Griffith BESS Hydrology Assessment

Hydrology Assessment

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Figures and Tables

1. Introduction

HARC was engaged by Eku Energy on behalf of Griffith BESS Co Pty Ltd (Eku) to conduct a hydrology assessment for the proposed utility-scale Battery Energy Storage System (BESS) near Griffith, NSW, referred to as the Griffith BESS. This report provides a technical assessment of potential hydrological impacts and flood risks to support the Environmental Impact Statement (EIS) application.

The purpose of the study is to:

- Assess the existing hydrological and flooding conditions of the site;
- Evaluate potential impacts of the proposed development on local and regional flooding;
- Ensure compliance with Griffith City Council requirements and relevant guidelines; and
- Respond to the applicable Planning Secretary's Environmental Assessment requirements (SEARs) (SSD-85372970) dated 23 June 2025.

1.1 Site Context

The project site is located in Yoogali, New South Wales, approximately 7 km southeast of Griffith. Griffith is a key urban centre in the Riverina region, known for its extensive irrigated agriculture and emerging renewable energy developments.

The site comprises two land parcels — 41 Bob Irwin Road, Yoogali (Lot 1 DP1252779) and 15 Bob Irwin Road, Yoogali (Lot 2 DP1252779) — with a combined area of approximately 4.5 hectares. The land is zoned RU1 Primary Production and has historically been used for irrigated cropping, consistent with surrounding agricultural uses.

Figure 1: Site

The site is situated approximately 1.8 km from Mirrool Creek, with open irrigation supply channels running along both the northern and southern property boundaries. This landscape places the site within a locally defined catchment, bounded by existing agricultural and renewable energy developments.

1.2 Proposed Development

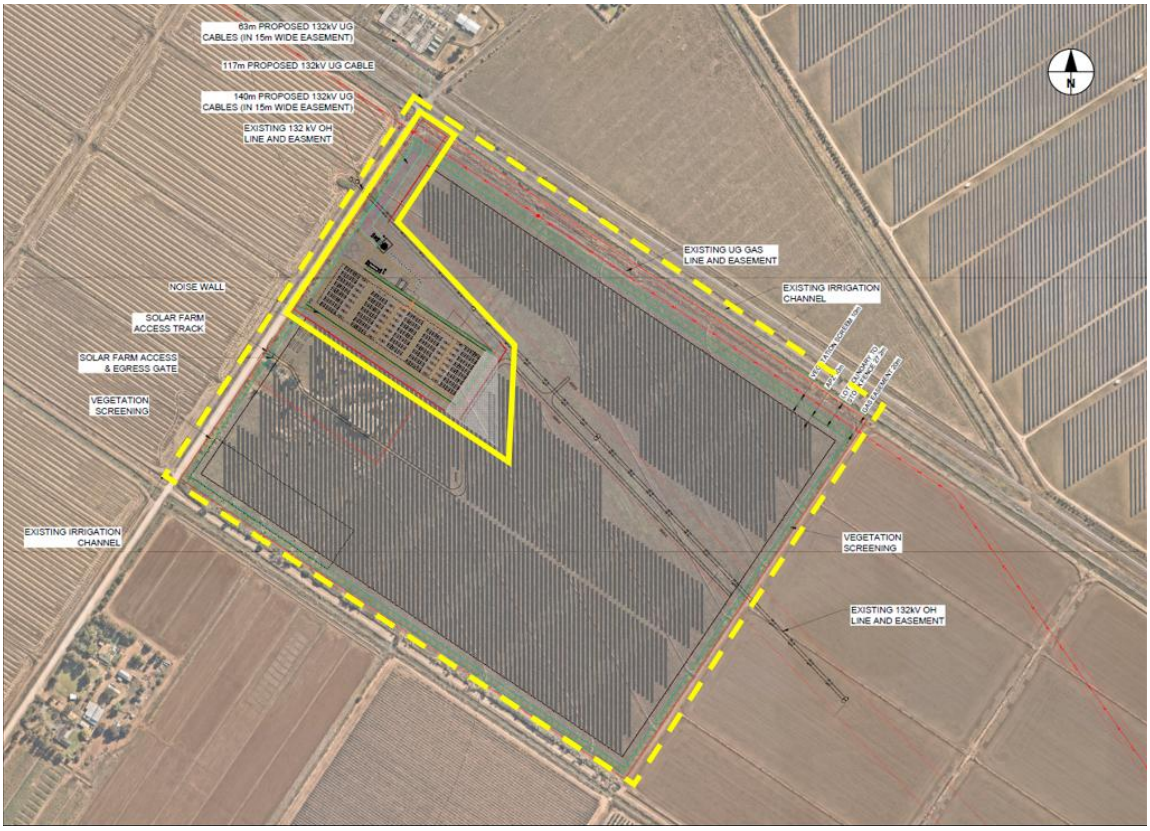
The project involves the development of a utility-scale Battery Energy Storage System (BESS) to be constructed on the site. The facility will provide large-scale storage capacity to support renewable energy integration into the grid, improving network stability and reliability.

