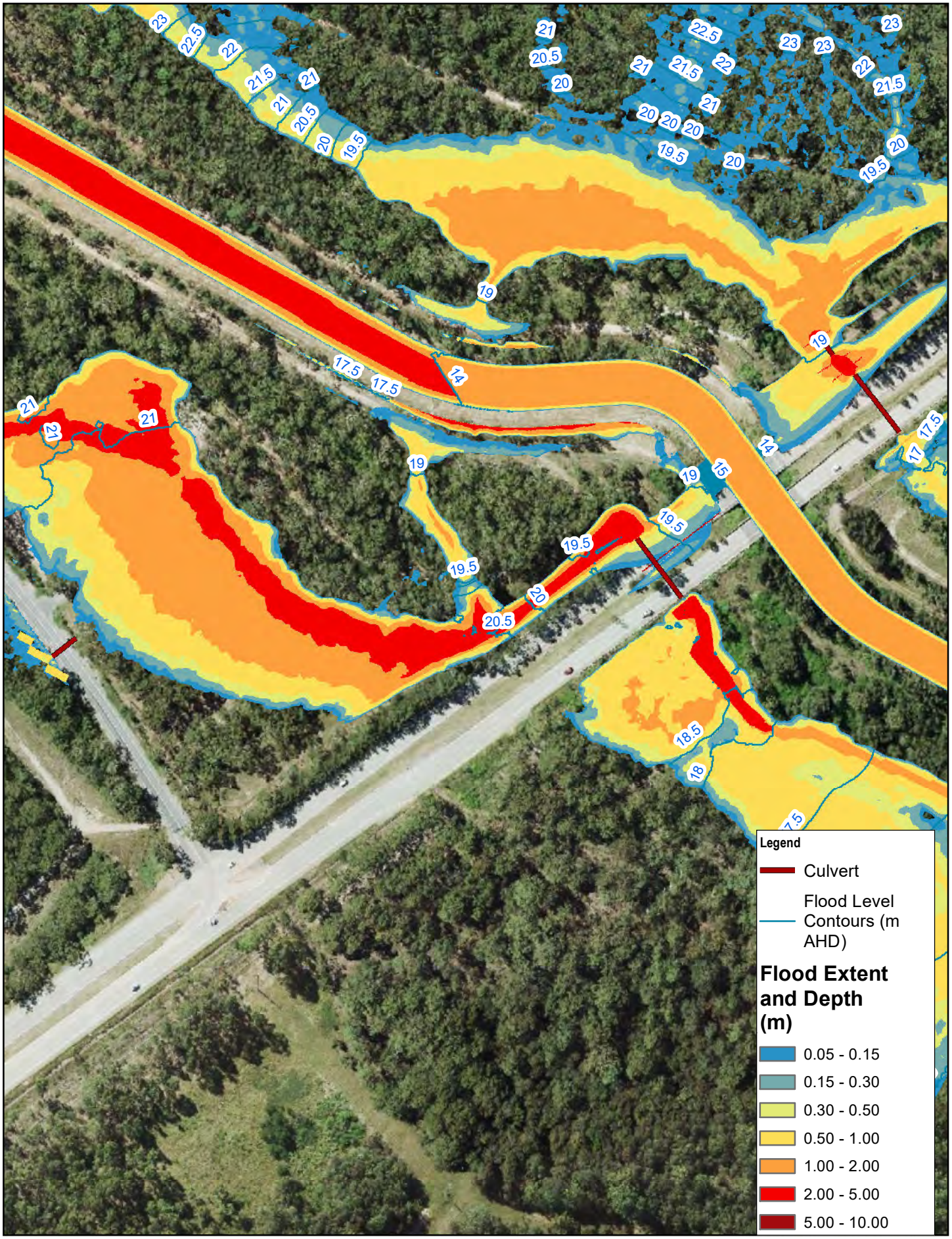

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Kilometers

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Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition Standard Operating Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-2

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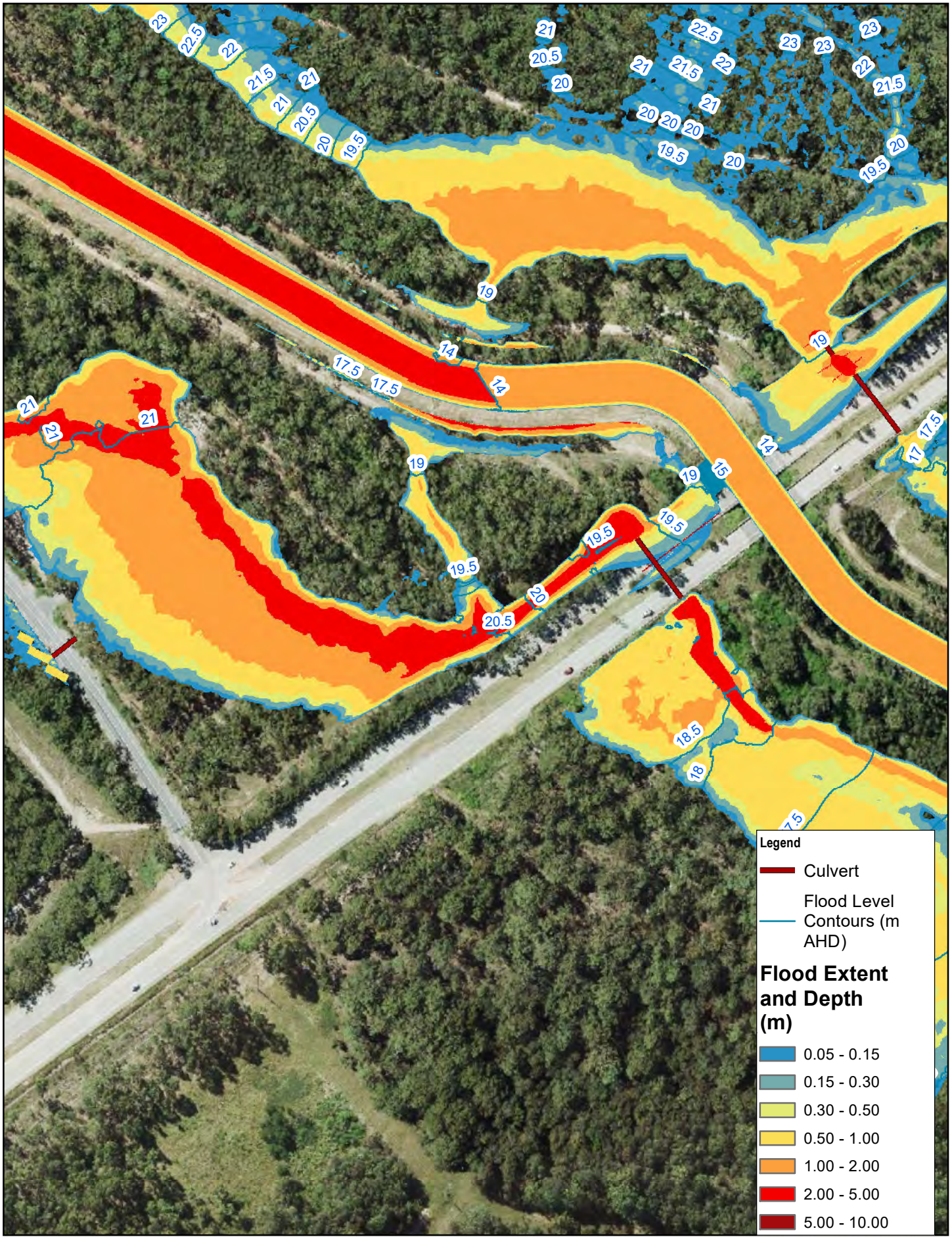

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Kilometers

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Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition Full Operating Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-3

