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27 April 2022

NL182423_B02_[B]

Bunder Family Trust
C/- SLR Consulting
Kate Young
Suite 2B, 125 Bull Street
Newcastle West NSW 2302

Dear Kate,

Re: 5 - 13 Louth Park Road, South Maitland – Qualitative Flood Assessment

Northrop Consulting Engineers (Northrop) have been engaged by Bunder Family Trust to prepare the Civil Engineering design and documentation including a qualitative assessment of the flood behaviour for the proposed service station at number 5 - 13 Louth Park Road, Maitland, herein referred to as the "subject site".

The purpose of this correspondence is to provide a qualitative flood assessment including a summary of the existing floodplain risk management considerations, and how these may be managed as part of the development of the subject site. This letter is provided to support a Development Application (DA) submission to Maitland City Council ("Council").

In preparation of this flood assessment, consideration has been given to the following documents and guidelines:

- Site specific flood information provided by Council dated the 22 of August 2019 and included in this correspondence as Attachment A.
- The Hunter River Branxton to Green Rocks Flood Study prepared by WMAwater, final revision completed in September 2010, herein referred to as the "Hunter River Flood Study (WMAwater, 2010)".
- The Draft Wallis and Swamp Fishery Creek Flood Study prepared by WMAwater, Draft version completed in September 2018, herein referred to as the "Wallis Creek Flood Study (WMAwater, 2018)".
- The Hunter River Floodplain Risk Management Study and Plan prepared by WMAwater and the final version completed in November 2015, herein referred to as the "Hunter River FRMS&P (WMAwater, 2015)".
- Maitland City Council Local Environmental Plan (LEP) (2011) in particular, Clause 5.21 - Flood Planning, herein referred to as the "MCC LEP (2011)".
- Maitland City Council Development Control Plan (DCP) (2011) in particular, Clause B.3 – Hunter River Floodplain, herein referred to as "MCC DCP (2011)"

- The New South Wales Floodplain Development Manual (2005), herein referred to as the NSW Floodplain Development Manual (2005) referenced as “FDM 2005”.
- Service Level Specification for Flood Forecasting and Warning Services for NSW and ACT – Version 3.3 (Bureau of Meteorology, 2021), herein referred to as the “NSW & ACT Service Level Specification (BOM, 2021)”.
- Maitland City Flood Emergency Sub-plan (June 2013).

The following outlines the subject site locality, the proposed development, the existing site flood behaviour, and the development compliance with the MCC LEP (2011) and MCC DCP (2011).

The Subject Site

As shown in Figure 1 below, the subject site and proposed development is contained within Lot 1, DP782596, Lots 1-4 DP110943, Lot 1 DP794525, Lot 6 DP199882, and Lots 17 and 18 of DP1044795. The existing land use is largely residential with four residential dwellings, landscaping, and open space across the subject site.

Detailed survey of the subject site suggests grades are generally flat with elevations ranging between 7.2m AHD to 7.5m AHD. Lot 1 DP1109043 is an exception, which drops down to elevations ranging between 6.4m AHD to 7.2m AHD.

The existing dwellings on the subject site are observed to be constructed as “*slab on ground*” with no allowance for raising above the expected flood levels.

Figure 1 - Subject Site Locality (SixMaps)

The Proposed Development

The below Figure 2 presents the proposed development which consists of a combined service station and fast-food outlet as well as the associated re-fuelling area, carparking and landscaping. The proposed building floor level is 7.6m AHD with the carparking and landscaping matching to existing topography as much as possible.