The BESS will be co-located with the proposed Yoogali Solar Farm, which was approved in 2019 and is currently in pre-construction. While located on the same property, the Griffith BESS and Yoogali Solar Farm are separate projects that will be developed independently.

The proposed development will connect to the Griffith Substation, alongside other renewable energy projects in the region, including:

- The operational Griffith Solar Farm,
- The Yoogali Solar Farm (associated with the Griffith BESS), and
- The Riverina Solar Farm, which has commenced construction.

Together, these projects form part of a growing renewable energy hub in the Griffith area, reinforcing the region's role in supporting NSW's clean energy transition.



Yoogali Solar Farm (yellow dash), Griffith BESS (yellow solid)

Figure 2: Proposed Development

2. Catchment and Flooding

The site is located within the Mirrool Creek Catchment between Mirrool Creek and the Griffith urban area. The Mirrool Creek Branch Canal lies southeast of the site, adjacent to Lot 141, with Mirrool Creek flowing on the opposite side of the canal. The subject property is bordered by open irrigation channels along both its northern and southern edges. Additionally, Main Drain J is positioned to the northwest of the site.

The catchment is known for flooding, and many flood studies have been conducted in this area dating back to 1978. The Griffith Main Drain J and Mirrool Creek Flood Mapping was completed in 2015 and updated in 2021. This study investigates regional flooding in the catchment, including the study area, assessing a series of design flood events up to and including the Probable Maximum Flood (PMF). The modelling results confirm that the site remains unaffected by flooding under all scenarios, with the Mirrool Branch Canal providing effective flood protection. The PMF outcome from this study is presented in Figure 3.

The Mirrool Branch Canal provides full protection from regional flooding up to the PMF event. As such, the site is only impacted by local rainfall with a very small catchment area, as shown in Figure 3. This local upstream catchment slopes gently toward the west and is mostly occupied by the Yoogali Solar Farm, which will remain permeable.

Figure 3: PMF Flood Extend from Griffith Main Drain J and Mirrool Creek Flood Mapping (2021)

3. Hydrology

A hydrology assessment was undertaken to establish the existing condition flows and determine the required storage for the developed condition. A Runoff Routing Model, RORB, was configured as shown in Figure 4.

A full ensemble model run was carried out for a range of Annual Exceedance Probability (AEP) events, with the critical storm duration identified for each event. The resulting peak site discharges for the existing condition are summarised in Table 1.

Figure 4 - RORB Model Setup – Catchments and reaches

Table 1: AEPs and corresponding critical events and site peak flows

AEP	Duration	Temporal pattern	Existing (m³/s)
5%	**2 hour**	**TP4**	**0.42**
1%	**1 hour**	**TP2**	**0.90**
0.5%	**1 hour**	**TP6**	**1.12**
0.2%	**30 minutes**	**TP2**	**1.43**

3.1 Detention Requirement

Griffith Council requires site discharges to be restricted to pre-development flows for both major and minor storm events. To meet this requirement, the RORB model was re-run under developed conditions, applying a fraction impervious (FI) of 0.9 to the site catchment node and including a detention basin.

The model was iteratively tested with different storage sizes until the developed outflows matched the existing peak discharge rates. The analysis determined that an on-site detention volume of approximately 1,210 m^3 is required to limit the 1% AEP developed flow to the existing peak of 0.9 m^3/s. The outlet of this system should be designed to ensure that flows in smaller events also meet the predeveloped discharge rate. The storage volume adopted above is sufficient for this to occur.

This on-site detention strategy ensures compliance with council guidelines and reduces the risk of downstream flooding and erosion, thereby safeguarding the surrounding properties and infrastructure.

