Armidale Future Secondary School Redevelopment Project

Flood Risk Assessment

Prepared for
NBRS Architecture

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1 Introduction

Eco Logical Australia (ELA) has been engaged by NBRS Architecture to undertake a desktop flood risk assessment for the proposed redevelopment of the existing Armidale High School (AHS) at Butler Street, Armidale (hereafter referred to as the "Project Site").

The assessment was undertaken to investigate potential drainage and flood-risk at the Project Site for the proposed activity.

1.1 Project Background

The Department of Education have determined that two existing schools in Armidale (Armidale High School and Duval High School) should be consolidated onto a single site to meet the educational needs for the future population of Armidale. The scope of the redevelopment includes demolition of existing buildings (excluding a heritage listed building and the gymnasium) and construction of new school buildings and a Performing Arts Facility joint initiative to accommodate a larger number of students. The new school is scheduled to be open by January 2021.

The NSW Secretary's Environmental Assessment Requirements (SEARs) were re-issued from the Department of Planning and Environment on 27 March 2018. Specifically, Sections 17 and 18 of the SEARs require a drainage and flood-risk assessment, respectively, for the Project Site to support the SSD Application (9095) for the high school redevelopment.

1.2 Study Area

The study area comprises 18.37 ha, located within the Armidale town centre, and constitutes the current Armidale High School, a public secondary school established in 1920 (**Figure 1-1**). The Site is bounded by Kentucky Street to the south, Mann Street to the north, Butler Street to the east and Barry Street to the west. The Kentucky Street – Butler Street intersection is located at the south-east corner of the site.

1.3 Objectives of the assessment

The objective of this assessment is to provide sufficient evidence to determine the flooding and drainage risks to the site to satisfy the requirement s of the SEARs. To achieve this a desktop drainage and flood-risk assessment is carried out for the Project Site in relation to the proposed activities. The desktop assessment focusses on identifying the existing drainage conditions and associated flooding risks and with providing initial advice on the assessment and management of these risks.

The following sections of the SEARs are therefore covered in this report:

- *Section 17– Drainage*: An assessment of drainage associated with the proposal, including springs, stormwater and drainage infrastructure based on relevant Policies and Guidelines and Guidelines for development adjoining land and water managed by DECCW (OEH, 2013).
- *Section 18 – Flooding*: An assessment of any flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity.

