

Blaikie Road Industrial Subdivision

Civil & Drainage Design Report

PREPARED FOR:

Levadetes Property Group Pty Ltd



Preliminary

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TABLE OF CONTENTS

1.	PURPOSE OF REPORT	1
2.	EXISTING SITE	2
2.1	Existing Flood Plain Conditions	3
3.	APPLICABLE REGULATIONS & DEVELOPMENT CONTROLS	5
4.	DEVELOPMENT PLAN	6
5.	STORMWATER MANAGEMENT OBJECTIVES	7
5.1	Minor Drainage System	7
5.2	Major Drainage System	7
5.3	Stormwater Quality Treatment	7
6.	BULK EARTHWORKS	9
7.	FLOODING	11
7.1	Modelling Limitations & Assumptions	11
7.2	Existing Modelling	12
7.3	Design Modelling	14
7.3.1	Design Modelling Results	15
7.4	Flood Depth Comparisons	17
8.	SUMMARY & RECOMMENDATIONS	19
9.	ACKNOWLEDGEMENTS	20

1. PURPOSE OF REPORT

CJ Arms have been engaged by Levadetes Property Group to provide civil and drainage design advice for a proposed industrial subdivision at 121-133 Blaikie Rd, Jamisontown, NSW.

The purpose of this report is to provide a design for the development that complies with the Council's development controls and stormwater guidelines for the following civil engineering aspects of the project:

- Stormwater management
- Sediment and erosion control
- Bulk earthworks
- Flooding

2. EXISTING SITE

The proposed site is located at 121-133 Blaikie Rd, Jamisontown, NSW (Lot 111 DP1035909) and is currently a vacant fenced lot (33°46'05.0"S 150°40'21.4"E - <https://goo.gl/maps/LMnMhVG4RfMFWA2M7>).



Figure 1 – Site Location

The site has been surveyed by LTS (Ref: 44778 002DT) and is approximately 2.25Ha.

The current ground cover consists of well-maintained grass. The surrounding land-use, apart from vacant land to the north, is generally commercial or industrial. The site is bounded by a Penrith Homemakers Centre to the West, a vacant lot to the North, Blaikie Road to the East and Pattys Place to the South

The site falls from RL29.08m on the south-eastern corner of the site, to RL25.60m at the bottom of the batter at the site's north-western corner. The top of this batter sits at a level of approximately RL26.70m. In existing conditions, the majority of water from the site discharges to a large depression on the north-western boundary of the site.



Figure 2 – Site Location

2.1 EXISTING FLOOD PLAIN CONDITIONS

The northern section of the site is currently affected by flooding (along with a major portion of Jamisontown) as per advice received from Council via letter dated 12/09/2019, Figure 3, below, shows the current extent of flooding per Council Modelling.

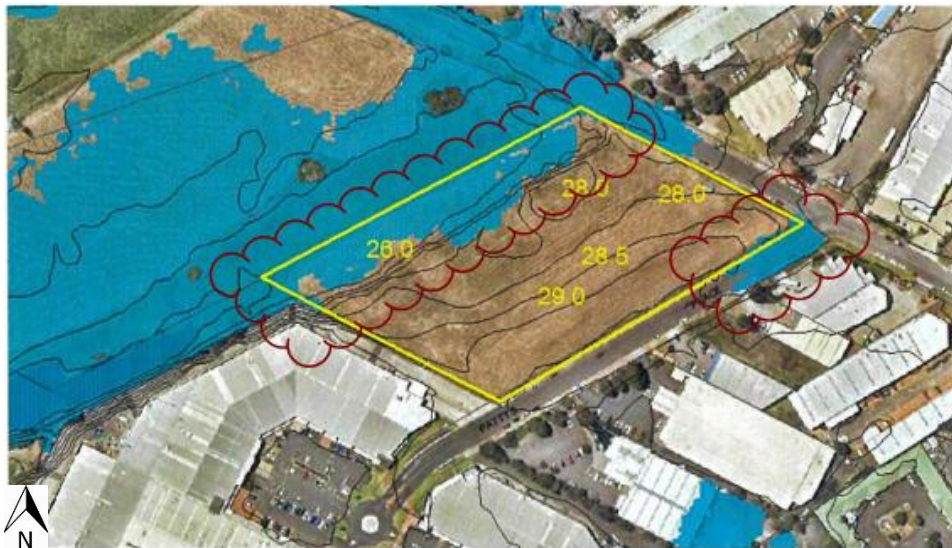


Figure 3 – Existing Flood Extents as Provided by Council

The above flooding needs to be looked at with a wholistic perspective, that is, in terms of the overall flooding within the Jamiestown township. Figure 4, below, captures the overall 1% AEP flood in the immediate catchment surrounding the site. From this figure, it is apparent that the flooding on the site appears to be caused by backwaters from the Nepean River floodplain, resulting from a 1% AEP storm event.