4. Hydraulic Model

To assess if there were any direct impacts on local flow behaviour, a detailed hydraulic model was requested by Department of Climate Change, Energy, the Environment and Water (DCCEEW).

A TUFLOW 2D hydrodynamic model of the site and surrounding solar farm area, including the entire contributing catchment, was developed. A 2D Rain on Grid (ROG) method was adopted, and the corresponding rainfall event identified as the critical event from the RORB model was adopted.

The model extent, outflow boundaries, and Manning's roughness values are shown in Figure 5. A rainfall layer was applied across the domain. Rainfall initial and continuing losses were applied using the roughness file.

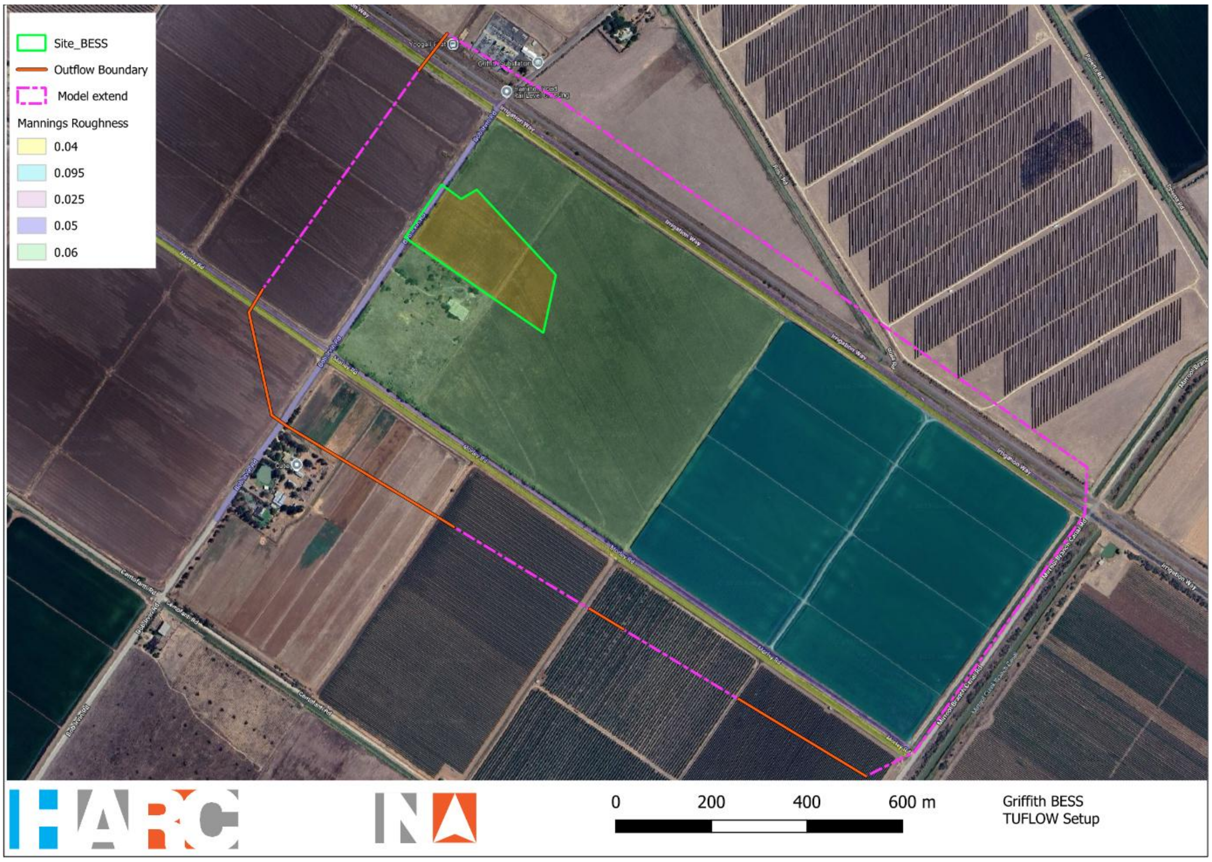


Figure 5 - Tuflow Model Setup (Roughness of 0.06 was applied everywhere else)

In accordance with the NSW Department of Planning, Housing and Infrastructure (DPHI) and the SEARs requirements for flood risk assessment, the hydraulic modelling assessed a range of design flood events to evaluate both current and future flood behaviour. The 0.2% AEP event was specifically included as a proxy for assessing sensitivity to climate change, representing a rare but extreme rainfall event with a higher intensity consistent with future climate projections. This approach ensures the model captures potential localised overland flow flooding under extreme conditions, addressing the agency's advice regarding local flood risk.