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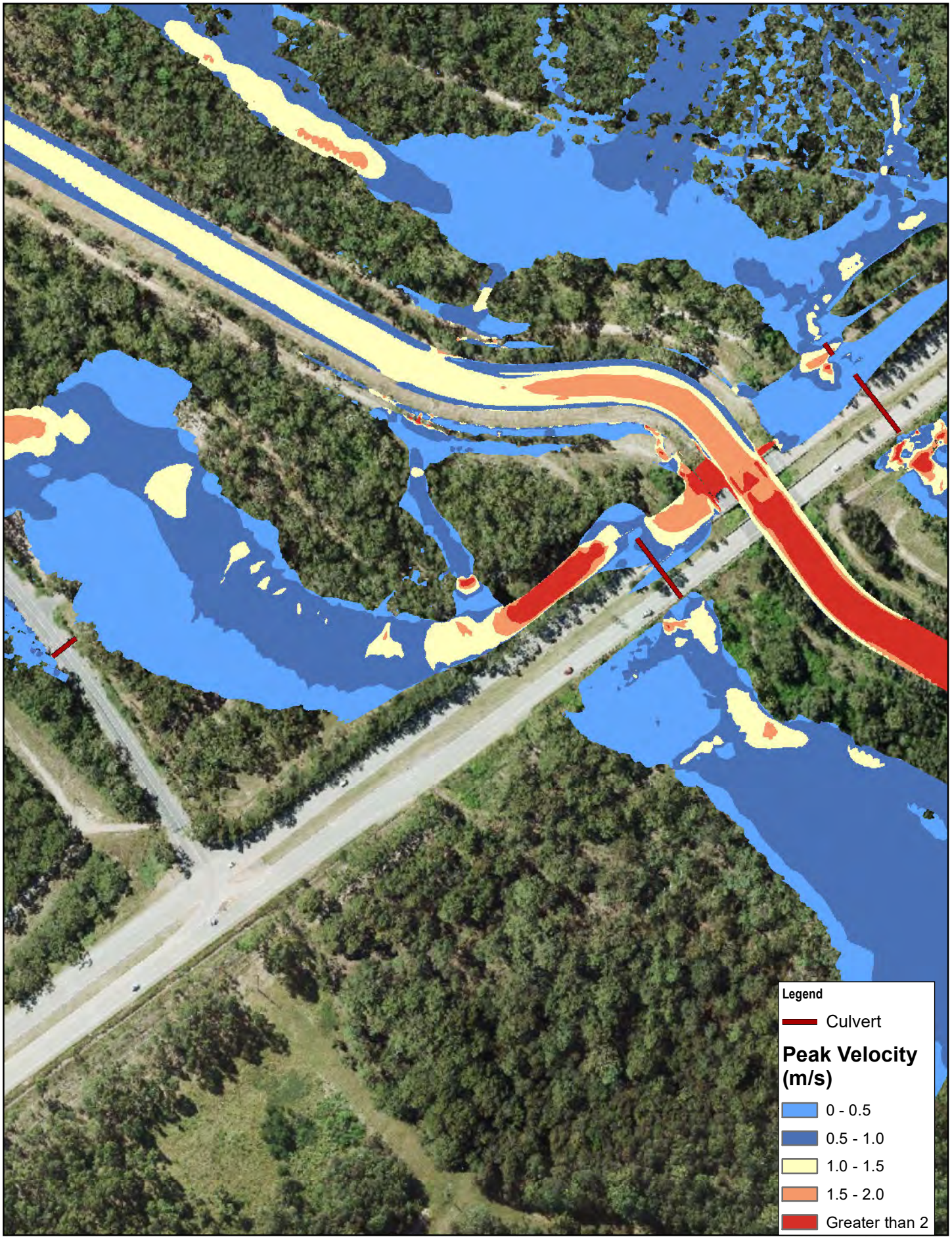

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition
1in100 AEP Level
Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-4

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition
Standard Operating Level
Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-5

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Existing Condition
Full Operating Level
Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-6

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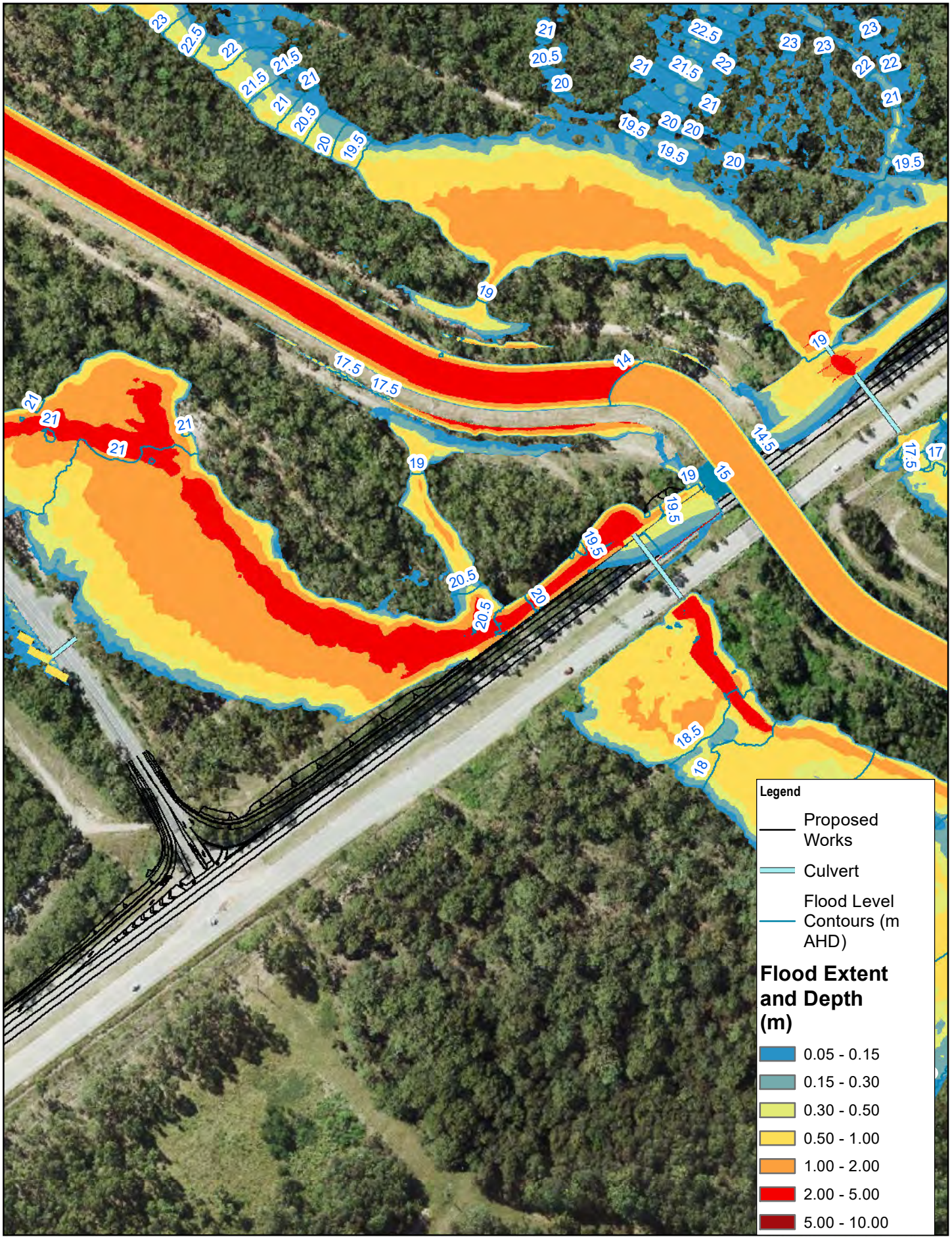

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Kilometers

Map Projection: Transverse Mercator
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Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition 1in100 AEP Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-7