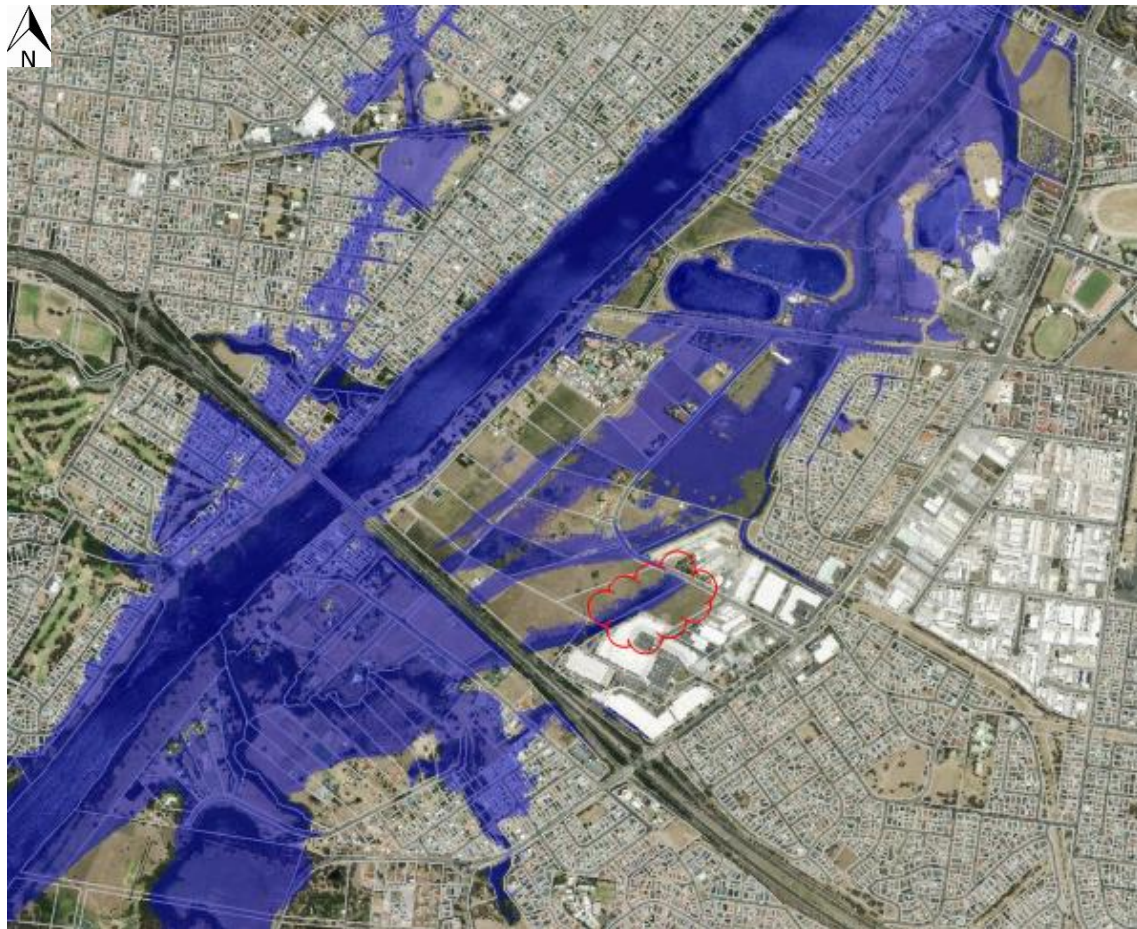


Figure 4 – Existing Flood Extents Surrounding Areas

(Sourced from Nepean River Flood Study Vol 2, dated 5/11/2018 by Penrith City Council) Red Clouded Area Indicates Site of Work.

3. APPLICABLE REGULATIONS & DEVELOPMENT CONTROLS

The table below outlines the requirements of the Council's design guidelines & stormwater drainage policy. These requirements have been considered as the absolute minimum parameters in our design.

Table 1 –Governing Guidelines and Council Policies

Sr. No.	Parameter Description	Regulation Requirement	CJA Comment
1	Minor Drainage Design (Inground Pipes and Pits) – Industrial Subdivision	5% AEP	Complied With
2	Stormwater Concept Plan (SCP)	Required	Included with DA Application
3	SCP Checklist	Required	Included with DA Application
4	Calculations	Required	Included as an appendix to this report
5	Flood Risk Mitigation	Min. HEC-RAS model required	A detailed TUFLOW model with details included in report.
6	Flooding Freeboard	500mm	Mostly Complied With, further discussion for Council' approval in report below.
7	OSD Requirement		As per discussions with Stephen Masters of Council at our meeting dated 25/9/2019, OSD will not be required for this site.
8	Water Sensitive Urban Design		Proposed for the Pavement Design Sections Only, Covenant to be added on individual lot owners to provide additional WSUD treatment as part of the building process. This is as per agreement with Stephen Masters of Council at our meeting dated 25/9/2019.
9	Nominated Flood Level Along Property	RL 27.3m	Per Advice received from Council and subject to elimination of Pattys Place Flood (RL 28.5) – reference meeting with Stephen Masters of Council dated 25/9/2019
10	Minimum Freeboard Required	500mm	Per Council Regs and per flood advice received from Council

4. DEVELOPMENT PLAN

The proposed development plan is shown in Figure 5 below. The development will accommodate the subdivision of the existing property into 15 industrial lots and provide a new road linking Pattys Place and Blaikie Road, which will be handed over to council.

In order to facilitate the development, supporting engineering works will need to be undertaken. This includes the construction of a retaining wall or batter along the site's northern boundary to lift site levels above the 1% AEP flood level of RL 27.30 - as modelled see Section 7 below.

The construction of at source bioretention treatment to treat stormwater runoff from the road will also be included. New stormwater pipework will be constructed within the road to provide drainage outlets for lots that do not have existing drainage frontage along Blaikie Road or Pattys Place.