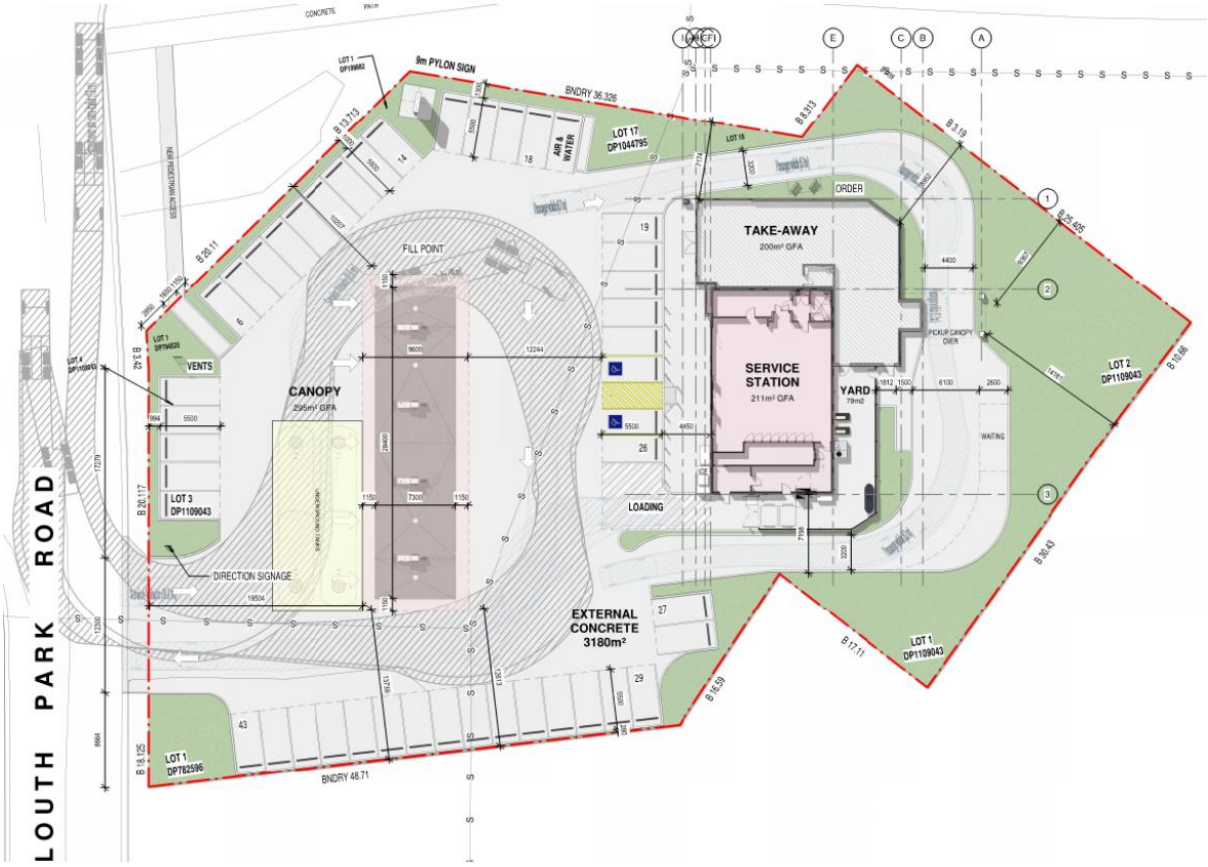


Figure 2 – Proposed Development

Site Flood Behaviour

The subject site is exposed to flooding by both the Hunter River and Wallis Creek catchments with the highest flood levels across the subject site observed during Hunter River flood events.

Review of the Hunter River Flood Study (WMAwater,2010) suggests the site is expected to experience inundation during events between the 5% and 2% AEP. Flooding of the subject site from the Wallis Creek catchment is expected to occur only during the PMF as presented in the Wallis Creek Flood Study (WMAwater, 2018).

The Belmore Bridge flood gauge provides information to the Bureau of Meteorology with respect to flood levels within the Hunter River. A warning time of 12 - 24 hours is expected for the subject site as per the Hunter River FRMS&P (WMAwater, 2015) and the NSW & ACT Service Level Specification (BOM, 2021). Similarly, the Wallis Creek Flood Study (WMAwater, 2015) suggests a critical duration for the PMF within the Louth Park area to be the 36-hour duration. As such, sufficient warning time for evacuation of the subject site is expected prior to flooding.

