Appendix H

Conceptual Erosion and Sediment Control Plan

Prepared for
RES Australia Pty Ltd
ABN: 55 106 637 754

Conceptual Erosion and Sediment Control Plan

Tarong West Wind Farm

20-Dec-2023

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Conceptual Erosion and Sediment Control Plan

Tarong West Wind Farm

Client: RES Australia Pty Ltd

ABN: 55 106 637 754

Prepared by

AECOM Australia Pty Ltd

20-Dec-2023

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Professional Registration

This document includes professional services that require approval from a registered professional.

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* The registered professional must be the originator of this work or have provided direct supervision to the originator.

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1.0 Introduction

1.1 Overview

This Conceptual Erosion and Sediment Control Plan (ESCP) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of RES Australia Pty Ltd (RES) to support the development application for the Tarong West Wind Farm (the Project). The Conceptual ESCP considers performance outcomes (PO) 7 and 8 of State code 23: Wind Farm Development (State code 23) and the supporting State code 23 Planning Guideline. The Conceptual ESCP identifies key risks, environmental sensitivities and controls that should be considered as the Project moves through its design and construction phases.

The Project proposes the development of up to 97 wind turbines and associated infrastructure to be developed west of Kingaroy, Queensland, within the South Burnett Regional Council Local Government Area. The Project will be established over freehold rural properties, State land and reserves, totalling approximately 17,500 ha (Project Site), with a planning corridor footprint of up to 1,952.96 ha and a maximum clearing and construction footprint of 1,062.14 ha within the corridor.

The Project infrastructure is comprised of linear, non-linear and temporary infrastructure. The overall footprint of the infrastructure will be determined by the final wind farm design including the design of roads, underground cabling and overhead lines. Vegetation clearing, excavation and working within proximity to watercourses will be required to establish the project.

Within Queensland there is a general environmental duty of care which means that the Project must not carry out any activity that causes, or is likely to cause, environmental harm unless all reasonable and practicable measures to prevent or minimise the harm have been undertaken. The Project must meet its requirements under relevant legislation and planning guidelines by demonstrating that it is feasible and practicable to manage potential sediment and erosion impacts during all project activities.

This Conceptual ESCP is provided to demonstrate RES' commitment to managing erosion and sediment risks at the Project Site and addressing all regulatory and planning requirements. It supports the Preliminary Stormwater Management Plan to demonstrate compliance with PO7 and PO8 of State code 23, and the Preliminary Construction Environmental Management Plan to meet PO13.

To fully meet PO7 and PO8 of the State code 23 Planning Guideline, it is expected that the State Assessment and Referral Agency (SARA) will condition RES to submit a detailed construction ESCP for the final wind farm design, through their selected engineering, procurement and construction (EPC) contractor. The ESCP for construction is to be prepared by a Registered Professional Engineer of Queensland (RPEQ) and submitted to SARA prior to the commencement of construction activities.

The requirement for ESCPs for operations and decommissioning is also expected to be conditioned.

1.2 Scope

The Best Practice Erosion and Sediment Control (BPESC) (AustIECA, 2008) outlines the planning process for Erosion and Sediment Control Planning. The overall planning process is shown in Figure 1.

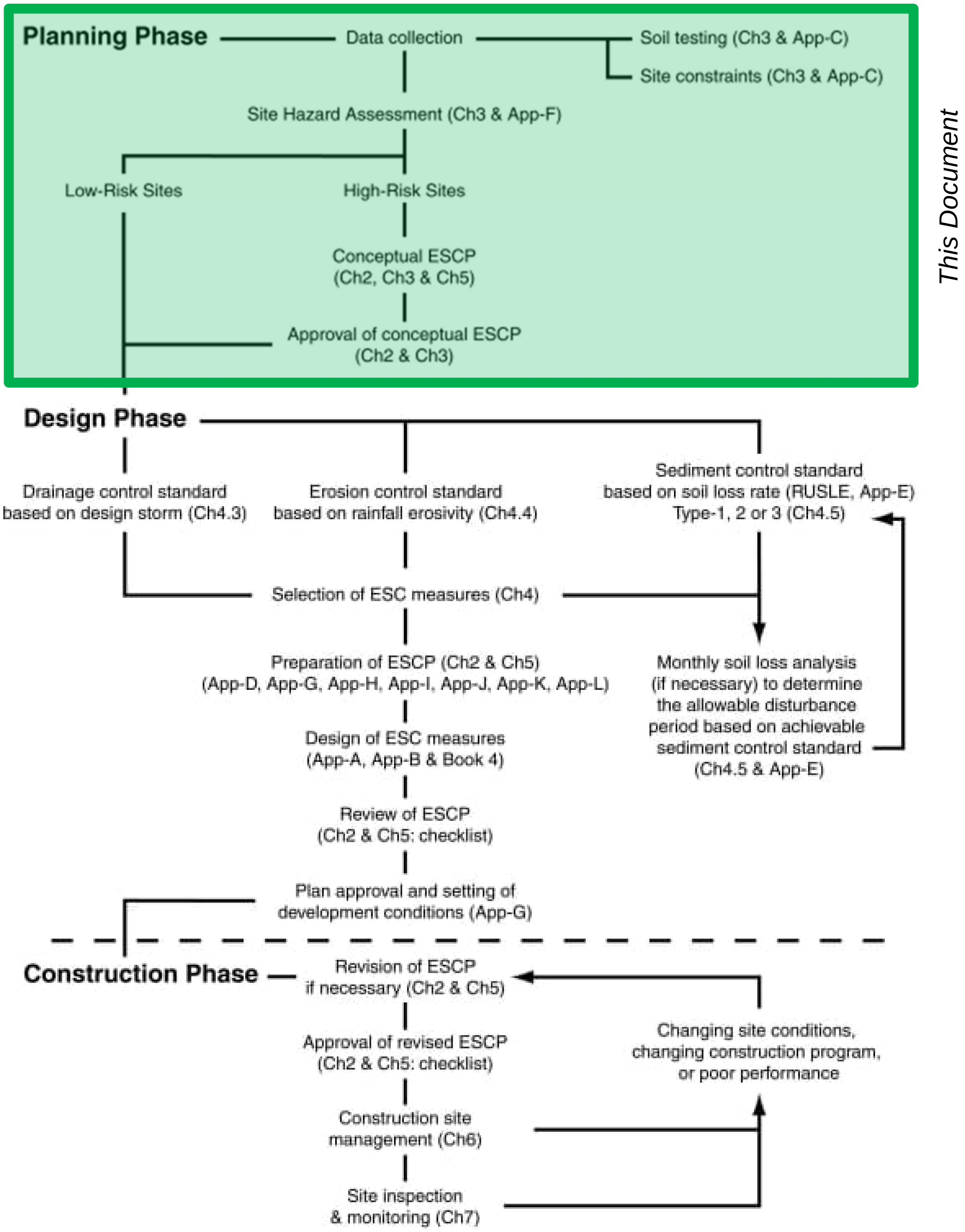


Figure 1 IECA Planning Process

The scope of this document is the Conceptual ESCP shown in the Planning Phase portion of the diagram.

A Conceptual ESCP is generally not as detailed as a final ESCP as they are typically prepared before key site layout, design and construction methodology information is finalised. It does not include detailed engineering design of controls and structures and it does not provide plans showing the layout of all erosion controls across the Project Site. As noted, in Section 1.1, these will be developed during detailed design by RES and their selected EPC contractor.

This Conceptual ESCP has been prepared to accompany the development application for a Material Change of Use (MCU) (Wind Farm) and Operational Work Permit (Native Vegetation Clearing).

It is noted that the Project also involves access track crossings of watercourses. AECOM understands that these in-line crossings are likely to be progressed under a separate development approval(s) for an operational works permit in regard to waterway barrier works, or alternatively in accordance with the Accepted Development Requirements (ADR).

1.3 Erosion and Sediment Control Framework

1.3.1 Regulatory Framework and Relevant Guidelines

The following regulatory framework and relevant guidelines are applicable to erosion and sediment control for the Project:

- International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Books 1 – 8 (2008).
- Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) State Development Assessment Provisions (SDAP) – State Code 23: Wind farm development (refer Table 1)

Table 1 State Code 23 - Performance Outcomes and Acceptable Outcomes

Performance Outcome	Acceptable Outcome
Water quality	
PO7 Development maintains the water quality of receiving waters.	No acceptable outcome is prescribed.
Natural drainage patterns	
PO8 Development maintains the natural drainage patterns on the site by protecting: 1. bank stability by limiting bank erosion. 2. water quality objectives by filtering sediments, nutrients and other pollutants. 3. aquatic habitats. 4. terrestrial habitats.	No acceptable outcome is prescribed.

1.4 Report Structure

The structure and content of this Conceptual ESCP is predominantly driven by the requirements of the IECA Best Practice Erosion and Sediment Control Guidelines and the SDAP Guidance Material – State code 23: Wind farm development

Table 2 Report Structure

Section	Description
Section 1 – Introduction	Introduces the scope and purpose of the plan.
Section 2 – Erosion and Sediment Control Principles	Outlines general principles of erosion and sediment control.
Section 3 – Existing Environment	Describes the natural setting of the project
Section 4 – Project Activities	Describes the proposed activities, relevant to erosion and sediment control planning

Section	Description
Section 5 – Identified Risks and Controls	Identifies key risks and controls for future erosion and sediment control planning.
Section 6 – Inspections and Monitoring	Conceptual development of inspection and monitoring requirements.
Section 7 – Conclusions and Recommendations	Closes the plan.

2.0 Erosion and Sediment Control Principles

2.1 Overview

Preventing unacceptable levels of sediments and contaminants from leaving the Project Site and entering the receiving waters is one of the most important functions of sediment and erosion control. As per IECA (2008), the two primary control methods of sediment and erosion control are as follows:

- Erosion control – prevention or minimisation of soil erosion (from dispersive, non-dispersive or competent material) caused by rain drop impact, or water flow.
- Sediment control – trapping or retention of sediment either moving along the land surface, contained within runoff (i.e. from up-slope erosion) or from windborne particles.

Erosion control and sediment control are two very different activities. Erosion control measures concentrate on preventing or minimising soil erosion. Sediment control measures are purposed to mitigate erosion and sediment mobilisation.

2.2 Erosion

Soil erosion is the process through which the effects of wind, water or physical action displace soil particles, causing them to be transported.

The most common forms of water erosion are as follows:

- splash erosion is the spattering of soil particles cause by the impact of raindrops on soil
- sheet erosion is the uniform removal of soil in thin layers from sloping land
- rill erosion is the removal of soil by water concentrated in small but well-defined channels
- gully erosion produces channels deeper and larger than rills, generally greater than 300 mm deep.

Another form of erosion is dusting, whereby soil particles are mobilised by wind action and/or vehicles. Dusting can be exacerbated by conditions such as:

- vegetation removal (clearing)
- topsoil and/or subsoil stripping
- dry and hot climatic conditions
- vehicle movements.

2.3 Sediment Control

The primary function of sediment control measures is to trap the coarser sediment fraction. Sediment basins and some filtration systems used during dewatering operations are possibly the only sediment control techniques that have any significant ability to trap finer sediment particles such as silts or clays. Due to the difficulty of trapping these finer sediments, priority should be given to the use of effective erosion control measures wherever practical.

3.0 Existing Environment

3.1 Climatic Conditions

Based on the Köppen Classification system, the climate for the Project Site is located within the subtropical zone (moderately dry winter).

The rainfall is seasonally distributed with a distinct wet season typically present from November through April and a drier season extending from May through October. The median rainfall received during the summer wet season is approximately 400 mm; however, the wet season rainfall is subject to a high degree of variability. Rainfall data is available from the Bureau of Meteorology (BoM) weather station at Warragai rainfall station (040246), located approximately 1.5 km west of the north-western boundary of the Project Area and at an elevation of 444 m AHD.

The closest open temperature recording station for the Study Area is located approximately 35 km east at Kingaroy Airport Station (Bureau of Meteorology [BoM] station 040922). The mean daily maximum summer temperatures are approximately 30°C and approximately 20°C during winter.

3.2 Hydrology and Drainage

The Project Site incorporates six main catchments which include the Boyne River and its main tributaries which include Mannuem Creek, Middle Creek, Jumma Creek, Boughyard Creek and Ironpot Creek (refer Figure 2). The runoff distribution for the catchments is complicated due to the number of contributing catchments, consequently all rainfall within the Project Site will enter the Boyne River system.

The Middle Creek catchment is contained within the Project Site to near entirety and therefore all run-off within this catchment is generated within Project Area before entering the Boyne River further downstream. Boughyard Creek, Jumma Creek and Ironpot Creek all have a number of contributing tributaries and hence have larger catchments. As a result, portions of these catchments lie within the Project Site before entering the Boyne River system.

The Boyne River system is a major tributary of the Burnett basin which has an approximate area of 2,496 km^2 (DES, 2013, formally DEHP) which makes up approximately 8 % of the 32,220 km^2 Burnett Basin.

As the Project Site contains the Boyne River watercourse and is contributed to by its upstream tributaries it is considered that drainage within the footprint is moderate in terms of width, channels are well-defined and low to moderate gradients ranging from 0.2 to 1.3 %. The drainage features are considered moderate across the planning corridor with approximately 50% of the streams within the total catchment having a stream order of 1 with the remaining waterlines having a stream order of 2 or 3 (based upon the Horton Stream Order approach).

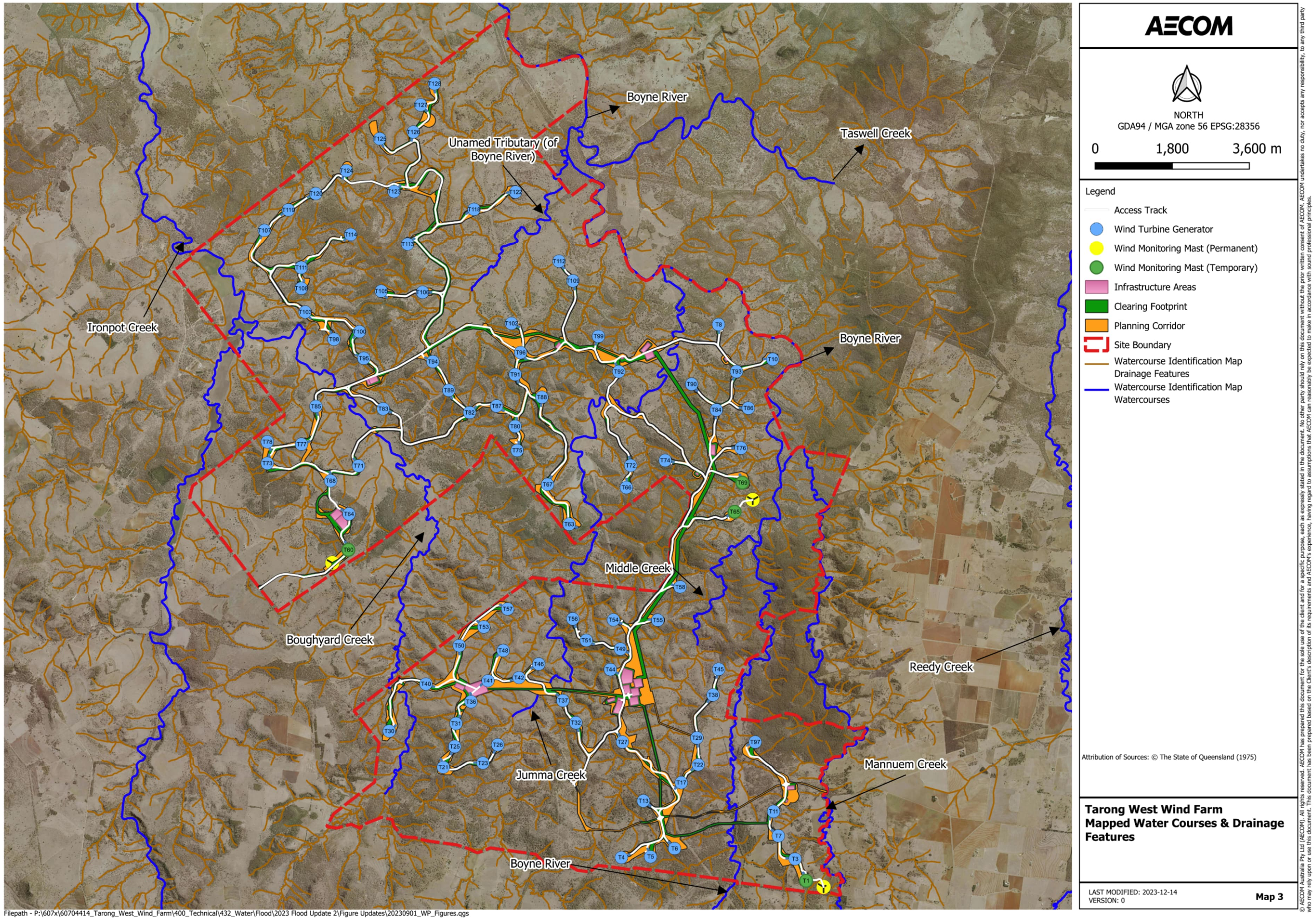


Figure 2 Watercourses

3.3 Soils

The soils spatial data available from the Queensland Government (Department of Resources) is mapped on Figure 3. The southern and western sections of the site are mapped as vertosols, with ferrosols mapped in the central-eastern portion, changing to sodosols for the northern-most section.