The existing-condition flood depths and water surface elevations (WSE) for the 0.2% AEP event are presented Figure 6 and Figure 7.

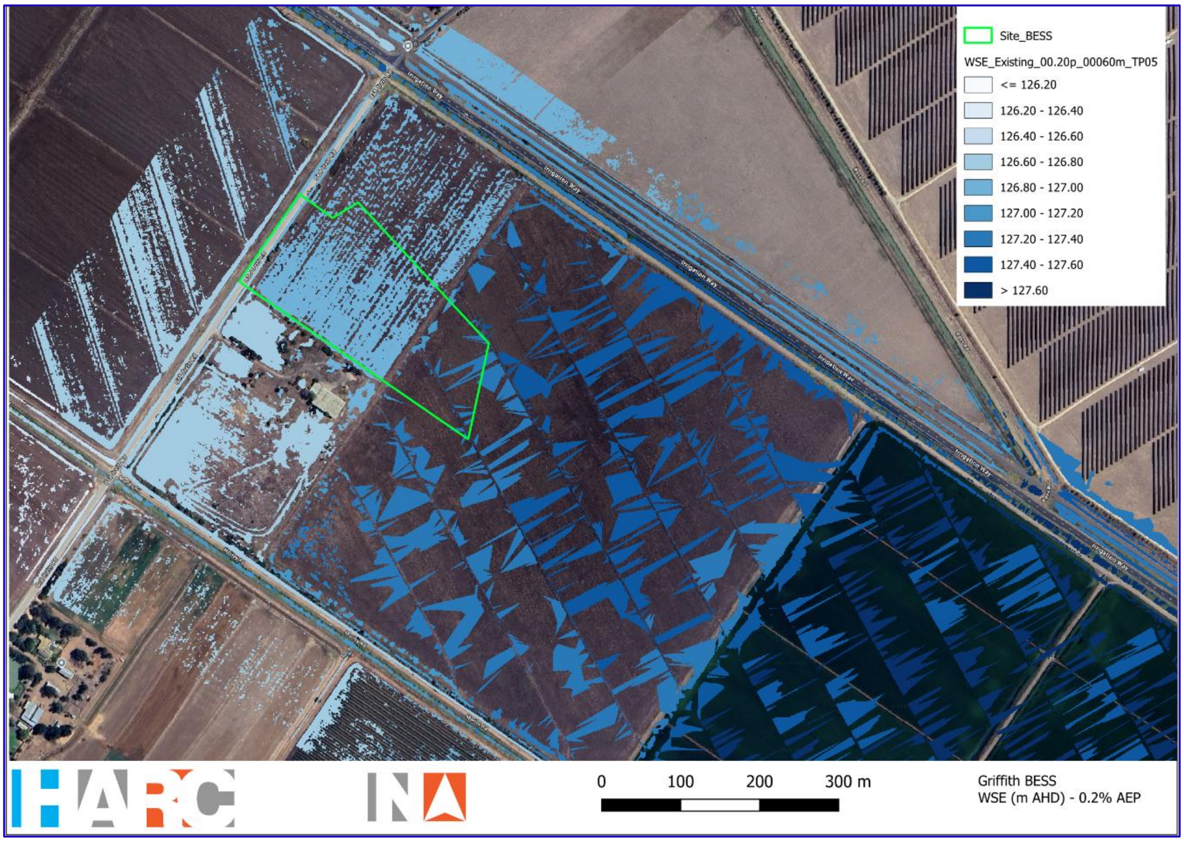


Figure 6 - WSE - Existing conditions

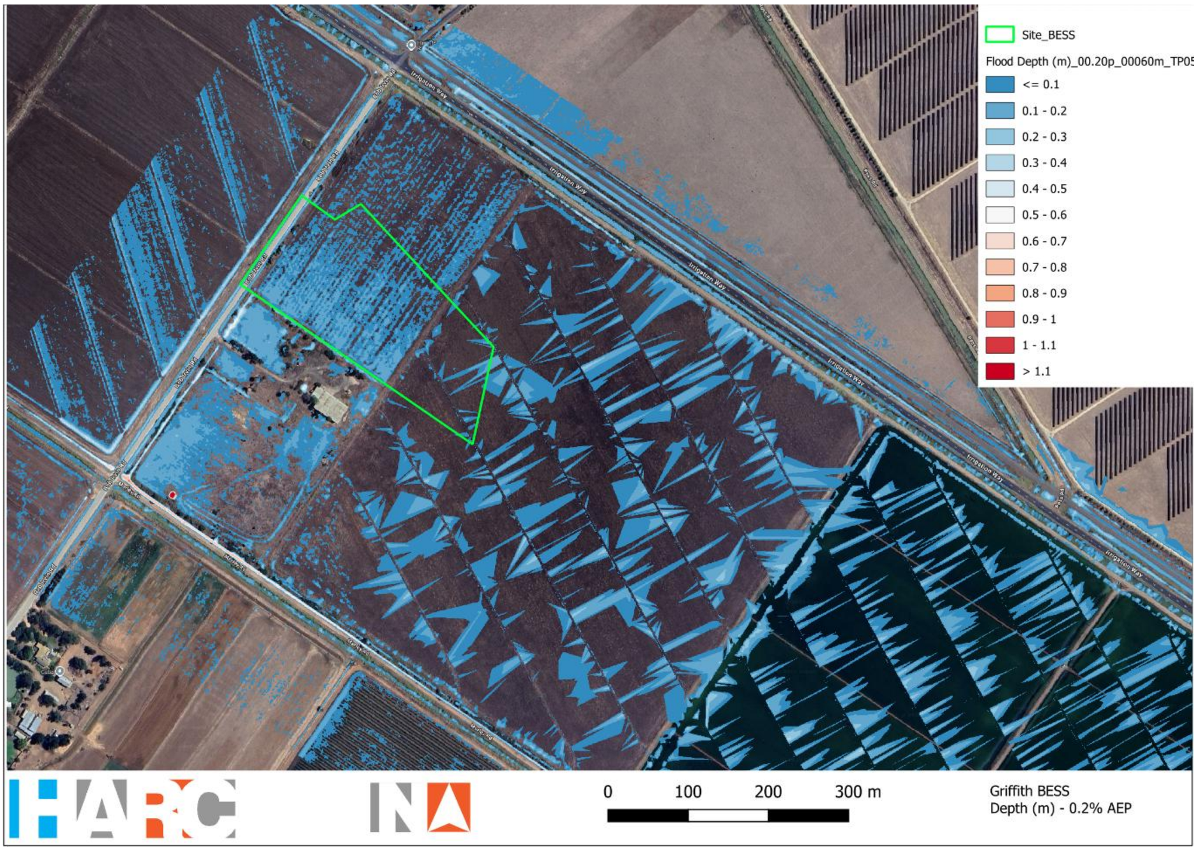


Figure 7 - Flood Depth - Existing conditions

4.1 Discussion and recommendations

These results show that there is no water coming into the site from the outside area except for the solar farm area to the north. Bob Irvin Road, Irrigation Way, and the canals along the Irrigation Way are acting as effective flood controls, preventing off-site flooding from entering the site. As these controls are not breached in the 0.2% AEP, they will also not be overtopped in less severe events (5%, 1%, and 0.5% AEP).

