Heywood BESS

HYDROLOGY AND STORMWATER MANAGEMENT

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FOR

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Executive Summary

This report presents the hydrology desktop investigation and stormwater management strategy for the proposed Heywood Battery Energy Storage System (BESS) utility installation at 100 Golf Course Road, Heywood, Victoria 3304 (primary parcel). The study area is centred on the primary parcel of approximately 18 hectares (ha) as well as the transmission connection corridor within the existing 500 kV cleared easement that runs between the Heywood Terminal Station and the BESS site. The proposed BESS is located within the Glenelg Shire Council and the Glenelg Hopkins Catchment Management Authority (CMA).

The BESS project has a conceptual capacity of up to 300 MW/1200 MWh. The project includes:

- BESS components including batteries, inverters, and transformer units.
- On-site substation with 275/33 kV main transformer and associated electrical infrastructure.
- Transmission connection infrastructure consisting of an underground 275 kV cable of approximately 1,000 m connecting to Heywood Terminal Station.
- Operation and maintenance building, including a control room.
- Temporary lay-down and construction area that will be reinstated after construction.
- Retention basin.
- Asset protection zone.

In the existing condition, the primary parcel is agricultural land used for grazing livestock. The primary parcel is adjacent to the Mount Clay State Forest, but it is otherwise surrounded by rural land generally used for agriculture with some rural residences.

The desktop hydrology investigation and stormwater management strategy (SWMS) for the proposed utility installation:

- Describes the existing hydrology, including preliminary two-dimensional stormwater modelling to define existing overland flow paths.
- Provides a conceptual stormwater management plan for the development demonstrating how stormwater and surface runoff will be managed in the developed condition.
- Demonstrates how existing overland flow paths and flood patterns will be maintained.
- Includes details and computations of peak flows and conceptual levels.
- Discusses impacts to on-site infiltration and surface water quality, including water quality in adjacent land and waterways.
- Includes details of how polluted or contaminated runoff can be managed.

In the proposed condition:

- The primary development area will be graded to slope down toward the south. Developed flows from the primary development area will be conveyed overland through internal access roads. Stormwater from the primary development area will be directed to a dam. The dam will serve to reduce multiple stormwater management functions including:
    - Reducing the volume to stormwater generated by the primary development area in the developed conditions to that experienced in the existing condition.
    - Limiting peak flows in major events up to and including the 1% AEP to those experienced in the existing condition.
    - Containing surface water during a water quality event where surface water needs to be contained on-site
- External flows from the southeast will be conveyed under the primary development area by a culvert sized to convey the 1% AEP flows to protect the development.

The stormwater management strategy proposed for the utility installation includes grading and methodology for managing internal and external stormwater. The strategy has been developed to allow for stormwater quality treatment to be provided through green engineering methods.

This report demonstrates that the proposed utility installation can be developed with minimal impact on existing hydrological conditions. In addition, stormwater management can manage stormwater to council and CMA requirements. The conceptual stormwater management plan allows for Country Fire Authority (CFA) requirements for containing surface water to be achieved. The proposed stormwater management provides green engineering solutions that treat stormwater to improve downstream water quality beyond statutory requirements.

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1. Introduction

This report presents the hydrology desktop investigation and stormwater management strategy for the proposed Heywood Battery Energy Storage System (BESS) utility installation at 100 Golf Course Road, Heywood, Victoria 3304 (primary parcel). The study area is centred on the primary parcel of approximately 18 hectares (ha). Refer to Figure 1. The primary development area, as shown in the concept layout plan and Figure 1, comprises approximately 5.7 ha. The permanent infrastructure, including the batteries, inverters, substation, and operational area has a footprint of approximately 4.2 ha within the primary development area.

This report and its associated plans and calculations are based on the presented layout. Any changes to the layout that increase the primary development area or the footprint of permanent infrastructure, will require stormwater calculations to be updated.

The proposed BESS is located within the Glenelg Shire Council and the Glenelg Hopkins Catchment Management Authority (CMA). The primary parcel is adjacent to the Mount Clay State Forest and existing rural land.

The BESS project has a conceptual capacity of up to 300 MW/1200 MWh. The project includes:

- BESS components including batteries, inverters, and transformer units.
- On-site substation with 275/33 kV main transformer and associated electrical infrastructure.
- Transmission connection infrastructure consisting of an underground 275 kV cable of approximately 1,000 m connecting to Heywood Terminal Station.
- Operation and maintenance building, including a control room.
- Temporary lay-down and construction area that will be reinstated after construction.
- Retention basin.
- Asset protection zone.

The project includes an underground transmission cable connection to the Heywood Terminal Sation. However, those works are not relevant to this assessment as they are underground and outside of the primary development area. Therefore, this report concentrates on the primary parcel, primary development area, and footprint of proposed infrastructure where earthworks and developed conditions will modify existing condition hydrology and stormwater for the life of the project.

This report comprises a desktop hydrology investigation and stormwater management strategy (SWMS) for the proposed utility installation. This report:

- Describes the existing hydrology, including preliminary two-dimensional stormwater modelling to define any existing flood extents.
- Provides a conceptual stormwater management plan for the development demonstrating how stormwater and surface runoff will be managed in the developed condition.
- Demonstrates how existing overland flow paths and flood patterns will be maintained.
- Includes details and computations of peak flows and conceptual levels.
- Discusses impacts to on-site infiltration and surface water quality, including water quality in adjacent land and waterways.

- Includes details of how polluted or contaminated runoff can be managed.

2. Overview

2.1 Location

The proposed utility installation is located at 100 Golf Course Road in Heywood, Victoria (primary parcel). The study area is centred on the primary parcel of approximately 18 hectares (ha). Refer to Figure 1. The primary development area, as shown in the concept layout plan and Figure 1, comprises approximately 5.7 ha. The permanent infrastructure, including the batteries, inverters, substation, and operational area has a footprint of approximately 4.2 within the primary development area. The proposed development is located in western Victoria approximately 350 km west of Melbourne and approximately 5 km south of the rural town of Heywood.

The proposed development is located within the Glenelg Shire Council and the Glenelg Hopkins CMA. As the development is located within Glenelg Shire Council, the Infrastructure Design Manual (IDM) is the relevant guiding document for flow calculations and concept drainage design. All calculations and conceptual drainage designs in this report are also compliant with *Australian Rainfall and Runoff 2019 (ARR19)* and reflect industry best practice approaches.

The primary parcel is adjacent to the Mount Clay State Forest along its southern boundary.

The proposed development is located within Victoria’s South West Renewable Energy Zone (REZ). Both Australian Energy Market Operator (AEMO) and the State Government of Victoria recognise this REZ. The REZ recognises the opportunity for renewable energy to contribute to long-term social and economic outcomes for the local area and region, and the presence of transmission lines.

2.2 Existing Land Use

Currently, the primary parcel is rural, is zoned as a Farming Zone—Schedule 1 (FZ1), and is currently used for grazing livestock.

There is an existing dwelling located within the primary parcel. The dwelling is an involved dwelling, and it will be vacated prior to development commencing.

Figure 1 shows the project area (orange outline), primary parcel (magenta hatch), and the primary development area (red dashed outline) in the existing condition. The primary development area is where the BESS and inverters, substation, and permanent utility infrastructure will be located in the developed condition. Key existing features around the project area including the existing dwelling and existing roads are also shown in Figure 1.

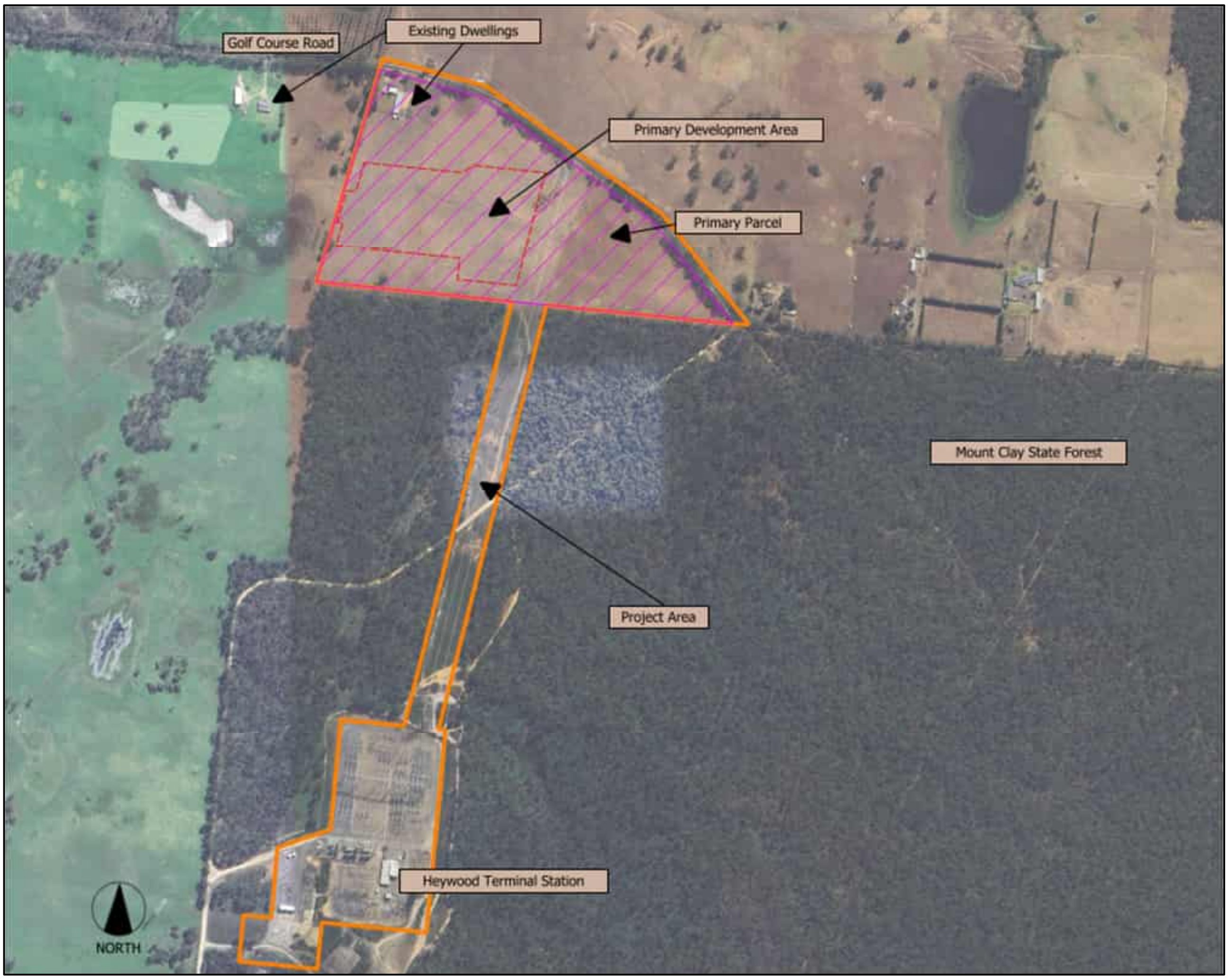

Figure 1: Existing Condition

2.3 Existing Planning Overlays

The primary parcel has two planning overlays relevant to the hydrology investigation in the existing condition. The siting of the utility installation has been undertaken to minimise impacts and respond to the existing planning overlays.

An Environmental Significance Overlay (ESO3) is in place across the primary parcel. This overlay is specifically to protect habitat for the endangered red-tailed black cockatoo. A flora and fauna investigation has been undertaken separately to this report. The flora and fauna investigation confirmed that no habitat relevant to the ESO3 is impacted by the proposed development.

A partial Bushfire Management Overlay (BMO) exists at the southern boundary of the primary parcel, in the area adjacent to the Mount Clay State Forest. As shown in Figure 2, the siting of the utility installation has been undertaken to mitigate impacts within the BMO. As detailed in Section 5.11, specific controls are proposed within the areas of the primary parcel impacted by the partial BMO. The Bushfire Attack Level (BAL) fire rating zone requirements are also shown in Figure 2.