- Vertosols: a grey, shrink-swell, cracking clay soil with a self-mulching surface and a gypsic horizon in the subsoil. Vertosols have moderate to low permeability, depending on surface condition and water content. Erosion hazard is moderate on disturbed slopes. The soil type is usually extremely saline below 0.5 m and strongly acid at depth.
- Ferrosols: well-drained soils with red or yellow-brown colour with clay-loam to clay textures associated with areas of former volcanic activity. Ferrosol topsoils typically contain 35-50% clay, with kaolinite the dominant clay mineral, and high iron content. They have a relatively stable structure and used for intensive crop production in the Kingaroy region.
- Sodosols: a texture-contrast soil that is strongly sodic and not strongly acid in the upper 0.2 m of the red clayey B horizon, the lower part of which is calcareous. Sodosols have low to very low permeability in the sodic B horizon. Erosion hazard is high, due to a highly dispersive layer below 0.15m. The soil type has high to very high salinity below 0.30 m.

The regional mapping of soils suggest that a variety of soil conditions could be encountered across the distributed project development. The primary soils risks associated with the project are expected to be:

- Dispersive soils (Sodosols) may require specific erosion and sediment control measures to be instated, and specific construction or handing methods may need to be used to manage potential impacts.
- Acidic soil and saline soils (such as the Vertosols) may need to be treated with soil ameliorants if they are disturbed.

The handling of soils during construction would be managed by the project's final CEMP and specifically the Construction Erosion and Sediment Control Plan (ESCP). More details are described in Section 5.0

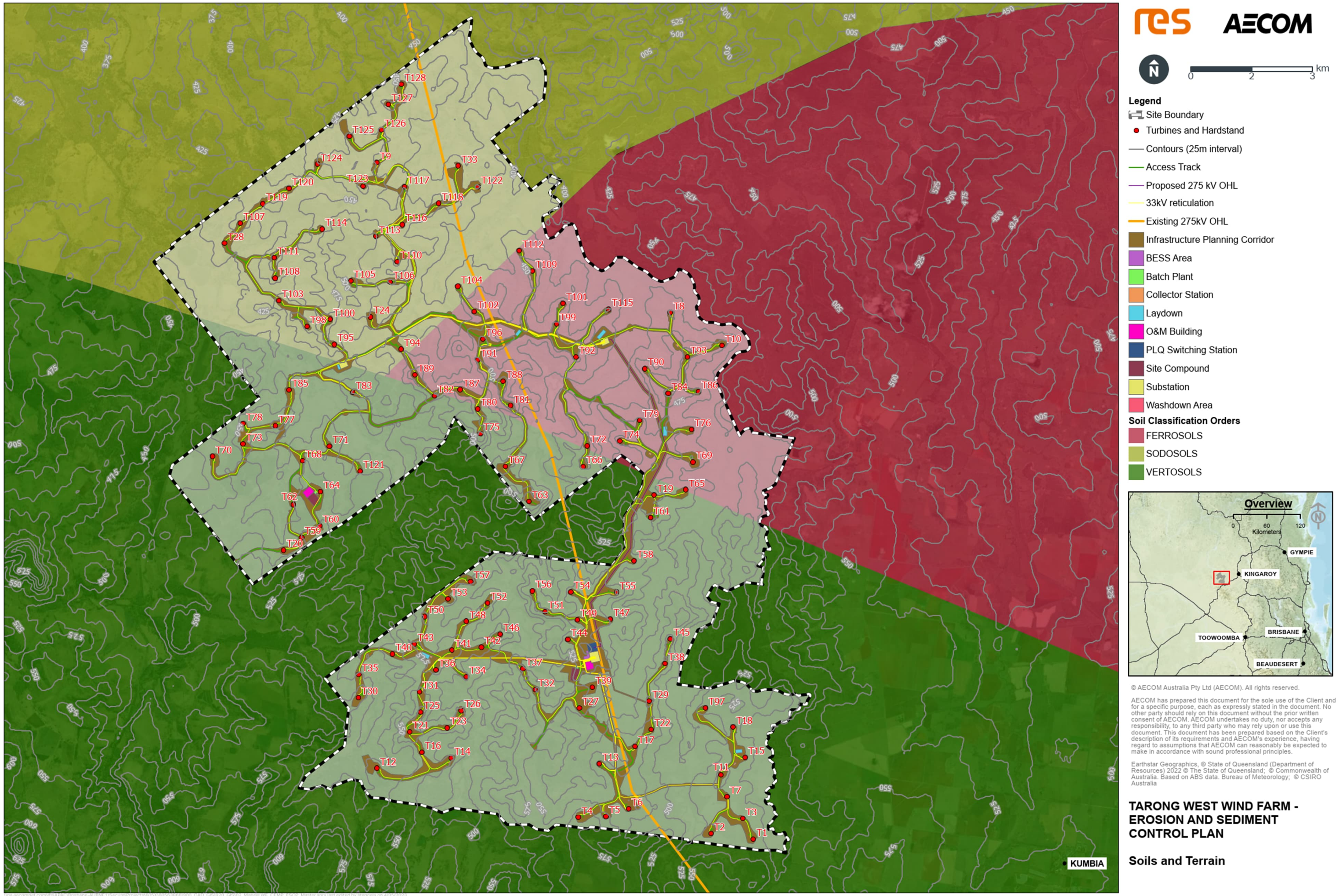


Figure 3 Soils and terrain

3.4 Surface Water Quality

No direct water quality measurements or qualitative water quality information is available for any watercourses that reside within the Project Site. The nearest publicly available water quality data is from the Boyne River DNRME stream gauge at Carters (GS 136315A). Although this gauge is located approximately 35 km downstream of the Project boundary there is likely to be some similarities for the upstream water quality. A summary of the water quality characteristics at Boyne River at Carters (GS 136315A) is presented in Table 3.

Table 3 Water Quality Data for DNRME Stream Gauge Boyne River at Carters (136315A)

Water Quality Data	Units	Maximum Result	Median Result	Minimum Result
Nitrate as NO_3	mg/L	12	1	0
Total Nitrogen	mg/L	1.8	0.585	0.4
Total Phosphorus	mg/L	0.4928	0.0825	0.049
Dissolved Oxygen	mg/L	9.8	6.5	5.4
Turbidity	NTU	338	14	1
Suspended Solids	mg/L	2500	20	2
pH		8.5	7.8	6.99
Salinity	µS/cm	1670	1050	150
Sulphate	mg/L	23	7	1.4

3.5 Land Use and Infrastructure

Cleared land within the Project Site is predominantly used for grazing. Built infrastructure is generally limited to those associated with the host-landowners' agricultural properties, including homesteads and sheds.

The Project Site is traversed in the north by state-controlled Kingaroy-Burrandowan Road, and dissected by several local roads, including Ironpot Road, Jumma Road, Boyne River Road and Greystonlea-Jumma Road.

4.0 Project Activities

This section provides an overview of project lifecycle activities with potential to generate impacts to soil and water quality.

4.1 Project Elements

The Project will involve the construction and operation of a wind farm consisting of up to 97 wind turbines with an overall rated capacity of up to 436.5 megawatts (MW) of clean and renewable electricity to supply to the National Electricity Market (NEM). The Project will be established over freehold rural properties, State land and reserves, totalling approximately 17,500 ha (Project Site), with a planning corridor of approximately 1,952.96 ha and a maximum clearing and construction footprint of 1,062.14 ha within the corridor. The planning corridor includes the proposed wind turbines, access tracks, underground cables, overhead lines and other associated infrastructure. Except for where there are turbine towers and associated infrastructure, the existing land will continue to be used for rural purposes including grazing livestock and cropping.

Further specific design of project infrastructure, access tracks, creek crossing infrastructure, stormwater drainage, erosion and sediment control features will be undertaken by RES and their construction contractor within detailed design. This will be carried out with consideration to the information outlined in sections 1.3 and 2.0.

4.2 Construction

Construction activities that could influence levels of erosion and sediment loss include:

- road formation, traffic use and maintenance (e.g. compaction and dust generation).
- watercourse crossing structures, e.g. bridges, culverts and level bed crossings.
- vegetation clearing and grubbing.
- earthworks including bulk movements, grading and levelling.
- establishment and management of stockpiles of uncompacted soils and vegetation.
- establishment of construction sites (substation, laydown areas, tower foundations).
- trenching, including excavation, filling, and/or directional drilling.
- site stabilisation, revegetation and rehabilitation.

4.3 Operation and Maintenance

Operation and maintenance activities that could influence levels of erosion and sediment loss include:

- road traffic use and road maintenance (e.g. compaction and dust generation).
- stormwater flows from hardstand and disturbed areas.

5.0 Identified Risks and Controls

An assessment of the potential for erosion hazards associated with the proposed development has been undertaken. This has considered at a high level:

1. The general spatial and temporal assessment of the erosion hazards associated with the proposed development.
2. The potential risks associated with the hazards.
3. The likely control measures and design criteria that are to be applied to mitigate the identified risks.

A summary of the assessment is provided in Section 5.1.6, including the likely controls, which will be amended or confirmed in the detailed ESCP.

To support a planned approach to erosion and sediment control, proposed project activities have been categorised:

- Access Tracks:
  - Network of access tracks to facilitate construction and ongoing management of the turbines.
- Turbine Hardstand Areas:
  - Footing and hardstand area associated with each turbine.
- Infrastructure Areas including operation and maintenance facilities.
  - BESS, substation, temporary laydown areas
- Trenching and Overhead Power Lines:
  - Associated with cabling and transmission works.

It is noted that the area of disturbance for the Project activities is generally small and distributed, except for infrastructure areas.

5.1 Site Hazard Assessment

5.1.1 Soil Loss Estimation

As part of the erosion and sediment control planning process, preliminary calculations have been developed to estimate the potential rate of soil loss over site infrastructure areas. The calculations are preliminary due to:

- no available site specific soil test data
- detailed design of turbine hardstand and infrastructure areas is not yet available.

The calculations were developed utilising the RUSLE (Revised Universal Soil Loss Equation) equation, as described in AustIECA (2008). The RUSLE equation is:

$$A = R \times K \times LS \times C \times P$$

Where
A = Annual soil loss due to erosion (t/ha/yr)
R = rainfall erosivity factor
K = Soil erodibility factor
LS = topographic factor derived from slope length and slope gradient
C = cover and management factor
P = erosion control practice factor

R Factor parameters were adopted from AustIECA (2008) as listed for the location of Toowoomba, and are listed in Table 4.

Table 4 Adopted R-Factor

Month	R-Factor
Jan	504
Feb	414
Mar	285
Apr	161
May	127
Jun	100
Jul	89.7
Aug	58.1
Sep	79.2
Oct	166
Nov	248
Dec	409
Annual	2642

In the absence of specific soil test data, the potentially present surface soil types of Vertosols, Ferrosols and Sodosols (refer Section 3.2) were utilised. Based on the assumed soil texture class K Factor values were adopted (refer Table 5).

Table 5 Preliminary K Factors

Soil Type	Assumed Soil Texture Class	K Factor
Vertosols	Medium Clay	0.015
Ferrosols	Clay Loam to Clay	0.018
Sodosols	Light Clay Loam	0.025

LS Factors describe the length and gradient of disturbed areas. Based on the available layout of turbine hardstand and infrastructure areas, which are expected to comprise hardstand pads with minimal gradients, LS factors were adopted as listed in Table 6. Access tracks or roads and the associated longitudinal drainage were not considered for this site hazard assessment as they present a very low erosion risk due to the absence of any upstream catchment, the very short flow lengths, the engineered stabilised surface and the frequency of drainage controls. These controls are discussed in more detail in Section 5.2.3.1.

Table 6 Preliminary LS Factors

Type	Assumed Flow Length	Assumed Gradient	LS Factor
Turbine	60 m	1%	0.18
Infrastructure Area	200 m	1%	0.24

C Factors describe the extent of cover (such as canopies) which reduce the impact erosivity of rainfall. C Factors were adopted as 1, representing no significant cover (refer Table 7).

Table 7 Preliminary C Factors

Type	C Factor
Turbine Hardstands	1
Infrastructure Areas	1

P Factors describe the surface conditions expected within disturbance areas. The default construction site condition was adopted as listed in Table 8.

Table 8 Preliminary P Factors

Surface Condition	P-Factor
Compacted and smooth (default construction phase condition)	1.3

The outcomes of the RUSLE equation development, for the potentially present soils and infrastructure types are listed in Table 9.

Table 9 RUSLE Estimates

Soil Type	Infrastructure Type	Annual Soil Loss Estimate (tonnes/ha/yr)
Vertosols	Turbine Hardstand Area	15.5
Ferrosols		18.5
Sodosols		15.5
Vertosols	Infrastructure Area	20.6
Ferrosols		24.7
Sodosols		20.6

Overall, the annual soil loss estimates (t/ha/yr) are minor, principally influenced by:

- low adopted gradients and flow distances (LS Factors)
- moderate rainfall intensity at the site location

AustIECA (2008) provides an erosion hazard assessment table (Soil Loss Class), to inform the magnitude of erosion hazard which is reproduced in Table 10.

Table 10 Soil Loss Class

Erosion Hazard	Soil loss (tonnes/ha/year)	Soil Loss Class
Very Low	0 - 150	1
Low	151 - 225	2
Low to Moderate	226 - 350	3
Moderate	351 - 500	4
High	501 - 750	5
Very High	751 - 1500	6

Erosion Hazard	Soil loss (tonnes/ha/year)	Soil Loss Class
Extremely High	>1501	7

The preliminary loss estimates suggest the erosion hazard for the Turbine and Infrastructure areas is generally Very Low (Soil Loss Class 1).

These estimates, whilst conceptually derived, suggest that erosion risks are of a minor scale, requiring common-sense application of ESC control measures. In general, a requirement for instatement of sediment basins and pond systems is not currently expected.

Notwithstanding, the erosion hazard of the site infrastructure should be revisited when the following information is available:

- detailed design of infrastructure areas
- site specific soil testing data to inform the erodibility of soils (refer to Section 3.3 for more details).

A key element of risk to be considered is the extent to which Sodosol soil types, or other dispersive soil types, are expected to be disturbed, as the erosion hazard of these soils can be significant. Dispersive soils can require specific erosion and sediment control planning.

5.1.2 Access Tracks

Access tracks have the potential to cause erosion and sediment issues during both the construction and operation phase.

The proposed access tracks traverse minor gullies, as well as more significant drainage paths. The tracks also traverse watercourses. However, these are outside the scope of this conceptual erosion and sediment control plan as site-specific detailed design information is required.

Typical details for the access tracks are attached in Appendix A.

Currently, a layout of the proposed access tracks has been developed, however a detailed design has not been completed. Accordingly, the precise elevations of the access track crest, and locations of cut or fill excavation are not yet known.

Where the access tracks are elevated compared to the existing ground level, upstream flow paths are likely to be interrupted by the access track. Conversely, any locations of access track formed in excavation are likely to prevent flows from conveying further downstream.

The key activities associated with the proposed access tracks are as follows:

- vegetation removal (clearing)
- topsoil stripping and sub-excavation
- earthworks (track construction)
- vehicles (construction plant and operational use)

The key risks associated with the activities required for access track construction are as follows:

Table 11 Access Tracks - Key ESC Risks

Risk	Description	Applicability	
		Construction	Operational
Mobilisation of soil	Mobilisation of soil from cleared and/or sub-excavated footprint of access tracks. Mobilisation of soil may occur in dry (dusting) or wet conditions (erosion).	Yes	No

Risk	Description	Applicability	
		Construction	Operational
Disruption of drainage paths	The construction of access tracks has the potential to alter the existing drainage path structures, resulting in changed hydraulic conditions during runoff events. Where a drainage path is obstructed, reduced runoff may result in loss of vegetation and subsequent erosion or gullying. Where a drainage path receives additional catchment areas, increased runoff may result in hydraulic scour.	Yes	Yes
Hydraulic scour	Where drainage features are instated (such as culvert crossings or sag points), hydraulic scour may occur.	Yes	Yes
Dusting of access track materials	Wind induced mobilisation of access track materials	Yes	Yes

The primary ESC risks are posed during the construction phase, during clearing and earthworks. After construction, a residual risk relates to the ongoing maintenance and management of the road and associated stormwater drainage system.

It is noted that overall, the density of disturbance posed by the proposed access track system is low, however the ESC risk is distributed over a wide area.