The following Table 1 demonstrates the predicted flood behaviour across the subject site during both the 1% AEP and PMF design storm events. Information with respect to the flood elevations and velocity have been provided by Council (see Attachment A). Flood depth has been determined from review of the existing elevations and the flood elevation information provided by Council. Similarly, flood hazard, hydraulic and emergency response categories have been obtained from the Hunter River FRMS&P (WMAwater, 2015).

Given the extended critical duration, large storage capacity of the floodplain and depth of flooding over the subject site, inundation is expected to last for several days following completion of rainfall.

Flood hazard presented in Table 1 is based on the categories presented in the FDM (2005), in particular Appendix L Figure L2, reproduced as Figure 3 below.

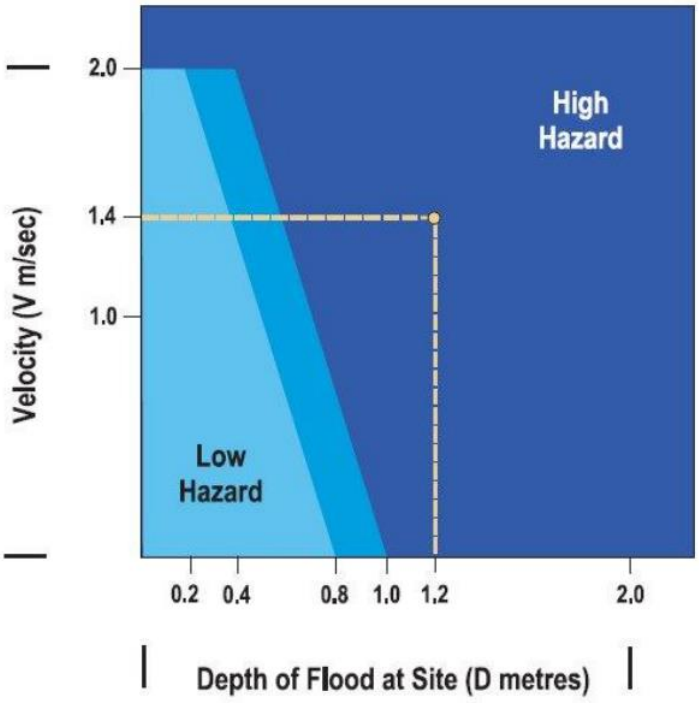


Figure 3 – Floood Hazard Classification (FDM, 2005)

The definition of the Floodway and Flood Storage is provided in the Hunter River FRMS&P (WMAwater, 2015) and are based on the following criteria:

Floodway is defined as areas where:

- The peak value of velocity multiplied by depth (V*D) > 1.0 m^2/s AND peak velocity > 0.1 m/s,

  OR

- Peak velocity > 0.8 m/ s.

Flood Storage comprises areas outside the Floodway where peak depth > 1.5 m.

The Flood Emergency Response Planning Classification of Communities guidelines (OEH, 2016) defines a Low Flood Island as below:

> "During a flood event the area is isolated by floodwater and property will be inundated. If floodwater continues to rise after it is isolated, the island will eventually be completely covered.".

Table 1 – Site Flood Behaviour Characteristics

Event	1% AEP	PMF
Flood Level (m AHD)	9.73	11.97
Flood Depth (m)	2.23 - 3.33	4.47 - 5.57
Velocity (m/s)	1.6	N/A*
Hazard (WMAwater, 2015)	High	High
Hydraulic Category (WMAwater, 2015)	Flood Storage	Floodway
Emergency Response (WMAwater, 2015)	Low Flood Island	Low Flood Island

* N/A – Not Available

Maitland City Council Local Environmental Plan (2011)

The subject site is identified as flood prone land as per the MCC LEP (2011) Flood Planning Map – Sheet FLD_004B. As such, the development controls outlined in Section 5.21 of the MCC LEP (2011) are applicable to the subject site. The development controls and a response with respect to the proposed development are listed below.