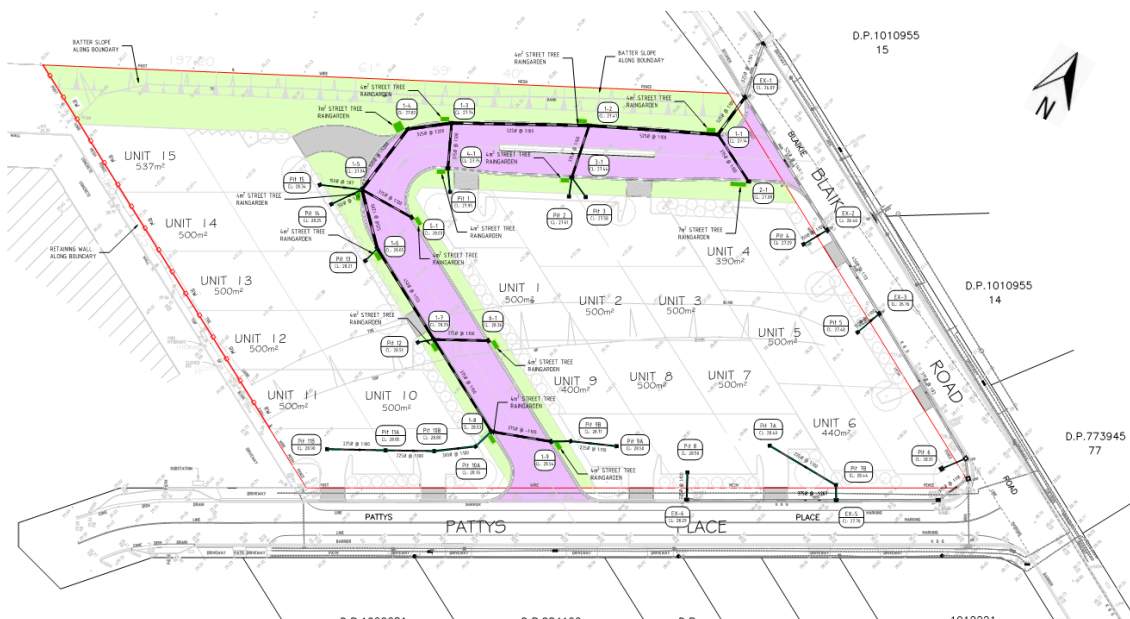


Figure 5 – Proposed Development Plan

5. STORMWATER MANAGEMENT OBJECTIVES

The following objectives are planned to meet the requirements of Penrith City Council relating to the stormwater generated from the development: -

- Conveyance of minor storm runoff (up to the 5% AEP event) via an inground pipe drainage network
- Conveyance of major storm runoff (up to the 1% AEP event) overland along roads and landscaped areas
- Treating rainfall runoff from the new road to Best Practice Stormwater Management quality objectives.
 - i. 85% reduction in total suspended sediments
 - ii. 45% reduction in nitrogen
 - iii. 65% reduction in phosphorous
 - iv. 90% reduction in gross pollutants

5.1 MINOR DRAINAGE SYSTEM

The minor drainage system will convey storm events up to, and including, the 5% AEP storm. This system will consist of an inground pipe drainage network that will discharge to the existing Council drainage in Blaikie Road. This system will be provided for all new lots that do not front the existing drainage on Blaikie Road or Pattys Place. A preliminary analysis of the road grading suggests that the invert level of the existing drainage at the low point of the site just commands the site. During detailed design this will be verified. Provision to extend the outfall drainage down Blaikie Road to the existing culvert located approximately 200 m downstream should be allowed for at this time. This will be covered by detailed survey during the detailed design process.

Each individual lot will be responsible for the stormwater quality discharging off their site as the treatment measures provided are proposed for the road system only.

5.2 MAJOR DRAINAGE SYSTEM

For events exceeding the 5% AEP event and up-to, and including, the 1% AEP event, flows will be managed within the proposed road through the site. All lots will be graded towards the road to direct overland flows through the site to the existing depression on the north-western boundary where stormwater currently drains. These flow paths will be appropriately sized to cater for the peak storm events, ensuring flood protection is achieved for the proposed lots, while maintaining a velocity x depth (V.d) ratio in accordance with Council guidelines.

5.3 STORMWATER QUALITY TREATMENT

Stormwater Quality Treatment for the proposed road will be managed using Water Sensitive Urban Design (WSUD) elements. These will be integrated with the surrounding streetscape to ensure an effective and aesthetic outcome.

As noted from section 5.1, above, that the stormwater runoff treatment will be provided only for the road reserve sections, a covenant will be added in the land sales contract to ensure that any buildings / development on the subdivided lots provide appropriate DCP compliant WSUD treatment systems.

A preliminary concept MUSIC model has been developed (see figure 6 below) on the proposed internal subdivision road. MUSIC modelling parameters have been based of NSW MUSIC modelling guidelines and Penrith City Council WSUD Technical Guidelines (June 2015).

The proposed WSUD solution includes 14 Street Tree pits (Raingarden) integrated into the vegetation strip. Each Raingarden has a filter media depth of 600mm and extended detention depth of 300mm. Each Raingarden will be positioned directly upstream of all proposed kerb inlet pits located in the proposed internal subdivision road. All Raingardens will have a filter media area of 4m² with the exception of two Raingardens directly upstream of proposed kerb inlet '2-1' and '1-4' which will have a 7m² surface area.

Results from the MUSIC model undertaken can be seen in Table 2 below. The comparison table below highlights that WSUD targets have been achieved.