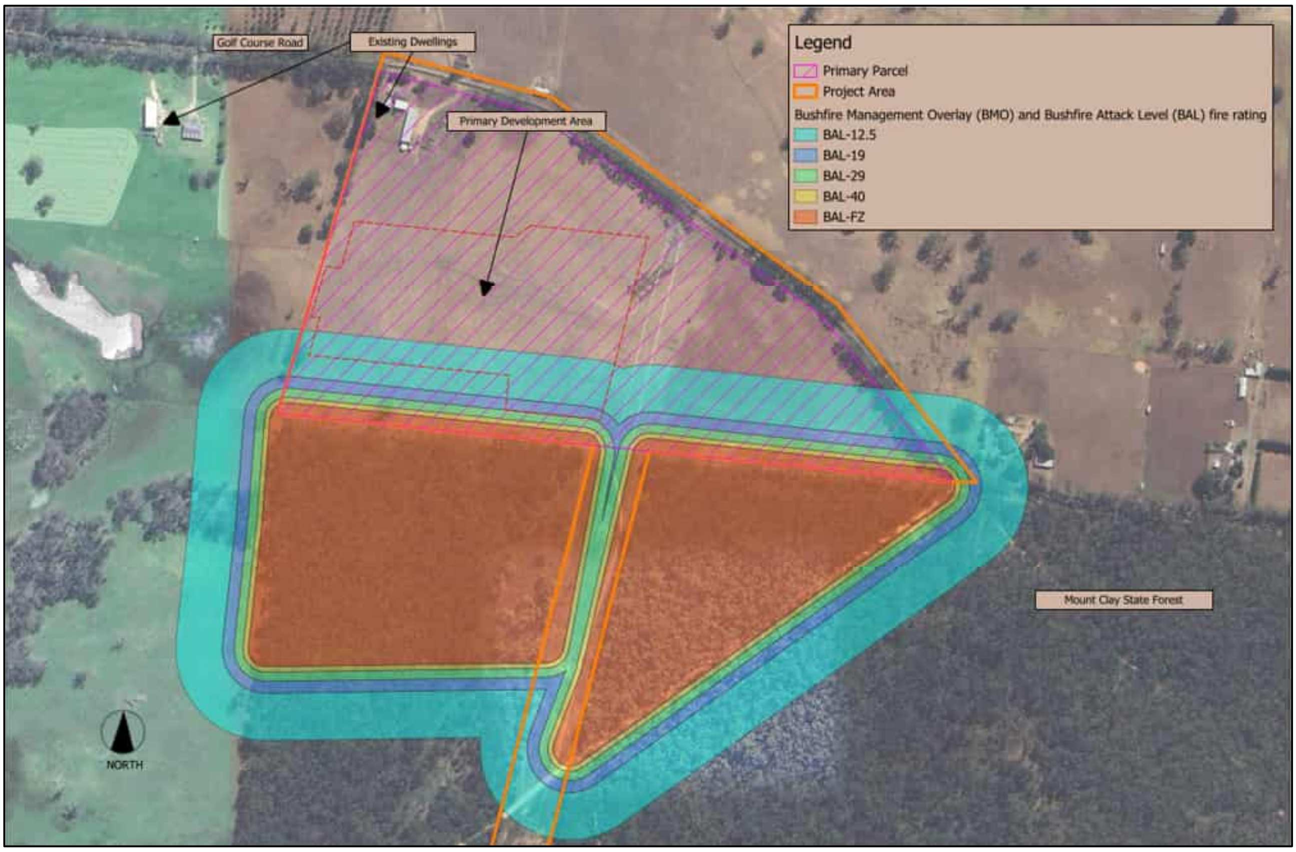

Figure 2: BMO and BAL Fire Rating

2.4 Existing Topography

The primary parcel slopes from east to west, as shown in Figure 3. The contours shown in Figure 3 are to Australian Height Datum (AHD) and are based on 1-m LiDAR data and purchased from Spatial Vision. Metadata provided by Spatial Vision indicates that the LiDAR survey was undertaken as part of a larger LiDAR capture project between 2022 and 2024. The custodian of the data is the Victorian Department of Environment, Land, Water and Planning.

The primary parcel has an external catchment. External stormwater flows overland from east to west through the primary parcel, as detailed in Section 3.3.

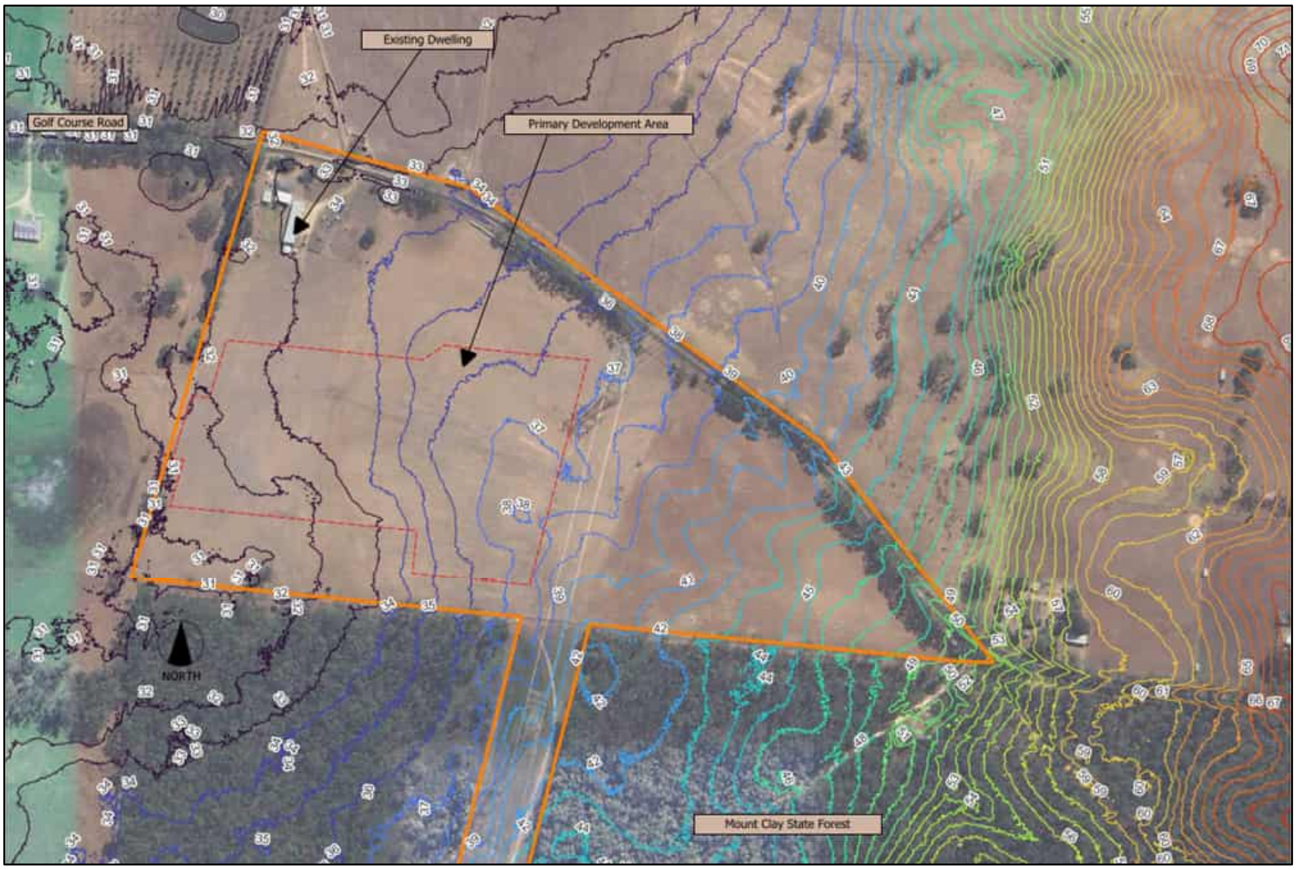

Figure 3: Existing topography

2.5 Existing Overland Paths

No existing waterways traverse the primary parcel. Overland flow paths for events up to the 1% (1-in-100) Annual Exceedance Probability (AEP) have been defined based on two-dimensional hydraulic modelling, as detailed in Section 3.3.

2.6 Potential for Fluvial/Riverine Flooding

The primary parcel is located approximately 3 km south and west of the Fitzroy River. The *Fitzroy River, Darlot Creek and Heywood Regional Floodplain Mapping Study Summary Report* (Water Technology for the Department of Environment, Land, Water and Planning, October 2017) includes the primary parcel (red outline) within the modelled area for floodplain mapping, as shown in Figure 4. However, there is no flood depth shown at the primary parcel. Therefore, fluvial/riverine flooding is not a concern at the primary parcel.

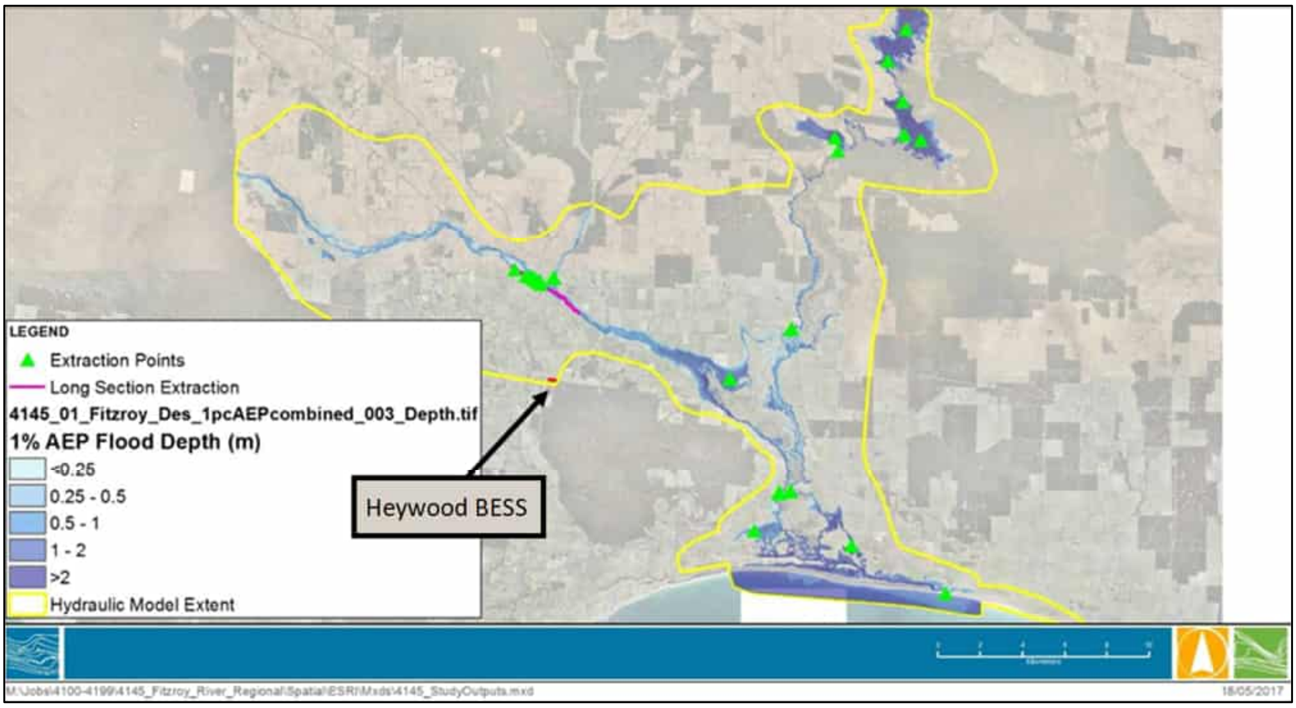

Figure 4: Primary parcel (red) within the Floodplain Mapping Study 1% AEP flood depth plan

3. Existing Condition Hydrology Investigation

The primary parcel forms part of a wider catchment. An investigation has been undertaken to assess the hydrology in the existing condition to ensure that hydrological performance can be retained in the developed condition.

3.1 Catchments

Catchments within the primary parcel have been defined based on LiDAR contours. Generally, the north and east of the primary parcel drain to the northwest, and the south of the primary parcel drains to the southwest, as shown in Figure 5.

External catchments are present, and, as a result, the project area experiences overland external flows. Two-dimensional hydraulic modelling has been used to assess overland flows through the primary parcel and the primary development area owing to the complex upstream catchments. Two-dimensional hydraulic modelling is detailed in Section 3.3.

The northern internal catchment drains generally to point A and has an approximate area of 11 ha. The southern internal catchment drains generally to point B and has an approximate area of 7 ha.

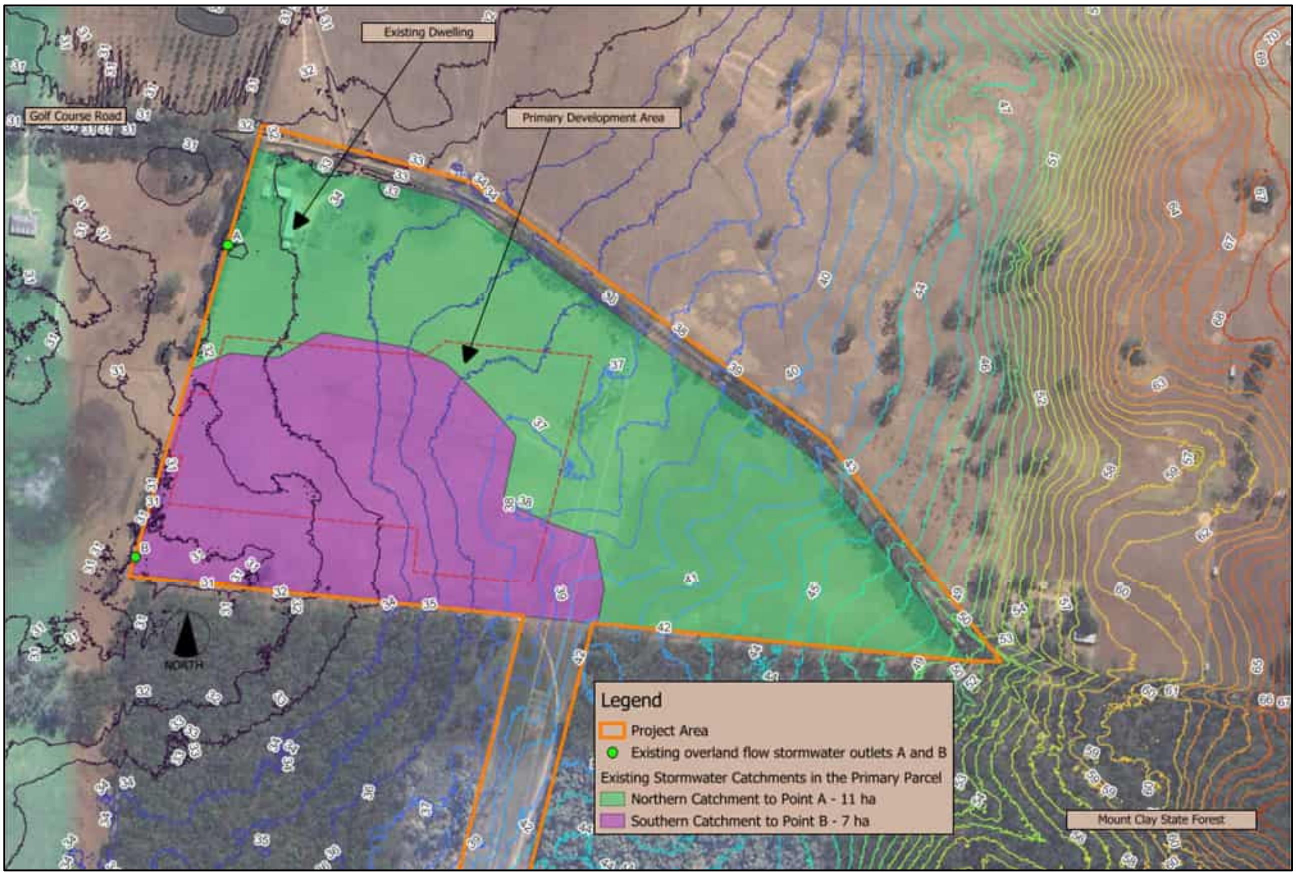

Figure 5: Existing Stormwater Catchments within the Primary Parcel

3.2 Peak flows

For the purposes of this report, peak minor flows have been defined as 10% AEP flows, and peak major flows have been defined as 1% AEP flows. The peak flow calculations include the climate change adjustment from *Australian Rainfall and Runoff version 4.2* (Engineers Australia, 2024). Peak flows have been calculated:

- At Point A, the general overland 'outlet' of the northern catchment within the primary parcel.
- At Point B, the general overland 'outlet' of the southern catchment within the primary parcel.