The MCC LEP (2011) Section 5.21 (2) states the following which is summarised in ***Table 2*** below.

Table 2 - MCC LEP (2011) requirements

Requirement	Response
Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:	
a) Is compatible with the flood function and behaviour on the land.	As discussed above, the subject site is located in a High Hazard zone and is defined by a Low Flood Island. Although these conditions present a significant flood risk, the proposal is expected to reduce the existing flood risk on the subject site by reducing the duration of occupation and reliance of tenants to the land (i.e reducing the number of people exposed to the hazard). Occupation is expected to change from permanent residents to employees. As such, with the introduction of appropriate flood management measures, the facility can be closed and evacuated prior to inundation. With the extended warning time, in the order of 12 - 24 hours as mentioned above, it is expected there will be enough time to communicate closure of the facility to employees prior to a flood event. It is noted that the proposed development is sited below the Flood Planning Level (FPL) as outlined in the MCC LEP (2011). The Floodplain Development Manual (2005) recognises the placement of the Finished Flood Level (FFL) for

Requirement	Response
	commercial facilities to be based on its economic benefit, personal safety and risk (pp.K-4). To achieve a floor level set at the FPL, the building would need to be raised 2.63m to an elevation of 10.23m AHD. This would create significant additional cost, result in un-desirable aesthetics and overshadowing, and would require significant changes to the existing landform making both vehicular and pedestrian site access difficult to facilitate. As such a building floor level of 7.6m AHD is proposed. Residual risk can be managed by the preparation of a Flood Emergency Response Plan. The Flood Emergency Response Plan should: • Promote satisfactory awareness of the expected flood behaviour and flood risks associated with the subject site. • Nominate roles and responsibilities when preparing for and responding to a flood emergency. • Identify measures to monitor weather forecasts and highlight warning systems available. • Provide education and awareness material for training programs with respect to flooding of the subject site. • Identify potential evacuation and evasion procedures including closure of the facility following receipt of a flood warning that predicts an event in excess of the 5% AEP flood event. With a change in use from residential to commercial; the extended warning time prior to the peak of a flood event; and the introduction of a Flood Emergency Response Plan for the proposed development; a reduction in the existing flood risk is observed when compared to the existing site land use.
b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties.	Given the subject site is located within a Flood Storage zone during the 1% AEP, flood affectation can be measured by the change in flood storage across the subject site. It is anticipated that due to the likely prolonged duration of inundation, with depths in excess of 3 meters during the 1% AEP, ingress of flood water into the proposed buildings will be un-

Requirement	Response
	avoidable. As such a significant loss in flood storage as a result of the proposed building is not expected. Similarly, the developed case topography has been designed to match existing levels as much as possible to limit flood affectation on adjacent properties caused by topographic changes. As previously mentioned, the proposed development FFL is sited below the FPL. The Floodplain Development Manual (2005) recognises the placement of the FFL for commercial facilities to be based on its economic benefit, personal safety and flood risk (pp.K-4). To achieve a floor level set at the FPL, the building would need require significant changes to the existing landform, which is expected to cause adverse flood impacts in adjacent properties. As such a building floor level of 7.6m AHD is proposed to limit flood impacts.
c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.	The proposed development is expected to reduce reliance on emergency services and evacuation routes with the preparation of a Flood Emergency Response Plan to promote early closure and evacuation of the facility. As previously mentioned, with the extended warning time prior to the peak of a flood event, and the introduction of a Flood Emergency Response Plan for the proposed development, a reduction in the existing flood risk is observed when compared to the existing site land use.
d) Incorporates appropriate measures to manage risk to life from flood.	A Flood Emergency Response Plan can be prepared to manage the risk to life that exists on the subject site. The Flood Emergency Response Plan should recommend that the site be closed and evacuated following receipt of a flood warning predicting a flood event in excess of a 5% AEP. Conversion of the subject site from residential to commercial is considered an improvement in the existing risk to life where, more rigorous preparation and management procedures can be introduced as part of the operation of the facility. Similarly, with the conversion of the subject site from residential to commercial land use, people are not expected to be asleep at the time of receipt of a flood warning.