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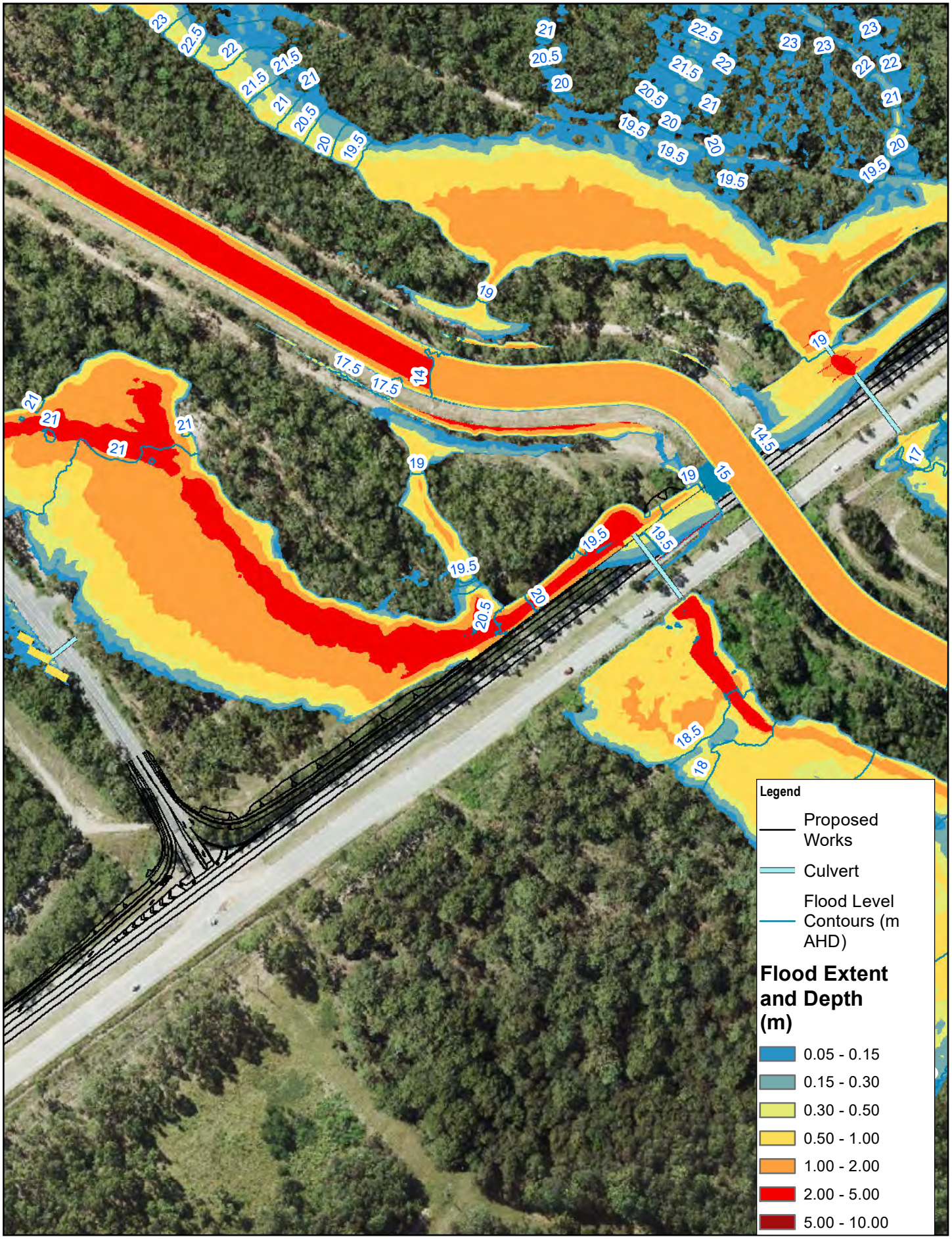

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Standard Operating Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-8

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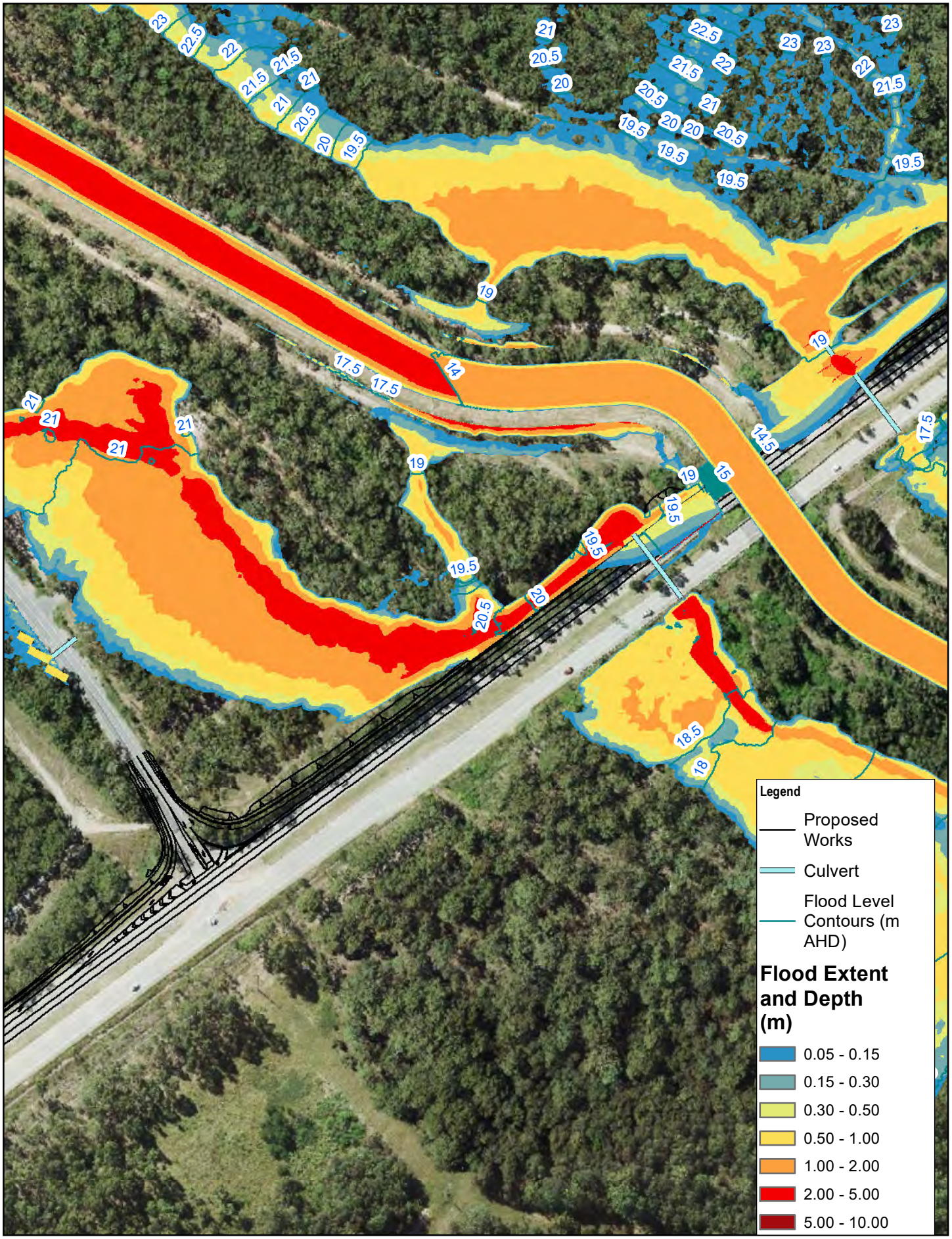

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Kilometers

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Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Full Operating Level Flood Extent and Depth

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-9

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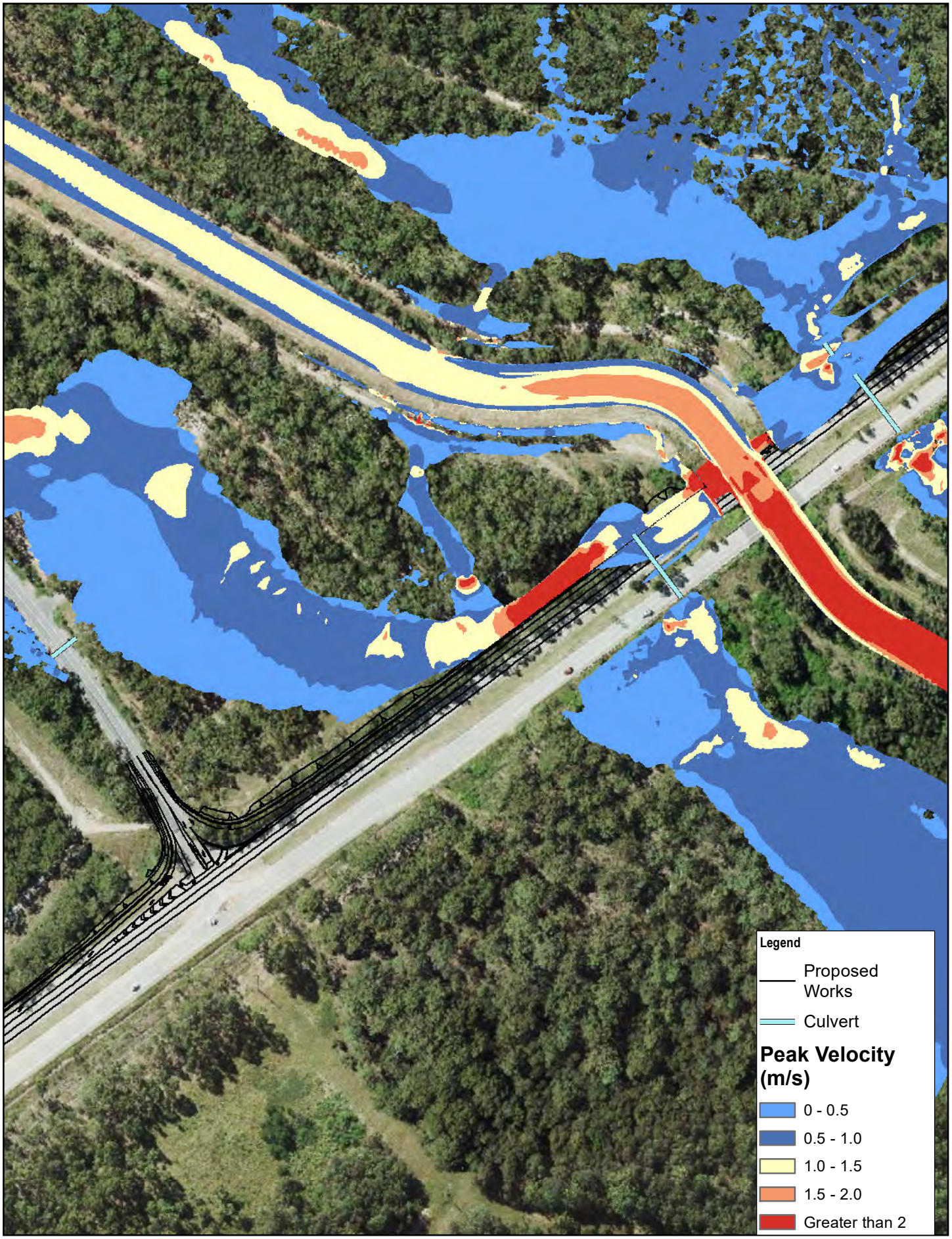