5.1.3 Turbine Hardstand Areas

The key activities associated with the proposed Turbine Hardstand Areas are as follows:

- vegetation removal (clearing)
- topsoil stripping and sub-excavation
- earthworks (hardstand)
- construction (turbine)
- vehicles (construction plant)

The key risks associated with the activities required for Turbine Hardstand areas are listed in Table 12:

Table 12 Turbine Hardstand Areas - Key ESC Risks

Risk	Description	Applicability	
		Construction	Operational
Mobilisation of soil	Mobilisation of soil from cleared and/or sub-excavated footprint of access tracks. Mobilisation of soil may occur in dry (dusting) or wet conditions (erosion).	Yes	No
Hydraulic scour	Concentrated flow may result in hydraulic scour of soil and other materials where: • Upstream flows are diverted around hardstand areas (as local drains) • Runoff generated over hardstand areas are discharged downstream	Yes	Yes
Dusting of hardstand materials	Wind induced mobilisation of hardstand materials	Yes	Yes

The primary ESC risks are posed during the construction phase, during clearing and earthworks. After construction, a residual risk relates to the ongoing maintenance and management of the hardstand turbine areas.

Overall, the area of each turbine hardstand area is small but distributed. Additionally, the location of hardstand areas is typically at elevation, proximate to topographic rises (ridgelines), which reduces the erosion risk posed by runoff events due to lack of large concentrated flowpaths.

5.1.4 Infrastructure Areas

The infrastructure areas will contain temporary and long-term infrastructure associated with the project, such as construction lay-down areas, BESS, substations and operation and maintenance areas.

The key activities associated with the proposed infrastructure areas are as follows:

- vegetation removal (clearing)
- topsoil stripping and sub-excavation
- earthworks (hardstand) including areas of cut and fill
- construction (offices, substations, battery energy storage system, etc)
- vehicles (construction plant).

The key risks associated with the activities required for Turbine Hardstand areas listed in Table 13:

Table 13 Infrastructure Areas - Key ESC Risks

Risk	Description	Applicability	
		Construction	Operational
Mobilisation of soil	Mobilisation of soil from cleared and/or sub-excavated footprint of access tracks. Mobilisation of soil may occur in dry (dusting) or wet conditions (erosion).	Yes	No
Hydraulic scour	Concentrated flow may result in hydraulic scour of soil and other materials where: • Upstream flows are diverted around infrastructure areas such as trenching and overhead power lines (as local drains) • Runoff generated over hardstand areas are discharged downstream	Yes	Yes
Dusting of hardstand materials	Wind induced mobilisation of infrastructure materials	Yes	Yes

5.1.5 Trenching and Overhead Power Lines

Trenching involves the excavation of alignments for the purpose of installation of services, followed by fill works to re-establish natural ground levels. Construction of overhead power lines may include clearing of footings, pad construction and tower construction and installation.

The key activities associated with the proposed trenching are as follows:

- vegetation removal (clearing)
- topsoil stripping
- excavation, trenching and installation of services
- earthworks (fill)

The key risks associated with the activities required for trenching areas are listed in Table 14:

Table 14 Trenching and overhead powerline areas - Key ESC Risks

Risk	Description	Applicability	
		Construction	Operational
Mobilisation of soil	Mobilisation of soil from cleared and/or sub-excavated footprint of trenching alignments. Mobilisation of soil may occur in dry (dusting) or wet conditions (erosion).	Yes	No
Hydraulic scour	Concentrated flow may result in hydraulic scour of soil and other materials where: • Upstream flows are diverted around infrastructure areas such as trenching and overhead power lines (as local drainage) • Runoff generated over infrastructure areas are discharged downstream	Yes	Yes

5.1.6 Summary

The proposed project activities have been assessed using RUSLE calculations, with key activities and ESC risks associated with the project infrastructure assessed.

Overall, the anticipated erosion and sediment risks associated with the project are considered very low to low, in association with the generally small footprint areas of disturbance. The most significant risks are associated with the proposed access tracks, which have the potential to impact existing drainage paths and waterways.

5.2 Controls

5.2.1 Sequencing

A key mitigation method for erosion and sediment risks is the proper sequencing of ESC during the planning, design and construction phases. Correct sequencing of ESC activities ensures that appropriate mitigations are in place prior to activities occurring that pose erosion and sediment risks to the downstream receiving environment. The sequence of activities will most likely comprise:

- Prior to Design Phase:

  Site soil sampling and testing may be completed to characterise the present topsoil and subsoil units. Noting the distributed nature of the Project, it is proposed that soil testing be completed for:

  - areas of proposed major infrastructure, locations of exposed soils such as batters, and areas of cut and fill.
  - major crossings of waterways and drainage paths by the proposed access tracks.

  Soil sampling may include a photographic record of soils, such that classification of soils can be inferred more widely across the project during the construction phase using visual inspection and at-site soil classification methods.

- Design Phase:
  - Proceeding approval, the development of a detailed design for the project will occur. Once the layout of proposed infrastructure and temporary construction works is finalised, and the present site soils are characterised, hydraulic sizing and design of the stormwater drainage system will be completed.
  - ESC considerations may be integrated into the drainage design, which may be reflected in the ESCP. The design may consider:
    - temporary control measures (to mitigate erosion during the construction phase)

    - permanent control measures (to mitigate erosion throughout operation of the completed project).
  - The ESCP may be revised to comprise a 'for construction' ESCP specific to the design and analysed soil conditions.
  - Key construction personnel will be trained in the application and execution of the 'for construction' ESCP.
- Construction Phase:
  - Prior to significant construction works:
    - temporary or permanent diversion drains may be installed to prevent runoff from upstream catchments eroding the exposed soils
    - sediment control features may be installed at locations downgradient of earthworks
  - During construction:
    - preserve existing vegetation at planned disturbance areas for as long as possible
    - routine monitoring and inspection of construction areas and downstream receiving drainage paths and waterways will be undertaken
    - depending on weather, dust suppression activities may be undertaken
    - regular clean out and maintenance of ESC features may occur, including removal of sediment from sediment control features.

  The ESC measures would be proposed to remain in place during the construction phase, until a stable, non-eroding landform had been constructed, whereupon they would be removed, or repurposed as designated outflows for runoff from internal areas for the operational phase.

  Additionally, construction works may be sequenced to limit the extent of works that are in a cleared and/or stripped phase, to limit the footprint of works that has not been constructed to a stable non eroding landform at any given time.
- Operational Phase:
    - Ongoing inspection and maintenance of the stormwater drainage system will occur.

5.2.2 Review of Controls

A review of potential control methods, for consideration in future ESCP activities was completed.

Erosion control techniques suitable for project disturbance areas are listed in Table 15.

Table 15 Erosion Control Techniques – Surface(s)

Technique	Typical Use
Gravelling	• Protection of non-vegetated soils from raindrop impact erosion. • Stabilisation of site office area, car parks and access tracks or roads.
Revegetation	• Temporary and permanent stabilisation of soil. • Stabilisation of long-term stockpiles of uncompacted soils
Rock Mulching	• Stabilisation of long term, non-vegetated banks and minor drainage channels.
Compaction	• Compaction of hardstand areas utilising construction plant (such as rollers) to produce a stable non-eroding surface.
Dust Suppression	• Treating areas such as road surfaces and bare soils to minimize windborne erosion.

Supplementary sediment controls are used in areas where the sediment producing catchment is small or the potential for producing sediment laden runoff is low. A list of appropriate supplementary sediment control techniques is given in Table 16.

Table 16 Supplementary Sediment Control Techniques (IECA 2008)

Technique	Typical Use
Check Dam / Sediment Trap	• Supplementary sediment trap in minor concentrated flow areas. • Trapping sediments in table drains and minor drainage lines. • Check dams may be constructed of rock, sand bags or compost filled socks.
Buffer Zones / Grass Filter Strips	• Mostly suited to sandy soils. • Can provide some degree of turbidity control while the buffer zone remains unsaturated.
Sediment Fence	• Supplementary device for sheet flow from minor catchment areas. • Suitable for all soil types. • Require maintenance after every runoff event.

Should the risk of erosion increase following soil sampling, primary sediment control techniques may be required and are listed in Table 17.

Table 17 Primary Sediment Control Techniques (IECA 2008)

Technique	Typical Use
Rock Filter Dam	• Locations where there is sufficient room to construct a relatively large rock embankment. • The incorporation of a filer cloth is the preferred construction technique if the removal of fine-grained sediment is critical (high maintenance).
Sediment Basin (Type C)	• Best suited to coarse grained soils. • Use when working areas containing coarse grained good settling soils.
Sediment Basin (Type F and D)	• Best suited to fine grained or dispersive soils. • Use for trapping coarse and fine sediments. • Assists with turbidity control. •

5.2.2.1 Minimum Controls

To mitigate the identified risks, minimum ESC controls for the development are recommended to comprise the elements listed in Table 18. Additional ESC controls may be required depending on identified soils from sampling. A list of other general ESC considerations for the types of project activities proposed is outlined in Table 19.

Table 18 Minimum ESC Controls

Aspect	Control(s)
Erosion Control – Upstream of construction areas	Design and instatement of the stormwater drainage system, including: • Longitudinal drainage (Access Tracks) • Transverse drainage - Culvert and/or pipes (Access Tracks) • Temporary Diversion (Trenching) • Permanent Diversion (Infrastructure Areas, Turbine Hardstand Areas)
Dusting from construction areas	• Dust suppression
Erosion Control - construction areas	• Planning to minimise the total disturbed footprint at any given time
Erosion at outlets of construction areas	Instatement of: • Rock splash-pad • Sediment Fencing (or similar) • Sediment Traps at concentrated flow locations

Table 19 Identified risks and controls

Phase / Activity	Risk of impacts to/from	Typical controls
Design	Generally: • Soil • Creeks • Vegetation	• Soil site investigations to be undertaken for infrastructure areas to confirm the presence/absence of erosion prone soils. The need for sediment trap or basin during the construction phase will be confirmed by a revision of the soil loss estimation calculation (RUSLE). • An at-site soils risk assessment will be undertaken for access track, turbine and trenching areas. The general ESC measures may assume coarse sediment control is required. Further measures for silt and dispersive measures may be instated, if the soils are identified. • Any further detailed design should take into consideration the requirements from this Conceptual ESCP. • Detailed design should consider the content of the Flood Assessment (AECOM, 2023a) and preliminary Stormwater Management Plan (AECOM, 2023b) prepared on the preliminary design, and undertake additional modelling if required as design and site investigations progress.
Construction planning and site preparation	Generally: • Soil • Creeks • Vegetation	• Prepare a CEMP that includes the staging of clearing and earthworks. • Develop a fully detailed ESCP prepared by a suitable qualified person on the final project design. • In accordance with the detailed ESCP, install ESC controls. • Ensure that erosion and sediment controls are regularly maintained, and new controls installed as required, as works proceed. • Only remove temporary erosion and sediment controls after their associated landforms are complete and permanent controls are fully established.
Clearing, grubbing	• Accelerated soil erosion • Gully erosion • Rill erosion • Sheet erosion • Wind erosion / dusting	• Land clearing areas to be surveyed and clearly defined prior to clearing commencing. • Land clearing will not occur unless preceded by the installation of appropriate drainage and sediment control measures. The exception would be any land clearing necessary to allow installation of these control measures. • Land clearing to be staged to minimise the extent and duration of soil disturbance. • The time between clearing and grubbing will be minimised. • Cleared vegetation should be mulched for use on the site or as an erosion control aid.
Earthworks	• Accelerated soil erosion • Mass movement • Soil structure	• Plan construction works to limit the amount of disturbed area at any one time. • Divert clean stormwater from upslope of disturbed areas using earth banks or catch drains, with energy dissipaters or level spreaders at their outlets as appropriate, to discharge stormwater in safe areas, avoiding erosion and flooding hazards. This requirement may be removed in situations where there is minimal risk of run-on (for example on crests). • Enact dust suppression measures for major disturbance areas. • Final site landscaping and revegetation will be undertaken as soon as practicable.
Stockpiles of uncompacted soils	• Accelerated soil erosion • Wind erosion	• Topsoil is stripped and stockpiled immediately before bulk earthworks occur. • Ensure stockpiles are located away from areas subjected to overland flow. • Topsoil stockpiles are covered or stabilised (e.g., hydro-mulched) to minimise loss through wind and water erosion.
Site stabilisation and revegetation	• Accelerated soil erosion • Mass movement • Gully erosion • Rill erosion • Sheet erosion • Stream bank erosion • Wind erosion • Scalding	• Site stabilisation may be achieved using vegetation, rock armouring, paving, concrete, geotextiles or any other cover that protects the ground surface against erosion. • The preferred site stabilisation method(s) will be identified on a site by site basis and included within the detailed ESCP. • When selecting stabilisation methods, a key factor that will be considered is the form of water runoff over the stabilised area. Areas subject to concentrated flow (i.e. watercourses and drains) will require different stabilisation techniques to those subject to sheet flow. • In most areas, revegetation will be the preferred method of stabilisation. • Use pasture grasses so that the lands may continue to be used for grazing purposes. Landowners are to be consulted and provide agreement on rehabilitation seed mixes to be used prior to construction works commencing (or as agreed between the developer and the landholder) to achieve a similar condition and pasture species composition to present conditions. • Annual cover crops may be used to provide temporary cover and under sown with the desired mix of perennial species (or as agreed between the developer and the landholder). • Revegetation details and proposed vegetation monitoring plan to be provided in the detailed ESCP and CEMP/Vegetation Management Plan.

5.2.3 Drainage System

5.2.3.1 Permanent Drainage

Permanent drainage refers to diversion channels that will remain during the operational period of the project, such as:

- diversion drains for turbine hardstand and infrastructure areas
- longitudinal drains associated with proposed access tracks
- transverse culverts and pipes associated with propose access tracks.

Any permanent diversion should be designed such that it appears and functions as a natural feature in the landscape largely indistinguishable from the natural watercourses in the area. A natural channel or flow path has features that develop through geomorphologic processes, such as channel and floodplain capacity, meanders, riffles and vegetation, to provide an environment where these conditions can continue to develop at a rate consistent with its environment. This is referred to as dynamic equilibrium. Similar features should be designed into the diversion channel in order to obtain a similar dynamic equilibrium.

Where the diversion is replacing an existing channel such as a gully, the existing gully should be used as a ‘template’ to design the diversion. That is, the diversion design should mimic the channel shape, floodplain capacity, bed slope etc. of the natural channel it replaces, where possible. Where the diversion collects an increased catchment of overland flow as it traverses downstream, a nearby natural channel that has a similar catchment area could be used as a template.

For all permanent diversions, vegetation should be used as the primary method of stabilising channel banks, terraces and floodplain drainage paths.

The following general principles should be followed in the design of drainage controls for unsealed roads, where necessary:

- Stormwater runoff from unsealed roads should be allowed to shed at regular intervals. The runoff should be discharged into a sediment trap or released as sheet flow via a level spreader into adjacent vegetation.
- Where stormwater runoff from unsealed roads collects within longitudinal table drains adjacent to the roadway, this water should ideally be discharged from the table drain at regular intervals.
- Where table drains are steep and water cannot shed, such as through a cutting or into a river channel, the alternate controls should be considered.
- When access is required across a slope, the road should be sited as close as possible to the contour of the land. This allows upslope water runoff to pass evenly across the track, thus avoiding concentrated flow.
- When an access road diagonally traverses a slope, the road will likely collect and concentrate upslope stormwater runoff. The collected runoff will need to shed at regular intervals using a level spreader or drainage channels.
- Wherever practical, longitudinal drainage such as table drains should form wide U-shaped drains to minimise potential invert erosion. Deep V-shaped drains should be avoided where roads are constructed on steep slopes along a cutting.

5.2.3.2 Temporary Drainage Controls

In accordance with IECA (2008), drainage channels, whether permanent or temporary, should be designed and constructed at a gradient that limits the maximum flow velocity to a value not exceeding the maximum allowable flow velocity for the given surface material.

Excessive flow velocities can cause channel erosion, usually along the invert of the drain, which can then lead to bank slumping and widening of the channel.

The flow velocity can be reduced by either:

- reducing the depth of flow (increasing the width of the channel)

- reducing the bed slope
- reducing the peak discharge (reducing catchment area)
- increasing channel roughness.

If the channel width, depth or gradient cannot be altered, then there are two options for controlling erosion as follows:

- reduce the flow velocity through the placement of rock check dams
- increase the effective scour resistance in the channel through the placement of an effective channel liner such as rock or an appropriate liner.

6.0 Inspections and Monitoring

An adequate inspection and maintenance program is ssential to an effective system of drainage, erosion and sediment control devices.

The precise inspection and maintenance program will be established through the:

- Construction ESCP
- Operations ESCP.

6.1 Construction phase

The ESC risks during the construction phase will be documented and managed under a construction ESCP. The plan will consider subsequent data available as the project progresses to detailed design.