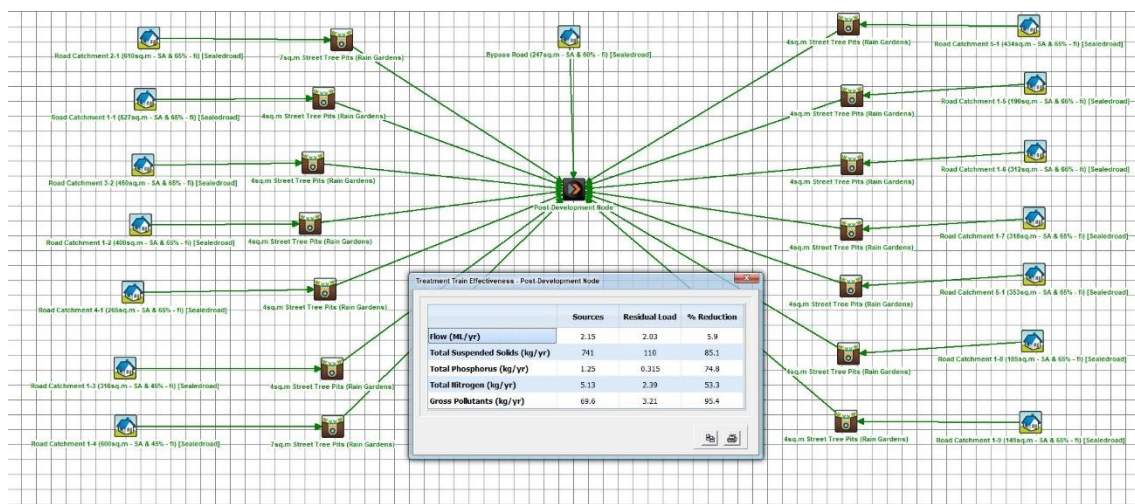


Figure 6– MUSIC Result

Table 2 –Stormwater Pollutant Reduction Summary

Pollutant	Penrith Council Reduction Targets (%)	Subject Site Achieved Targets (%)
Total Suspended Solids	85	85.1
Total Phosphorous	60	74.8
Total Nitrogen	45	53.3
Gross Pollutants	90	95.4

Provided this level of treatment satisfies the DCP requirements, the Raingarden details will be subject to detailed documentation.

6. BULK EARTHWORKS

As noted in Section 3, Table 1 above, Council requires a minimum 500mm freeboard to the Finished Floor Level (FFL) of any proposed lots. Upon enquiry with the Authority Engineer (Stephen Masters), it was indicated that the preference would be to ensure that the entire buildable portion of the subdivision is 500mm above the nominated flood level applicable to site.

We have hence endeavoured to improve levels of the building pads within the subdivision to ensure these are a minimum of 500mm above modelled regional flood levels impacting the site.

To achieve this, a retaining wall / batter up-to 2.0m high is required to be constructed along the northern boundary of the site, adjacent to the proposed access road off Blaikie Road – Proposed subdivision levels, contours and location of retaining walls are depicted in Figure 7 below.



Figure 7 – Proposed Finished Surface Levels

The required earthworks (cut/fill) and earthworks volumes (without bulking factors) are shown in Table 3 and Figure 8 below.

Table 3 – Proposed Earthworks Volumes

Cut (m ³)	Fill (m ³)	Net (m ³)
2,200	12,700	10,500 (Fill)

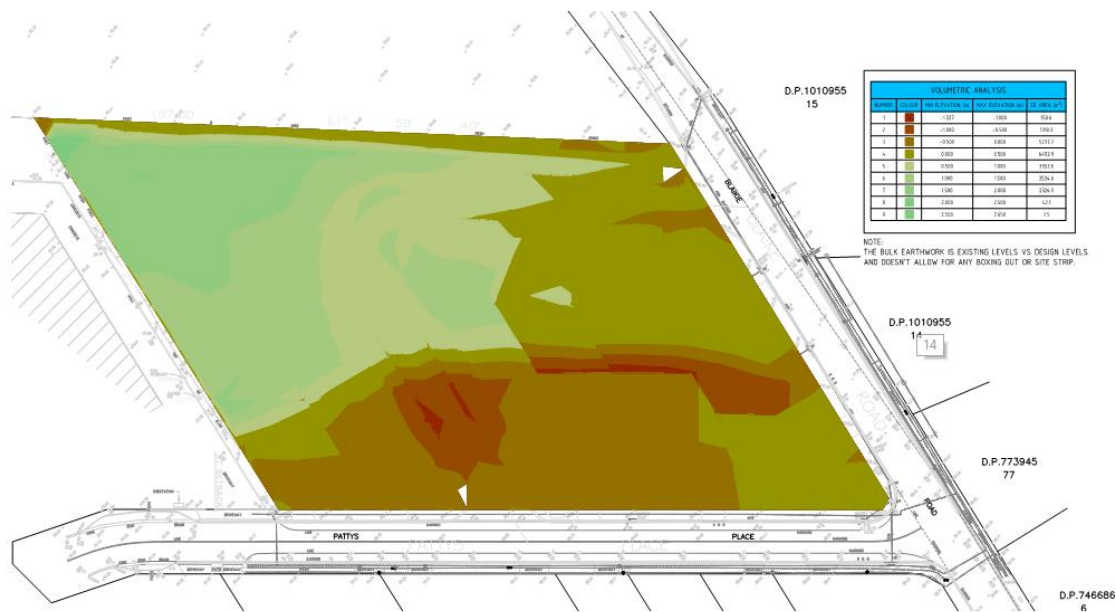


Figure 8 – Proposed Earthworks

Final lot and road grading are subject to detailed design.