Complete drainage calculations are included in Appendix A.

Table 1: Peak Existing Condition Flows

Location	Upstream Catchment Area (ha)	Existing 10% AEP Flow (m^3/s)	Existing 1% AEP Flow (m^3/s)
Point A	11.1	0.17	0.39
Point B	7.2	0.16	0.35

3.3 Preliminary Two-Dimensional Hydraulic Modelling (TUFLOW)

Preliminary two-dimensional hydraulic modelling was undertaken using TUFLOW software. The TUFLOW modelling was completed to define existing overland flow paths through the primary parcel in the 1-in-100 AEP event. There are no formal waterways through the primary parcel. Contours based on 1-m LiDAR data indicate that the primary parcel conveys external flows. Preliminary TUFLOW modelling provides a methodology to better understand overland flows through the primary parcel.

The results of the preliminary two-dimensional modelling have been used within this report to:

- Determine Points A and B, generally the two main overland outflows.
- Assess the existing risk of pluvial (flash) flooding in events up to and including the 1% AEP.
- Determine existing pluvial overland flow paths through the primary parcel.
- Determine existing pluvial flood levels at the primary development area.
- Inform design/developed levels for the conceptual stormwater management strategy to protect the proposed utility installation from events up to and including the 1% AEP.

It should be noted that the two-dimensional hydraulic modelling undertaken for this report is preliminary. A large area of approximately 3.5 km^2 was modelled. This area encompasses the catchment areas that drain through the primary parcel as well as the catchments of other overland flow paths in the vicinity. The model is coarse, but it indicatively determines flood extents and flood levels within the primary parcel and the primary development area during the 1% AEP rainfall event.

When the detailed design of the proposed utility installation is undertaken, it is recommended that more detailed two-dimensional modelling be undertaken to set finished levels for the primary development area.

3.3.1 Hydrological modelling

Hydrological modelling was undertaken to determine 1% AEP rainfall excess (rainfall less initial and continuing losses) for use as an input to the two-dimensional hydraulic modelling. RORB hydrological modelling software was used to determine rainfall excess. In line with contemporary modelling practice, rainfall depths from the Bureau of Meteorology were used with temporal patterns and losses from the ARR data hub. The ARR 4.2 climate change adjustment factors were applied to rainfall depths, pre-burst, and losses to produce results applicable at present.

The rainfall excess outputs from the hydrological modelling were used as inputs for the hydraulic modelling. Ten temporal patterns for each of the fourteen modelled rainfall durations were generated for a total of 140 modelling scenarios.

3.3.2 Hydraulic modelling

Hydrological modelling was undertaken using TUFLOW software. Using the rainfall excess data generated in RORB, 140 two-dimensional model runs were undertaken. For each duration, median flooding results were selected. Then, the maximums of the median results were compiled. The resultant flood levels are shown in Figure 6.

Sensitivity testing resulted in selection of a 10-m grid. At this grid size, sufficiently detailed results were produced using sub-grid sampling (SGS) while run times appropriate for the number of simulations considered were achieved. The TUFLOW model adopts a coarse grid size appropriate for a preliminary investigation.

A rainfall excess on grid modelling approach has been adopted. Rainfall excess was determined using RORB as detailed in Section 3.3.1. The rainfall excess was applied to all cells in the TUFLOW modelling extent. The modelled catchment is generally rural and undeveloped. Therefore, a fraction impervious of 0.1 has been adopted throughout. A plan of the entire 3.5-km^2 extent modelled in TUFLOW is shown in Appendix B.

A Manning's roughness value of 0.08 has been adopted for the portion of the model with dense vegetation. A Manning's value of 0.04 has been adopted for the portion of the model where land has been cleared for agriculture, including the primary parcel.

At the primary parcel and primary development area, critical durations for the overland flow path were the 2-hour and 3-hour rainfall events. At these durations, the most stormwater runoff was experienced. The critical durations are reasonable for the 3.5-km^2 model area and the compact shape of the overall catchment.

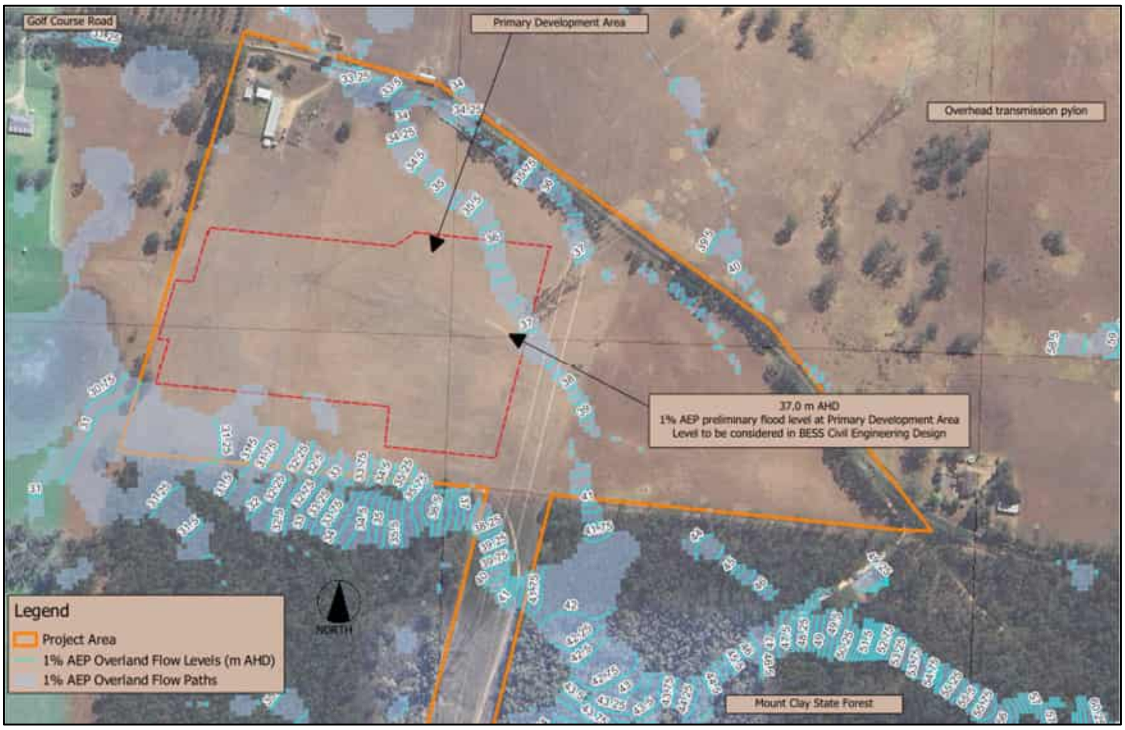

Figure 6: 1% Flood Level Contours (TUFLOW)

3.3.3 Hydraulic modelling—results and discussion

The preliminary TUFLOW modelling for the existing condition shows maximum flood depths within the existing overland flow paths at the primary development area of approximately 100-200 mm, as shown in Figure 7.

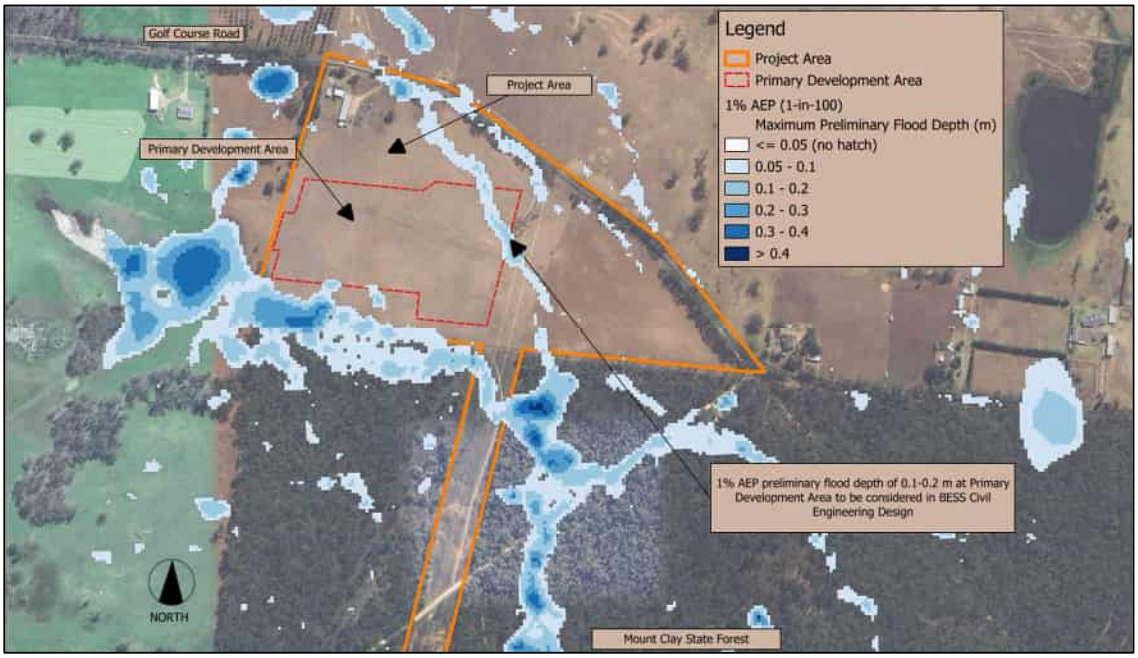

Figure 7: 1% AEP Flood Depths Complete Model (TUFLOW)

Modelling results indicate that the peak 1% AEP flow through the existing overland flow path at the northeast of the primary development area is approximately 1.3 m^3/s.

The hydraulic modelling indicates that the project area is not subject to substantial overland flooding. However, there are flow paths that traverse the project area. Flood depths of approximately 0.1-0.2 m occur in the existing condition within the flow path at the northeast of the primary development area, as called out in Figure 7. The design of the fill pad for the utility installation should ensure that the finished level of the pad is located above the 1% AEP flood level. The peak preliminary 1% AEP flood level of 37.0 m AHD at the project area is shown in Figure 6.

Complete TUFLOW results are included in Appendix B.

3.4 Losses and permeability

The primary parcel is used for sheep grazing. The land is compacted from its agricultural use. While defining permeability is outside the scope of this report, the existing land use of the project area in areas without trees does not allow for substantial soil permeability. Rainfall losses are impacted by the permeability of the soil and the existing vegetation.

4. Proposed Project Concept

The proposed concept layout plan is shown in Figure 8. A full-size plan is included as Appendix C. Note that the layout is still conceptual. Stormwater management infrastructure is included in Figure 9.

As shown in Figure 8, the primary development area comprises approximately 5.7 ha. Within the primary development area, permanent infrastructure including batteries and inverters, the substation, internal roads, and operational buildings will have a footprint of approximately 4.2 ha. The project site area will be developed as a utility installation including:

- BESS components including batteries, inverters, and transformer units.
- On-site substation with 275/33 kV main transformer and associated electrical infrastructure.
- Transmission connection infrastructure consisting of an underground 275 kV cable of approximately 1,000 m connecting to Heywood Terminal Station.
- Operation and maintenance building, including a control room.
- Temporary lay-down and construction area that will be reinstated after construction.
- Retention basin.
- Asset protection zone.