The plan is expected to detail:

- planned ESC measures for infrastructure areas
- at site processes for identifying erodible and/or dispersive soils.

Frequency of inspection of ESC measures, such as:

- at the commencement of the wet season period (1 November) (e.g., at stockpiles of uncompacted soil or vegetation, trenches)
- proceeding significant rainfall events (e.g., creek crossings, sediment basin inlets and outlets).

ESC works to be executed under the Construction ESCP include:

- ensuring pre-clearing works, are instated
- maintaining erosion and sediment control measures
- inspecting adjacent drainage paths and waterways for any developing erosion issues
- ensuring ESC measures are in place until a stable non-eroding landform has been achieved, as detailed in the ESCP
- removal of temporary ESC measures.

The EPC contractor is expected to document their incident reporting procedures including:

- the chain of responsibility
- procedures for recording instances of ESC issues and corrective actions
- monthly reporting procedures (if required)
- internal recording and filing procedures.

6.2 Operations phase

Once the construction period has ended, an Operations ESCP is to be developed and executed by the site operator based on as-built conditions. The plan is expected to document the ongoing erosion and sediment control management, including:

- Management of the permanent stormwater network, including ongoing inspection, monitoring, cleaning and, if necessary, remediation. The stormwater network is expected to comprise:
  - Longitudinal and transverse drainage of the proposed access tracks
  - Local drains for infrastructure areas
- Management of road pavement surfaces, hardstand areas and batter slopes.
- Monitoring of drainage paths in proximity to site infrastructure, and remedial works, if required.

6.3 Decommissioning

Decommissioning of the site will operate according to an ESCP specific to the decommissioning and rehabilitation program or as required by regulatory authorities at the time. The execution of the ESCP will depend upon the parties involved in the decommissioning program.

7.0 Conclusions and Recommendations

This Conceptual ESCP is provided to demonstrate Tarong West Wind Farm's commitment to managing drainage, erosion and sediment risks at the Project Site and addressing applicable regulatory and planning requirements.

In preparing this document, the IECA entitled Best Practice Sediment and Erosion Control Guidelines (2008), SDAP Guidance Material – State Code 16: Native vegetation clearing and State Code 23: Wind Farm development have been considered.

Further recommendations for sediment and erosion control relevant to this project include:

- Complete soils testing for the infrastructure areas proposed to confirm soil conditions (including tests for dispersive soils) expected to be encountered during clearing works.
- Prepare a detailed construction ESCP that is in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines and SDAP State code 23 prior to any disturbing works. The detailed ESCP may contain (but is not limited to):
  - site specific targets for soil and water quality management
  - erosion assessment using the Revised Universal Soil Loss Equation (RUSLE) (if required)
  - pro forma checklists and forms for inspections, monitoring and reporting
  - any conditions stipulated by regulatory authorities based on this preliminary ESCP or the preliminary stormwater management plan (AECOM, 2022b)
  - signature of a suitably qualified and experienced professional.
- As the construction phase completes, develop an operations ESCP, scoped to cover the ongoing management and maintenance of the site.

8.0 References & Supporting Documents

AustIECA (2008), Best Practice in Erosion and Sediment Control, Australasia Division of International Erosion Control Association, November 2008.

AECOM (2023a). Tarong West Wind Farm – Flood Assessment, AECOM Australia Pty Ltd, 2023, Brisbane

AECOM (2023b). Tarong West Wind Farm – preliminary Stormwater Management Plan, AECOM Australia Pty Ltd, September 2023, Brisbane

ANZECC/ARMCANZ (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2018, Canberra.

CSIRO (2009), Australian Soil and Land Survey Field Handbook, Third Edition, National Committee on Soil and Terrain, CSIRO Publishing

Department of Environment and Science (DES), 2019 Environmental Protection (Water and Wetland Biodiversity) Policy 2019, Queensland Government.

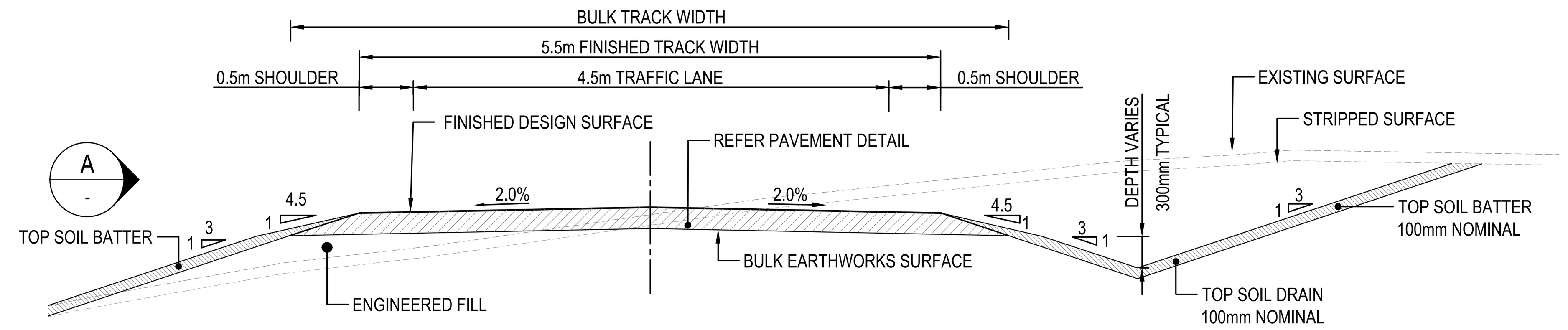
Environmental Protection Act 1994 (EP Act), Queensland Government, current as 9 December 2019.

International Erosion Control Association (IECA), 2008, Best Practice Erosion and Sediment Control – For Construction and Building Sites, Published 2008)

Department of Environment and Science (DES) (2022) Erosion and sediment control (ESC) on construction sites | Environment | Department of Environment and Science, Queensland (des.qld.gov.au)

Appendix A

Typical Access Track Details

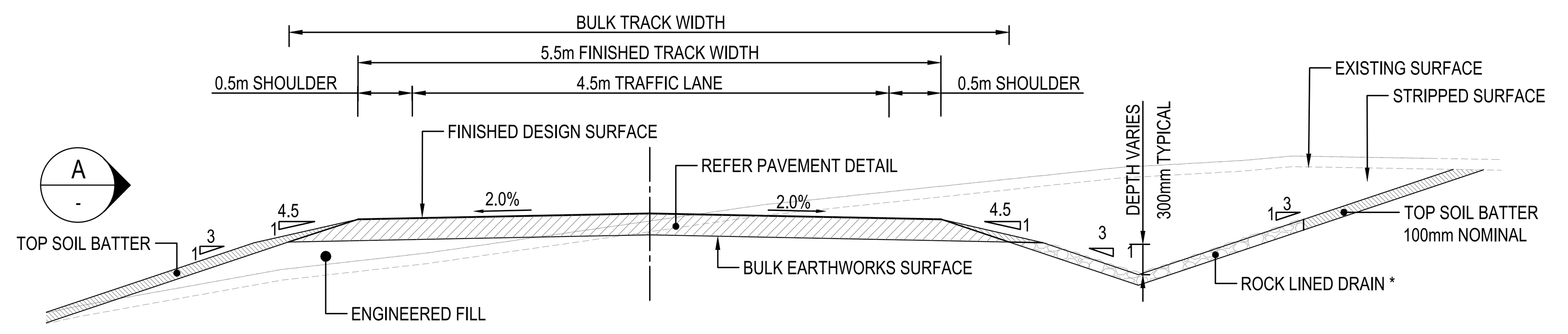


TYPICAL WIND FARM ACCESS TRACK CROSS SECTION - TOP SOIL DRAIN

NTS

TOPSOILED DRAIN ORDER

1. STRIP SURFACE
2. CUT BULK EARTHWORKS SURFACE
3. PLACE PAVEMENT
4. TOPSOIL BATTERS



TYPICAL WIND FARM ACCESS TRACK CROSS SECTION - ROCK LINED DRAIN

NTS

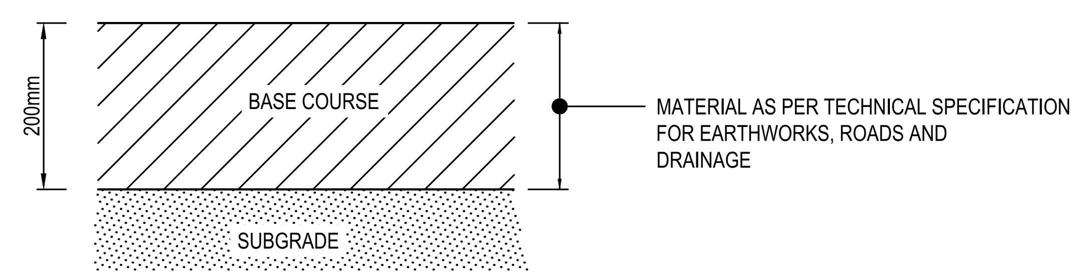
ROCK LINED DRAIN ORDER

1. STRIP SURFACE
2. CUT BULK EARTHWORKS SURFACE
3. ROCK LINE DRAINS
4. PLACE PAVEMENT
5. TOPSOIL BATTERS

PAVEMENT NOTES

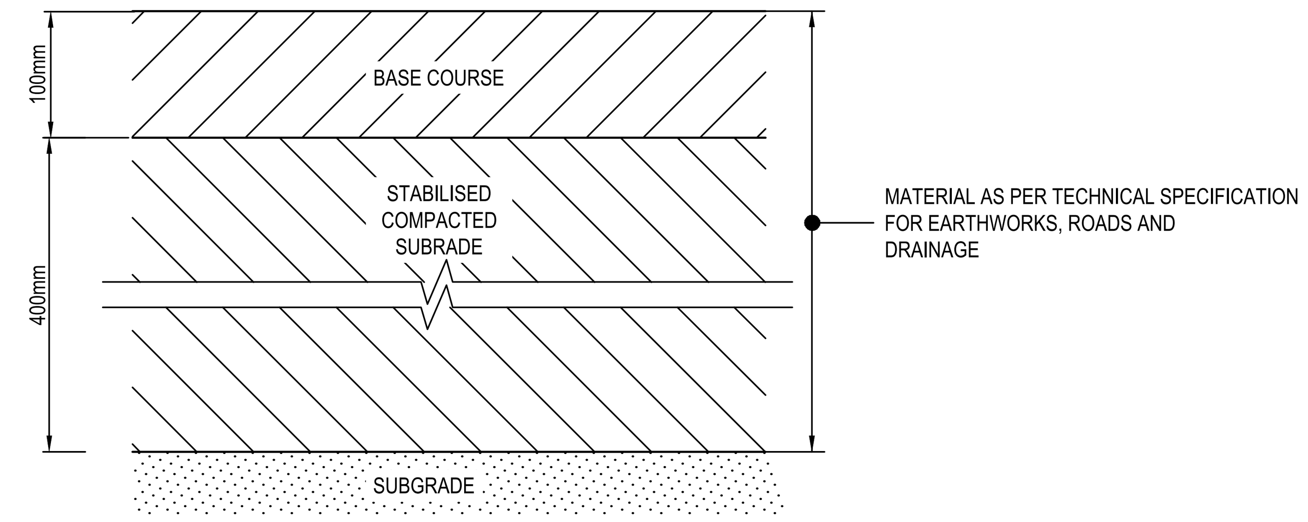
ALL PAVEMENTS ARE BASED ON A SOUND AND TRAFFICABLE SUBGRADE.
WET AND/ OR SOFT AREAS FAILING THE SUBGRADE PROOF ROLL TEST MAY REQUIRE SOME FORM OF SUBGRADE IMPROVEMENT.
THE DESIGN ENGINEER SHALL BE CONSULTED TO ASSESS OPTIONS SUCH AS;
- STABILISATION
- GEOTEXTILE STRENGTHENING
- COARSE ROCKFILL STRENGTHENING
- SUBGRADE REPLACEMENT

OR A COMBINATION OF ALL THESE OPTIONS.
SUBGRADE UNDRAINED SHEAR STRENGTH TO BE TBC OR BETTER.