7. FLOODING

Penrith City Council has identified the site is subject to flooding during the 1% AEP storm event.

The flooding of the site is associated with the Nepean River high tailwater level impact, stormwater off the site and surrounding areas become trapped, leading to the upstream areas surrounding the site becoming inundated. The Nepean River is located approximately 1.0km to the west of the site – as seen in Figure 9.

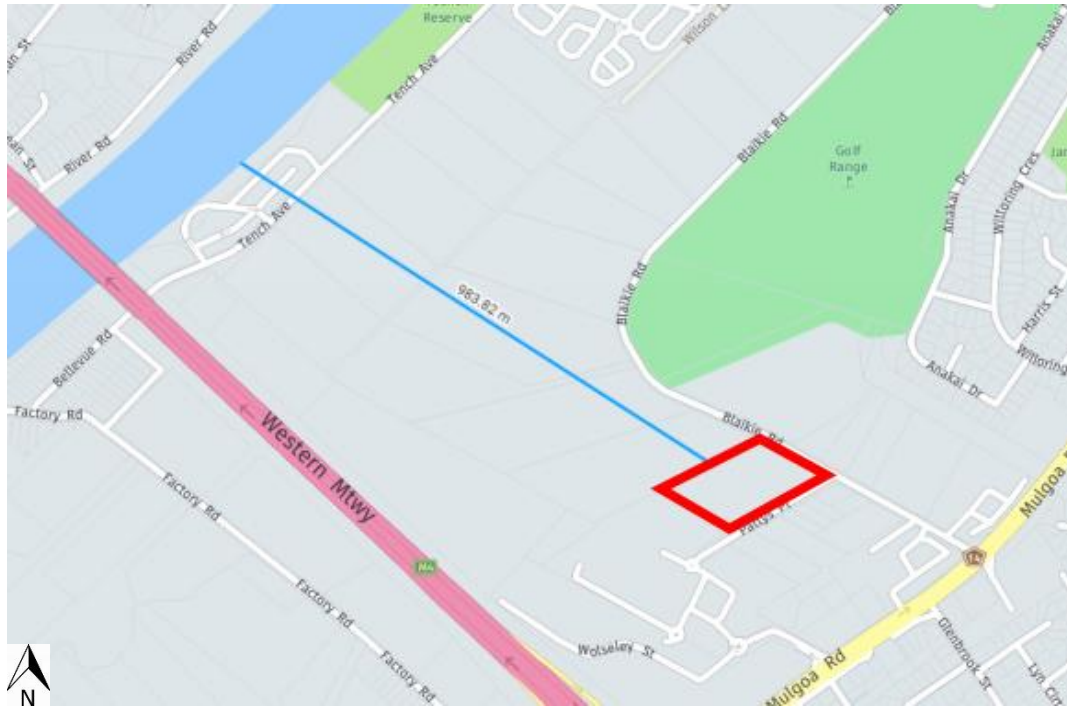


Figure 9 – Site Proximity to Nepean River

7.1 MODELLING LIMITATIONS & ASSUMPTIONS

It has been assumed that the modelling undertaken by Catchment Simulation Solutions (CSS), which has been provided by Council, is generally correct, the modelling in this report has adopted the CSS model as the base case and edited the model to form the design conditions model.

- The modelling outlined in this report is for discussion purposes only, further development of the design scenario modelling will allow a more accurate output.
 - The design scenario modelling does not allow for any inground drainage within the subject site. As a result, this is considered conservative and will be continually updated during detailed design.
- The temporal pattern and storm duration used for the modelling is the 4567 pattern and 60-minute storm – which is in line with that adopted by CSS
- The flood level for the site has been adopted utilising a 5% AEP storm hydrograph and a 1% AEP tailwater level

7.2 EXISTING MODELLING

Existing modelling of the area is covered in the Peach Tree Creek and Lower Surveyors Creek Flood Study, undertaken by Catchment Simulation Solutions on behalf of Penrith City Council. This modelling was completed and adopted by Council in November 2018, and as such, the modelling has been adopted as the base case model for the area.

The Peach Tree Creek and Lower Surveyors Creek modelling has an overall extent of 1,250 hectares. Our subject site accounts for 2.25 hectares or 0.18% of the area – this can be seen in Figure 10 below.