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Kilometers

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Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition 1in100 AEP Level Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-10

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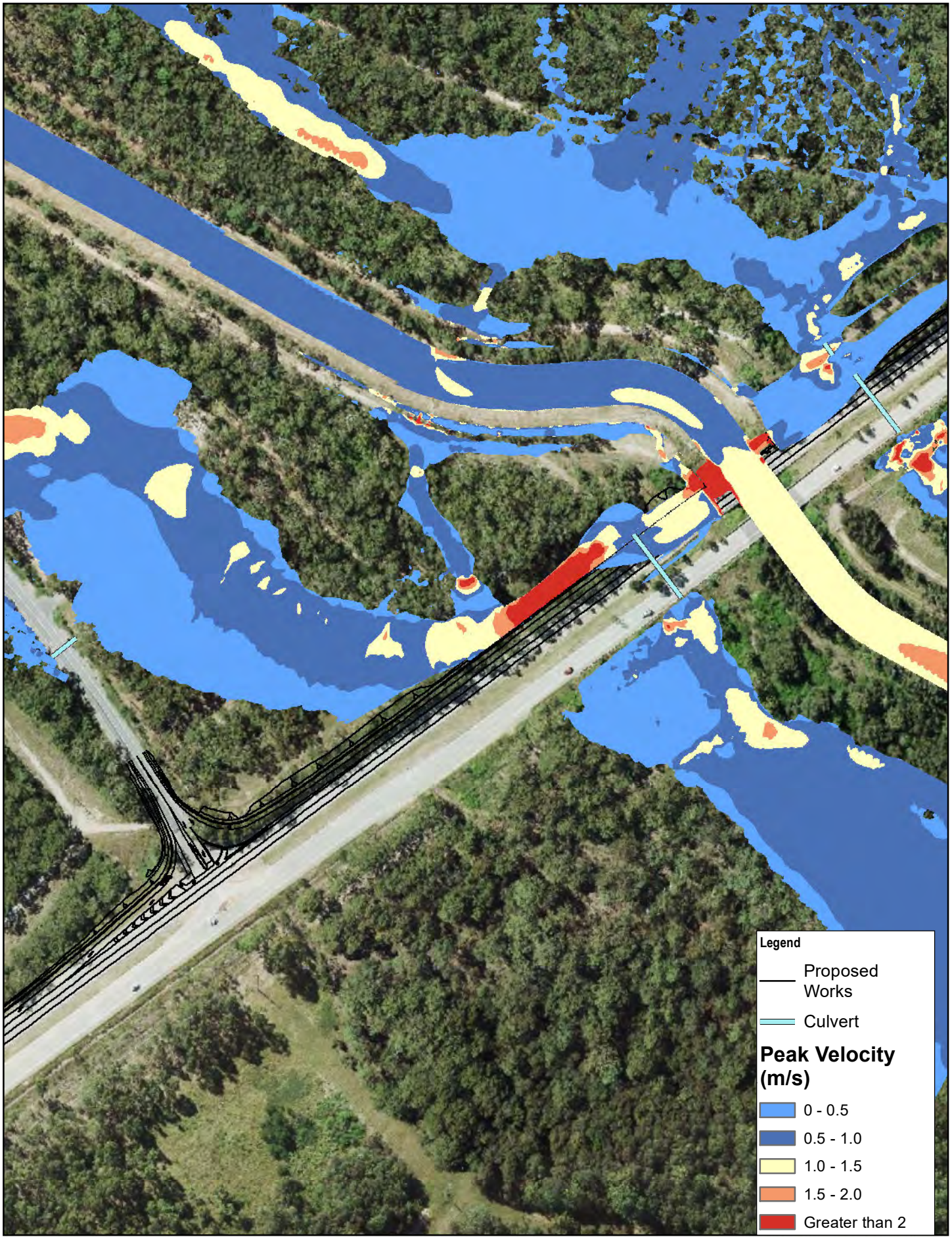

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Standard Operating Level Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-11

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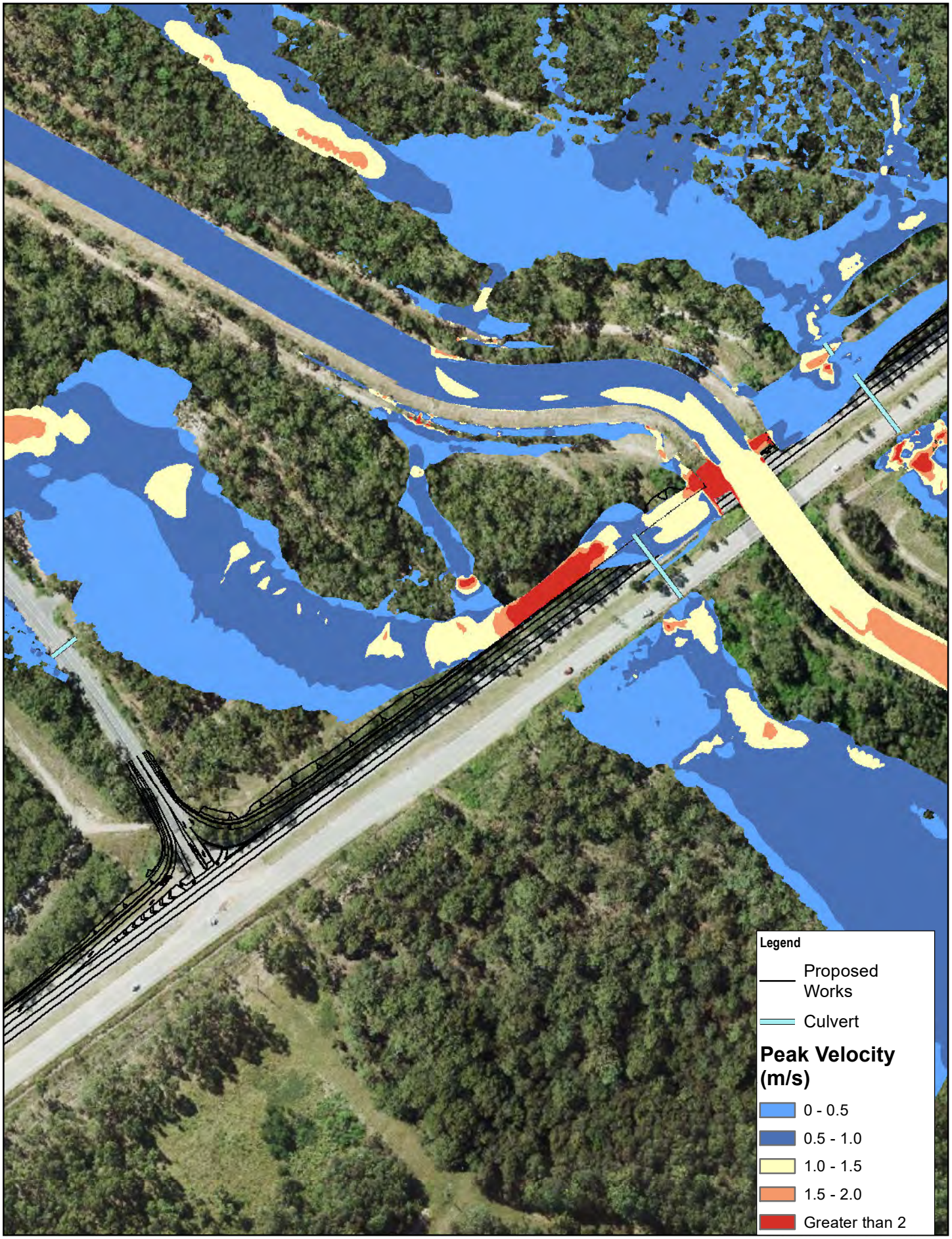