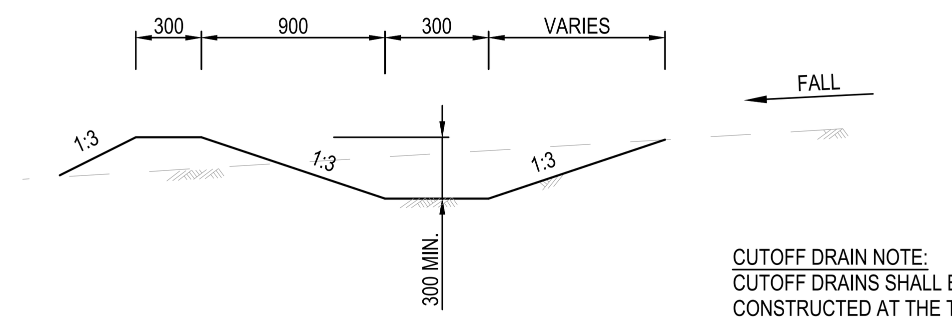
ACCESS TRACK PAVEMENT DETAILS

SUBJECT TO FINAL DESIGN BASED ON INSITU STRENGTH TESTING



ALTERNATIVE PAVEMENTS - STABILISED SUBGRADE DETAILS

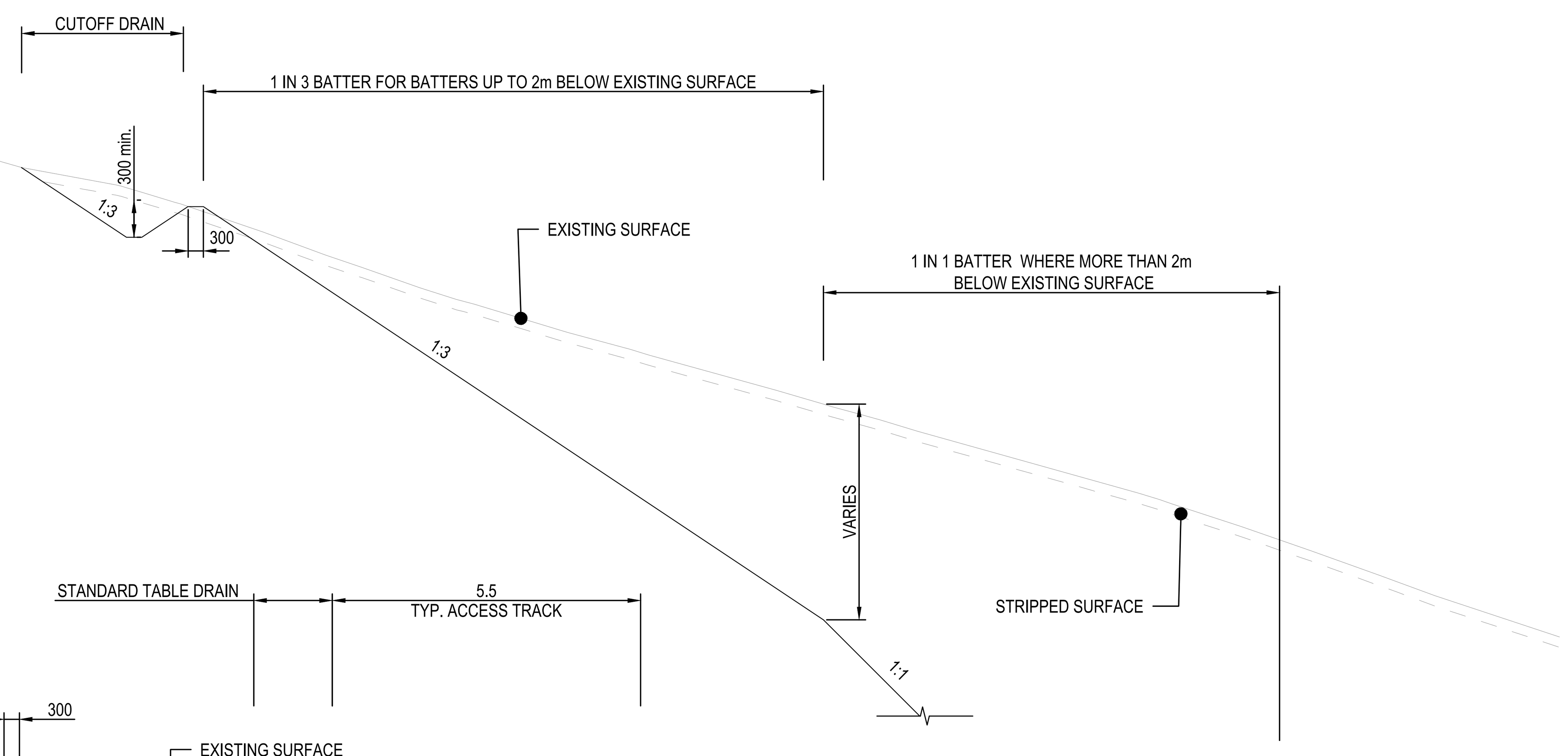
SUBJECT TO FINAL DESIGN BASED ON INSITU STRENGTH TESTING

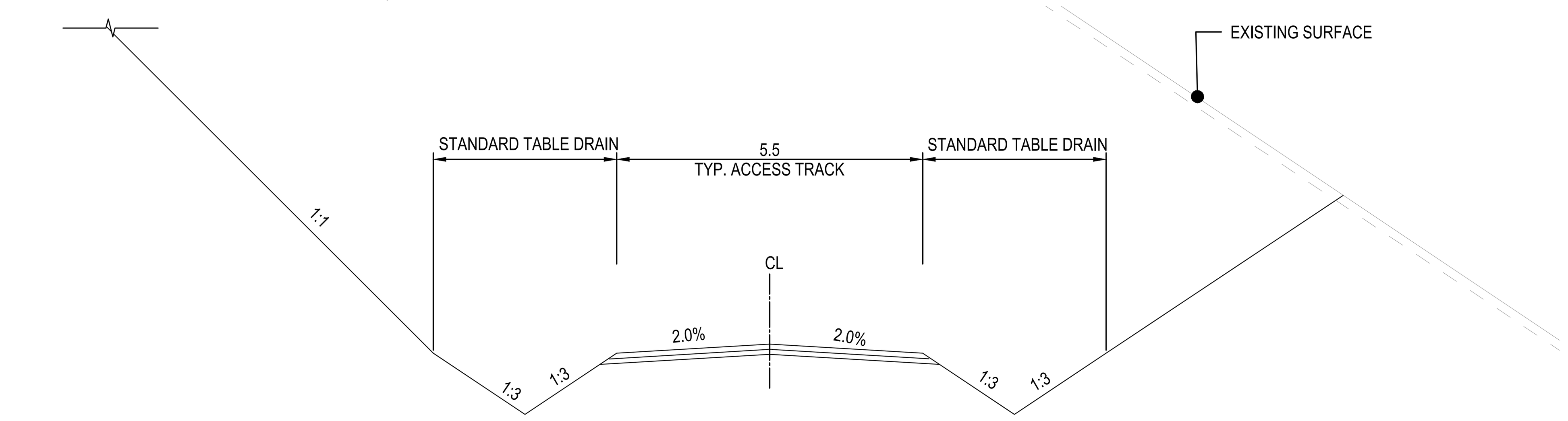


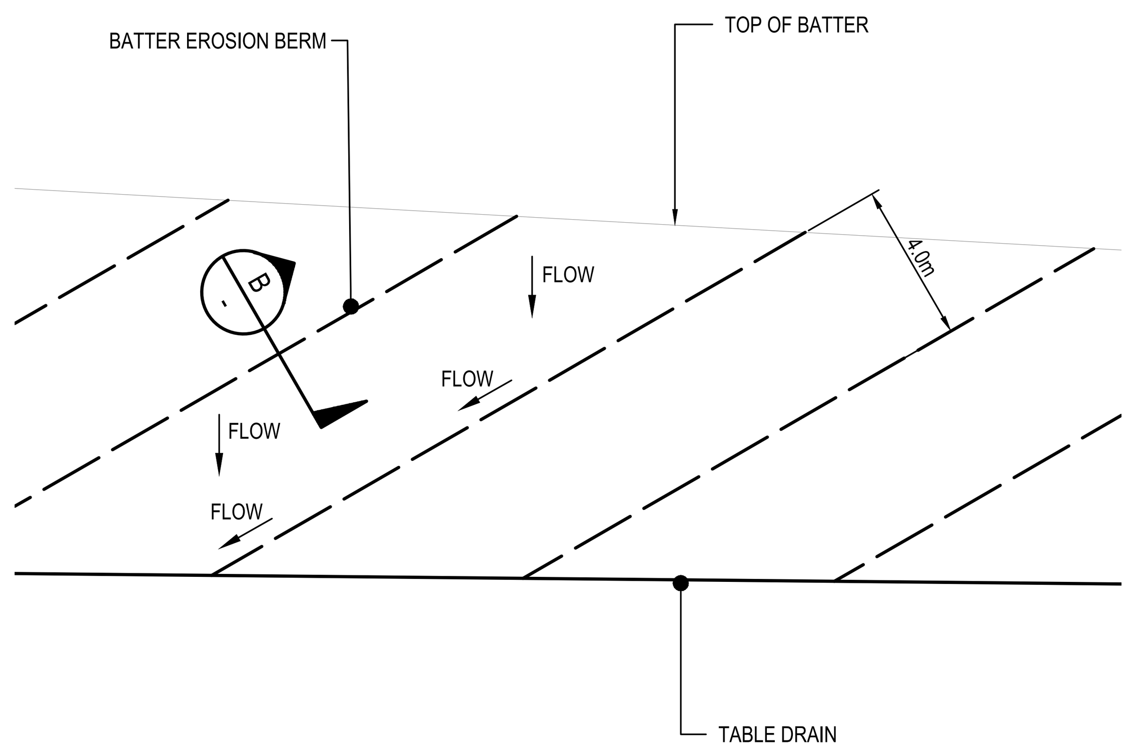
CUTOFF DRAIN NOTE:
CUTOFF DRAINS SHALL BE CONSTRUCTED AT THE TOP OF CUT BATTERS TO DIVERT CLEAN UPSLOPE WATER AWAY FROM CUT BATTERS.

TYPICAL CUTOFF DRAIN DETAIL

NTS



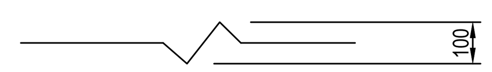




A BATTER EROSION BERM ELEVATION

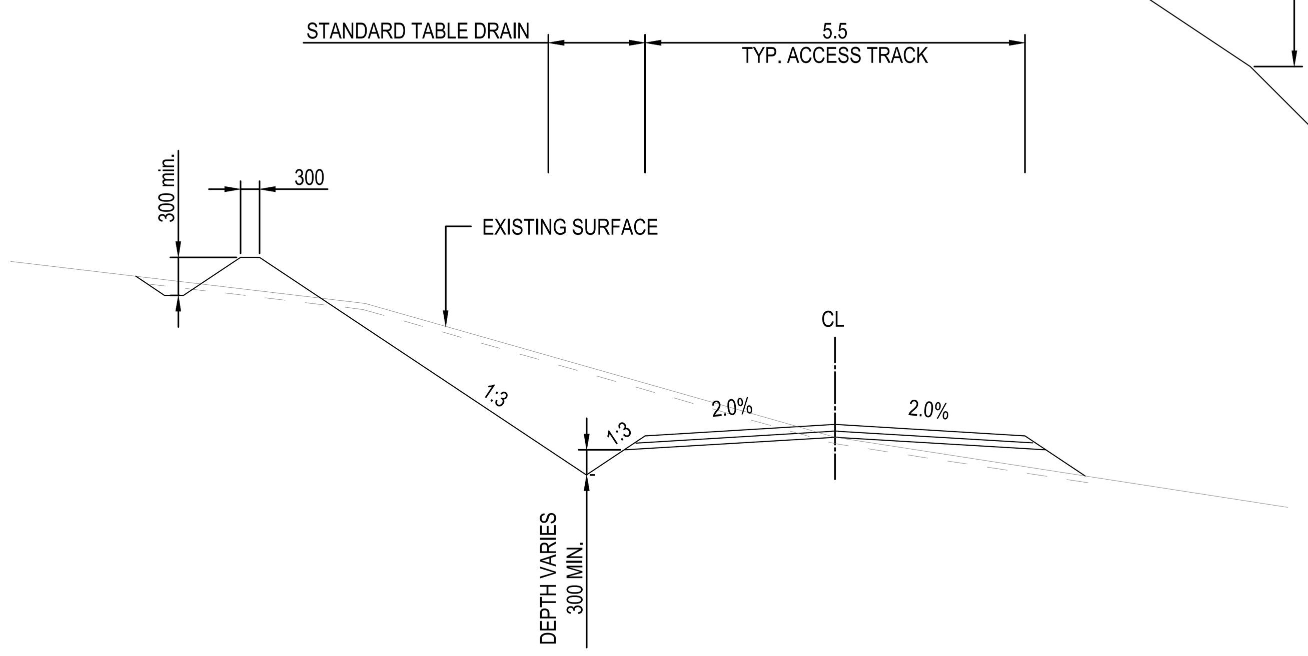
NTS

BATTER EROSION BERMS SHALL BE PROVIDED ON ALL CUT AND FILL BATTER

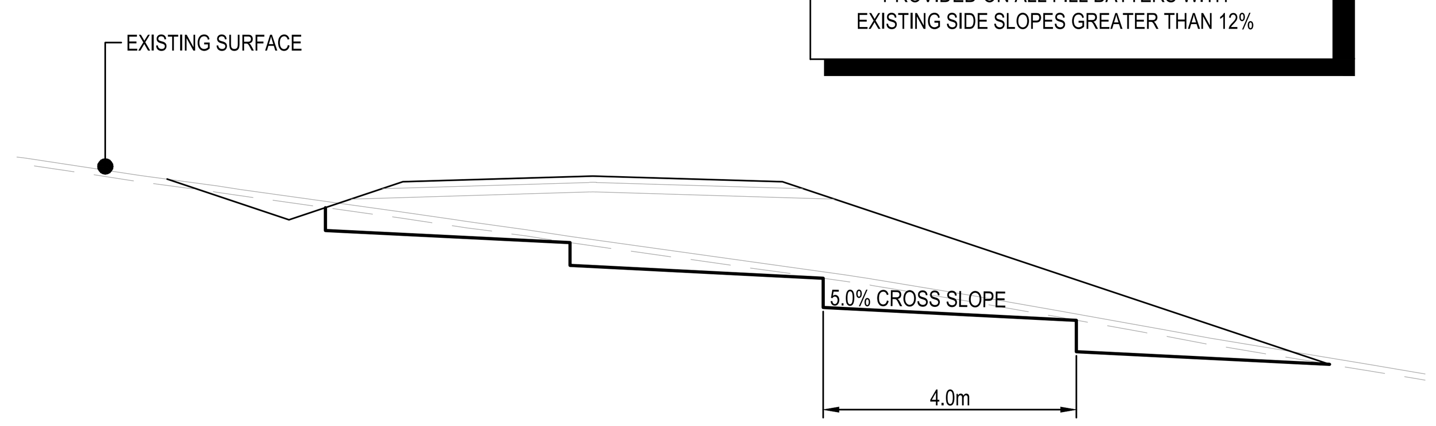


B BATTER EROSION BERM SECTION

NTS



FILL EMBANKMENT KEY IN DETAIL TO BE PROVIDED ON ALL FILL BATTERS WITH EXISTING SIDE SLOPES GREATER THAN 12%



TYPICAL WIND FARM CROSS SECTION

NTS

TYPICAL WIND FARM ACCESS TRACK CROSS SECTION - BATTERS IN CUT GREATER THAN 2m DEPTH

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TYPICAL EMBANKMENT FILL KEY DETAIL

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REV	DETAIL	DRN	CHK	APP	DATE

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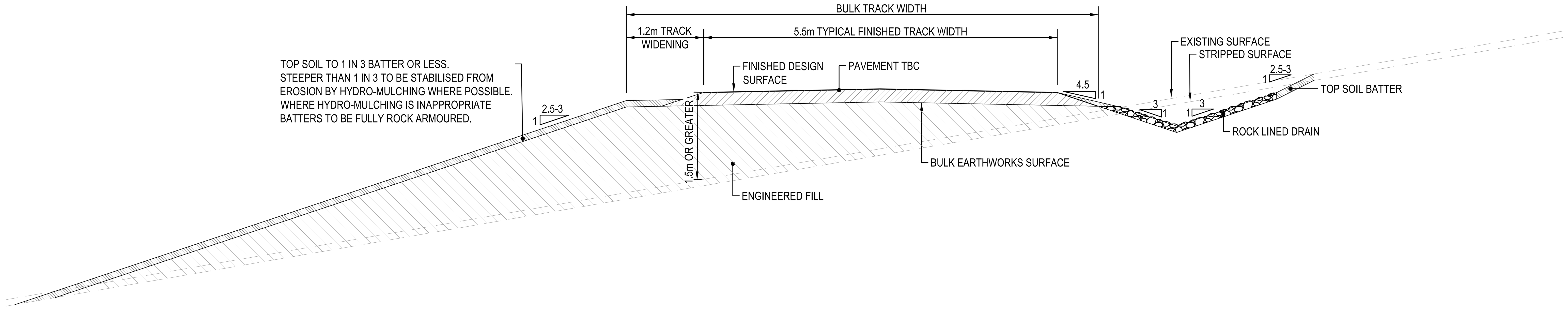
PROJECT: TARONG WEST WIND FARM

DRAWING STATUS: PRELIMINARY

TITLE: TYPICAL ACCESS TRACK CROSS SECTION DETAILS AND NOTES

PROJECT No. 18-181 | DO NOT AMEND MANUALLY | SCALE AS SHOWN | SIZE A1

DRAWING No. ILWF - TYP - 001 | REV. A



TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 1

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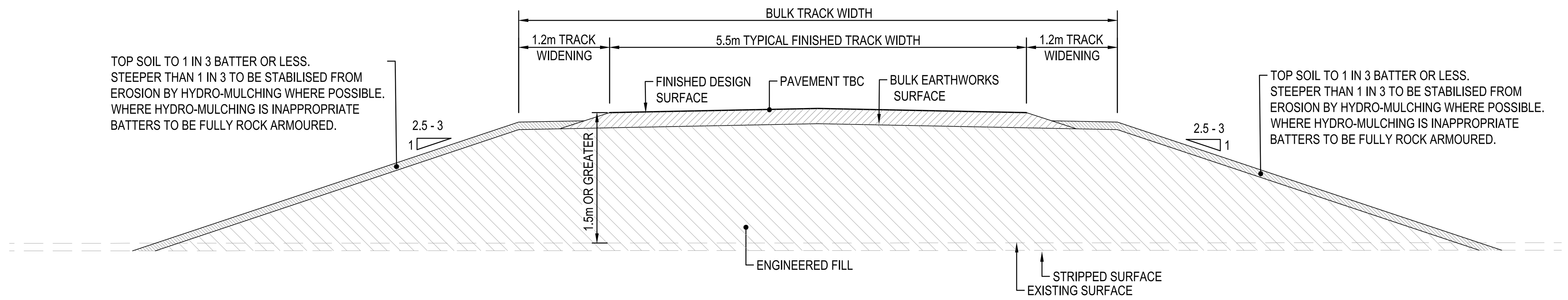

TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 2

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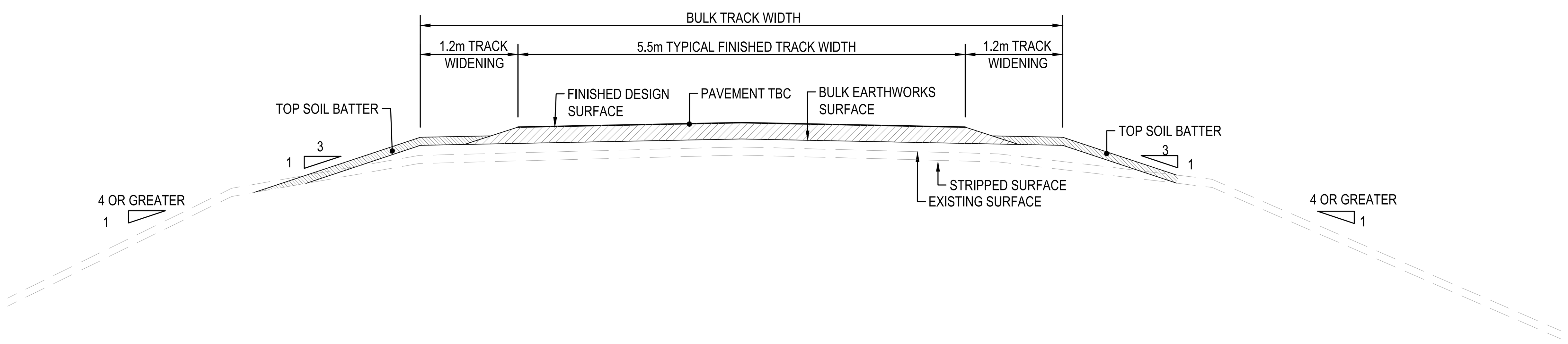

TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 3

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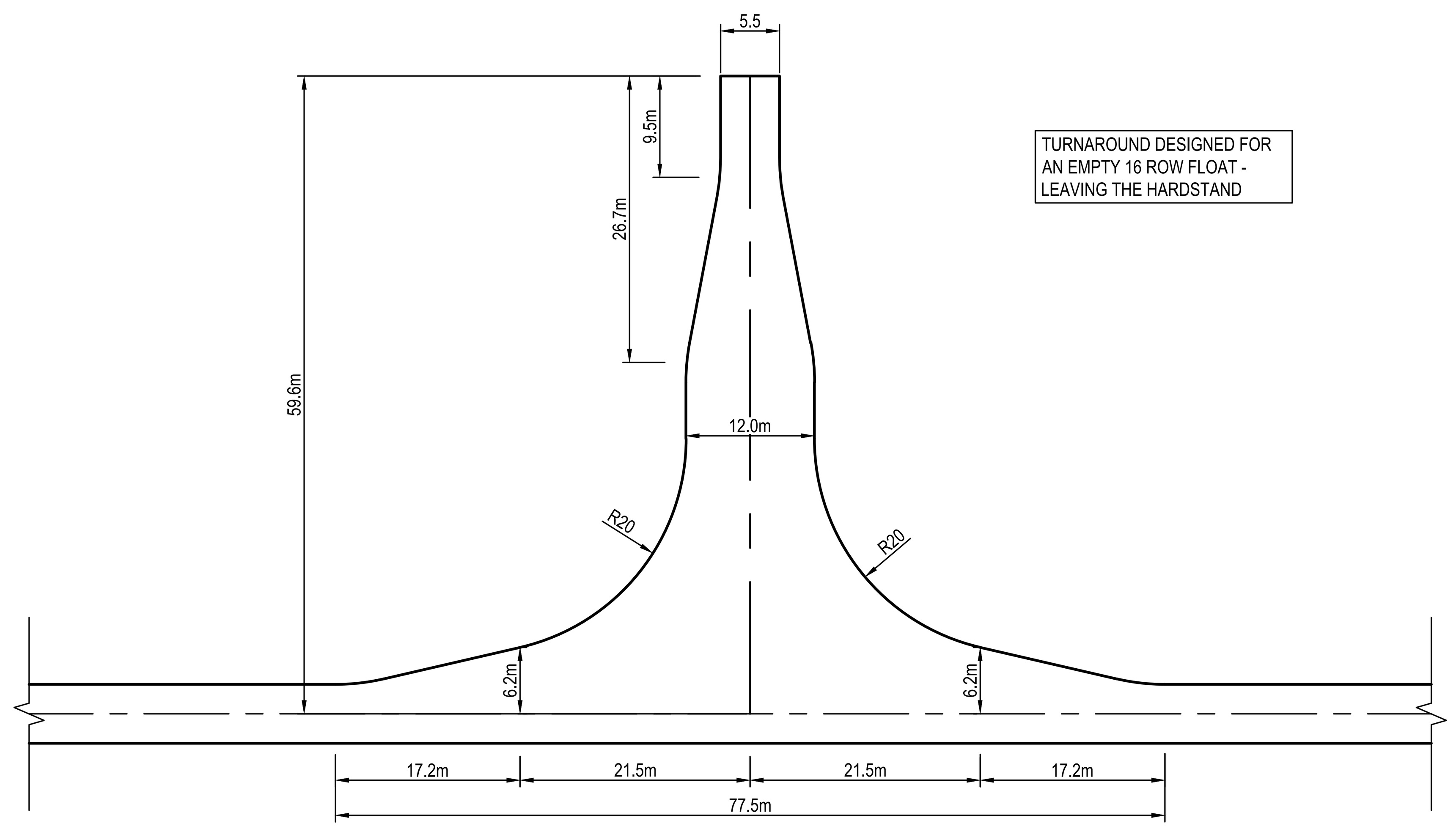
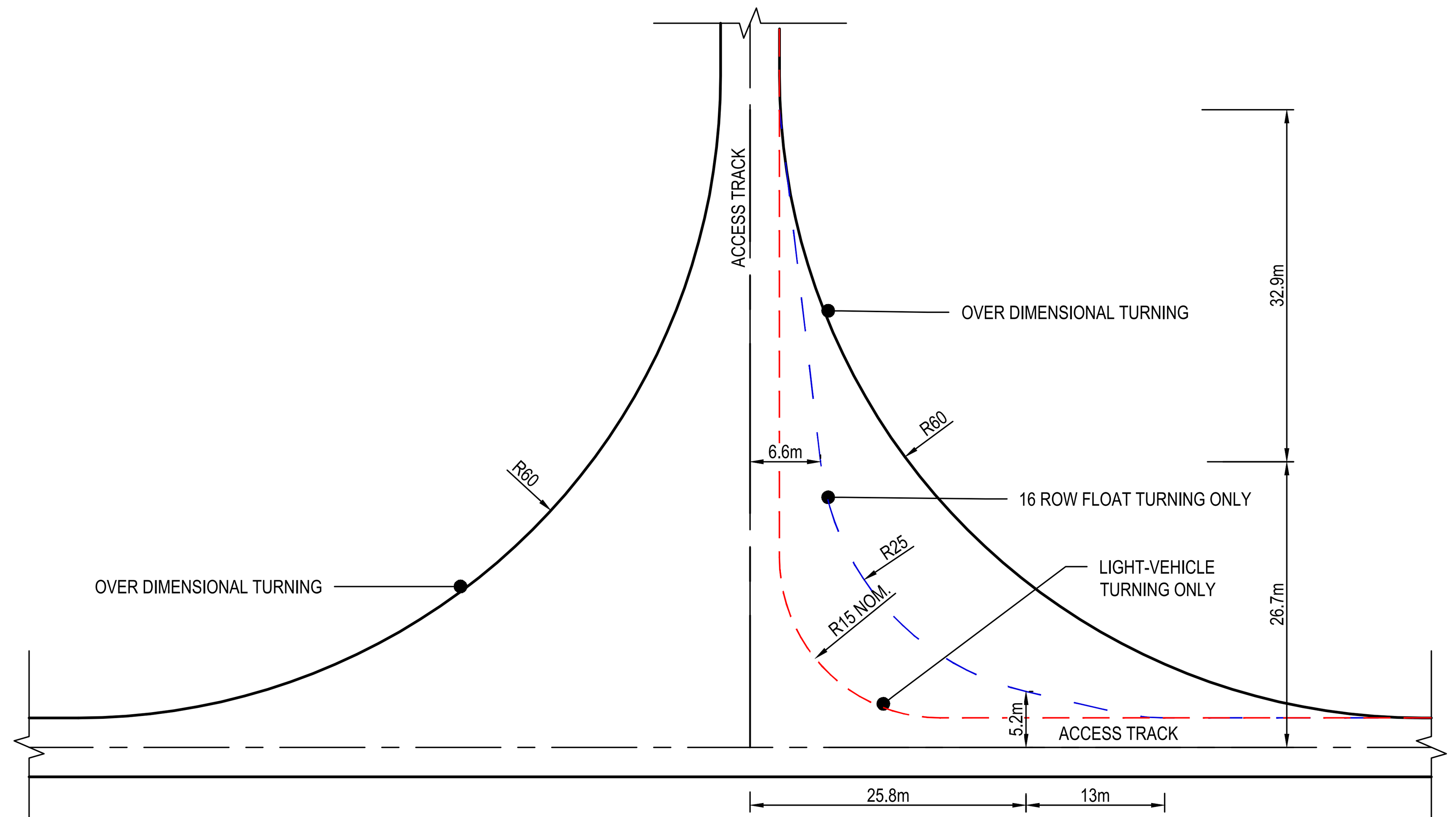


TYPICAL HARDSTAND TURNAROUND DETAIL

NTS



TYPICAL INTERSECTION DETAIL

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ACN 106 675 106
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PROJECT: TARONG WEST WIND FARM

TITLE: TYPICAL INTERSECTION AND WIDENING DETAILS

DRAWING STATUS: PRELIMINARY

PROJECT No. 18-181

DO NOT AMEND MANUALLY

SCALE: AS SHOWN

SIZE: A1

DRAWING No. ILWF - TYP - 002

REV. A

BEDDING LEGEND

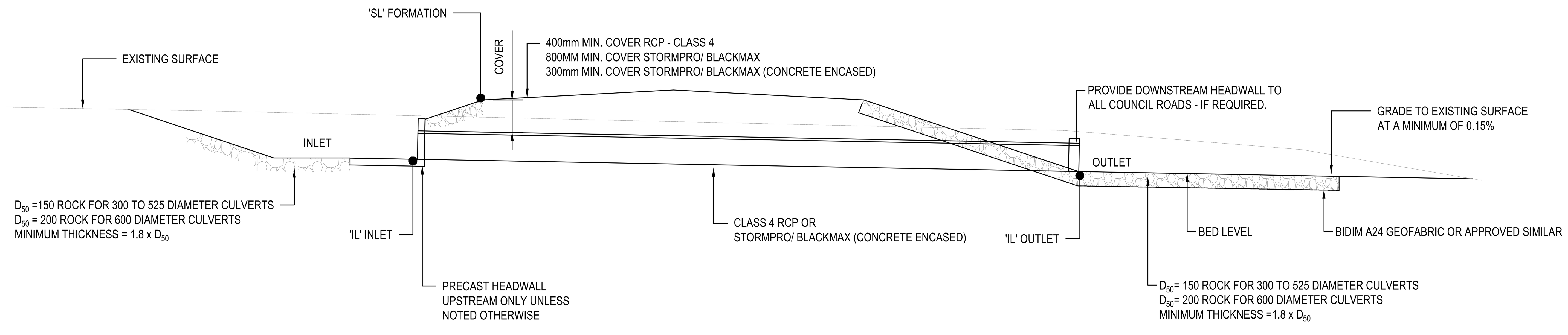
- EVENLY GRADED BED, 20mm NOMINAL SIZE CLASS 2 FCR OR OTHER APPROVED BEDDING
- CLASS 3 FCR, 30mm NOMINAL SIZE OR OTHER APPROVED MATERIAL

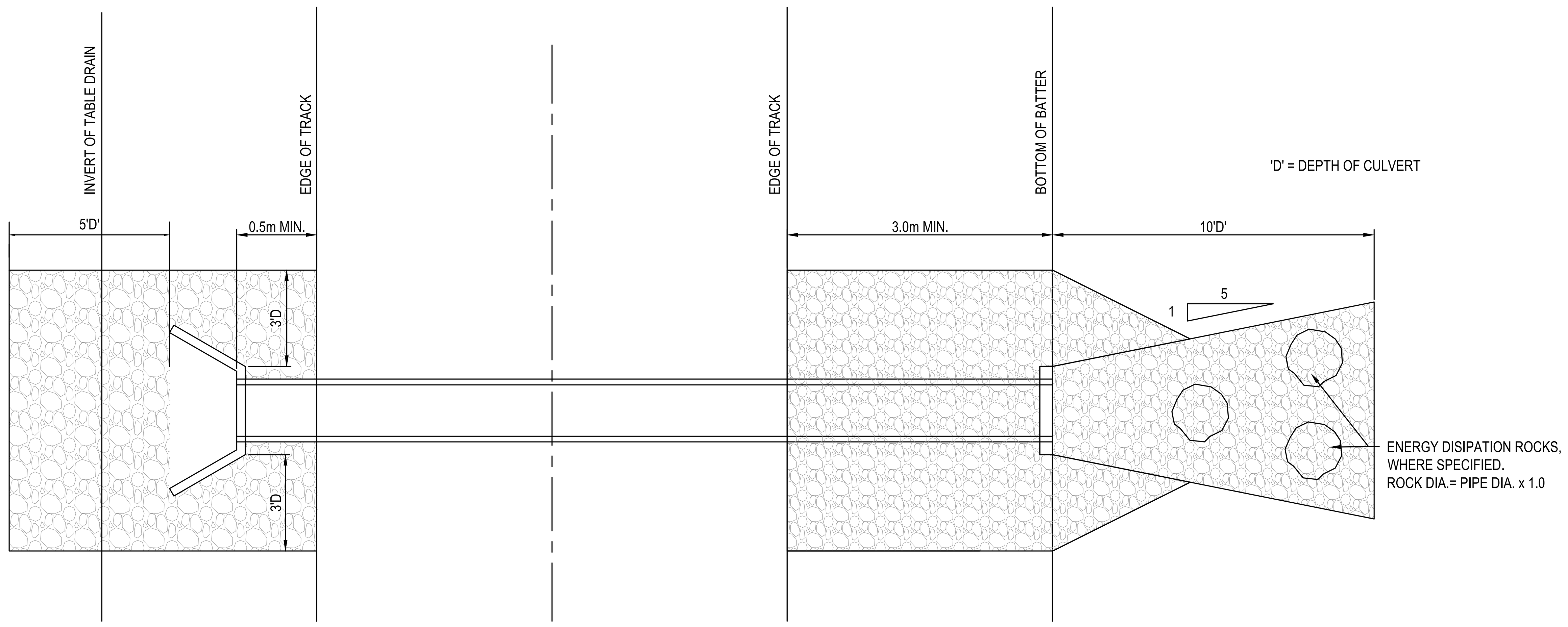
DRAINAGE NOTES

1. THE USE OF FIBRE REINFORCED CONCRETE CULVERTS IS NOT APPROVED.
2. STORMPRO/ BLACKMAX WITH AT MINIMUM 0.8m COVER REFER RCP TRENCH DETAILS. STORMPRO/ BLACKMAX WITH LESS THAN 0.8m COVER REFER CONCRETE ENCASED TRENCH DETAILS.
3. RCP-CLASS 4 PIPES WITH LESS THAN 400mm COVER MUST BE CONCRETE ENCASED.

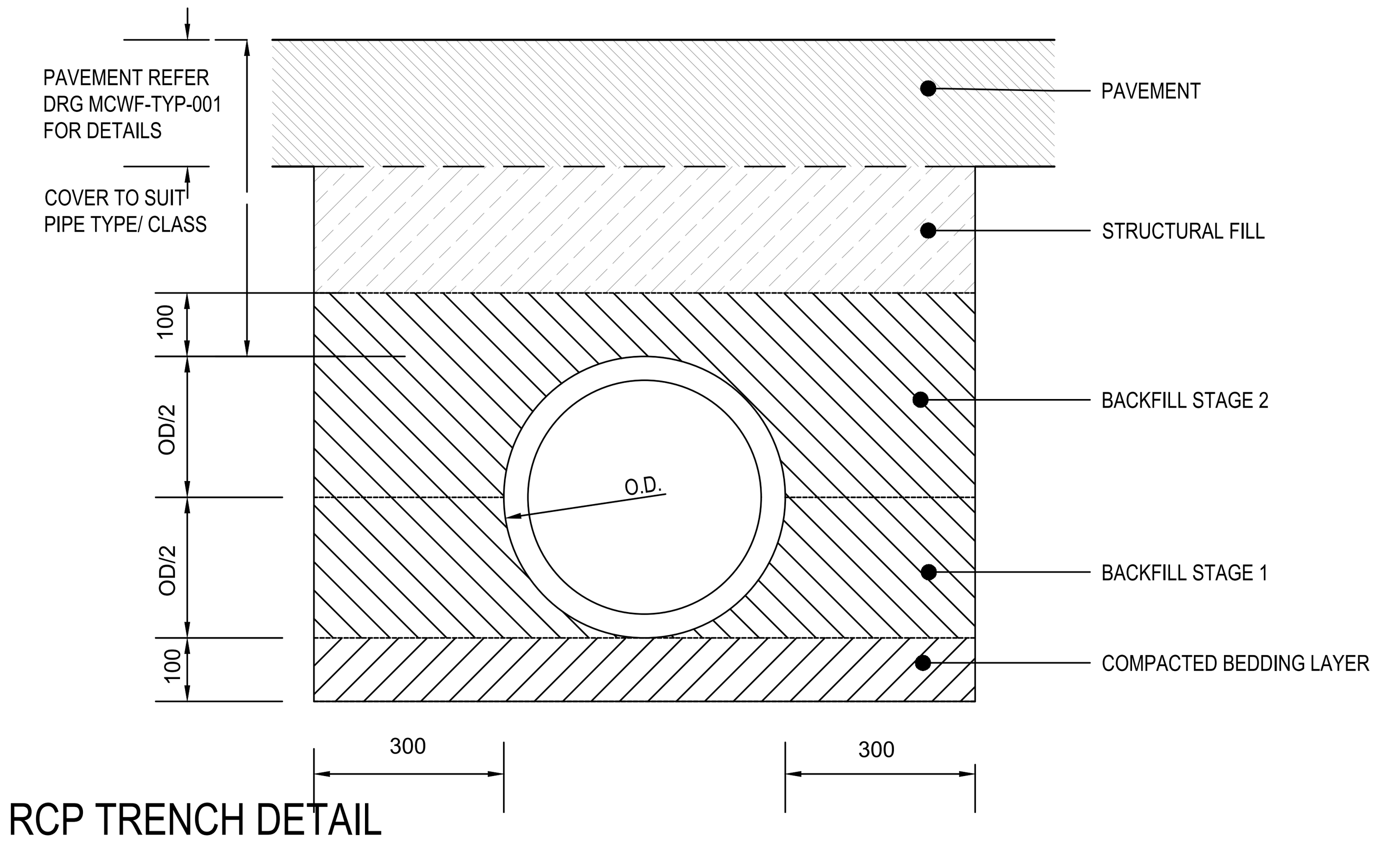
GENERAL NOTES

1. ALL DIMENSIONS WITH DECIMALS ARE IN METRES, ALL THOSE WITHOUT ARE IN MILLIMETRES
2. BACKFILL SHALL BE COMPACTED TO 98% STANDARD MDD COMPACTED AT ± 3% OMC. PAVEMENT LAYERS SHALL BE AS PER TYPICAL ACCESS TRACK DRAWING MCWF-TYP-001