Requirement	Response
	Furthermore, being commercial rather than a residential land use, people are not expected to want to remain on-site during an emergency and will be more willing to evacuate.
e) Will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	The subject site is located approximately 450m from the nearest Wallis Creek tributary and approximately 850m from Swamp Creek. As such, the proposed development is not expected to have an impact on any nearby watercourses.

Maitland City Council Development Control Plan (2011)

The subject site is identified as flood storage as per the MCC DCP (2011) Floodplain Management DCP – Hydraulic Categories Sheet – 004B. The requirements are summarised in ***Table 3*** below.

Table 3 - Maitland DCP (2011) requirements

Requirement	Response
1) An application for development below the FPL must demonstrate.	Per below
• The proposed development will not increase the flood hazard or flood damage or adversely increase flood affectation on other properties, as assessed by a suitably qualified hydraulic engineer.	The proposal removes a number of individual dwellings and converts to a consolidated commercial premises. The construction of this new building is likely to be such that damages from a flood event are minimised – particularly when compared to the current case. Furthermore, the building footprint will be similar to the existing in a more consolidated format which is likely to reduce impacts. It is unlikely the proposed development will increase flood hazard, damages or impacts.
• the design of the proposed development is such that the risks of structural failure or damage in the event of flooding (including damage to other property) up to the FPL would be minimal, as assessed by a suitably qualified structural engineer.	This is recommended for post DA analysis and can be included as a condition of consent.
• the proposed development has been designed to withstand the effects of inundation of floodwaters up to the FPL, with contents or fittings susceptible to flood damage being located above this level.	This is recommended for post DA analysis and can be included in a condition of consent.

Requirement	Response
• if levees are proposed to protect a development, the impact of the levees on flood behaviour must be assessed and the habitable floor level of the proposed development behind the levee must still be set at or above the FPL (assuming no levee is in place).	No site-specific levees proposed.
• the proposed measures to allow the timely, orderly and safe evacuation of people from the site (these measures should be permanent and maintenance free), and the measures proposed to safeguard goods, material, plant and equipment in a flood. These measures should be compatible with the Maitland City Local Flood Plan.	Maitland Grossman High School (Cumberland Street, East Maitland) may be activated as an evacuation centre. Evacuation to this location is considered consistent with the subplan and no different to the existing dwellings on-site.
• in rural areas, the proposals for the evacuation of any livestock in a flood.	Not applicable.
• the measures to reduce the risks that the development will allow the accumulation and build-up of debris being carried by floodwaters (particularly associated with fences in flood liable areas).	The proposal consolidates a number of existing lots and reduces the total fences and building section width.
• the design complies with the Table 1: Flood Aware Design Requirements for Residential Development on Flood Prone Land.	The proposed development is not residential in nature and consideration to the principles outlined in this table are recommended.
• Details of any proposed filling to be provided.	Proposed surface levels are outlined on the civil plans, reference NL182423 sheets C1.00 – C3.01.
2) Survey plans shall be dimensioned in metres with levels to Australian Height Datum (AHD), prepared and signed by a Registered Surveyor.	Detailed survey of the site has been prepared by Cadence Consulting Surveyors and dated 14 June 2019.
3) The type and extent of survey information likely to be required to support a development in a flood liable area is as follows.	Per below.
• the location of the site relative to other features such as roads, bridges, etc.	Origin of levels and co-ordinates is presented on the survey plan.
• the assessed flood levels at the site (for the 1:100 ARI as a minimum and PMF where critical infrastructure is proposed), the origin of that level and how it was derived.	Flood levels are described relative to the same datum in Table 1 above. The origin of these levels is the Hunter River Flood Study (WMAwater, 2010).
• the position of existing buildings (if any) and proposed buildings and works on the site.	Existing structures are noted on the survey and proposed buildings and works are described on the architectural and civil documentation.