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Kilometers

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Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Full Operating Level Peak Velocity

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-12

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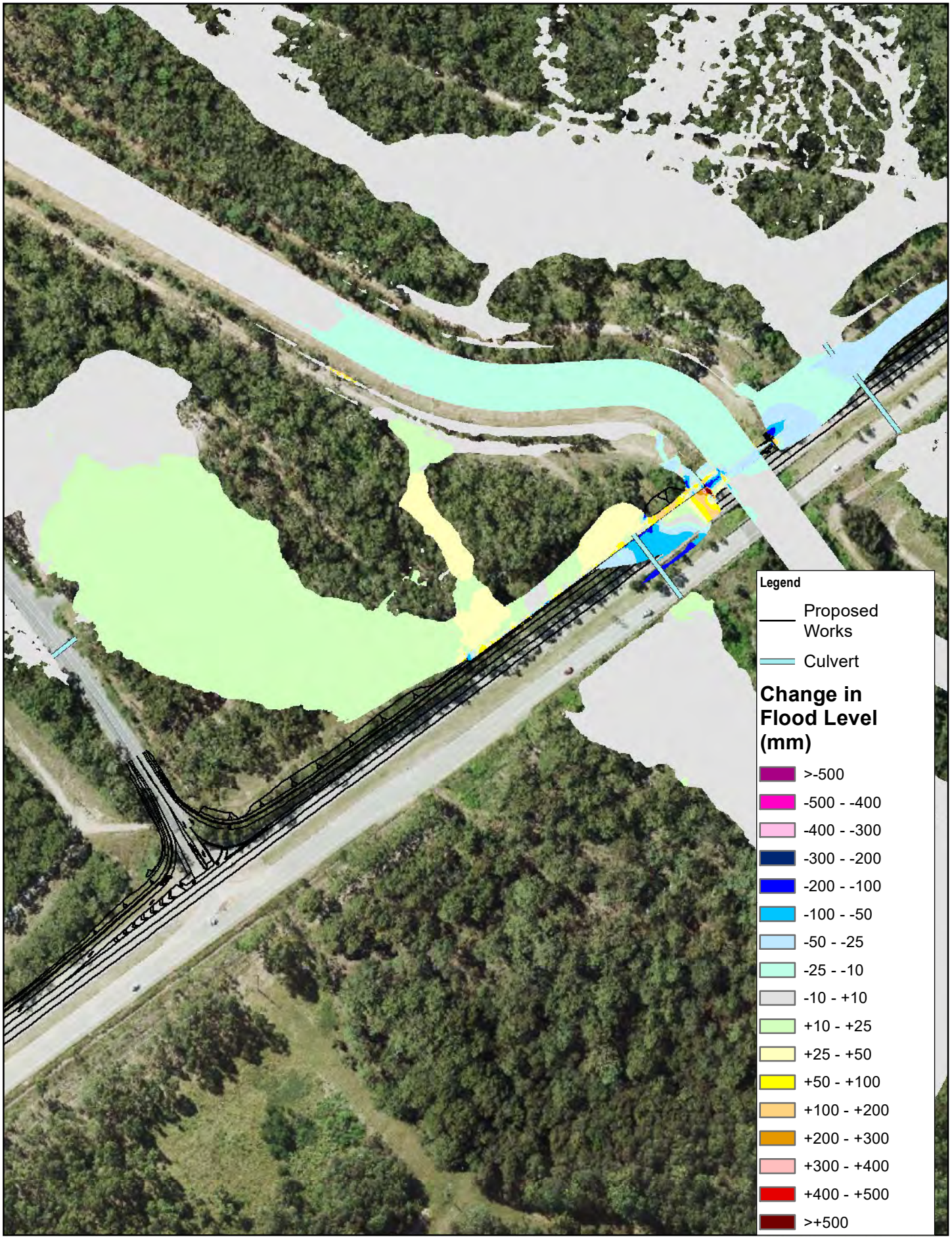

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition 1 in 100 AEP Level Change in Flood Level

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-13

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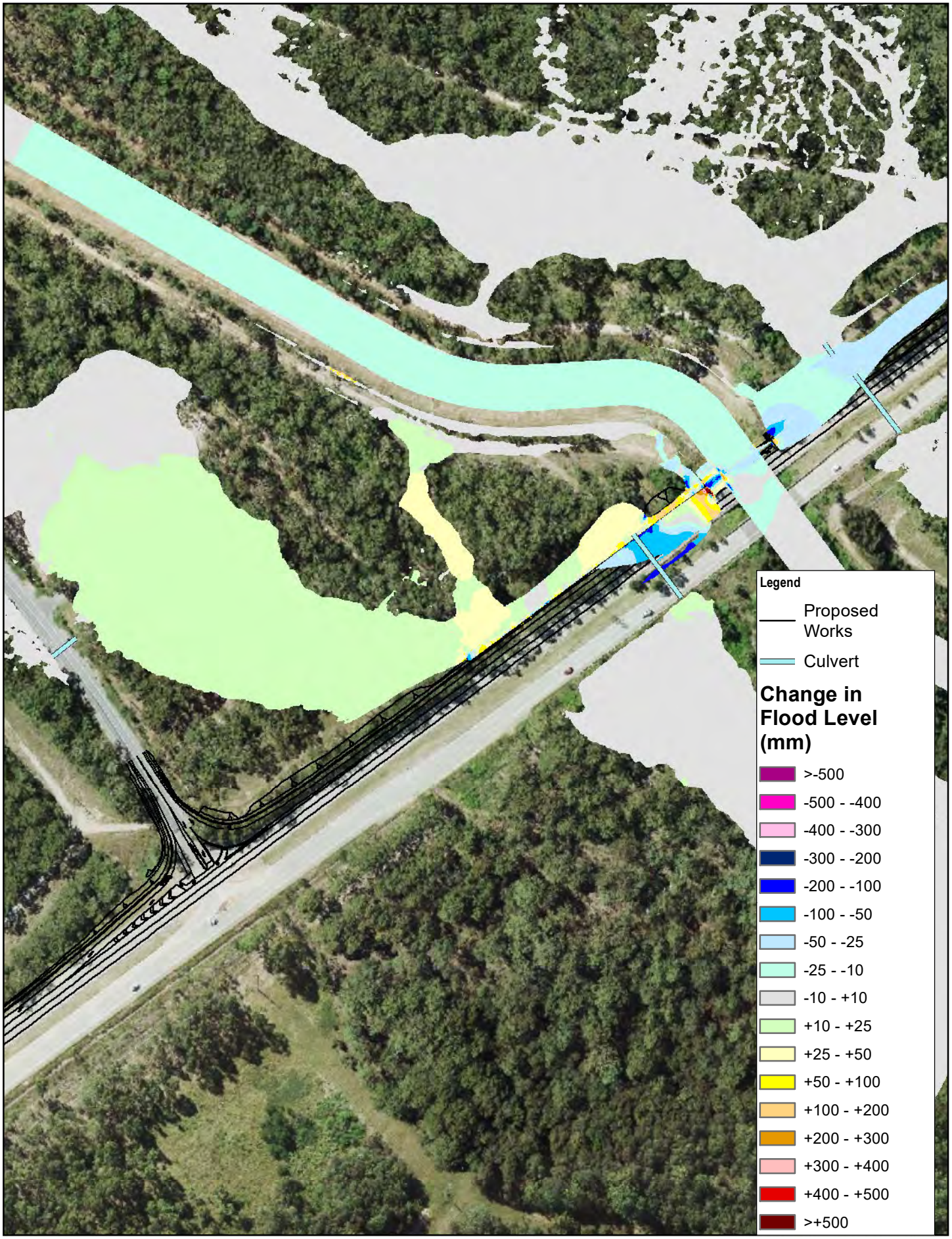