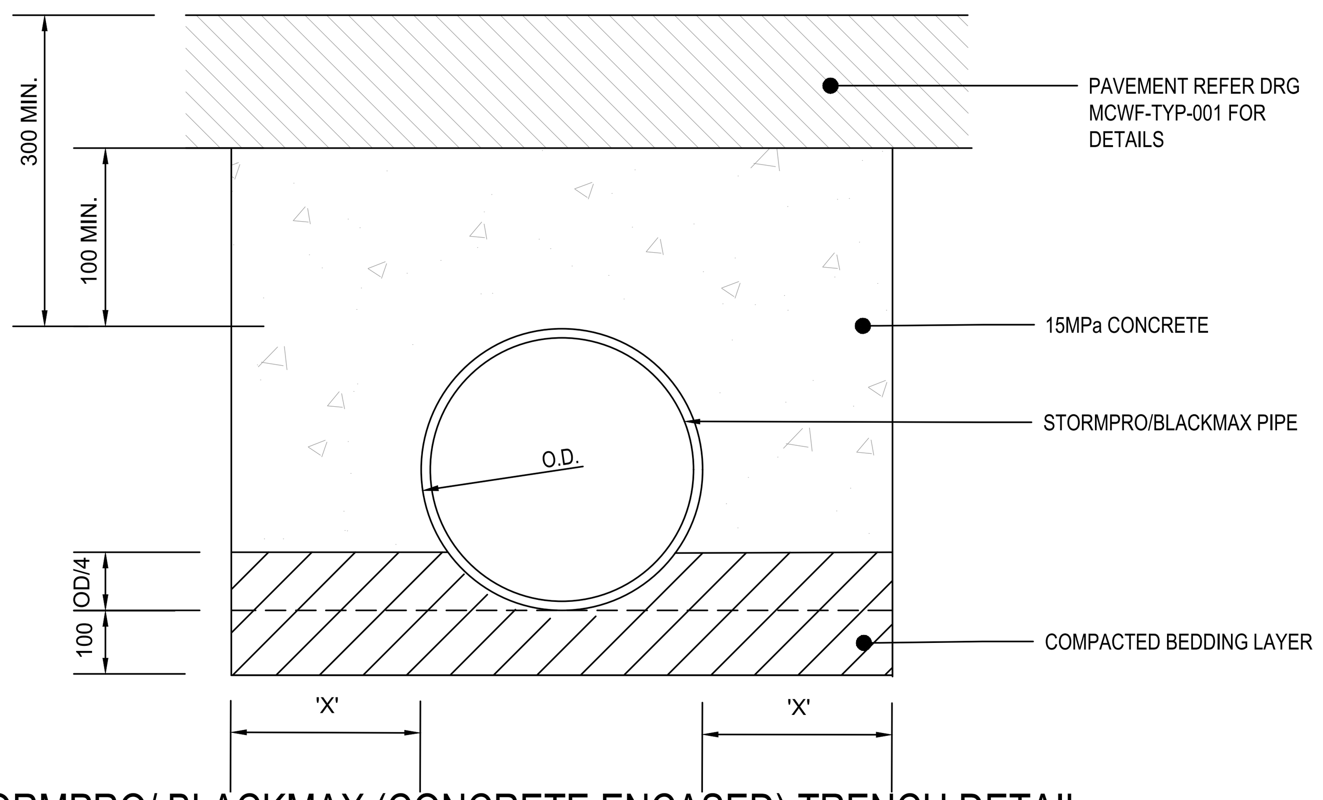




STORMWATER RCP CULVERT DETAIL - 0.4m TO 2.0m COVER
NTS

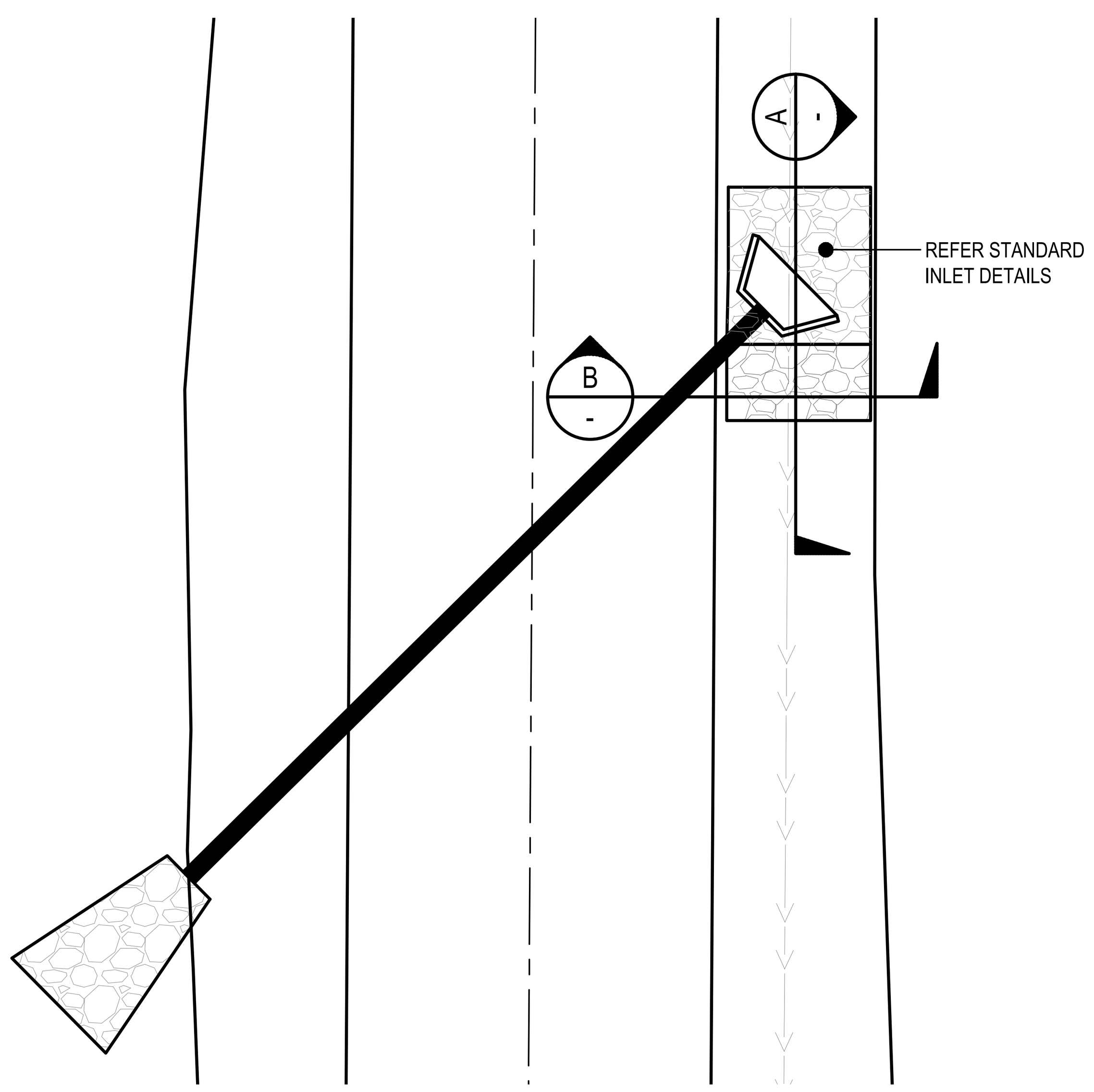


RCP TRENCH DETAIL
NTS

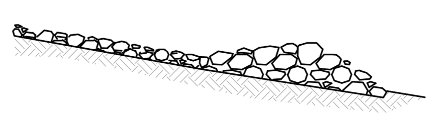


STORMPRO/ BLACKMAX (CONCRETE ENCASED) TRENCH DETAIL
NTS

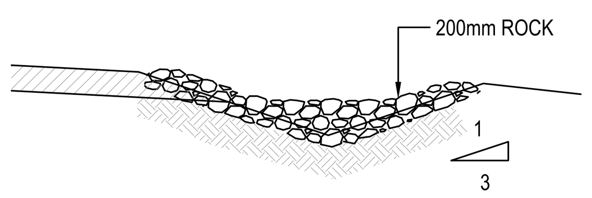
TRENCH DIMENSIONS	
PIPE SIZE	'X' MINIMUM
300 DIA	0.15m
375 DIA	0.175m
450 DIA	0.2m



STORMWATER BUND DETAIL
NTS



A - STORMWATER BUND SECTION
NTS



B - STORMWATER BUND SECTION
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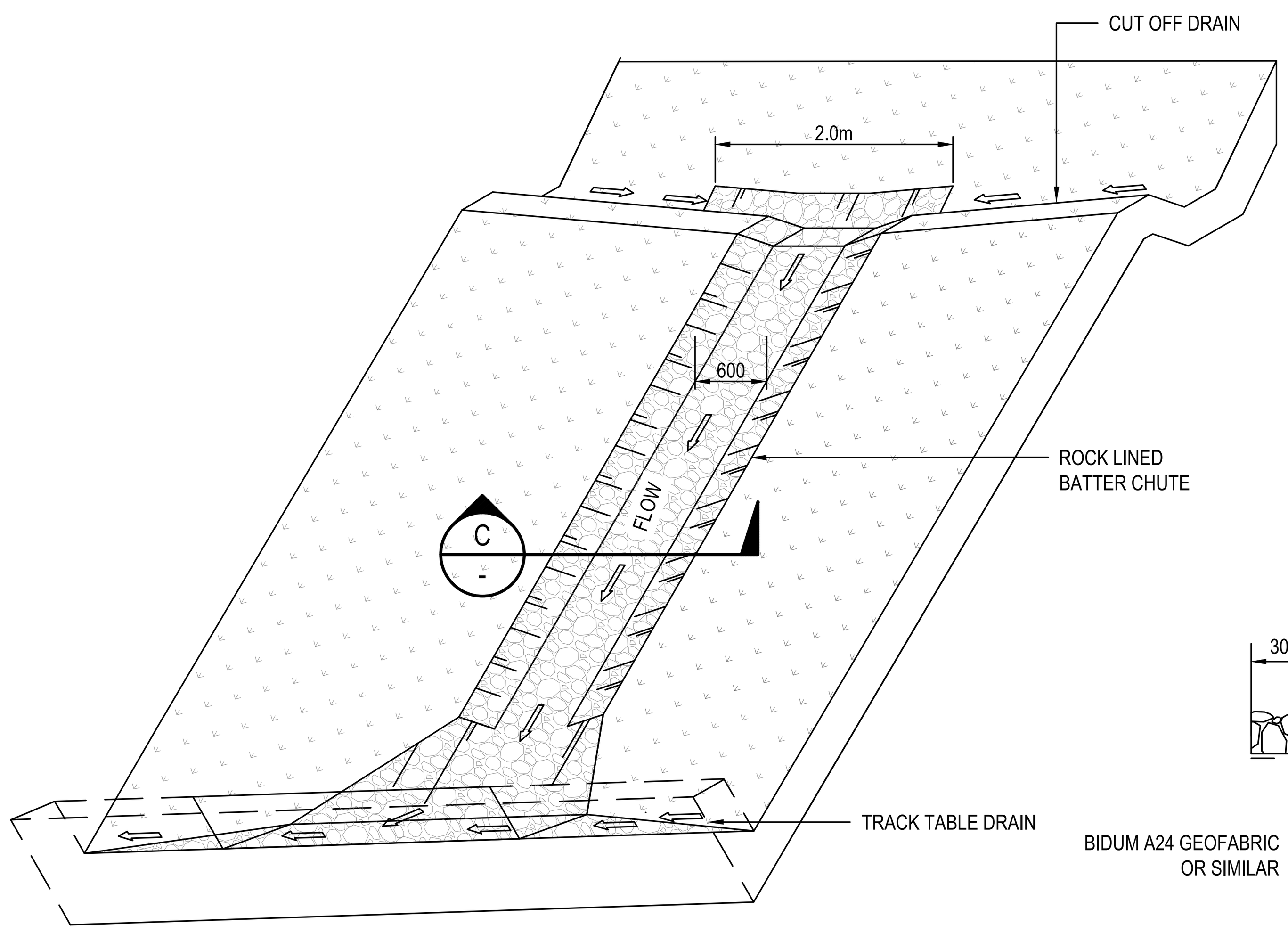
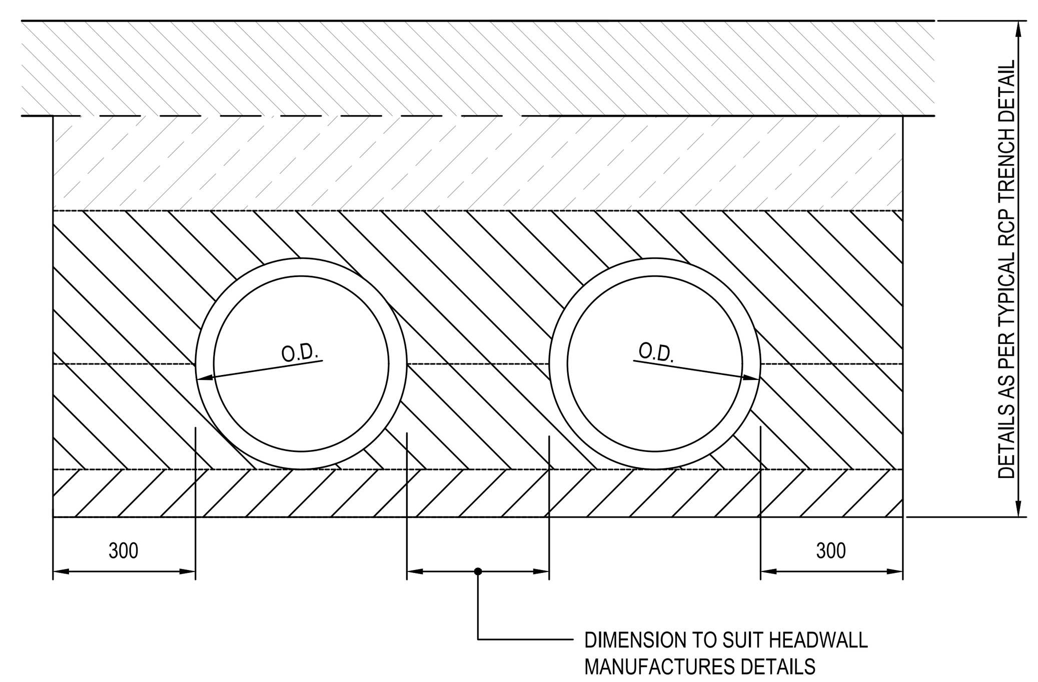
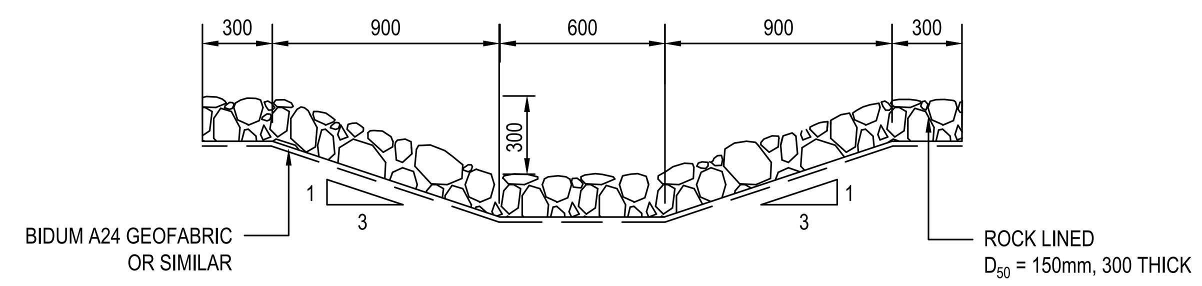