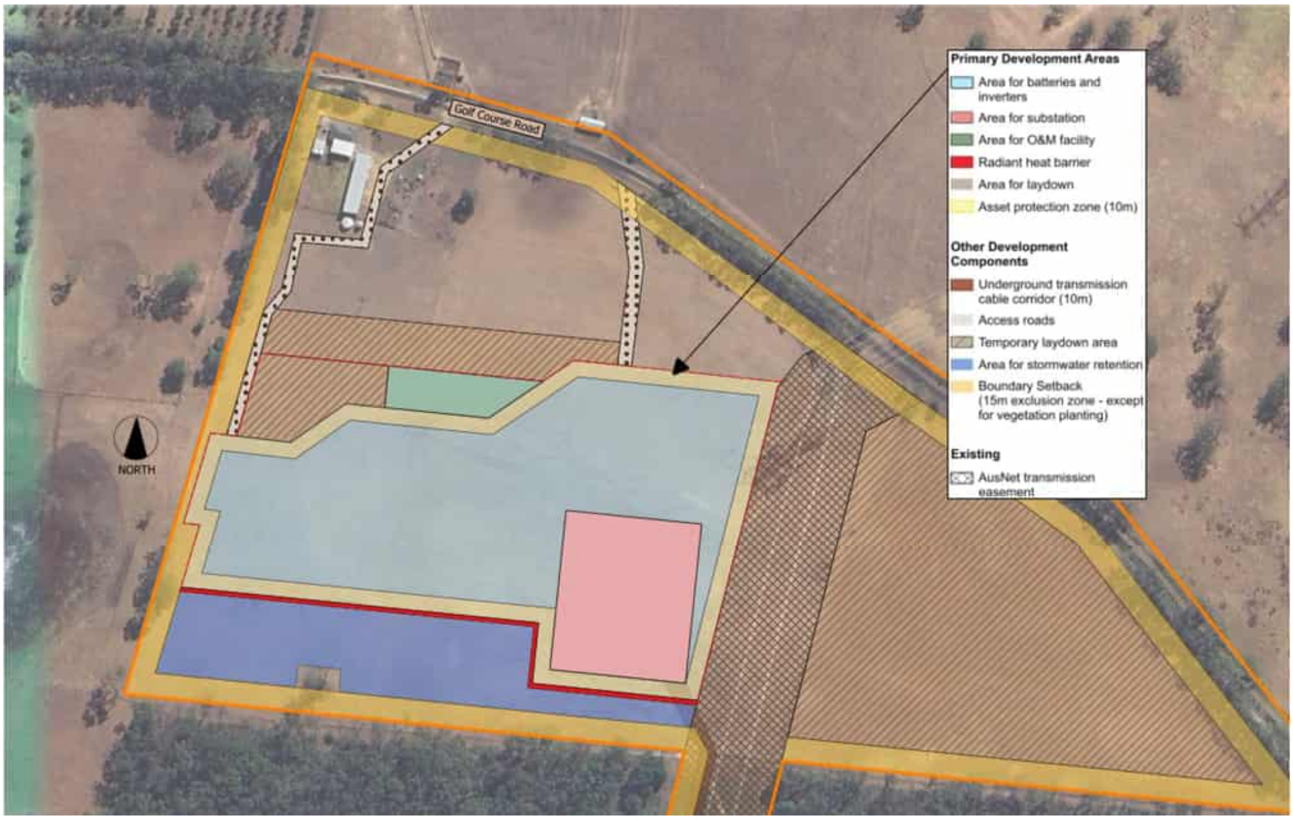

Figure 8: Proposed Project Layout Plan

5. Stormwater Management

Stormwater can be effectively managed in the developed condition. Management of stormwater can both protect the installation from major flows and ensure that there are minimal changes to existing flow regimes. Opportunities exist for integrated water management and green infrastructure to be incorporated into the design of the proposed utility installation. An overview stormwater management plan is included in Figure 9. The components of the plan are detailed in this section of the report.

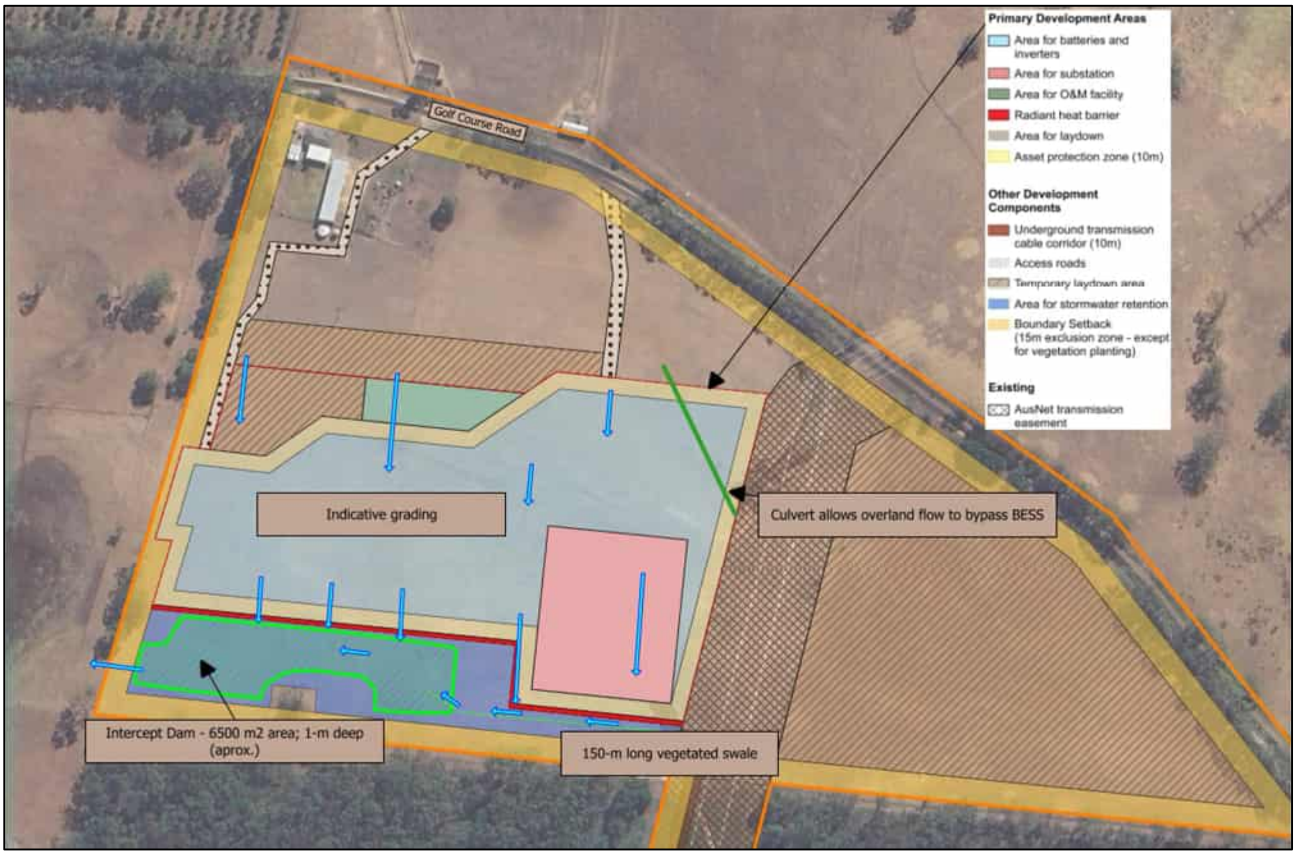

Figure 9: Stormwater Management Overview Plan

5.1 Grading

The grading of the primary development area is an important component of stormwater management. The grading will protect the utility installation from overland external flows and will ensure that all surface runoff from the utility installation can be isolated from other stormwater.

At the northeast of the primary development area, preliminary modelling indicates that the peak 1% AEP level in the overland flow path is approximately 37.0 m AHD. It is suggested that the primary development area adjacent to the flow path be designed to a level that provides at least 300 mm of freeboard to overland flow.

It is proposed that the primary development area be graded to generally slope down to the south. Grading the site to the south allows for runoff to be conveyed by internal access roads through the utility installation. At the southeast of the primary development area, a vegetated swale will collect all runoff from the utility installation and direct it to an intercept dam providing volume reduction, stormwater retention, and stormwater isolation. At the southwest of the primary development area, stormwater will drain directly to the proposed intercept dam. It is expected that the earthworks for the primary development area, including final levels and the design of all swales, will be finalised during detailed civil design.

5.2 External Overland Flow Culvert

As shown in Figure 9, a culvert is proposed to be installed at the northeast of the primary development area to convey external flows up to and including the 1% AEP flow of 1.3 m^3/s (see Section 3.3). The size of the culvert will depend on its grade. Therefore, the culvert should be sized during detailed civil design.

A conceptual plan of the culvert is shown in Figure 10. Note that the headwall of the culvert will likely be located within the overhead transmission easement. The design of the culvert will need to coordinate with AusNet to ensure that it is appropriately designed relative to the existing transmission easement and overhead transmission pylon buffers.

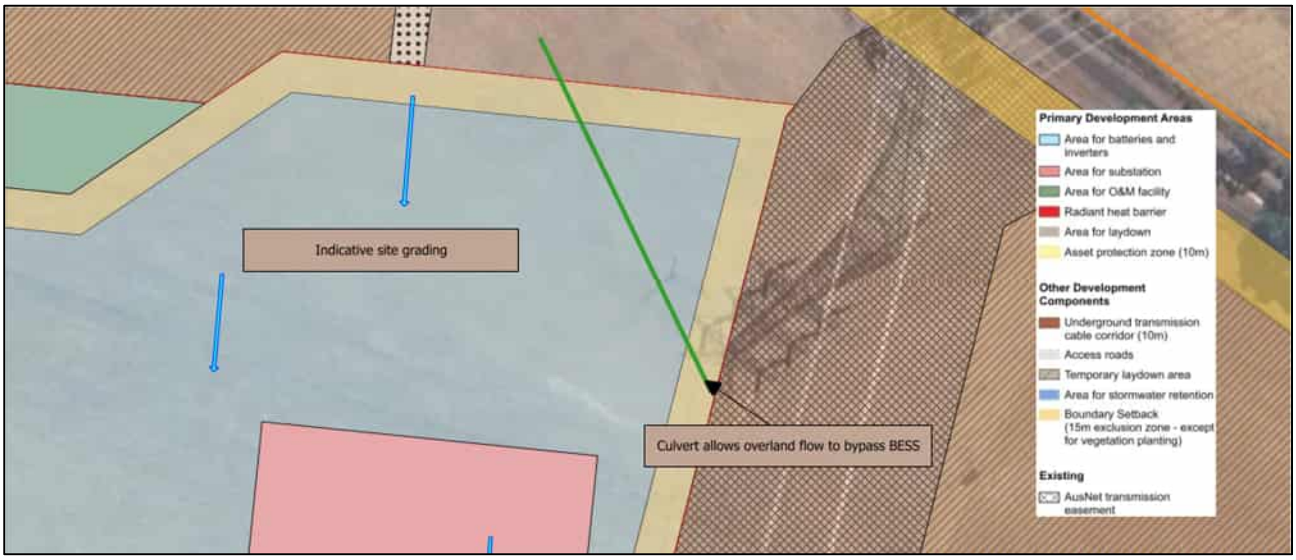

Figure 10: Concept plan of external overland flow path culvert

5.3 Peak developed flows

As discussed in Section 5.1, the primary development area will be graded to slope to the south. As shown in Figure 9, a vegetated swale can convey flows from the east of the development to the intercept dam. The swale will be sized to convey stormwater runoff for events up to and including the 1% AEP to the proposed intercept dam.

Rational Method computations have been used to calculate 1% AEP flows and to inform sizing of the swale. A fraction impervious of 0.55 was adopted for the utility installation. Peak developed flows are shown in Table 2. Complete drainage calculations are included in Appendix A.

Table 2: Peak developed flows

Location	Upstream Catchment Area (ha)	Developed 10% AEP Flow (m^3/s)	Developed 1% AEP Flow (m^3/s)
Intercept Dam	4.2	0.27	0.61

5.4 Conveyance swale

The conveyance swale connecting stormwater from the east of the primary development area to the intercept dam has been indicatively sized. A swale with the properties detailed in Table 3 will have the capacity to convey the entire post-developed 1% AEP flows from the subject site. The swale dimensions and construction methodology should be finalised during detailed civil engineering design to optimise cut-fill balance and to ensure adequate freeboard is provided to the utility installation.

Table 3: Conveyance swale properties

Attribute	Value	Unit
Length	300	m
Base width	1	m
Depth	0.25	m
Batters	1 in 5	n/a
Longitudinal Slope	1 in 50	m/m
TOTAL WIDTH	5	m
DEPTH OF FLOW	0.25	m

The maximum depth of water in the conveyance swale in the 1% AEP must be below the finished surface level of the adjacent road and the concrete supports for the BESS units to ensure that stormwater drains appropriately. A conceptual cross-section is shown in Figure 11.

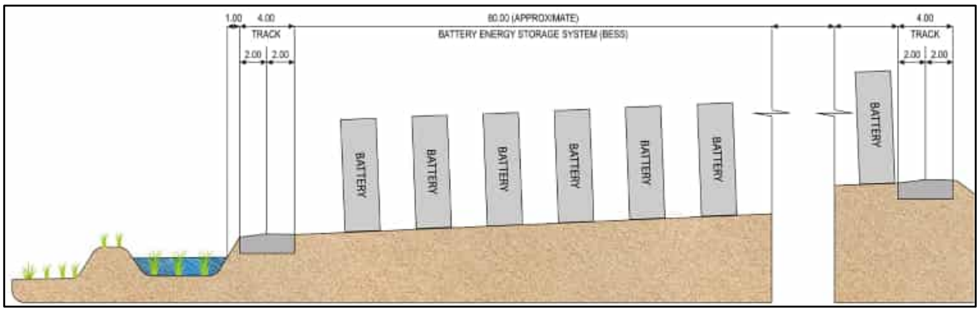

Figure 11: Conceptual cross-section

5.5 Intercept Dam

For stormwater management, it is suggested that an intercept dam be included in the design of the utility installation. The intercept dam will fulfill multiple stormwater management purposes, including stormwater volume reduction and retention of peak flows. It is proposed to locate the dam to the south of the primary development area, as shown in Figure 9.

The available storage in the dam has been sized for the dam's role in reducing annual stormwater volume to those experienced in the existing condition. See Section 5.7 for details.

5.5.1 Stormwater Retention

Stormwater retention calculations were made to ensure the sizing of the dam is appropriate. The sizing of the required retention volume has been undertaken using Boyd's Method. Complete calculations are included in Appendix A. A storage volume of approximately 525 m^3 is required to limit 1% AEP outflows from the 4.2 ha of permanent infrastructure within the primary development area to those from 4.2 ha of undeveloped area. Note that the volume required for stormwater volume reduction is substantially larger than the required retention volume. See Section 5.7 for details.

The stormwater retention function of the intercept dam will ensure that there is no increase in peak flow following development.