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Standard Operating Level Change in Flood Level

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-14

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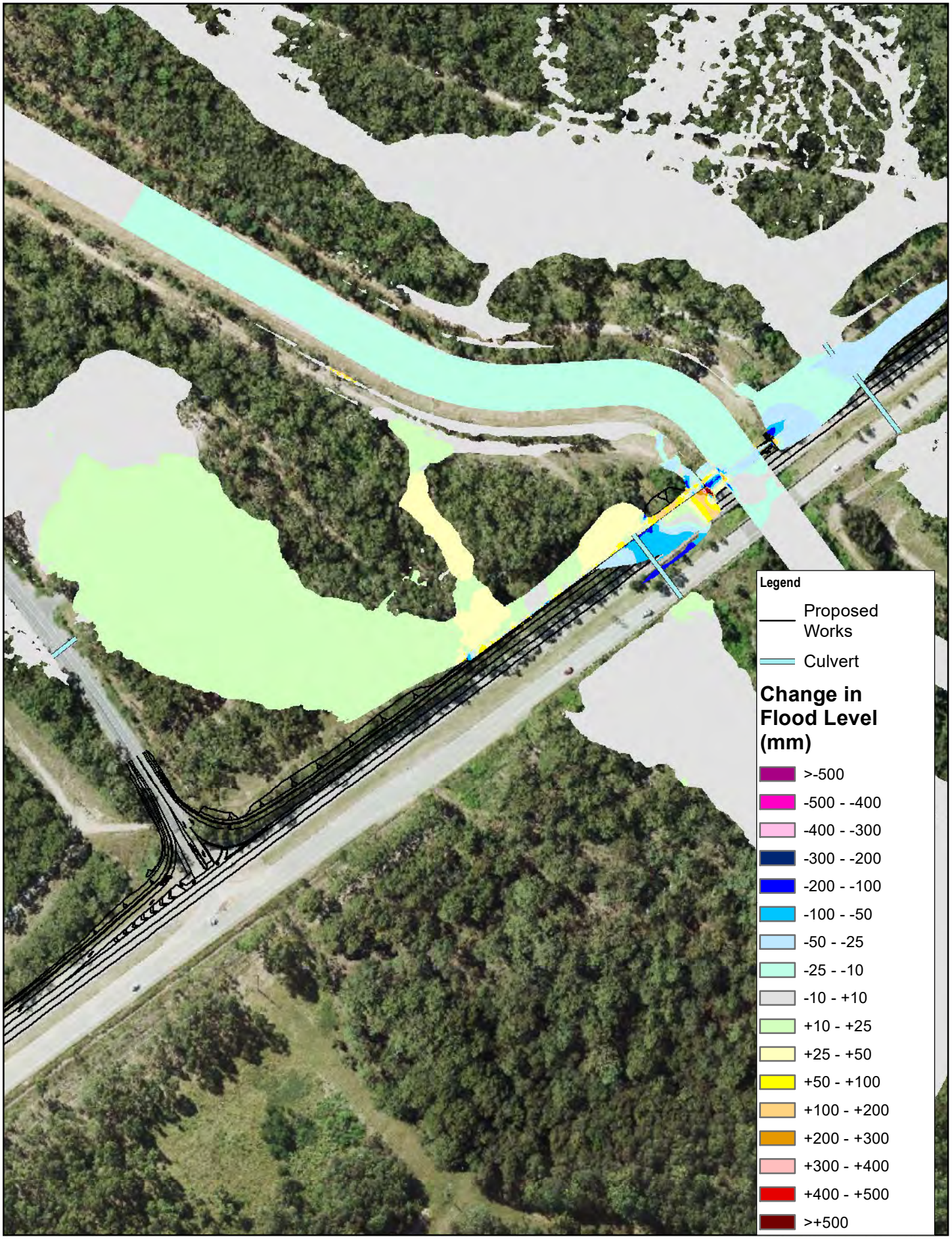

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Boral Resources (NSW) Pty Ltd
Boral Quarry Seaham
Italia Road Intersection

Proposed Condition Full Operating Level Change in Flood Level

Project No. **12599191**
Revision No. **-**
Date **01/08/2023**

FIGURE F-15

G:\22\12599191\GIS\Maps\Deliverables\12599191-Flood Maps_0.mxd
Print date: 01 Aug 2023 - 09:10

Appendix G

Water Quality Correspondence with HWC

Adam Sneddon

From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Wednesday, 30 October 2024 12:37 PM
To: Adam Sneddon
Cc: John Simpson (InTouch); John Arnold; Grant Wood; Tom Darley; Brooklyn Davis; Brent Cassidy
Subject: RE: Italia Road - MUSIC model and Musiclink reports.

Hi Adam,

We have reviewed your revised submission and technical supporting information.

While we do have some remaining questions regarding the technical aspects (eg we are still not clear on what the *WaterNSW 2023* reference is), in the interest of moving forward, and given the engagement and consideration to date, we are generally satisfied that the revised proposal for Option 2 protects the receiving waterbody (Grahamstown Dam) to the maximum degree practicable given the constraints of the site.

We note that there may be issues that preclude Option 2 and in that case Option 1 would be the lesser preferred alternative.

Our advice is to revise your report and other documentation and resubmit to Council so that the formal assessment process can be completed. Please remember to include details of the following:

- The type-f barrier revision
- Acknowledgement of the spill containment risk / existing basin issues (as discussed) as a primary concern for Hunter Water and a commitment to raise this with TfNSW in the WAD process (or similar) as a pathway for Hunter Water and TfNSW to resolve this issue.
- The details of the revised stormwater strategy proposal, noting that:
    - Option 2 is preferred
    - Feasibility of this option will be considered at the detailed design stage
    - If Option 2 is demonstrably not feasible, Option 1 is a lesser preferred alternative
    - Include results, plans, etc. and acknowledged shortcomings
    - Noting that given the site constraints (please include detailed description / justification) this is considered to be the most practicable solution to protect water quality from the identified risks.

If this revised information is submitted concisely and re-referred to us, we will issue our formal response to Council as soon as we can.

Feel free to contact me with any questions on the above.

Regards,
Kirby

Kirby Morrison
Manager Water Planning
M 0425 796 832 | T 1300 657 657
36 Honeysuckle Drive Newcastle NSW 2300
www.hunterwater.com.au

From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Tuesday, 29 October 2024 2:39 PM
To: Brent Cassidy <brent.cassidy@hunterwater.com.au>; Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: John Simpson <john.simpson@hunterwater.com.au>; John Arnold <john@arnoldplanning.com.au>; Grant Wood <Grant.Wood@ghd.com>; Tom Darley <Thomas.Darley@ghd.com>; Brooklyn Davis <Brooklyn.Davis@ghd.com>
Subject: RE: Italia Road - MUSIC model and Musiclink reports.

Hi Brent,

Tom has responded with the following.

The WaterNSW 2023 reference is with regards to:

- Pollutant loading for “forest” landuse type, which is a reference of Fletcher 2004 derived for NSW. This dataset is also used by the NSW MUSIC modelling guideline as referenced in PSC’s modelling guide BMT WBM 2011. The reference made is to WaterNSW 2023 instead of BMT WBM 2015, as we understand the WaterNSW guideline postdates and potentially corrects a typo in the BMT WBM 2015 published mass loading rates
- Slopes of vegetated swales are justified above the specified range by PSC on the basis that check-dams are included as per guidance by WaterNSW 2023.

Regards

Adam Sneddon
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Technical Director - Roads

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---

From: Brent Cassidy <brent.cassidy@hunterwater.com.au>
Sent: Tuesday, 29 October 2024 1:01 PM
To: Adam Sneddon <Adam.Sneddon@ghd.com>; Kirby Morrison (InTouch) <kirby.morrison@hunterwater.com.au>
Cc: John Simpson (InTouch) <john.simpson@hunterwater.com.au>; John Arnold <john@arnoldplanning.com.au>; Grant Wood <Grant.Wood@ghd.com>; Tom Darley <Thomas.Darley@ghd.com>; Brooklyn Davis <Brooklyn.Davis@ghd.com>
Subject: RE: Italia Road - MUSIC model and Musiclink reports.

Hi Adam,

I’m just heading into another meeting. Short on time…

The answer might be in the attachments. But can you please let me know specifically what the WaterNSW 2023 reference is to?