BATTER CHUTE DETAIL
NTS



MULTI BARREL - RCP DETAIL
NTS



C - BATTER CHUTE DETAIL
NTS

REV	DETAIL	DRN	CHK	APP	DATE

REVISIONS AND APPROVALS

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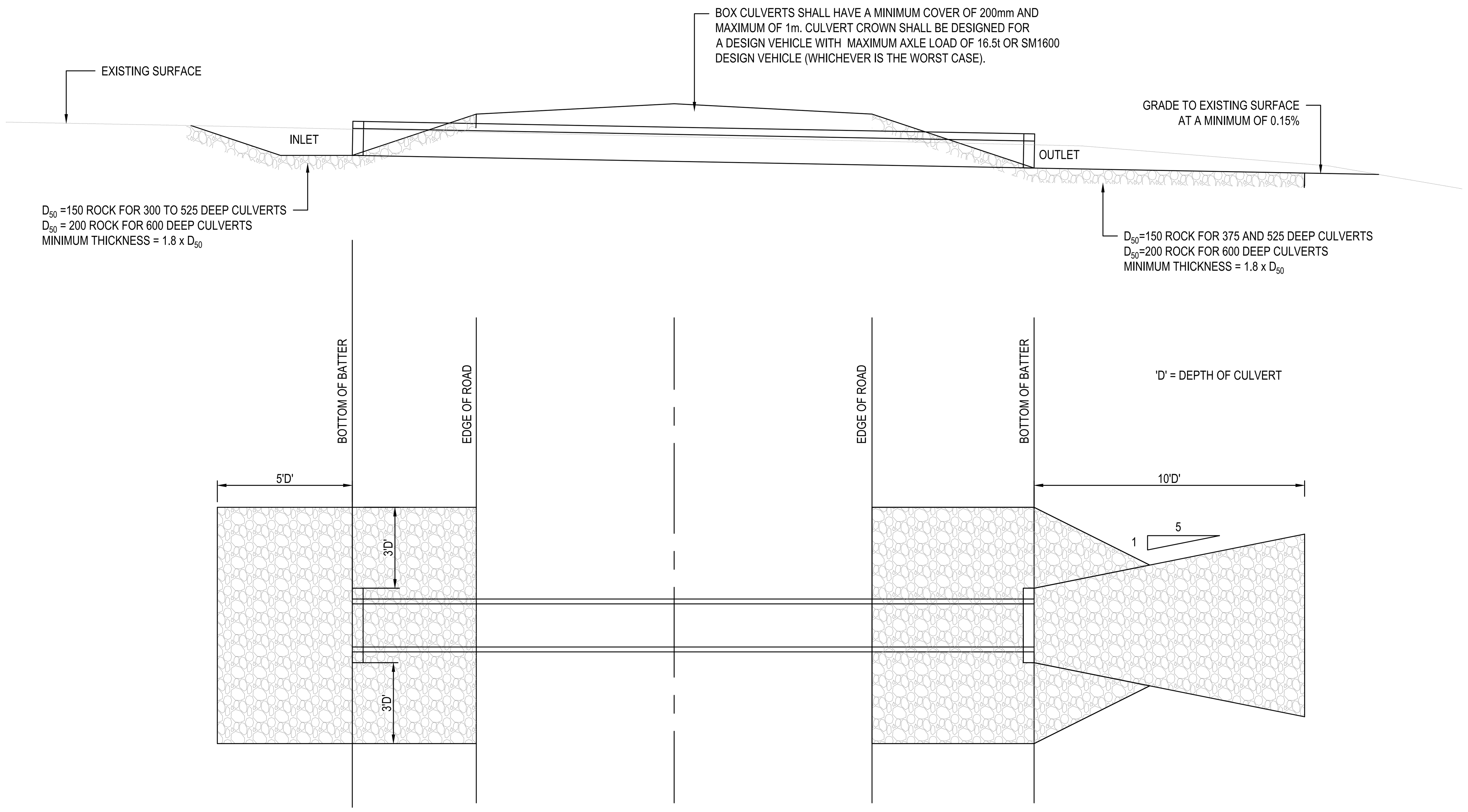
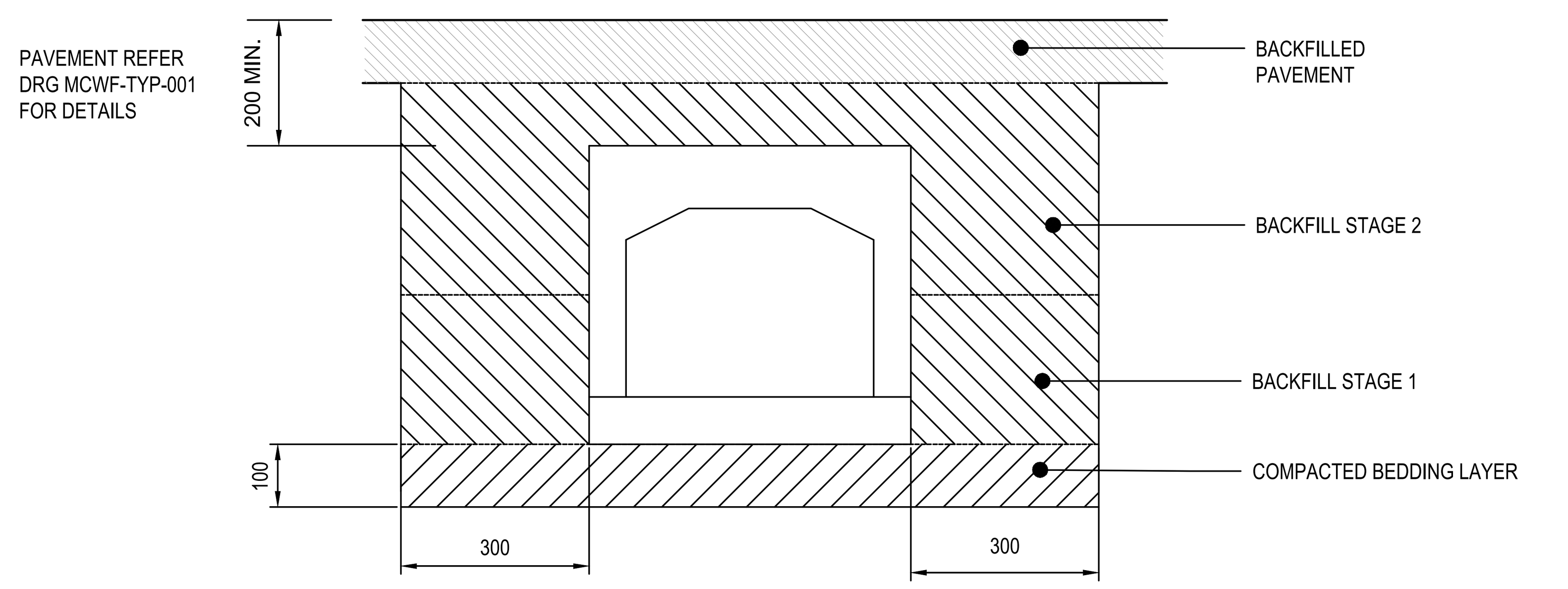
PROJECT	TARONG WEST WIND FARM
TITLE	TYPICAL STORMWATER DETAILS SHEET 1
DRAWING STATUS	PRELIMINARY
PROJECT No.	18-181
	CAD DO NOT AMEND MANUALLY
SCALE	AS SHOWN
SIZE	A1
DRAWING No.	ILWF - TYP - 003
REV.	A



STORMWATER RCBC CULVERT DETAIL

NTS



NOTE:
IF BOTTOM OF PAVEMENT IS ABOVE 100mm ABOVE THE TOP OF CULVERT, INCLUDE BACKFILL STAGE 3.

RCBC TRENCH DETAIL

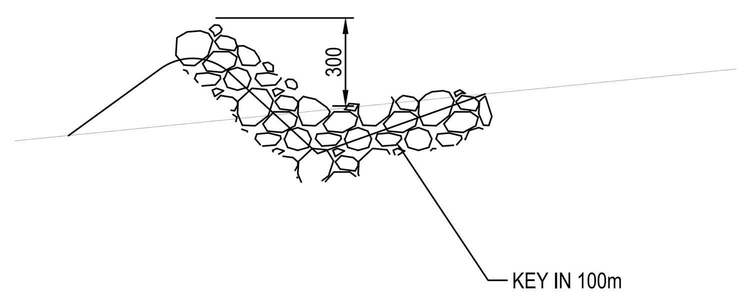
NTS

BEDDING LEGEND

- EVENLY GRADED BED, 20mm NOMINAL SIZE CLASS 2 FCR OR OTHER APPROVED BEDDING
- CLASS 3 FCR, 30mm NOMINAL SIZE OR OTHER APPROVED MATERIAL

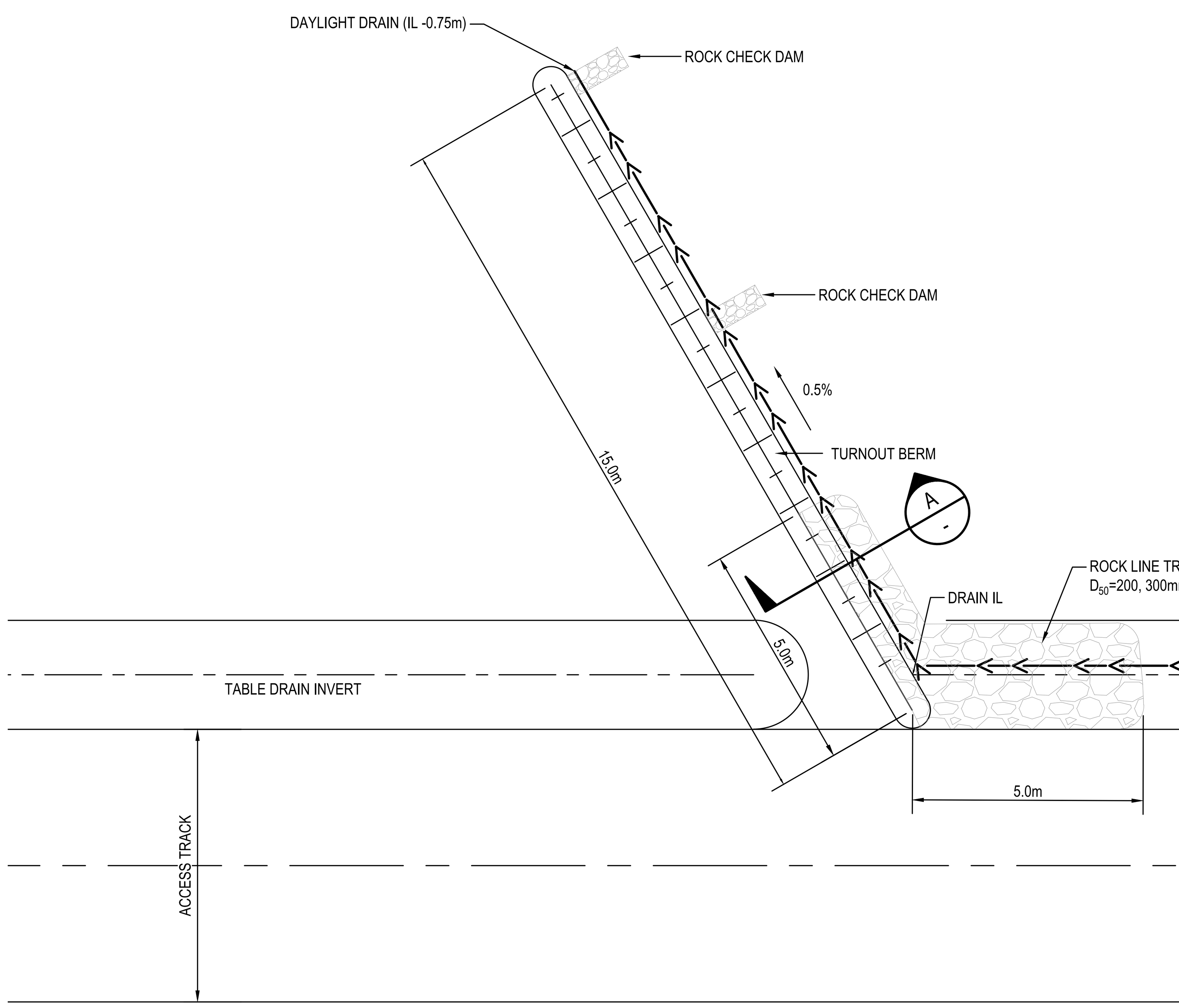
GENERAL NOTES

1. ALL DIMENSIONS WITH DECIMALS ARE IN METRES, ALL THOSE WITHOUT ARE IN MILLIMETRES
2. BACKFILL SHALL BE COMPACTED TO 98% STANDARD MDD COMPACTED AT ± 3% OMC. PAVEMENT LAYERS SHALL BE AS PER TYPICAL ACCESS TRACK DRAWING MCWF-TYP-001



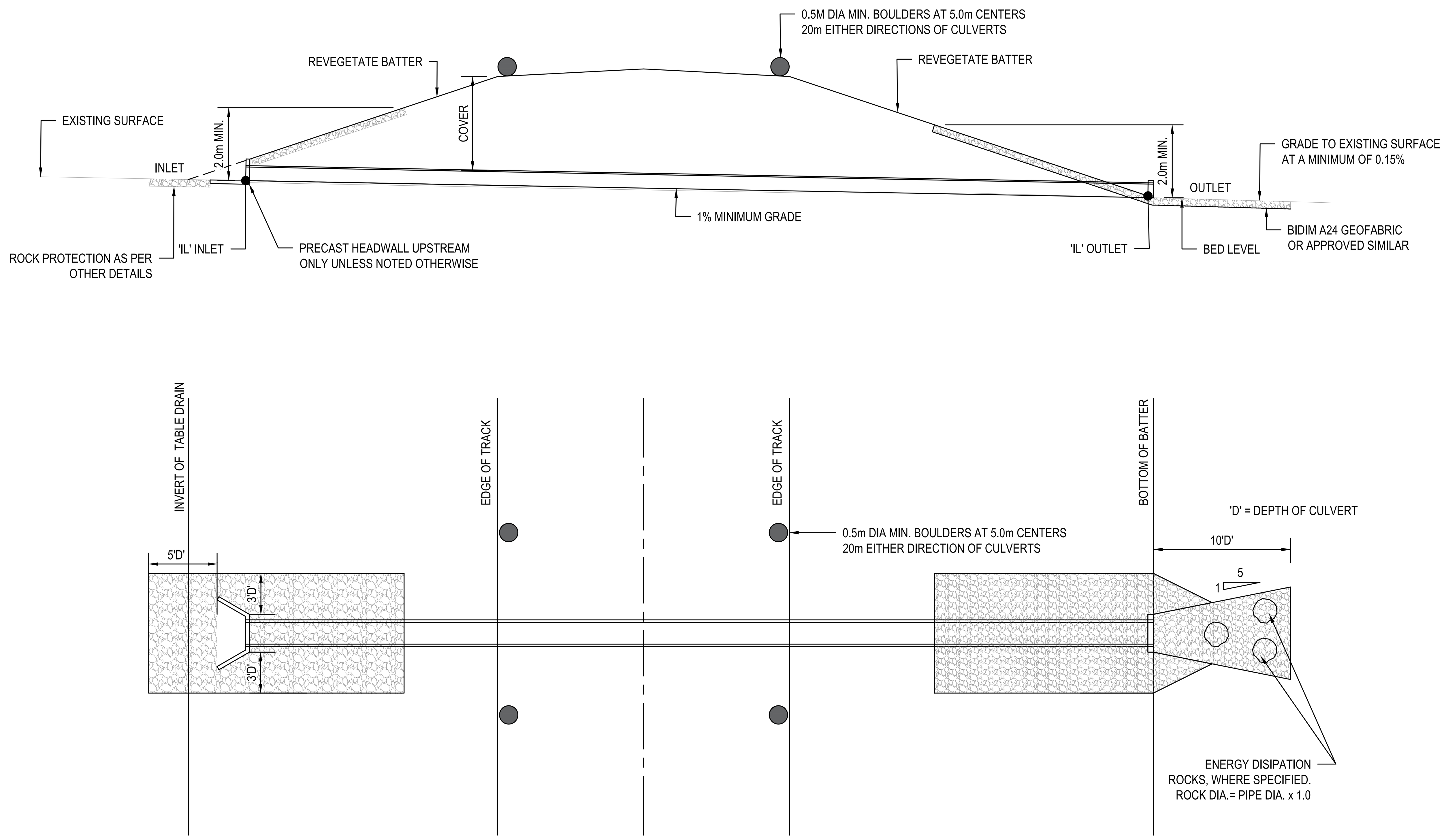
TURNOUT BERM SECTION

A
-
NTS



TURNOUT BERM TYPICAL DETAIL

NTS



STORMWATER CULVERT DETAIL - 2.0m + COVER

NTS

REV	DETAIL	DRN	CHK	APP	DATE

REVISIONS AND APPROVALS

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ACN 106 675 106
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PROJECT	TARONG WEST WIND FARM
DRAWING STATUS	PRELIMINARY
TITLE	TYPICAL STORMWATER DETAILS SHEET 2
PROJECT No.	18-181
	DO NOT AMEND MANUALLY
SCALE	AS SHOWN
SIZE	A1
DRAWING No.	ILWF - TYP - 008
REV.	A