The intercept dam must discharge overland. The proposed utility installation is not adjacent to any existing waterways. It is suggested that the design of the dam overflow incorporates methods to disperse outflow so that concentrated outflows from the intercept dam do not contribute to downstream erosion.

5.5.2 Intercept/Stormwater Disconnection

The intercept dam manages surface water disconnection. In case of an environmental incident, the dam will collect surface water from the proposed utility installation—keeping any contaminated runoff on-site and separate to downstream waterways.

The outlet from the intercept dam can be effectively shut off, keeping surface water from the proposed utility installation separate to downstream waterways.

5.6 External Stormwater Management

As discussed in Section 5.1, the project area will be filled, thereby blocking an existing overland flow path. Construction of a culvert, detailed in Section 5.2, will manage external stormwater so that it bypasses the primary development area but maintains its existing downstream connections.

Other external flows enter the subject site. However, there are no other overland flow paths that interact with the primary development area.

5.7 Stormwater Volume Reduction

Discussions with Glenelg Shire Council identified the need to reduce developed condition annual stormwater volumes to those experienced in the existing condition.

MUSIC modelling software was adopted to simulate 10 years of rainfall data to determine the size of the dam required to limit stormwater volume from the development. Appropriate MUSIC modelling of mean annual runoff volume requires at least 10 (ten) years of local rainfall data recorded at 6-minute intervals. The period selected must also have similar rainfall patterns to the modelled location. The 6-minute (pluviograph) rainfall data is only available at certain weather stations across Australia.

Bureau of Meteorology and Council information indicates that the mean annual rainfall in Heywood is between 750-800 mm. The nearest weather station with 10-year pluviograph 6-minute rainfall data to the proposed Heywood BESS is the Casterton Showgrounds station. However, Casterton Showgrounds is inland from the proposed utility installation and has a lower annual rainfall of approximately 650 mm/year.

A 10-year rainfall template was developed based on Bureau of Meteorology data recorded at Casterton Showgrounds from 2011 to 2021. The template was adjusted (rainfall increased uniformly) so that the mean annual rainfall was 750 mm, in line with recorded averages for Heywood. It is suggested that during the detailed design of the stormwater reduction dam, the project team should liaise with Glenelg Shire Council to see if Council has a preferred rainfall template for modelling stormwater volume reduction. A schematic of the MUSIC model used to investigate mean annual runoff volumes is shown in Figure 12.

Modelling indicates that there is 9.8 ML of mean annual stormwater volume in the existing condition. A dam was sized to collect developed surface runoff and allow evaporation to reduce the annual stormwater volume. A dam with a surface area of approximately 6,500 m^2 is required to reduce the stormwater volume in the developed condition to that experienced in the existing condition. MUSIC modelling indicates that allowing for at least 1 m of depth of water within the dam allows sufficient storage for evaporation.

The modelling indicates that, on average, stormwater will be stored in the dam to a depth of 0.8 m. The large volume of stored stormwater provides an opportunity for reuse in the developed condition. However, for the purposes of this report, the only method of volume reduction considered was evaporation.

Sizing the intercept dam to have an area of at least 6,500 m^2 and a depth of at least 1 m will allow it to perform the stormwater volume reduction function. Stormwater volume will be reduced so that there is no increase in stormwater volume in the developed condition.

5.8 Stormwater Quality Treatment

Stormwater quality treatment to achieve Best Practice Environmental Management Guidelines (BPEMG) standards is not applicable to the proposal, since the proposed development is a utility installation.

The proposed stormwater management provides an opportunity to integrate stormwater quality treatment into the project at minimal additional cost. The swale that will collect and convey stormwater at the southeast of the primary development area will be vegetated and will provide stormwater quality treatment. The volume reduction dam also provides stormwater quality treatment.

MUSIC modelling was undertaken adopting the same adjusted 10-year rainfall template detailed in Section 5.7. The MUSIC model schematic is shown in Figure 12. Stormwater quality treatment results are compared to Best Practice Environmental Management Guidelines (BPEMG) targets in Table 4.

Half of the length of the proposed swale was input to the MUSIC model to account for stormwater entering the swale at different locations. A vegetation height of 0.1 m was adopted to simulate well-maintained mowed vegetation. Taller vegetation will provide additional stormwater quality treatment.

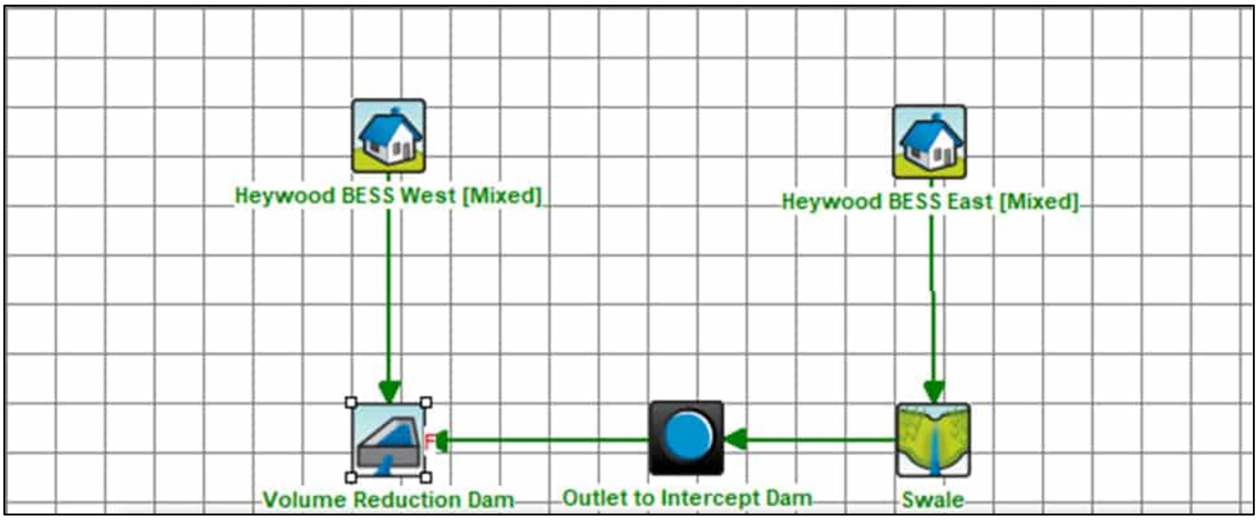

Figure 12: MUSIC modelling schematic

Table 4: Stormwater Quality Treatment

Pollutant	BPEM Target reduction %	Vegetated Swale Reduction %	Volume Reduction Dam %
Total Suspended Solids (TSS)	80 %	84.3 %	92.6 %
Total Phosphorus (TP)	45 %	56.9 %	79.2 %
Total Nitrogen (TN)	45 %	22.9 %	70.4 %

The stormwater quality results are above the statutory requirement, and the stormwater quality results are a flow-on-effect of the volume reduction function of the intercept dam combined with the proposed conveyance swale. Should additional treatment be desired, it is recommended that the opportunity to incorporate regenerative stormwater conveyance in line with the *IDM sustainable infrastructure guidelines* be considered. Regenerative stormwater conveyance can provide additional stormwater quality treatment whilst also achieving the required stormwater management performance.

5.9 Water Quality Location

As shown in Figure 9, the primary development area will be graded to fall to the intercept dam south of the project site area. As all stormwater runoff is isolated from external flows, water quality can be managed. The intercept dam allows for stormwater from the proposed utility installation to be disconnected from the surrounding hydrological system by blocking the outlet from the intercept dam.

5.10 Infiltration and Groundwater

The surface treatment for the permanent infrastructure including the BESS and infrastructure at the proposed development is expected to be crushed rock. A crushed rock surface allows continued permeability of the subject site. In addition, the proposed use of an open swale for conveyance of stormwater promotes infiltration and minimises impacts of the development on existing groundwater conditions.

If a detailed assessment of existing and proposed groundwater conditions is required, or if monitoring needs to be undertaken, a geotechnical professional should be engaged.

5.11 Bushfire Management Overlay (BMO)

A BMO exists over the southern portion of the project site area, as shown in Figure 2. The proposed intercept dam is located inside of the BMO. The vegetated swale proposed within the BMO can be vegetated with mown grass that is maintained by the utility installation owner in line with the requirements of the BMO.

Conclusion

This report presents the hydrology and stormwater management investigation for the proposed BESS utility installation at 100 Golf Course Road, Heywood, Victoria (primary parcel). The primary parcel comprises approximately 18 ha, and of that area, the primary development area comprises 5.7 ha. The area of permanent infrastructure, including the BESS and associated infrastructure, comprises approximately 4.2 ha.

Preliminary two-dimensional TUFLOW modelling was undertaken to identify any existing overland flow paths through the development. One such flow path was identified by the modelling.

The hydrology investigation indicates that the primary parcel is not subject to fluvial flooding, and the impacts from pluvial (flash) flooding are limited to the existing overland flow path through the primary development area identified by two-dimensional flood modelling.

A stormwater management strategy was developed for the concept layout to ensure that the existing hydrology is maintained after development. Key components of the stormwater management strategy include:

- Indicative grading of the development to protect the utility installation from 1% AEP overland flows
- Culvert to allow external flows from the east to be diverted through the primary development area.
- Construction of stormwater drainage swale along the southeastern boundary of the development footprint to collect surface runoff and direct it to the intercept dam.
- Construction of an intercept dam located to the south of the development footprint to fulfill the following stormwater management goals:
    - Provide retention volume to retain peak flows to those experienced in the existing condition
    - Provide stormwater volume reduction, limiting volume to that experienced in the existing condition
    - Provide a way to isolate surface runoff from the subject site to protect downstream waterways in an environmental incident.

The proposed utility installation can manage stormwater appropriately. The stormwater management methodology of adopting a vegetated swale to collect surface runoff from the project site in combination with the volume reduction dam has the added benefit of providing stormwater quality treatment in excess of the statutory guidelines for total suspended solids, total phosphorus, and total nitrogen.

Appendices

Appendix A Drainage calculations

DALTON
CONSULTING
ENGINEERS

Stormwater Calculations

HEYWOOD BESS

Rev B May 2025

Atmos
RENEWABLES

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MAJOR STORM EVENT HYDROLOGY COMPUTATIONS

PROJECT DETAILS	
Job Description:	HEYWOOD BESS
Job Number:	24115
Compiled by:	JMB
Date:	08-05-25
Council:	OTHER
Minor Storm Frequency 1:	10% AEP
Minor Storm Frequency 2:	
Major Storm Frequency:	1% AEP
Blockage Factor (%):	

RAINFALL DATA							
Source	BOM IFD						
Latitude	-38.169546	Longitude	141.640312	Zone	0	Date	15-01-24

C'10	0.088106952

Climate Change Adjustment Factor	1.1

TIME OF CONCENTRATION
Based on the Kinematic Wave Equation:

$$To\ I^{0.4} = 6.94\frac{(L\ x\ n)^{0.6}}{S^{0.3}}$$

Where….
T = Overland Flow Time (min)
I = Rainfall Intensity, (mm/hr)
L = Length of flow path, (m)
n = Manning
S = Slope, (m/m)

PEAK FLOW
Based on the Rational Method:

$$Q = CIA$$

Where….
Q = Peak Flow (cu.m/s)
C = Co-Efficient of Runoff
I = Rainfall Intensity, (mm/hr)
A= Area (hectares)

CATCHMENT DETAILS (ALL AREAS IN HECTARES)									
	Sub-Catch 1	Sub-Catch 2	Sub-Catch 3	Sub-Catch 4	Sub-Catch 5				
Name	BESS FACILITY	Medium Density	Open Space	Drainage Reserve	Lot 600-1000sq.m				
Fraction Imp. (f)	0.55	0.9	0.1	0.25	0.6				
C'10	0.535	0.819	0.169	0.291	0.575				
C Minor 1	0.535	0.819	0.169	0.291	0.575				
C Minor 2	0.508	0.778	0.161	0.277	0.546				
C Major	0.642	0.983	0.203	0.349	0.690	Minor 1/2?	Minor 1 Ae		Major Ae
EXG SOUTH			7.200			1	1.219		1.463
EXG NORTH			11.150			1	1.888		2.265
Permanent Infrastructure	4.200					1	2.246		2.695

FLOW CALCULATIONS

Section	Contributing Catchments																				Length (m)	Initial T (min)	Surface	n	S = Slope (m/m)	Minor 1 ToC (min)	Minor 1 I (mm/hr)	Minor 1 Ae (ha)	Minor 1 Q (m3/s)					Major ToC (min)	Major I (mm/hr)	Major Ae (ha)	Major Q (m3/s)
	DEV SOUTH	DEV NORTH	EXG SOUTH	EXG NORTH	Permanent Infrastructure	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T																	
3			Y																		330	5.0	Grass Channel	0.035	0.021	25.600	41.761	1.219	0.16					20.835	79.005	1.463	0.35
4				Y																	780	5.0	Grass Channel	0.035	0.023	44.272	29.397	1.888	0.17					35.080	55.896	2.265	0.39
5					Y																350	5.0	Grass Channel	0.035	0.017	28.371	38.979	2.246	0.27					22.941	74.620	2.695	0.61

STORAGE CALCULATIONS

PROJECT DETAILS	
Job Description:	HEYWOOD BESS
Job Number:	24115
Compiled by:	JMB
Date:	08-05-25
Council:	OTHER
Existing Storm Frequency:	1% AEP
Developed Storm Frequency:	1% AEP

C'10	0.088106952

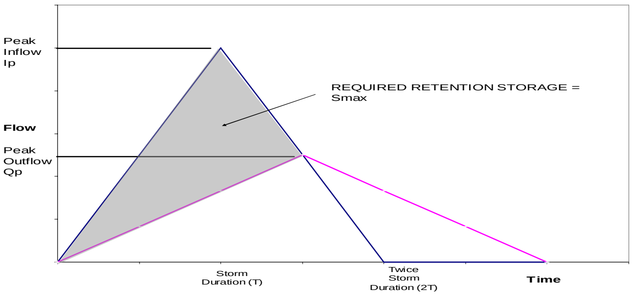
STORAGE

Based on Boyds Formula:

$$Smax = v1(1-\frac{Qp}{Ip})$$

Where....