Thanks,

Brent

From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Tuesday, 29 October 2024 12:33 PM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson <john.simpson@hunterwater.com.au>; John Arnold <john@arnoldplanning.com.au>; Grant Wood <Grant.Wood@ghd.com>; Tom Darley <Thomas.Darley@ghd.com>; Brooklyn Davis <Brooklyn.Davis@ghd.com>
Subject: RE: Italia Road - MUSIC model and Musiclink reports.

Hi Kirby,

Our responses to comments below in green with updated outputs attached.

With all scenarios combined and run simultaneously – there’s a new table with very minor changes.

Analyte	Option 1 Swales				Option 2 Swale + Bioretention			
	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change
Total Suspended Solids (kg/yr)	3924.7 kg/yr	4655.9 kg/yr	2884.7 kg/yr	26.5% Reduction	3924.7 kg/yr	4629.1 kg/yr	2935.5 kg/yr	25.2% Reduction
Total Phosphorus (kg/yr)	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	16.3% Reduction	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	15.6% Reduction
Total Nitrogen (kg/yr)	27.8 kg/yr	32.6 kg/yr	30.2 kg/yr	8.5% Increase	27.8 kg/yr	32.6 kg/yr	27.2 kg/yr	2.4% Reduction
Gross Pollutants (kg/yr)	274.2 kg/yr	327.4 kg/yr	181.4 kg/yr	33.8% Reduction	274.2 kg/yr	327.4 kg/yr	174.3 kg/yr	36.4% Reduction

Regards

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From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Monday, 28 October 2024 2:44 PM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson (InTouch) <john.simpson@hunterwater.com.au>
Subject: RE: Italia Road - MUSIC model and Musiclink reports.

Hi Adam,

We have reviewed the revied documents and modelling.

We note that Option 1 does not meet NorBE with a TN increase of 8.1% according to our results, and Option 2 does not meet the 'at least 10%' post-development residual load reduction for TN either, with only a 2% reduction. Neither option meets Council's DCP stripping targets, which is something we would indicate in our formal response and will be for Council and the proponent to resolve.

Option 2 may be the most practical option from HWC's perspective, given the site constraints. However, before we can determine this, there are some modelling issues that need to be resolved to ensure accuracy with the results. These include:

- The model should be adjusted to include pre and post development node structures in the same scenario.
  - This allows for comparison against the same stochastically pollutant generation export rates each time the model is run. Amended in model version attached. This was initially done to reduce run-times. Agree with comment.
- The node parameters should be adjusted in accordance with PSC's MUSIClink design criteria.
  - Please see all the failing parameters included in the provided MUSIClink reports. Noted. GHD were aware of these and had justification previously that was not provided to HWC.
  - Any parameters outside of these ranges should be supported by appropriate justification. Refer report attachment 1 for justification of "failing parameters".
  - Until these modifications are made, the results presented cannot be relied upon. We are of the opinion that the "failing parameters" are suitable for use based on BMW WBM 2011 and WaterNSW 2023.
- Noting the previous discussion about roadside impervious area percentages, we anticipate this may be a parameter GHD seeks to customise. We provide our consultant's shorthand response to reviewing the photos and questioning of previous report commentary for your consideration:
  - "Based on the photos, Nearmap and the drawings, the impervious area width from the current left hand lane edge line is approx. 4m (existing concrete road shoulder 2.5m wide + bitumen sealed verge (some sections only) 1.5m wide). This would increase up to 8m (new deceleration lane 3.5m wide + new shoulder 2.5m wide + new verge 2m wide). Increase in sealed width slightly lower for acceleration lane (4m to 7m). The area of widening appears to be currently grassed or otherwise vegetated pervious area. Only difference would be if they're narrowing the existing two lanes (which doesn't seem to be the case)." Attached are 2 PDF's of the minor areas we consider to have hardstand material located as per the photographs previously issued. The areas are shown in CYAN colour and are indicative of the material installed to make the verge areas trafficable, the WHITE outline is the total new impervious areas, in some areas these overlap as we will be removing the existing hardstand material and replacing with either new concrete pavement or new granular pavement all the way to the top of the

batter. I note you comment about grass which may well be growing over these areas in some locations. The MUSIC model assumes the existing shoulder areas which are an engineered road base with low permeability and have an impervious fraction of 80%. These areas are relatively minor and compare approximately 2.7% of the pre-development catchment by area (0.045ha). In the post-development scenario the existing shoulder areas are replaced by 100% impervious “sealed road”.

- Once the above is resolved, a discussion about the meaning of the revised results and option feasibility would be prudent. Overall though, the modelling is heading in a much more suitable direction for accurately assessing the potential water quality impacts resultant of the proposed development.

We’re happy to meet (can be virtual) to discuss the above and the path forward, either before or after the model revisions are made, just let us know.

Regards,
Kirby

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Manager Water Planning
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Hunter Water acknowledges the Traditional Countries of the Awabakal, Geawegal, Darkinjung, Wonnarua and Worimi peoples on which we operate and the Countries beyond where our water flows. We recognise and respect the cultural heritage, beliefs and continuing connection to the lands and waters of our Traditional Custodians and pay respect to their Elders past, present and emerging.

From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Friday, 25 October 2024 2:18 PM
To: Brent Cassidy <brent.cassidy@hunterwater.com.au>
Cc: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Subject: Italia Road - MUSIC model and Musiclink reports.

Hi Brent,

Please find attached the music link reports. We found a minor typo in our model which has been updated in this MUSIC model and table updated below

Analyte	Option 1 Swales				Option 2 Swale + Bioretention			
	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change
Total Suspended Solids (kg/yr)	3866.3 kg/yr	4639.7 kg/yr	2872.6 kg/yr	25.7% Reduction	3866.3 kg/yr	4664.3 kg/yr	2948.4 kg/yr	23.7% Reduction
Total Phosphorus (kg/yr)	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	15.7% Reduction	6.5 kg/yr	7.8 kg/yr	5.5 kg/yr	15.3% Reduction
Total Nitrogen (kg/yr)	27.8 kg/yr	32.6 kg/yr	30.1 kg/yr	8.5% Increase	27.8 kg/yr	32.5 kg/yr	27.2 kg/yr	2.2% Reduction
Gross Pollutants (kg/yr)	274.2 kg/yr	327.4 kg/yr	181.4 kg/yr	33.8% Reduction	274.2 kg/yr	327.4 kg/yr	174.3 kg/yr	36.4% Reduction

Regards

Adam Sneddon
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Technical Director - Roads

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From: Brent Cassidy <brent.cassidy@hunterwater.com.au>
Sent: Friday, 25 October 2024 11:33 AM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Kirby Morrison (InTouch) <kirby.morrison@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE - Email 2 of 2

Hi Adam,

Also, if you have a MUSIClink report, that is worth attaching too.

If not, no worries I can generate the report myself when I run the model.

Thanks,

Brent

From: Brent Cassidy
Sent: Friday, 25 October 2024 11:25 AM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE - Email 2 of 2

Hi Adam,

The second email didn't have a MUSIC model attached.

It was a pdf from the first email (pre-dev catchment plan).

We need the ".mxproj" file or ".sqz" file, likely the first as that is the same format you have previously submitted. There are two versions of MUSIC with each having a different model file extension.

Thanks,

Brent

From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Friday, 25 October 2024 10:41 AM
To: Brent Cassidy <brent.cassidy@hunterwater.com.au>
Subject: FW: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE - Email 2 of 2

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From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Friday, 25 October 2024 10:32 AM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Subject: FW: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE - Email 2 of 2

MUSIC model and BDY plan

Regards

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---

From: Adam Sneddon
Sent: Friday, 25 October 2024 10:15 AM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: John Arnold <john@arnoldplanning.com.au>; Grant Wood <Grant.Wood@ghd.com>; Michael Monroe <Michael.Monroe@ghd.com>
Subject: FW: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Resent due to HWC bounce of email.

Regards

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Please consider the environment before printing this email

From: Adam Sneddon
Sent: Friday, 25 October 2024 10:13 AM
To: Kirby Morrison (InTouch) <kirby.morrison@hunterwater.com.au>
Cc: John Arnold <john@arnoldplanning.com.au>; Grant Wood <Grant.Wood@ghd.com>; Michael Monroe <Michael.Monroe@ghd.com>
Subject: FW: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Kirby,

I have been waiting for out team to complete QA of the amended model and outcomes, so sorry for the delay.

Attached for your teams review is the simplified MUSIC model that was recommended by your formal review process. Also attached are pre and post catchment plans which corelate to the MUSIC model as attached.