Requirement	Response
• the existing and proposed floor levels of buildings on the site.	The existing floor levels are noted on the survey and the proposed building flood level is 7.6m AHD.
• the existing ground levels around all existing buildings on the site, or if the site is vacant, ground levels on the site and on adjacent properties within approximately 30 metres of the boundary of the site.	Existing ground levels are presented on the survey.
• the locations should be shown of any structure of the Hunter Flood Mitigation Scheme (such as levee banks, spillways, floodgates etc.), which are inside or within 100 metres of the subject property site; and.	No known Hunter Flood Mitigation Scheme infrastructure is located within the subject site and immediate surrounds.
• the position and floor and ground levels of buildings on adjacent properties, and the use of the properties within 100 metres of the subject site.	There is an existing service station on the western side of Louth Park Road opposite the proposed development, and residential properties in the surrounding streets, within 100 metres of the subject site.
3.1) Development in Floodways	Not applicable as noted Flood Storage on Floodplain Management DCP – Hydraulic Categories Sheet – 004B.
3.2) Filling of Flood Storage and Flood Fringe Areas. An application for filling must be supported by a flood model unless.	Per below.
• There is no net importation of fill within the 1:100 ARI flood extent. or	No detailed bulk earthworks calculations have been undertaken to determine whether this requirement has been met. It is likely there will be in up to 300mm cut over the carparking area and in the order of one metre of fill across the building and surrounds. Any net fill is minimal when compared to the depth of water in the 1%AEP.
• Filling up to 7,000m³ or 20% of the total 1:100 ARI flood storage/flood fringe volume of the lot (whichever fill volume is lower) that. - is associated with construction of a dwelling in rural zones, and - where construction of a dwelling is permitted; and - all of other flood requirements (such as evacuation) is achieved; and/or	Not applicable.
• Filling up to 3,500m³ or 10% of the total 1:100 ARI flood storage/flood fringe volume of the lot (whichever fill volume is lower) associated with construction of a mound to provide refuge for stock during floods.	Not applicable.

Requirement	Response
3.3) General Building Requirements	Per the below.
• All habitable finished floors shall be no lower than the FPL.	It is requested to alter this requirement because compliance would result in an outcome that is not considered desirable from an operational perspective. It may also have other implications from a financial and overshadowing perspective. A finished floor level of 7.6m AHD is above the 5% AEP Hunter River flood and provides a good match with existing levels.
• Parts of buildings and structures at or below the FPL shall be constructed in accordance with Table 1: Flood Aware Design Requirements for Residential Development on Flood Prone Land. The development shall be certified by a qualified Structural Engineer that the building has been designed to withstand the depth of inundation, buoyancy and flow velocity forces (including potential for debris impact) at the development site for a 1:100 ARI event.	This is recommended for post DA analysis and can be included as a condition of consent.
• Flood-free access shall be provided from the development to an appropriate evacuation facility (as identified in the Maitland Local Flood Plan), at the 1:20 ARI flood level or higher.	The site is not subject to Hunter River flooding in the 5% AEP (1:20 ARI). It is a possibility Maitland Grossman High School (Cumberland Street, East Maitland) is activated as an evacuation centre in a flood event and access to this location from the subject site in the 5% AEP event.
• Provision shall be made for the safe evacuation of people from the development in accordance with the Maitland Local Flood Plan.	Per the above. This is considered an improvement over the existing situation.
• Sufficient storage space for household effects shall be provided above the FPL.	Not residential development. As discussed above, it is not feasible to provide floor space above the FPL for this type of development. It is considered an improvement over the existing situation.
• Electrical fixtures such as light fittings and switches shall be sited above the FPL unless they are on a separate circuit (with earth leakage protection) to the rest of the building.	This is recommended for post DA analysis and can be included as a condition of consent. It is unlikely fittings and switches can be provided above the FPL.
• These above requirements do not apply to the following development: - The extension of an existing dwelling house by no more than 50% of its internal floor area - An addition to an existing dwelling house with an area of no more than 50% of the internal floor area of that dwelling to be used for the purpose of a dual occupancy.	Not applicable.