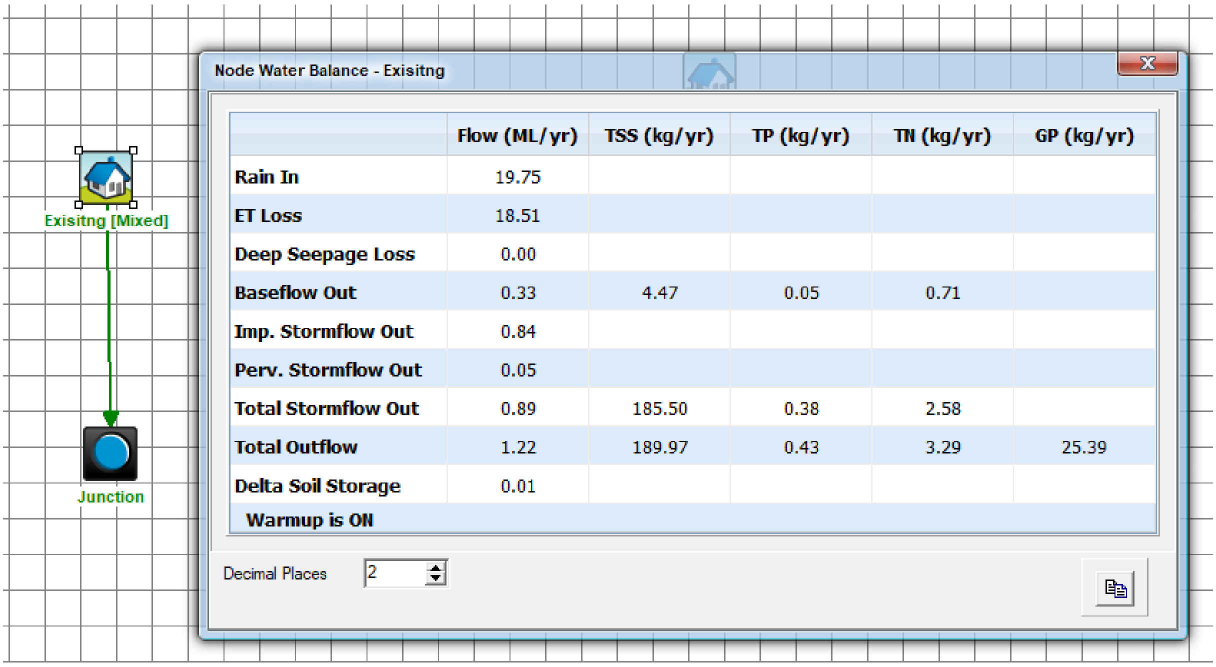
By restricting site outflow to the existing runoff rates (as established in Section 3), impacts on neighbouring properties will be removed.

To ensure draining of the upstream Yoogali Solar farm area, the flow from this area should be directed through or around the BESS works to the existing site outfall along the northern boundary.

5. Water Balance Modelling

A water balance modelling was carried out using MUSIC, a continuous flow simulation model commonly used to assess stormwater quantity and quality. Rainfall and potential evapotranspiration (PET) data were sourced from the MUSIC rainfall templates for Wagga Wagga.

The existing condition model was set up with a 95% perviousness (5% Impervious) and the site produces 1.22 ML/year of outflow, as shown in Figure 8.



	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	GP (kg/yr)
Rain In	19.75				
ET Loss	18.51				
Deep Seepage Loss	0.00				
Baseflow Out	0.33	4.47	0.05	0.71	
Imp. Stormflow Out	0.84				
Perv. Stormflow Out	0.05				
Total Stormflow Out	0.89	185.50	0.38	2.58	
Total Outflow	1.22	189.97	0.43	3.29	25.39
Delta Soil Storage	0.01				
Warmup is ON					

Figure 8: Existing conditions water balance

The developed condition model was set up as shown in Figure 9 with,

- 95% imperviousness.
- Two rainwater tanks with 5 ML.
- Reuse for toilet flushing for 2 person equivalent full-time occupancy accounting, 40 L/day.
- A retarding basin of 1300 m² area.

The results are shown in Figure 10, which shows that a flow of 14.8 ML/year of flow is produced under developed conditions. So, under the developed conditions, an additional 13.6 ML/year of flow is generated, which is equivalent to approximately 37 m³/day.

The proposed detention basin, with a volume of 1,210 m³, is sufficient to manage this additional flow.

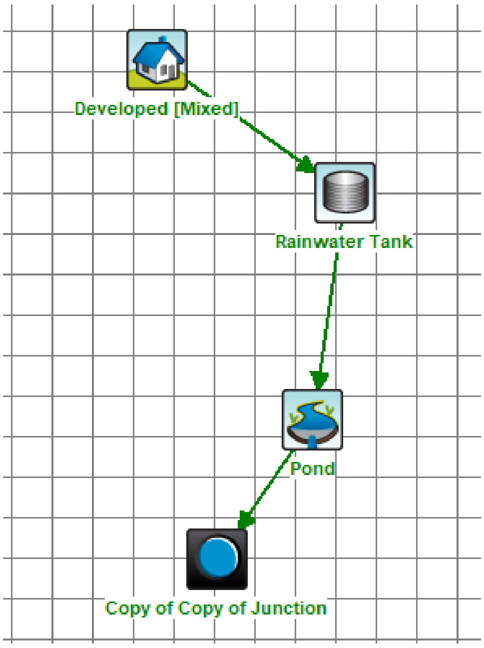


Figure 9: Developed conditions water balance

Mean Annual Loads - Copy of Copy of Junction

	Inflow	Outflow	% Reduction
Flow (ML/yr)	14.8	14.8	0.0
Total Suspended Solids (kg/yr)	762	762	0.0
Total Phosphorus (kg/yr)	2.41	2.41	0.0
Total Nitrogen (kg/yr)	27.0	27.0	0.0
Gross Pollutants (kg/yr)	0.00	0.00	0.0

Figure 10: Developed conditions results

5.1 Water Supply and Use

The anticipated water requirements and supply arrangements for the proposed Griffith BESS were provided by Eku Energy. These are summarised below and are consistent with other comparable BESS projects.