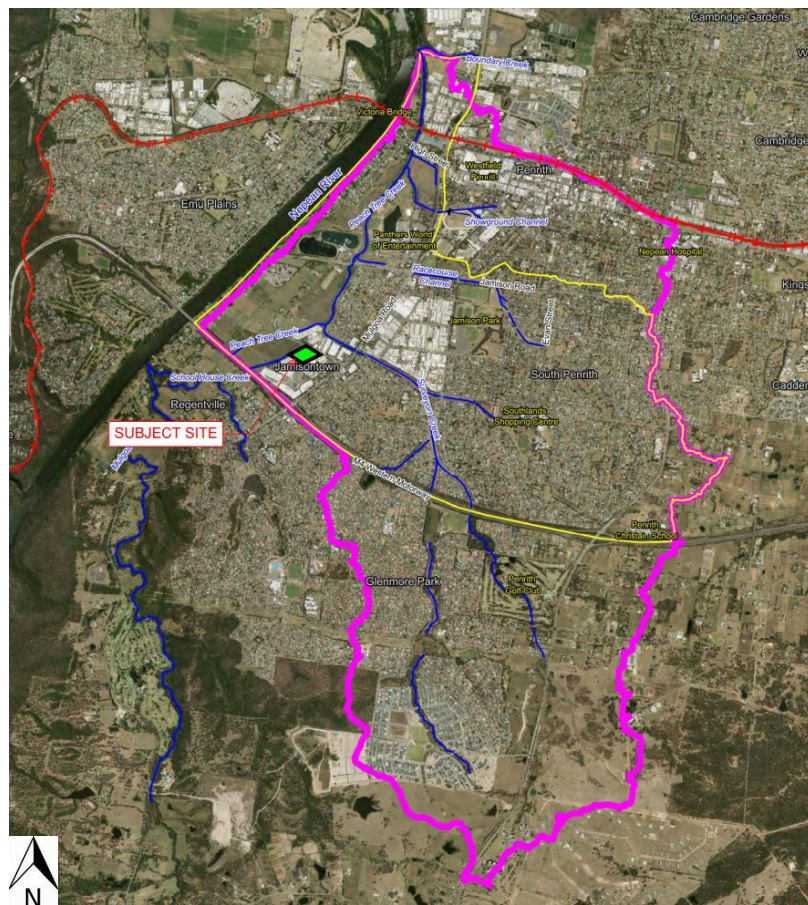


Figure 10 - Peach Tree Creek & Lower Surveyors Creek Model Extents

Advice from Penrith City Council states that the studies undertaken by Council indicates areas potentially affected by overland flow in excess of 150mm. As such, any flooding in the area that is less than 150mm has not been considered as 'flooding' and therefore is not shown on any of the figures below.



Figure 11 – Penrith City Council Flood Advice

Figure 1 is an extract from Council’s flood advice for the site, this plan has been used as a visual comparison to ensure the results obtained in the existing and proposed modelling are relevant and follow the advice from Council.

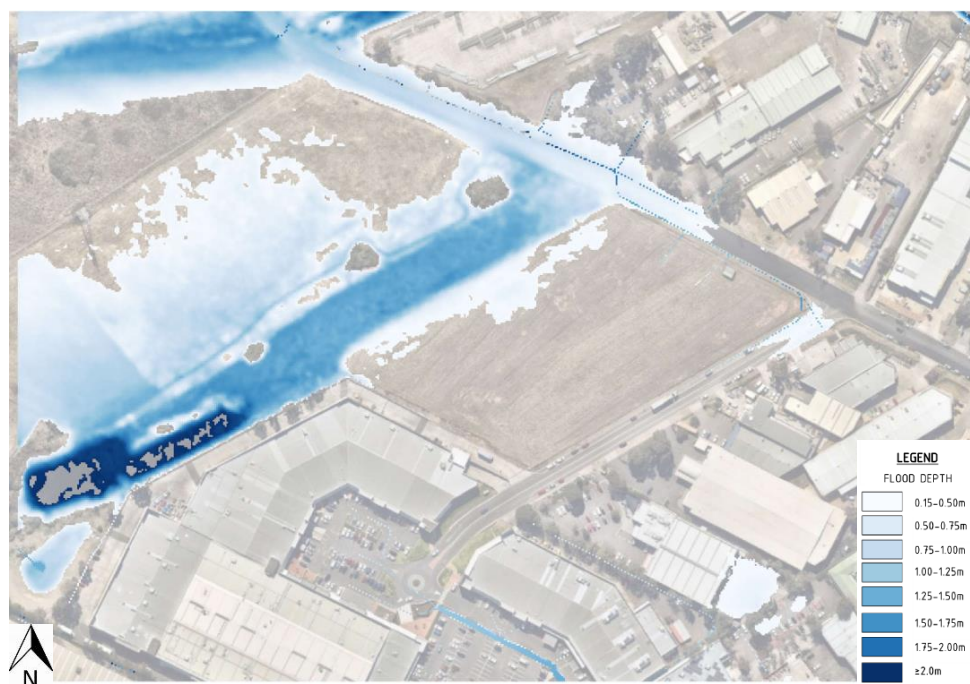


Figure 6 – Existing Conditions Modelling – Flood Depths

Figure 6 above shows the results from the existing conditions modelling. The plan indicates the extent of flooding on the site greater than 150mm. This is in line with council advice (Figure 11) above.

The majority of flooding on the site is along the site’s northern boundary – parallel to Pattys Place. There is a small portion of flooding that occurs at the intersection of Blaikie Road and Pattys Place, this flooding occurs for a short period of time, until there is capacity in the drainage system to relieve the area.

7.3 DESIGN MODELLING

The proposed development of the site has been modelled to assess any impacts the development may have on the existing conditions identified above. As per Council advice, any development in the area is required to be a minimum of 500mm above the 1% AEP flood level.

As described in Section 6 above, the proposed development will be filled to ensure the finished floor level (FFL) of any development within the site is a minimum of 500mm above the 1% AEP flood level.

The purpose of this design scenario modelling is to assess the impact (if any) this filling has on the surrounding properties and overall catchment.

In order to model the design scenario, the following finished surface model was added to the model



Figure 13 – Proposed Finished Surface Levels

7.3.1 Design Modelling Results

Results from the design model indicate that the extent of flooding on the site will be significantly reduced as a result of filling the site (as described in Section 6), facilitating development of the site.