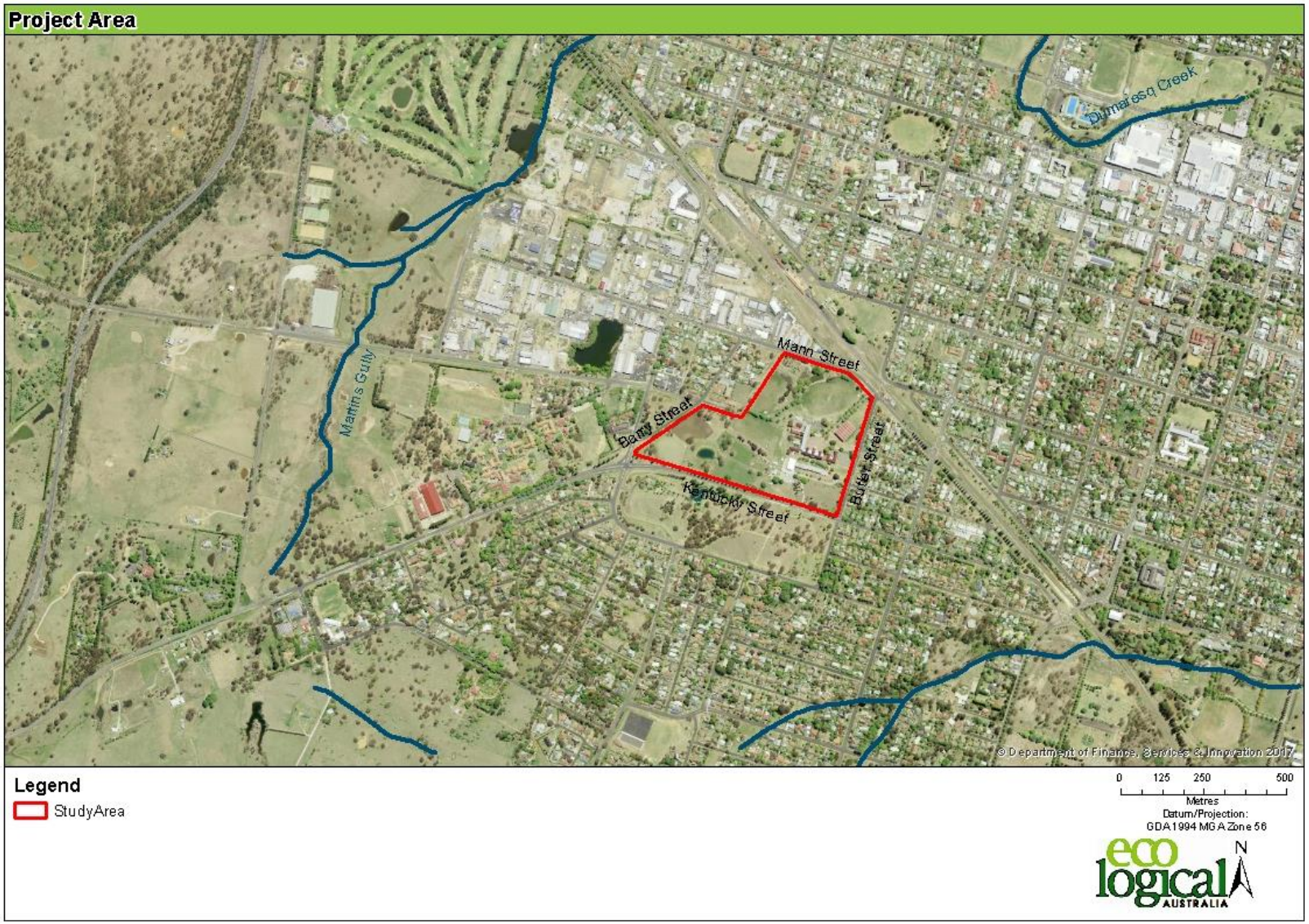

Figure 1-1: Project Area

2 Methodology

The assessment focused on the following tasks:

- Data collation and review;
- Characterisation of the existing environment; and,
- Drainage and flood-risk assessment.

2.1 Data collation and review

Data was collated from several online sources, including spatial databases, Bureau of Meteorology (BoM), and government legislative sites. A review of previous research, relevant company reports and associated project data was also undertaken which included, but was not limited to:

- Upgrading Dumaresq Dam: Phase 1 – Flooding Review and Dambreak Assessment, ARUP, 2013;
- Report for Dumaresq Dam: Dam Break, Study and Flood Inundation Mapping, GHD Geotechnics, 2009;
- Guidelines for development adjoining land and water managed by DECCW (OEH, 2013); and
- Local contour maps and digital elevation models.

2.2 Characterisation of the existing environment

The existing environment was characterised to form a conceptualisation of the hydrological features, such as any stormwater and drainage infrastructure, existing watercourses and retention basins. These features were characterised at the Project Site and within the local area based on their potential to undergo impacts from the proposed use of the Site. The outcome of this conceptualisation is discussed in **Section 3.**

2.3 Drainage/flood-risk assessment

The assessment utilised the site conceptual model as well as various other data sources, e.g., local contour maps and digital elevation models to identify potential areas of concern or limitations to be considered. Existing risks and potential risks from the proposed development were evaluated together with assessment of gaps in the evaluation (e.g. data availability) requiring further investigation. The assessment is reported in **Section 4.**.

3 Flooding and drainage characterisation

3.1 Site conceptualisation

The Project Site falls within the Macleay River catchment (NOW, 2016). The closest main watercourses are Dumaresq Creek (5th order channel) and Martin's Gully (3rd order channel) that run approximately 1.5 km north and 1 km west of the Site, respectively. A small 1st order channel runs approximately 600 m south-east of the Site (**Figure 1-1**).