Smax = Max Volume of Temporary Storage (cu,m)
V1 = Co-Efficient of Runoff
I = Volume of Inflow Flood (cu.m)
Ip = Peak Discharge of Inflow Hydrograph (cu.m/s)
Qp = Peak Discharge of Outflow Hydrograph (cu.m/s)



CATCHMENT DETAILS (ALL AREAS IN HECTARES)						
	SubCatchment 1	SubCatchment 2	SubCatchment 3	SubCatchment 4	SubCatchment 5	
Name	BESS FACILITY	Open Space	Lot 1000-4000sq.m	Mixed Use Zone	Industrial	
Fraction Imp. (f)	0.55	0.1	0.3	0.7	0.9	
C10	0.535	0.169	0.332	0.656	0.819	
C Existing	0.642	0.203	0.398	0.788	0.983	
C Developed	0.642	0.203	0.398	0.788	0.983	Eff. Area
Existing Catchment Area		4.2				0.853
Developed Catchment Area	4.2					2.695

ALLOWABLE OUTFLOW								
Existing Time of Concentration (Kinematic Wave Equation)								
Length (m) =	350		Lookup Value Below				Interpolated	
F_R =	Grass Channel	0.035	$T_O I^{0.4}{}_{(BELOW)}$=	101.402	T_o (mins.) =	17.000	T_o (mins.) =	17.941
Slope (m/m) =	0.017		Lookup Value Above				T_i (mins.) =	5.000
$T_O I^{0.4}{}_{(CALC)}$=	105.69		$T_O I^{0.4}{}_{(ABOVE)}$=	105.953	T_o (mins.) =	18.000	T_c (mins.) =	23.000

STORAGE CALCULATION						
Estimated Duration (mins)	Duration	I	I_p	Q_p	V_1	S_{max}
30	(mins)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	(m^3)
Used to populate duration column only, must be greater than 10.	20	79.005	0.591	0.172	709.630	503
	21	76.737	0.574		723.725	507
	22	74.620	0.559		737.265	510
	23	72.637	0.544		750.298	513
	24	70.776	0.530		762.864	515
	25	69.026	0.517		775.003	517
	26	67.377	0.504		786.745	518
	27	65.820	0.493		798.121	519
	28	64.347	0.482		809.157	520
	29	62.951	0.471		819.876	520
	30	61.626	0.461		830.300	520
	31	60.367	0.452		840.448	520
	32	59.169	0.443		850.337	520
	33	58.027	0.434		859.983	519
	34	56.937	0.426		869.401	518
	35	55.896	0.418		878.603	517
	36	54.900	0.411		887.602	516
	37	53.946	0.404		896.409	514
	38	53.032	0.397		905.034	513
	39	52.154	0.390		913.487	511
	40	51.312	0.384		921.776	509
	41	50.502	0.378		929.909	506
					STORAGE REQUIRED (m3) =	521

RAINFALL DATA

Source	BOM IFD						
Latitude	-38.169546	Longitude	141.640312	Zone		Date	15-01-24

Annual Exceedance Probability (AEP) Coefficients

	4EY	2EY	1EY	0.2EY	50% AEP#	20% AEP*	10% AEP	5% AEP	2% AEP	1% AEP
C0	-1.80E-01	9.87E-02	3.48E-01	7.75E-01	4.56E-01	7.55E-01	9.35E-01	1.10E+00	1.29E+00	1.43E+00
C1	9.67E-01	9.35E-01	8.89E-01	8.49E-01	8.77E-01	8.49E-01	8.36E-01	8.27E-01	7.88E-01	7.25E-01
C2	-2.30E-01	-1.84E-01	-1.25E-01	-7.01E-02	-1.07E-01	-7.01E-02	-5.50E-02	-4.56E-02	-9.75E-04	7.29E-02
C3	6.26E-02	3.89E-02	1.19E-02	-1.46E-02	3.10E-03	-1.46E-02	-2.08E-02	-2.40E-02	-4.19E-02	-7.35E-02
C4	-1.09E-02	-5.73E-03	-3.55E-04	5.35E-03	1.61E-03	5.35E-03	6.47E-03	6.84E-03	1.00E-02	1.62E-02
C5	9.78E-04	4.75E-04	-1.05E-05	-5.64E-04	-2.09E-04	-5.64E-04	-6.47E-04	-6.49E-04	-8.98E-04	-1.45E-03
C6	-3.41E-05	-1.60E-05	4.2092412e-07	1.9968733e-05	7.7756895e-06	1.9968713e-05	2.1893513e-05	2.0511359e-05	2.7375001e-05	4.6108038e-05

NOTE:

The coefficients can be applied to estimate the design rainfall depth for a full range of durations from 1 minute to 7 days.

It is recommended that only three significant figures are used when undertaking calculations using design rainfalls generated in this way.

The 50% AEP IFD does not correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.

* The 20% AEP IFD does not correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

Duration (mins)	4EY	2EY	1EY	0.2EY	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
1	50.115	66.227	84.973	130.272	94.623	127.718	152.801	179.551	218.605	251.558
2	44.696	58.644	74.403	113.002	82.628	110.786	132.091	154.786	186.376	210.889
3	39.251	51.616	65.709	100.131	73.053	98.167	117.142	137.332	165.731	188.250
4	35.132	46.272	59.098	90.329	65.763	88.557	105.777	124.094	150.189	171.374
5	31.973	42.137	53.934	82.605	60.052	80.985	96.805	113.636	137.858	157.866
6	29.473	38.840	49.778	76.340	55.445	74.843	89.511	105.124	127.760	146.689
7	27.438	36.141	46.350	71.139	51.637	69.744	83.444	98.034	119.302	137.240
8	25.742	33.882	43.464	66.738	48.426	65.429	78.303	92.019	112.092	129.123
9	24.303	31.959	40.994	62.957	45.675	61.723	73.880	86.839	105.858	122.061
10	23.061	30.296	38.850	59.667	43.285	58.497	70.027	82.323	100.405	115.852
11	21.976	28.841	36.969	56.772	41.187	55.659	66.634	78.343	95.586	110.343
12	21.019	27.555	35.301	54.203	39.326	53.140	63.620	74.806	91.293	105.417
13	20.165	26.407	33.810	51.903	37.661	50.885	60.921	71.636	87.438	100.983
14	19.397	25.375	32.468	49.830	36.163	48.853	58.488	68.777	83.956	96.967
15	18.703	24.442	31.251	47.951	34.805	47.011	56.281	66.182	80.791	93.312
16	18.071	23.591	30.143	46.238	33.567	45.331	54.268	63.815	77.901	89.968
17	17.492	22.813	29.128	44.668	32.433	43.792	52.423	61.646	75.250	86.895
18	16.959	22.098	28.194	43.224	31.390	42.377	50.726	59.649	72.807	84.062
19	16.467	21.437	27.331	41.890	30.427	41.069	49.158	57.803	70.547	81.440
20	16.011	20.825	26.531	40.654	29.533	39.856	47.704	56.092	68.451	79.005
21	15.587	20.255	25.786	39.503	28.703	38.729	46.351	54.499	66.500	76.737
22	15.190	19.723	25.092	38.430	27.927	37.677	45.089	53.014	64.679	74.620
23	14.819	19.226	24.442	37.426	27.202	36.692	43.909	51.624	62.974	72.637
24	14.470	18.759	23.832	36.485	26.522	35.769	42.801	50.320	61.375	70.776
25	14.142	18.320	23.259	35.600	25.882	34.902	41.761	49.094	59.871	69.026
26	13.832	17.906	22.719	34.766	25.279	34.084	40.780	47.939	58.454	67.377
27	13.540	17.514	22.208	33.979	24.710	33.312	39.854	46.849	57.116	65.820
28	13.262	17.144	21.725	33.234	24.171	32.582	38.979	45.818	55.850	64.347
29	12.999	16.793	21.268	32.529	23.661	31.891	38.149	44.841	54.651	62.951
30	12.749	16.460	20.833	31.859	23.176	31.234	37.362	43.913	53.512	61.626
31	12.511	16.142	20.419	31.222	22.716	30.610	36.613	43.032	52.430	60.367
32	12.283	15.840	20.026	30.616	22.277	30.016	35.901	42.193	51.400	59.169
33	12.066	15.551	19.650	30.039	21.858	29.450	35.222	41.393	50.419	58.027
34	11.859	15.276	19.292	29.487	21.459	28.909	34.573	40.629	49.482	56.937
35	11.660	15.012	18.949	28.960	21.077	28.392	33.954	39.899	48.586	55.896
36	11.470	14.759	18.620	28.456	20.711	27.898	33.361	39.201	47.730	54.900
37	11.287	14.517	18.306	27.973	20.361	27.424	32.793	38.533	46.909	53.946
38	11.112	14.285	18.004	27.509	20.025	26.970	32.249	37.891	46.122	53.032
39	10.943	14.061	17.714	27.064	19.702	26.534	31.726	37.276	45.367	52.154
40	10.780	13.846	17.435	26.637	19.392	26.115	31.224	36.684	44.642	51.312
41	10.624	13.639	17.167	26.226	19.093	25.712	30.741	36.116	43.945	50.502
42	10.473	13.440	16.909	25.830	18.806	25.324	30.276	35.569	43.274	49.723
43	10.327	13.248	16.660	25.449	18.529	24.950	29.828	35.041	42.628	48.973
44	10.186	13.062	16.420	25.081	18.262	24.590	29.397	34.533	42.005	48.250
45	10.051	12.883	16.188	24.727	18.004	24.242	28.980	34.043	41.404	47.553
46	9.919	12.710	15.964	24.384	17.755	23.906	28.578	33.569	40.824	46.880
47	9.792	12.543	15.748	24.053	17.514	23.581	28.189	33.112	40.263	46.230
48	9.668	12.380	15.538	23.733	17.281	23.268	27.814	32.670	39.722	45.602
49	9.549	12.223	15.336	23.423	17.056	22.964	27.450	32.242	39.198	44.995
50	9.433	12.071	15.140	23.123	16.838	22.670	27.098	31.827	38.690	44.408
55	8.903	11.376	14.243	21.756	15.842	21.329	25.493	29.939	36.380	41.733
60	8.440	10.771	13.467	20.573	14.979	20.169	24.106	28.307	34.384	39.427
65	8.033	10.241	12.786	19.537	14.224	19.154	22.892	26.880	32.642	37.415
70	7.671	9.770	12.185	18.623	13.556	18.258	21.821	25.621	31.105	35.644
75	7.347	9.350	11.648	17.808	12.960	17.459	20.867	24.499	29.738	34.070
80	7.055	8.971	11.165	17.077	12.425	16.742	20.010	23.493	28.513	32.661
85	6.789	8.628	10.729	16.416	11.941	16.094	19.237	22.585	27.408	31.392
90	6.547	8.315	10.332	15.815	11.501	15.505	18.534	21.760	26.405	30.241

ARR16 IFD MAP CHECK

CONSTANTS

Council	C'10
CARDINIA	0.11508008
CASEY	0.11508008
HUME	0.16031382
MELTON	0.15445632
WHITTLESEA	0.16031382
WYNDHAM	0.15445632
OTHER	0.08810695

Zone	Frac. Impervious
Lot <450sq.m	0.8
Lot 450-600sq.m	0.7
Lot 600-1000sq.m	0.6
Lot 1000-4000sq.m	0.3
Major Roads	0.8
Local Roads	0.7
Drainage Reserve	0.25
Open Space	0.1
Schools	0.7
Mixed Use Zone	0.7
Industrial	0.9
Medium Density	0.9
BESS FACILITY	0.7
Impervious	1

Pit Type	
SEP	
GEP	

Co-Ordinate Type	
Easting	Latitude
Northing	Longitude

	Frequency Factor
4EY	0.80
2EY	0.80
1EY	0.80
0.2EY	0.95
50% AEP	0.85
20% AEP	0.95
10% AEP	1.00
5% AEP	1.05
2% AEP	1.15
1% AEP	1.20

Surface	FR
Smooth Concrete	0.013
Asphalt	0.015
Road Reserve	0.02
Earth Channel	0.025
Grass Channel	0.035
OTHER	

Pipe Type	Mannings
PE	0.01
PP	0.01
PVC	0.01
RC	0.013
VC	0.015

Y or N?
Y
N

1or 2?
1
2

Pipe Sizes	No. of Pipes
225	1
300	2
375	3
450	4
525	5
600	
675	
750	
825	
900	
1050	
1200	
1350	
1500	
1650	
1800	

Storm
Minor 1
Minor 2
Major
Overland

Manning Formula Uniform Trapezoidal Channel Flow at Given Slope and Depth

Project Area Conveyance Swale

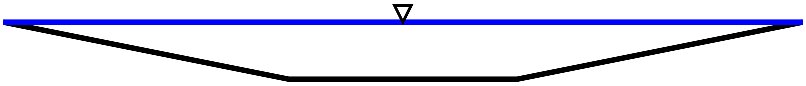
HEYWOOD BESS

Inputs

Bottom width, b	1	m
Side slope 1 (horiz./vert.)	5	
Side slope 2 (horiz./vert.)	5	
Manning roughness, n ? ○Strickler ○B/B (See notes)	0.035	
Channel slope, S	2	% rise/run
Flow depth, y	0.25	m
Bend Angle ? (for riprap sizing)	0	
Rock specific gravity (2.65)	2.65	
Design rock size, D50 ○Isbash ○Maynord ○Searcy * 1.25 (See notes)	0.1	m