5.1.1 Construction

The site will require water for dust suppression, earthworks, concreting, and amenity use during the construction phase. Potable water will not be sourced from a mains connection, and no new connections are proposed as part of this development. Water will be sourced externally through a licensed private supplier or from Griffith City Council, and imported to site via water tankers.

The total construction water demand is expected to be in the order of 20 megalitres (ML) over an estimated 22-month construction period, inclusive of dust suppression, construction activities, and limited landscaping. Water consumption for workforce amenities and drinking purposes is estimated at up to 1 kilolitre (kL) per day, based on typical site staffing levels, while approximately 20 kL of water will be required for the initial filling of on-site fire tanks.

The volume of on-site water storage for firefighting will be determined as part of the Fire Safety Study that will be required by Fire and Rescue NSW (FRNSW). The water will be sourced as above and trucked into site. Water will not be used for fire suppression on the batteries but may be used for cooling and protecting adjacent equipment if required.

No extraction from surface water or groundwater sources is proposed. Given the modest quantities required and reliance on external supply, no impacts to local surface or groundwater resources are expected.

5.1.2 Operation

During operation, water use will be limited to the maintenance of on-site amenities and the washing of vehicles and equipment. Potable water will be trucked to site and stored in a 15 kL tank located adjacent to the Operations and Maintenance (O&M) building. Rainwater harvesting will supply water for amenities and other non-potable uses.

Fire protection water will be stored in dedicated tanks designed in accordance with the results of the Fire Safety Study. Under normal operation, the project does not anticipate any fire-water use.

As no connection to mains water is proposed and all water will be supplied externally by licensed suppliers, the project will have negligible impact on local water resources during operation.

6. Erosion and Sediment Control

Effective erosion and sediment control (ESC) is essential to prevent environmental degradation during and after construction. To manage these risks, a site-specific Erosion and Sediment Management Plan must be developed and implemented. This plan should address both the construction phase and post-construction site stability.

The ESC plan must be prepared in accordance with relevant regulations and recognised guidelines, in particular the Best Practice Erosion and Sediment Control (BPESC) manual by the International Erosion Control Association (IECA) – Australia. This will ensure that control measures are effective, compliant, and minimise off-site impacts.

7. Conclusions

HARC has undertaken a comprehensive hydrology and flood risk assessment to support the Environmental Impact Statement (EIS) for the proposed Griffith Battery Energy Storage System (BESS). The assessment combined hydrologic, hydraulic, and water balance modelling to evaluate flood behaviour, site discharge requirements, and potential impacts of the development.

The key outcomes are:

- The site is protected from regional flooding by the Mirrool Branch Canal and associated drainage infrastructure. Flood mapping confirms the site remains unaffected even under the Probable Maximum Flood (PMF).
- A RORB model was used, and an on-site detention volume of 1,210 m^3 is required to restrict developed outflows to pre-development rates for the 1% AEP event.
- TUFLOW modelling shows that external flooding does not enter the site even under the 0.2% AEP event. Site impacts are limited to runoff from the adjacent Yoogali Solar Farm, which can be effectively managed by directing flows to the existing outfall along the northern boundary. The proposed retarding basin will ensure site discharges remain restricted to pre-development rates and offsite impacts are avoided.
- MUSIC modelling indicates the development will generate an additional 13.6 ML/year of runoff. The proposed detention basin is sufficient to manage this increase, ensuring the water balance is maintained.
- A site-specific ESC plan, prepared in accordance with the IECA Best Practice Erosion and Sediment Control manual, will be required to mitigate risks during construction and operation.

Overall, the assessment concludes that the proposed Griffith BESS can be developed without adverse hydrological or flooding impacts on neighbouring properties or the broader catchment, provided that the recommended detention basin and erosion and sediment controls are implemented.