Rainfall and temperature data were obtained from the Bureau of Meteorology (BoM) online climate database for the Armidale (Tree Group Nursery) weather station (BoM site 056037), located approximately 2.1 km east of the Project Site. The regional climate is categorised as warm temperate, with year-round rainfall (average annual rainfall 755.3 mm) occurring with a seasonal distribution showing greater rainfall in the summer months.

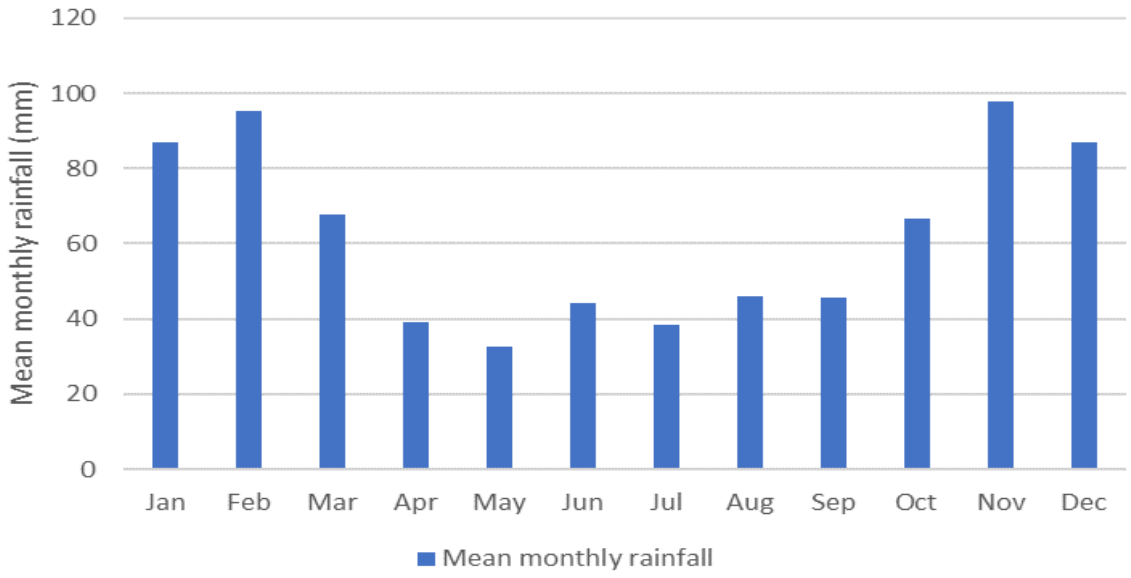

Figure 3-1: Mean monthly rainfall Armidale (Tree Group Nursery) weather station (#056037)

The Project Site is not listed under lands acquired by OEH (e.g. national parks, nature reserves, karst conservation areas, regional parks or state conservation areas; OEH 2013). The Site also falls outside floodplains from the main watercourses and major local overland flooding areas as defined in the NSW Floodplain Development Manual (NSW Floodplain Development Manual, 2005). The provisions outlined in OEH (2013) and the Floodplain Development Manual (NSW Floodplain Development Manual, 2005), therefore, do not apply to the Project Site.

3.2 Overland flow paths within the Project Site

The topography of the Project Site and surrounding areas is generally undulating in a south-to-north direction, with a slight fall towards the north and the north-east direction (**Figure 3-2**). The Site encompasses two identified flow-paths, one flow path starts at the southern boundary of the Project, traverses through the site and drains into a culvert located at the north boundary under Mann Street.

Another smaller flow path starts at the eastern boundary, traverses the north-east section of the Site and drains into the culvert located at the north boundary.

Most of the proposed development is located at the middle and south-western sections of the Project Site (**Figure 3-2**). Surface water runoff, especially during high rainfall events may potentially cause localised impacts in isolated areas, particularly in the middle and/or the north-east sections of the Site. Appropriate stormwater management will be required to reduce risk of overland flow and ensure flow is contained within the identified flow-lines.

3.3 Previous flooding assessments around the Project Site

No previous site-specific flooding/drainage assessment studies were identified in the literature review. Flooding assessments undertaken at Dumaresq Creek at Stephens Bridge and Dumaresq Dam outflow (ARUP, 2013, GHD Geotechnics, 2009) located approximately 3.2 km north-east and 10.5 km north-west of the Project Site, respectively, were reviewed for this study.