Figure 7 indicates the flood depths on site for the design scenario. It can be seen that the flood extent onsite has been reduced. There is also no longer any flooding greater than 150mm at the intersection of Pattys Place and Blaikie Road. The proposed grading of the site allows for flows from Pattys Place to enter the subdivision and drain out, rather than being trapped at the intersection until there is available capacity. Any flooding >150mm on the site is generally contained within the proposed roadway.

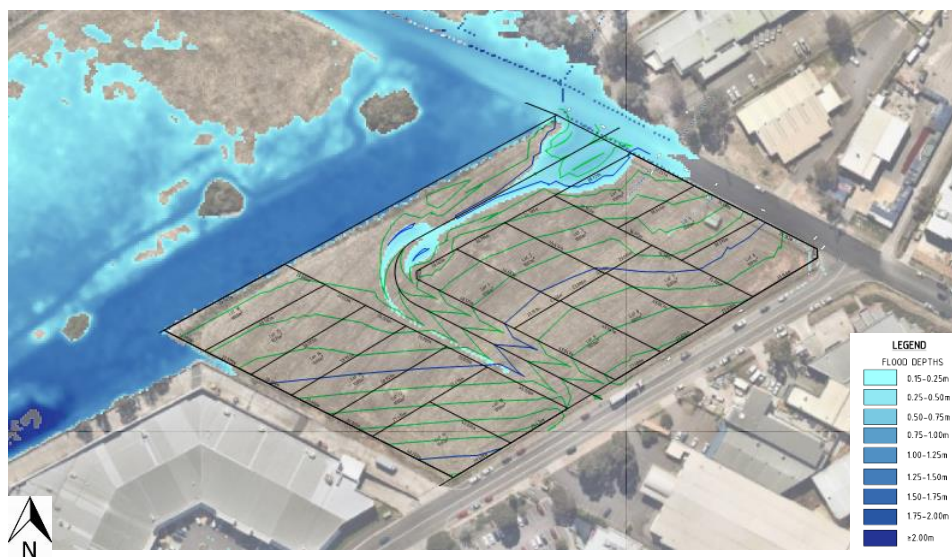


Figure 7 – Design Scenario Modelling – Site Flood Depths



Figure 8- Design Scenario Modelling – Surrounding Flood Depths

The flood levels for the design scenario can be seen below in Figure 9 and Figure 10.

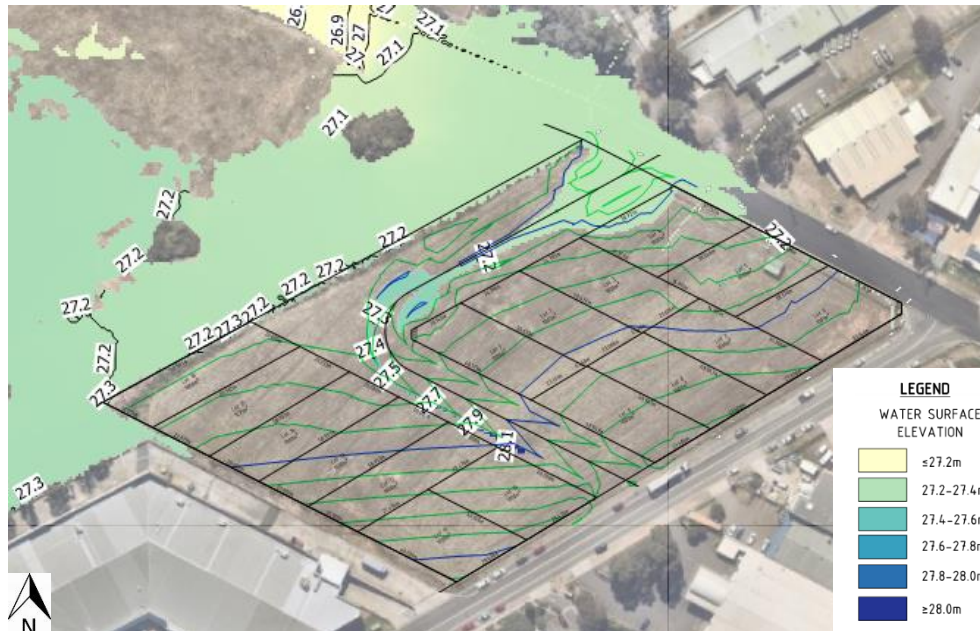


Figure 9 – Design Scenario Modelling - Site Flood Levels



Figure 10 – Design Scenario Modelling Surrounding Area Flood Levels

7.4 FLOOD DEPTH COMPARISONS

In order to assess whether the proposed development has any impact in the surrounding properties and / or catchment, a comparison between the existing and design scenarios has been undertaken.

The focus for this comparison is the areas immediately surrounding the site; the wider extents of the catchment are not impacted by this development.

As seen in Figure 11 below, the proposed development results in a minor impact to the north-western area surrounding the site. As a result of filling the site, there is an approx. 5mm increase (light yellow) in flood depths to the area to the west of the site, as well as, an approx. 5mm decrease (light green) in depths to the north of the site

There is also an increase in flood depths within the subject site itself. This increase ranges from approx. 5mm to 380mm.