Requirement	Response
- Tourist and visitor accommodation.	
3.4) Multistorey Residential Development	Not applicable as the development does not include multistorey residential.
3.5) Basement Car Parking	Not applicable as no basement car parking is proposed.
3.6) Additions and Renovations	Not applicable as the development does not fall into one of these categories.
3.7) House Raising and Flood Proofing	Not applicable as the development does not fall into one of these categories.
3.8) Critical Infrastructure and Flood Proofing	Not applicable as the development does not fall into one of these categories.
3.9) Mitigating Circumstances	We request consideration an alteration to DCP requirements for habitable floor levels as we consider this unfeasible to achieve. The type of development is commercial which is considered a lower overall risk with respect to floor levels. This is acknowledged in several Council DCPs which allow retail / commercial below the FPL. The development is not subject to Hunter River flooding in the 5% AEP. We put forward the proposal reduces the number of dwellings within high hazard flood prone land and consolidates these lots to a more appropriate highly managed commercial land use.

Recommendations

The following recommendations are for design development and may be considered as appropriate conditions of consent to be provided prior to Construction Certificate:

- Consideration should be given to the buildings capacity to withstand flood forces during detailed design to reduce the likelihood of building collapse during flood events.
- The design of the below ground fuel tanks should consider buoyancy and seek to minimise or prevent leakage during flood events.
- Consideration to installing flood resistant electrical components during future building design and construction.
- Consideration to the SES guideline *"Reducing Vulnerability of Buildings to Flood Damage"*, and DCP Table *"Flood Aware Design Requirements for Residential Development on Flood Prone Land"* during building design and construction.
- A Flood Emergency Response Plan (FERP) should be prepared for the subject site to reduce the flood risk associated with the subject site.

Conclusion

A qualitative flood assessment has been undertaken for the proposed development at numbers 5-13 Louth Park Road, South Maitland. The flood assessment has been prepared to support the Development Application (DA) submission to Maitland City Council and concludes the following.

- The developed flood risk can be appropriately managed with the introduction of a Flood Emergency Response Plan.
- The conversion of the existing land use of the subject site, from a residential to commercial, is considered an improvement to the existing flood risk on site.

As such, development of the subject site is considered acceptable from a floodplain risk management perspective. We submit these conclusions to Council for their consideration.

Should you have any queries regarding this correspondence, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by:

Laurence Gitzel
Civil Engineer
BEng (Civil) MIEAust CPEng NER (Civil)

Reviewed by:

Angus Brien
Principal | Group Manager | Civil Engineer
BEng (Civil) (Hons) MIEAust CPEng NER
RPEQ Member SIA FMA

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Bunder Family Trust.

The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required. To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Attachment A