Importantly, ARUP (2013) reported that the Project Site falls just outside the flood extent of a 100 annual return interval (ARI) event and outside a Probable Maximum Precipitation with Dam Break (PMPDF-with dambreak) event.

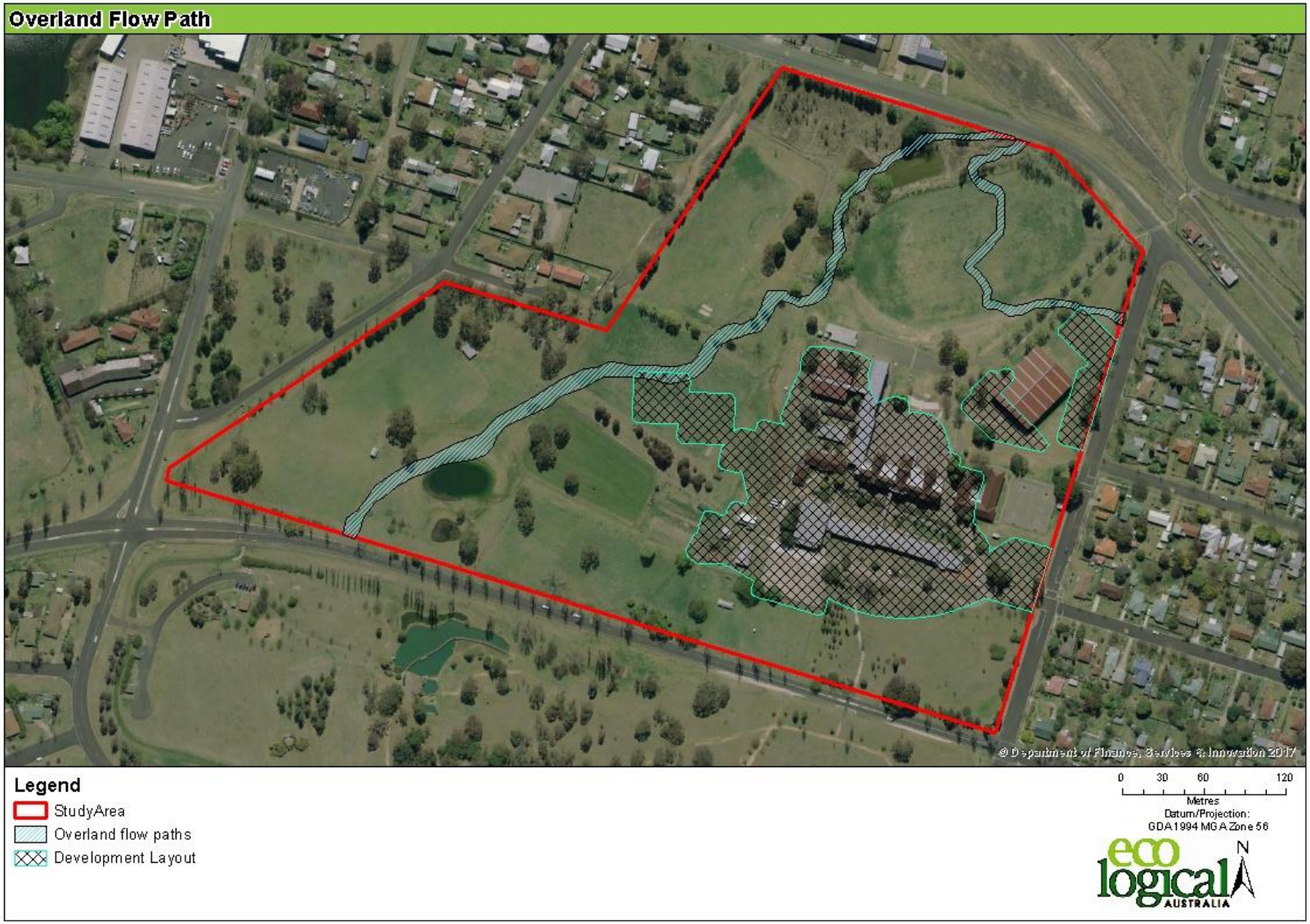

Figure 3-2: Overland flow paths within the Project Site

3.4 Potential effects of climate change on flooding

A recent study (ELA, 2017) undertaken at Metz Solar Farm, located approximately 18 km east of the Project Site, undertook a climate change assessment on potential flooding. The study reported that changes to rainfall intensity could potentially increase peak surface water flows by between 7.1% (1% Annual Exceedance Probability - AEP) and 10.5% (0.1% AEP) and water levels in creeks might increase potentially by between 3.1% (1% AEP) and 4.7% (0.5% AEP) above existing conditions due to climate change.

The Project Site is located within a more urbanised area (i.e. with greater impervious area) compared to the solar farm study. Drainage design criteria should therefore account for these potential impacts, particularly as there is the potential for greater flows and higher water levels in the urban environment compared to those reported in ELA (2017) for a rural setting.

4 Flooding and drainage assessment

Assessment of drainage associated with the proposed development activities (SEAR no 17) and an on-site flood risk assessment (SEAR no 18) detailing the most recent flood studies for the project area has been undertaken for the Project area.

Drainage from local catchment run-off is unlikely to pose a risk to the proposed development with appropriate stormwater management. The on-site impacts due the proposed activities are likely to be minor and will depend upon detailed project design and activities. Activities close to the identified surface water flow paths will require appropriate drainage and civil construction. Consideration should be made for potential long-term impacts due to climate change, which may increase overland flow at the site. A detailed survey of the land could be undertaken to be able to accurately model the likely drainage flow paths based on the proposed impervious areas at the Site.

No springs are identified within (or downstream of) the project area and the Project does not trigger assessment against OEH (2013) criteria.

Results from local flood modelling (ARUP, 2013) indicate that flooding from the major watercourses near the Project Site is unlikely to expand across the Site and the Site is likely to be subject only to local catchment flooding, which would be captured in the local surface water flow lines. The Project falls outside floodplains from the main watercourses and major local overland flooding areas as defined in the NSW Floodplain Development Manual (NSW Floodplain Development Manual, 2005).