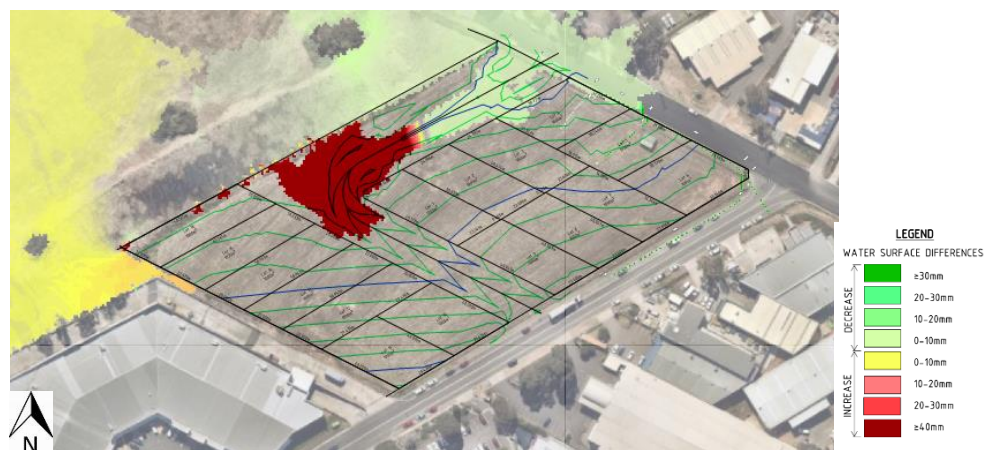


Figure 11 – Depth Comparison (Design vs Existing)

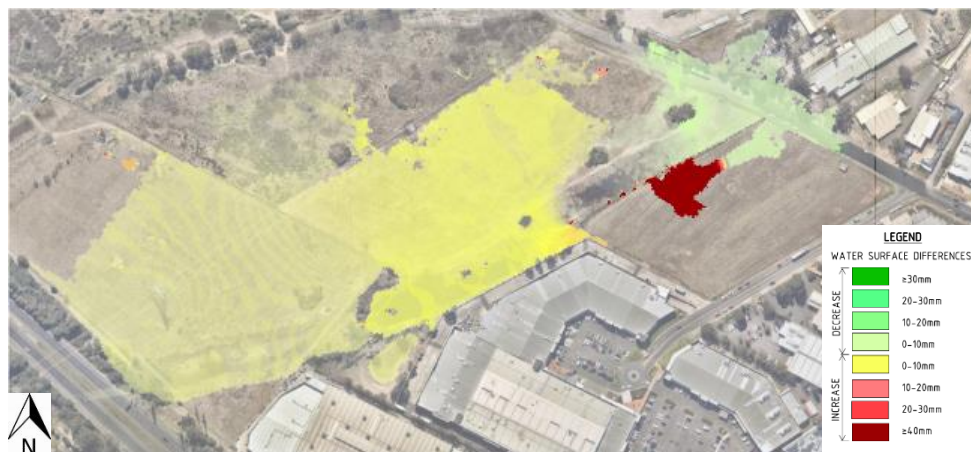


Figure 129 – Depth Comparison (Surrounding Extents)

Figure 13 below indicates areas that have either now become 'wet' when they previously 'dry' or areas that are 'dry' when previously they were 'wet'. This plan indicates all areas of flooding (including any areas on <150mm). It can be seen that the majority of flooding on the site has been reduced.

The flooding at the intersection of Pattys Place and Blaikie Road has also been removed.

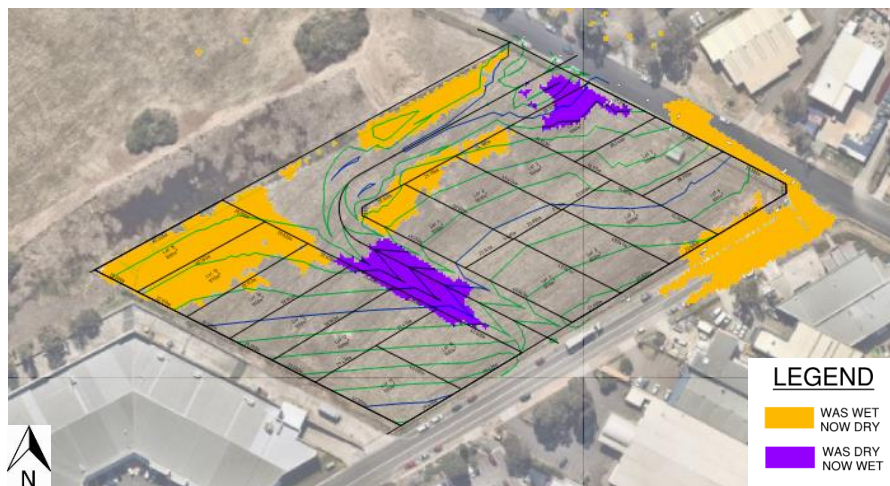


Figure 13 – Additional Flooded Areas



Figure 14 – Additional Flood Areas (Surrounding Properties)

8. SUMMARY

The proposed work / development is within the realms of the Council's relevant engineering design and development guidelines and does not adversely affect adjoining properties.

We hence request that the Council look at this proposal favourably and provide Levadetes Property Group with the relevant approvals to enable the development to progress further.

9. ACKNOWLEDGEMENTS

We wish to acknowledge the contributions made by Stephen Masters (Senior Engineer, Major Developments) and Myl Senthilvasan (Engineering Co-ordinator, Policy & Projects) for providing the information needed for and used in preparation of our design philosophy and basis of design as described in various sections of this report.