Results

Flow area, a	0.5625	m^2
Wetted perimeter, P_w	3.5495	m
Hydraulic radius, R_h	0.1585	m
Velocity, v	1.1833	m/s
Flow, Q	0.6656	m^3/s
Velocity head, h_v	0.0714	m
Top width, T	3.5000	m
Froude number, F	0.94	
Average shear stress (tractive force), tau	31.0796	N/m^2
n for design rock size per Strickler	0.0323	
n for design rock size per Blodgett	0.0707	
n for design rock size per Bathurst	0.0512	
Blodgett vs. Bathurst	Blodgett	
Required bottom angular rock size, D50 (Isbash & MC) ?	0.0531	m
Required side slope 1 angular rock size, D50 (Isbash & MC) ?	0.0542	m
Required side slope 2 angular rock size, D50 (Isbash & MC) ?	0.0542	m
Required angular rock size, D50 (Maynord, Ruff, and Abt 1989)	0.0589	m
Required angular rock size, D50 (Searcy 1967)	0.0308	m

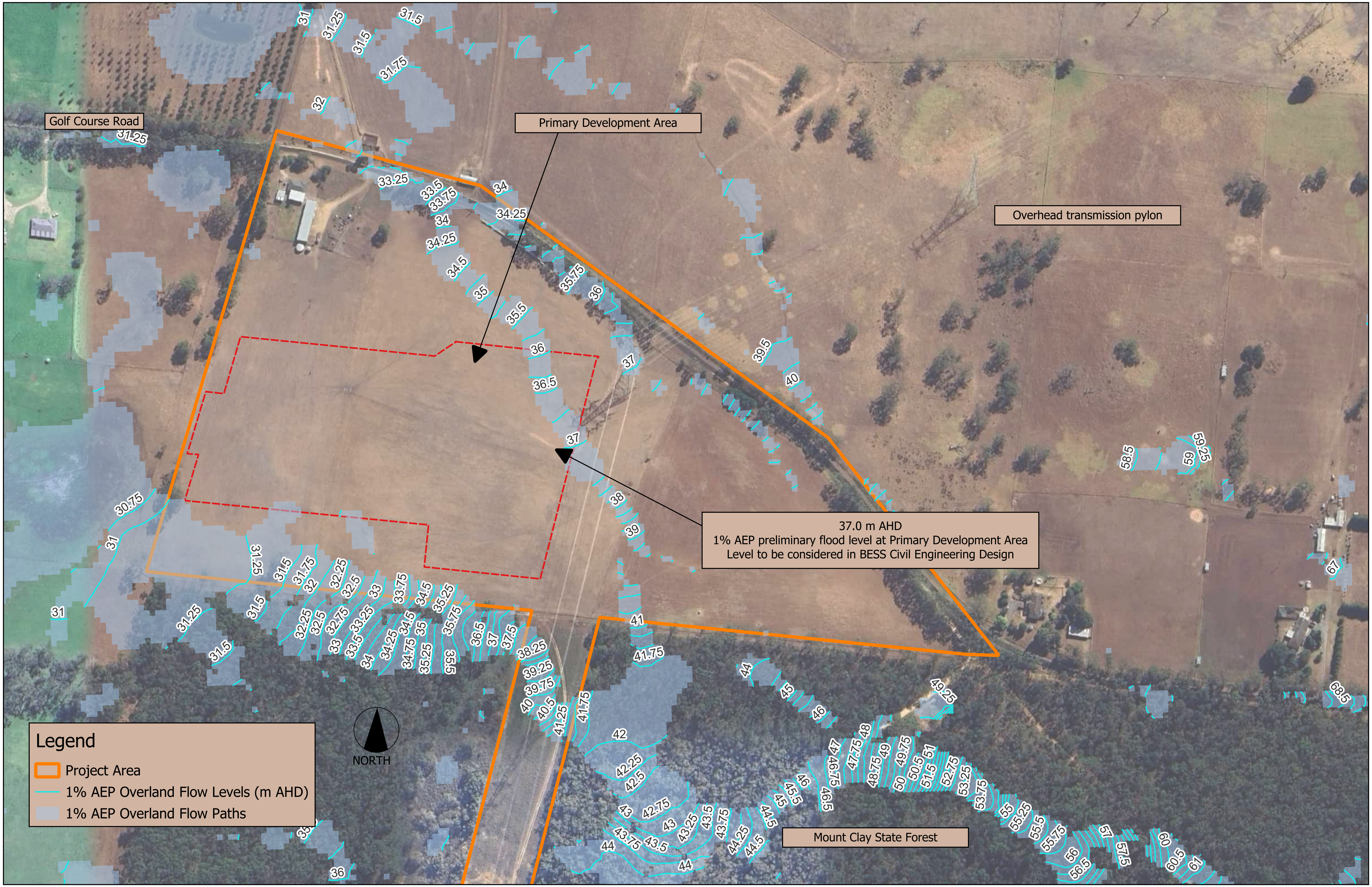


Notes:

Automated rock size and roughness design iteration
Choose a roughness radio button (BB recommended) and a design rock size radio button (Isbash recommended). Fine-tune depth and rock size safety factor to get your desired flow with an even rock size. Every time you change any input value, the following iteration cycle happens: 1. Roughness is calculated from design rock size. 2. The requested roughness calculation is copied to input roughness. 3. Channel flow and required rock size are calculated. 4. Design rock size is adjusted. 5. Repeat until error in the design rock size is very small.

Basic calculator (no iteration)
Enter your desired roughness value. Ignore the design rock size input area.

Appendix B TUFLOW results



37.0 m AHD
1% AEP preliminary flood level at Primary Development Area
Level to be considered in BESS Civil Engineering Design

DESIGNED:	J Baumann
CHECKED:	J Baumann
DATE OF ISSUE:	06/05/2025
REVISION:	C

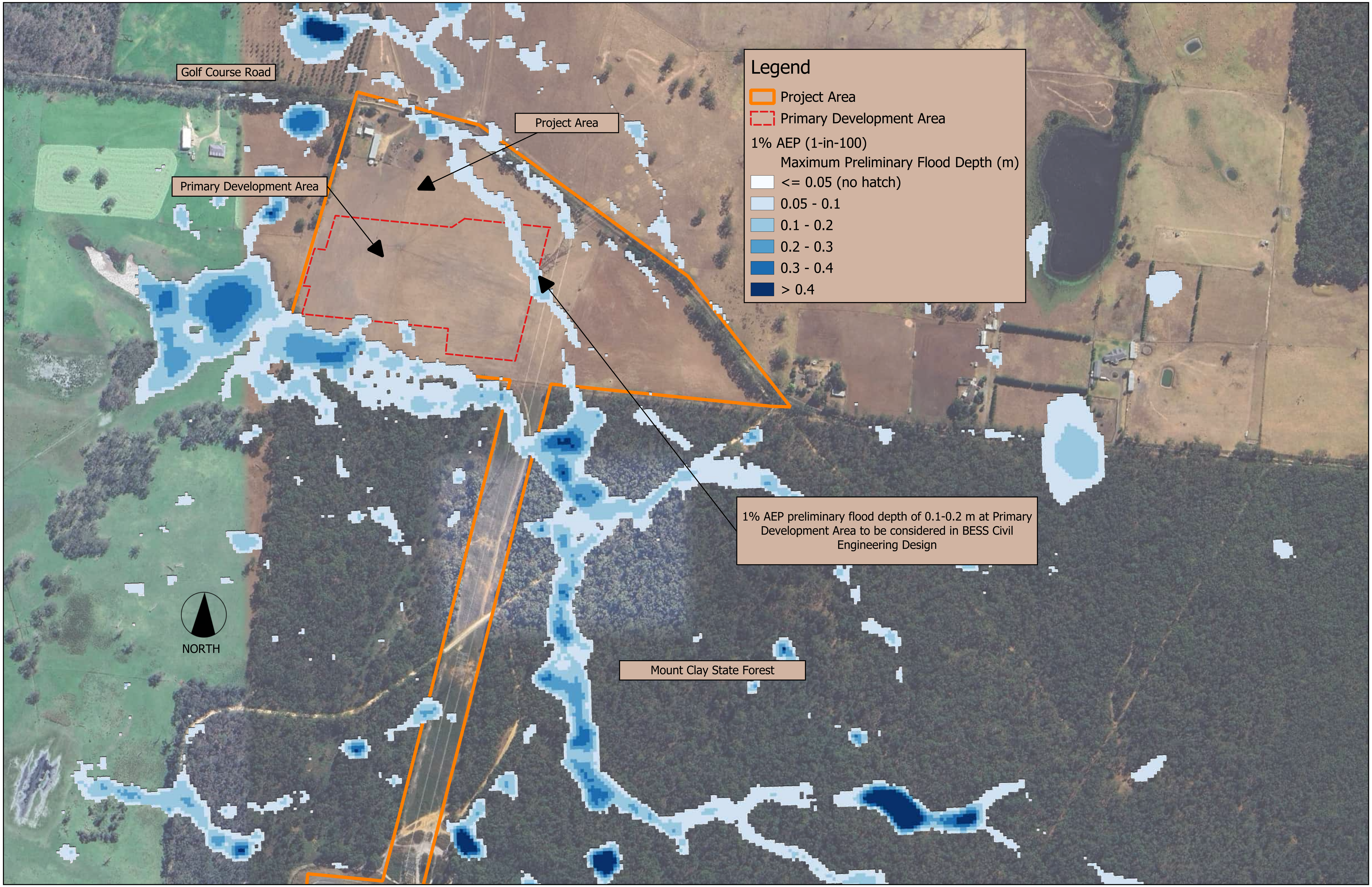
0 100 200 300 400 500 m

Heywood BESS

TUFLOW MODELLING RESULTS

May 2025

DALTON
CONSULTING
ENGINEERS



1% AEP preliminary flood depth of 0.1-0.2 m at Primary Development Area to be considered in BESS Civil Engineering Design

DESIGNED: J Baumann
CHECKED: J Baumann
DATE OF ISSUE: 07/05/2025
REVISION: C

Heywood BESS
TUFLOW MODELLING RESULTS
May 2025

DALTON
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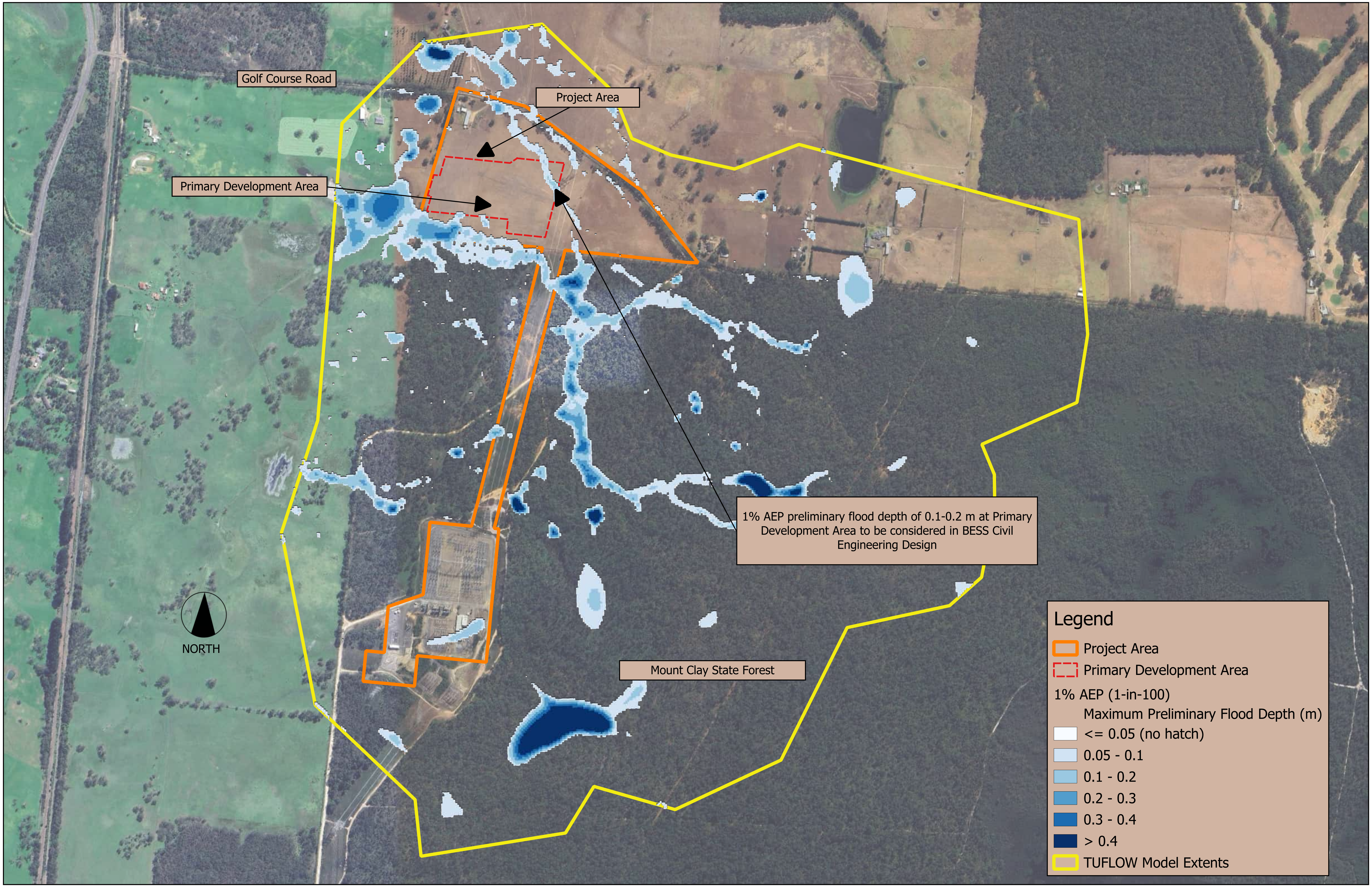