There is potential for increased surface water flow due to future climate change, based on local climate modelling (ELA, 2017).

5 Conclusions and recommendations

A desktop flood risk assessment for the proposed redevelopment of the existing Armidale High School (AHS) at Butler Street, Armidale has been carried out and has determined that there is minimal risk of flooding across the site.

In response to the relevant sections of the SEARs, the following conclusions may be drawn:

- *Section 17– Drainage*: The proposed development does not cross any principal drainage lines within the Project area and will not be impacted from flooding from regional watercourses. Design criteria for drainage infrastructure should be aware of the potential for future climate change impacts that may increase drainage requirements above current conditions.

- *Section 18 – Flooding*: There is minimal risk of flooding from regional watercourses to the Project area. Potential climate change impacts may increase localised pooling of water due to increased urbanisation but will not increase the risk of flooding.

5.1 Recommendations

This desk-top assessment has determined that there is likely minimal risk from flooding and that drainage is currently adequate for the designated purpose. As assurance of this, two recommendations are proposed:

1. Civil design criteria should include provision for the potential future impacts from climate change.
2. Any changes to the proposed development design should be assessed against the location of the identified surface water flow lines across the Project area.

6 References

ARUP. 2013. Upgrading Dumaresq Dam: Phase 1 – Flooding Review and Dambreak Assessment, ARUP, 2013.

ELA. 2017. Metz Solar Farm Environmental Impact Statement. Eco Logical Australia Pty Ltd, 2017.

GHD Geotechnics. 2009. Report for Dumaresq Dam: Dam Break Study and Flood Inundation Mapping, GHD Geotechnics, 2009.

NOW. 2016. Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources, NSW Office of Water, 2016.

NSW Floodplain Development Manual. 2005. Floodplain Development Manual, management of flood liable land, NSW Government, 2005.

OEH 2013. Guidelines for developments adjoining land managed by the Office of Environment and Heritage. Office of Environment and Heritage, 2013.

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