Council Flood Information

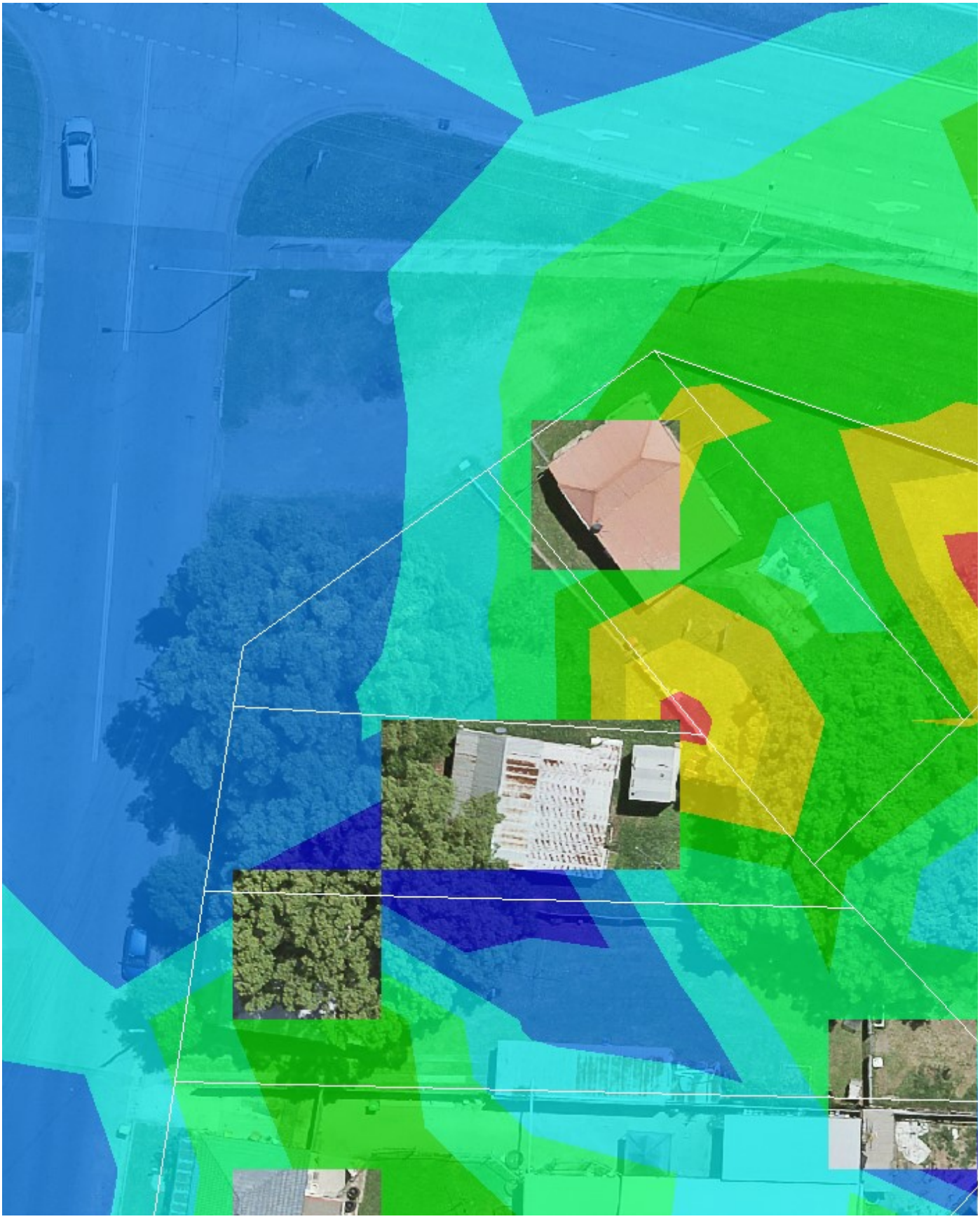
Laurence Gitzel

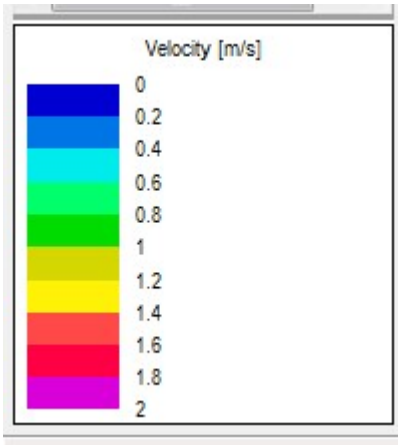
From: Kristy Cousins <Kristy.Cousins@maitland.nsw.gov.au>
Sent: Monday, 4 February 2019 11:50 AM
To: Jordan Hoey
Subject: 5 Louth Park Road

Dear Jordan,

With regards to the flood characteristics for 5 Louth Park Road, Council's mapping identifies the following:

1:100 year event – 9.73m AHD
PMF – 11.97m AHD
I have included a map of the velocity within a 1:100 year event below which shows a range over the site.





Please do not hesitate to contact me if you require additional information in relation to this matter.

Regards,
Kristy Cousins
Town Planner
Planning Environment & Lifestyle | Maitland City Council
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