We have assessed 3 scenarios:

- Baseline
- Option with swales as recommended by Hunter Waters consultant
- Option with Swales with bio-retention (supplied for info only as we agree that maintenance of these will be difficult)

A summary of the outputs from MUSIC is shown below:

Analyte	Option 1 Swales				Option 2 Swale + Bioretention			
	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change	Pre-development	Post-development (before treatment)	Post-development (after treatment)	Change
Total Suspended Solids (kg/yr)	3540.4 kg/yr	4641.5 kg/yr	2876.7 kg/yr	18.7% Reduction	3540.4 kg/yr	4656.6 kg/yr	2943.1 kg/yr	16.9% Reduction
Total Phosphorus (kg/yr)	5.9 kg/yr	7.9 kg/yr	5.5 kg/yr	6.6% Reduction	5.9 kg/yr	7.8 kg/yr	5.6 kg/yr	5.9% Reduction
Total Nitrogen (kg/yr)	27.3 kg/yr	32.7 kg/yr	30.2 kg/yr	10.9% Increase	27.3 kg/yr	32.7 kg/yr	27.3 kg/yr	0.1% Increase
Gross Pollutants (kg/yr)	274.2 kg/yr	327.4 kg/yr	181.4 kg/yr	33.8% Reduction	274.2 kg/yr	327.4 kg/yr	174.3 kg/yr	36.4% Reduction

As you may recall from our meeting I was sceptical that we would be able to meet the 10% betterment criteria for Nitrogen once the bio-retention swales were removed as the physical removal and of plants regularly is the mechanism for the reduction.

In order to finalise our drawings we will need to agree with Hunter Water an approach to agree on a happy medium as the site is extremely constrained by the road reserve boundaries, private property proximity (plan attached) and these works are considered by TfNSW as an interim solution to a wider network upgrade.

I am happy to discuss the findings with your team, but also note the urgency of a resolution going forward.

Regards

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Technical Director - Roads

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---

From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Wednesday, 23 October 2024 11:35 AM
To: Adam Sneddon <Adam.Sneddon@ghd.com>; John Arnold <john@arnoldplanning.com.au>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson (InTouch) <john.simpson@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Adam,

Thanks for the update and heads up. We'll aim to review your updated information including models as soon as we receive them.

Regards

Kirby Morrison
Manager Water Planning
M 0425 796 832 | T 1300 657 657
36 Honeysuckle Drive Newcastle NSW 2300
www.hunterwater.com.au

Hunter Water acknowledges the Traditional Countries of the Awabakal, Geawegal, Darkinjung, Wonnarua and Worimi peoples on which we operate and the Countries beyond where our water flows. We recognise and respect the cultural heritage, beliefs and continuing connection to the lands and waters of our Traditional Custodians and pay respect to their Elders past, present and emerging.

From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Wednesday, 23 October 2024 10:49 AM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>; John Arnold <john@arnoldplanning.com.au>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson <john.simpson@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Kirby,

Sorry for the delay in any feedback since my last email. We have been setting up a new simplified MUSIC model and have had some staff off sick at the start of the week.
I am hoping to have revised models and a short summary available to you tomorrow morning.

Once HWC are happy with the models we will formally respond to Hunter Water's letter.

I can confirm our drawings have been amended to replace the type F barrier with a high containment thrie beam (steel barrier on posts). Updated drawings and report will be issued via the formal response. Any changes to the treatment systems will also be updated.

Regards

Adam Sneddon
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Technical Director - Roads

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From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Thursday, 17 October 2024 11:07 AM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson (InTouch) <john.simpson@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Super, thanks Adam

Kirby Morrison
Manager Water Planning
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From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Thursday, 17 October 2024 11:05 AM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson <john.simpson@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Kirby,

I think this covers them all, let me know if I have missed any.

Photo 1 - Looking from Italia Road along private property boundary towards Balickera Canal. Note cleared area is Energy Australia easement for 11kV.

Photo 2 a and b - looking into ponded inlet to culverts from Pacific Highway, not stone revetment to batter

Photo 3 – Verge material (TfNSW R44 pavement material south of Italia Road (most southern end of proposed left turn lane extension into Italia Road)

Photo 4 - Verge material (TfNSW R44 pavement material south of Italia Road (northbound approach to Italia Road)

Photo 5 - Verge material (TfNSW R44 pavement material) north of Italia Road towards Balickera Canal

Photo 6 – Drowned inlet to culvert

Photo 7 – Verge (TfNSW R44 pavement material) northbound approach to HWC access north of Balickera Canal.

Photo 8 – Rock armouring of south-western embankment of Balickera Canal (northbound lane)

Regards

Adam Sneddon
BE(Civil) MIEAust
Technical Director - Roads

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From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Thursday, 17 October 2024 10:07 AM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>; John Simpson (InTouch) <john.simpson@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Adam and Brooklyn,

Thanks for the productive meeting yesterday.

Are you able to please send us your photos of the road shoulder etc for our reference?

Thanks,
Kirby

Kirby Morrison
Manager Water Planning
M 0425 796 832 | T 1300 657 657
36 Honeysuckle Drive Newcastle NSW 2300
www.hunterwater.com.au

From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Thursday, 10 October 2024 5:11 PM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Thanks Kirby,

I will be in attendance with Brooklyn Davis also from GHD.

Regards

Adam Sneddon
BE(Civil) MIEAust
Technical Director - Roads

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---

From: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Sent: Thursday, October 10, 2024 4:04 PM
To: Adam Sneddon <Adam.Sneddon@ghd.com>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>; Brent Cassidy <brent.cassidy@hunterwater.com.au>
Subject: RE: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Adam,

We are available to meet at 12pm next Wednesday 16th October at Hunter Water's Honeysuckle office. We don't require Salients to attend, as Brent from my team is across all modelling and other details and we can provide any interpretation and guidance needed regarding Hunter Water's requirements.

I also want to thank you for mentioning the issue of stockpiled vehicles on land in the vicinity of the Italia Rd/Pac Hwy intersection. We regularly deal with abandoned vehicles on our property, but weren't aware of this site. Our rangers inspected the site and, following consultation with police, we have been advised to only attend the property with a police escort. You may want to include this in your safety briefings for any site visits.

It may also be helpful if you can bring along any photos or other information on the existing basins, if available.

Regards,
Kirby

Kirby Morrison
Manager Water Planning
M 0425 796 832 | T 1300 657 657
36 Honeysuckle Drive Newcastle NSW 2300
www.hunterwater.com.au

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From: Adam Sneddon <Adam.Sneddon@ghd.com>
Sent: Thursday, October 10, 2024 10:20 AM
To: Kirby Morrison <kirby.morrison@hunterwater.com.au>
Cc: Brooklyn Davis <Brooklyn.Davis@ghd.com>
Subject: HW2024-137 - DA 16-2023-477-1 - Italia Road interim intersection upgrade - NorBE

Hi Kirby,

Thanks for taking my call on Tuesday to discuss Hunter Water's response to the proposed intersection safety upgrade at Italia Road.

We would like to meet with Hunter Water and your consultant next week if possible to discuss the findings in the response and work towards a satisfactory solution to the water quality issues raised in Hunter Waters response.

We would be available to meet from Wednesday 16th October onwards, this will allow us some time to investigate the MUSIC model and any potential adjustments. We note that we have a hard deadline with a second attendance to the JRPP on the 11th November to discuss how we have responded to the responses issued by authorities, so a meeting as early as possible would be appreciated.

Can you please advise both yours and a representative of Salients availability to meet at Hunter Waters Honeysuckle Drive office to resolve the issues raised.

Regards

Adam Sneddon
BE(Civil) MIEAust
Technical Director - Roads

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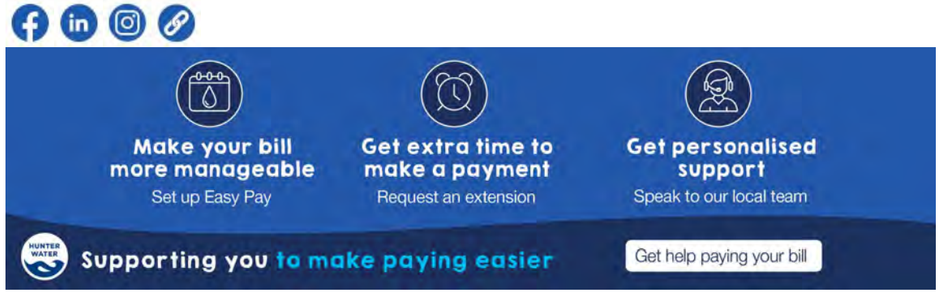

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