DESIGNED:	J Baumann
CHECKED:	J Baumann
DATE OF ISSUE:	07/05/2025
REVISION:	C

Heywood BESS
TUFLOW MODELLING RESULTS

May 2025

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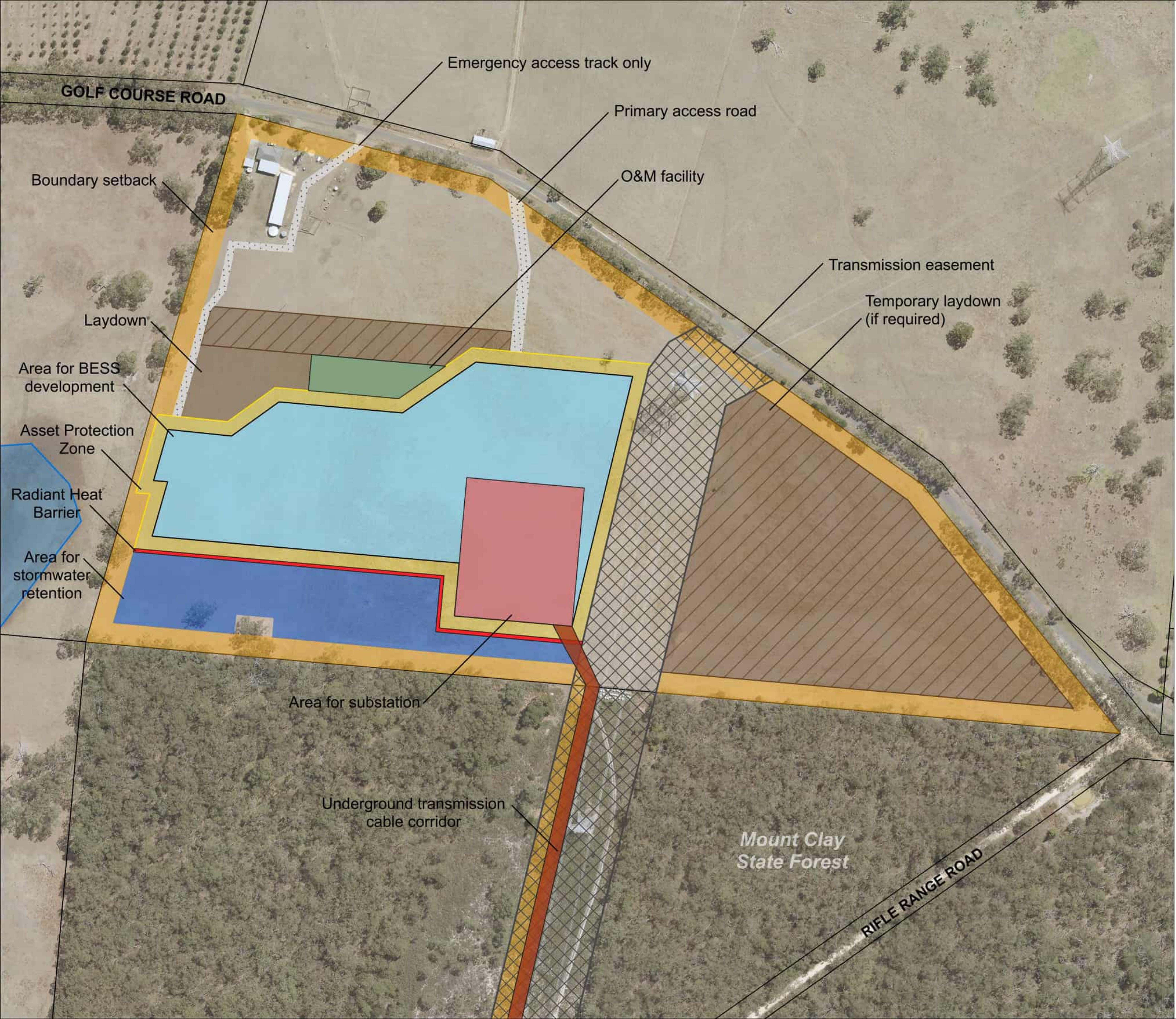
Appendix C Project Layout Plan



Atmos RENEWABLES

Concept Layout Areas Plan

2425 - Heywood BESS

Primary Development Areas

- 🟦 Area for batteries and inverters
- 🟥 Area for substation
- 🟩 Area for O&M facility
- 🟥 Radiant heat barrier
- ▨ Area for laydown
- 🟨 Asset protection zone (10m)

Other Development Components

- 🟫 Underground transmission cable corridor (10m)
- ⁘ Access roads
- ▨ Temporary laydown area
- 🟦 Area for stormwater retention
- 🟧 Boundary Setback (15m exclusion zone - except for vegetation planting)

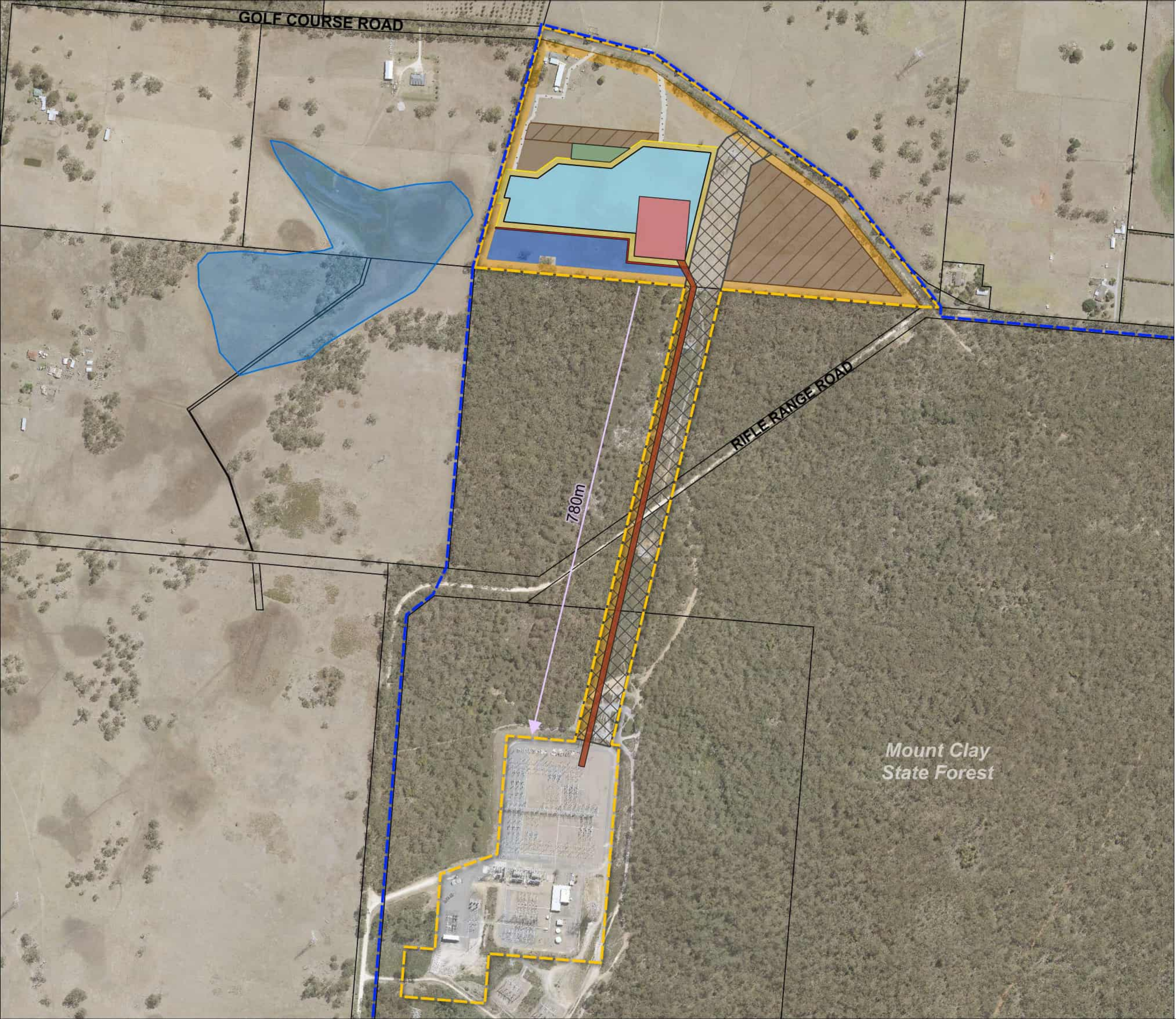
Existing

- ▩ AusNet transmission easement
- 🟦 Wetland
- ☐ Cadastre (parcels)

Please note the Project is in early concept design and is subject to change.

Date: 01/05/2025

0 50 100 m



Atmos RENEWABLES

Concept Layout Areas Plan (Project Area)

2425 - Heywood BESS

- ▭ Site
- ▭ Project Area

Primary Development Areas

- 🟦 Area for batteries and inverters
- 🟥 Area for substation
- 🟩 Area for O&M facility
- 🟥 Radiant heat barrier
- ▨ Area for laydown
- 🟨 Asset protection zone (10m)

Other Development Components

- 🟫 Underground transmission cable corridor (10m)
- ▨ Access roads
- ▨ Temporary laydown area
- 🟦 Area for stormwater retention
- 🟧 Boundary Setback (exclusion zone - except for vegetation planting)

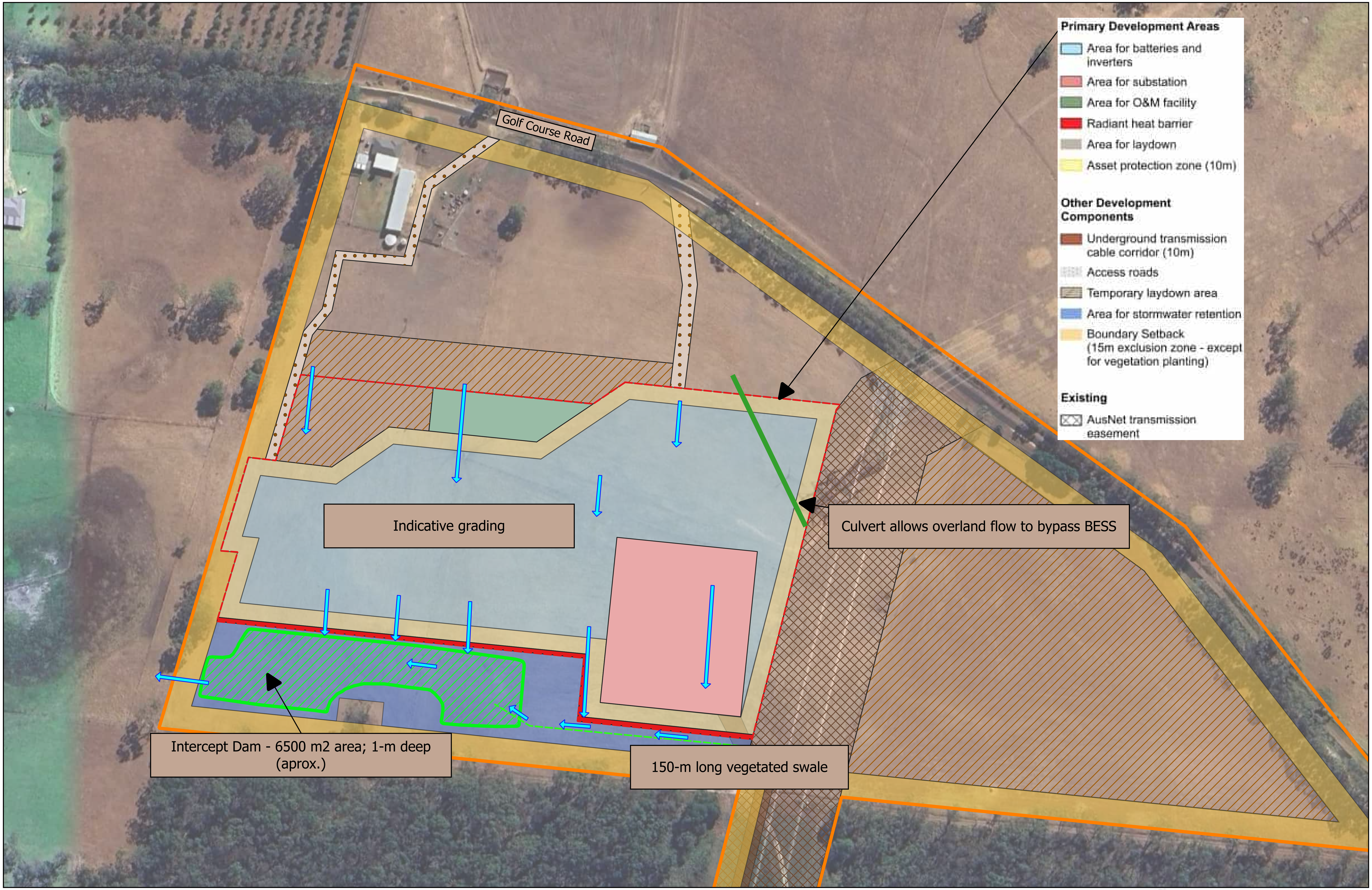
Existing

- ☒ AusNet transmission easement
- 🟦 Wetland
- ☐ Cadastre (parcels)

Please note the Project is in early concept design and is subject to change.

Date: 01/05/2025

0 100 200 m



DESIGNED: J Baumann
CHECKED: J Baumann
DATE OF ISSUE: 08/05/2025
REVISION: C

0 25 50 75 100 125 m

Heywood BESS
Stormwater Management
May 2025

DALTON CONSULTING ENGINEERS