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& PARTNERS

ENGINEERS PLANNERS SURVEYORS ENVIRONMENTAL PROJECT MANAGEMENT

RILEY'S HILL DEVELOPMENT

Lot 100 DP 1201719
Hills Road, Riley's Hill

FLOOD STUDY REPORT INVESTIGATIONS AND EMERGENCY MANAGEMENT

Submission to:



**Richmond
Valley
Council**

for:
Monal Pty Ltd

September 2021

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0	First Issue
1	Updated based on revised development plan and Council review comments
2	Updated based on revised development plan
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1. Introduction

Ardill Payne and Partners (APP) has been commissioned by Monal Pty Ltd to prepare a flood study in respect of Lot 100 DP 1201719 at Hills Road, Riley's Hill. The study has been undertaken to support and inform a planning proposal for rezoning of the 8.3ha site to a village zone to permit future residential subdivision and development.

The site is identified as Rare Low Hazard – Extreme Flood Fringe in the current Richmond Valley Council (RVC) flood maps. The site is mostly situated above the defined 5m AHD design flood level and the flooding of the small remaining part of the site could be managed by localised fill/earthworks.

The Department of Planning issued a conditional Gateway Determination (Dated 16th February 2018) in respect of the subject land. This Flood Study was initially prepared to address part of Condition 1 of the gateway determination requesting the site flooding condition to be detailed in a flood study.

The previous revisions of the report were issued to cover the changes to the planning proposal in terms of the development layout/number of the lots and the Council earlier review comments.

The current version of the report includes additional information regarding the flooding of the site in extreme storm events, site flooding risks and an evacuation plan. The additional information has been included in this version of the report to address the information request dated May 2021 from Richmond Valley Council (RVC).

2. Site Condition

2.1.Slopes and Discharge Point

The subject site contains an area of approximately 8.3ha. The site contours and detailed survey is provided in Attachment 1. The site is situated next to the existing Riley’s Hill Village in the vicinity of the Richmond River. The site is currently an open grassed land with no formal drainage system.

The site has an average slope of 3.0% generally toward the south-east draining the site run-off to the Broadwater National Park located on the opposite side of Hills Road.

2.2.On Site Flooding Extent

Richmond River is the main source of flooding of the site. The on-site flooding information obtained from RVC is presented in Attachment 3 of this report. The site flood levels provided in Table 2.1 are based on this information:

Table 2.1: Site flooding levels in different design storm events

Storm Event	Onsite Flood Level
20 year ARI	3.8m AHD
50 year ARI	4.5m AHD
100 year ARI	5.0m AHD
100 year ARI Including Climate Change	5.1m AHD
500 year ARI	6.2m AHD
PMF	9.5m AHD

RVC is completing an assessment of the site flood levels with consideration of a different scenario for the future climate change effects. The climate change assessment is being undertaken for a scenario with 900mm sea level rise and 10% increase in rainfall intensities. The study results are not available yet but the effect of the sea level rise will have negligible effect at Riley’s Hill and as such we do not expect that the outcome of the study will significantly change the 100 year ARI flood levels at the site area.

Flood planning requirements are depicted in Part H-1 of the RVC’s DCP 2015. The 100 year ARI storm has been defined as the design event for the flood related development planning. According to the DCP, the site minimum design floor level needs to be located 0.5m above the 100 year ARI flood levels at or above 5.5m AHD.

The site elevations vary mainly between 4.5m AHD and 14m AHD. Approximately 82% of the site is located above 5m AHD with more than 50% being located above the 5.5m AHD, these areas are marked with green highlight in Figure 2.1. As shown in Figure 2.1, the proposed development is located at the site high lands with more than 96% of the subdivision located above 5m AHD.

The site flooding condition is shown in a wider scale in Figure 1, Attachment 2. The flooded areas are colored in the figure with darker colors indicating deeper inundation. As shown in the figure, the site is isolated from the river flood currents, only receives slow moving backwater from the National Park and the proposed lots are not located within the flood prone areas.

The flood levels and velocity vectors for the selected design events acquired from RVC are provided in Attachment 3.

3. Design Considerations

3.1. Fill Earthworks and Floor Levels

Areas of the site within the development footprint will be filled to a minimum level of 5m AHD to achieve a flood free site. A Flood Planning Level of 5.5m AHD will be considered in designing the building floors and all habitable areas.

The entire site internal road will also be filled above 5m AHD. This will provide a flood free access to the other parts of Riley's Hill.

3.2. Development Impact Assessment

The site is not located in a floodway corridor or flood storage area. As such no adverse impact in relation to the proposed development and site fill is anticipated.

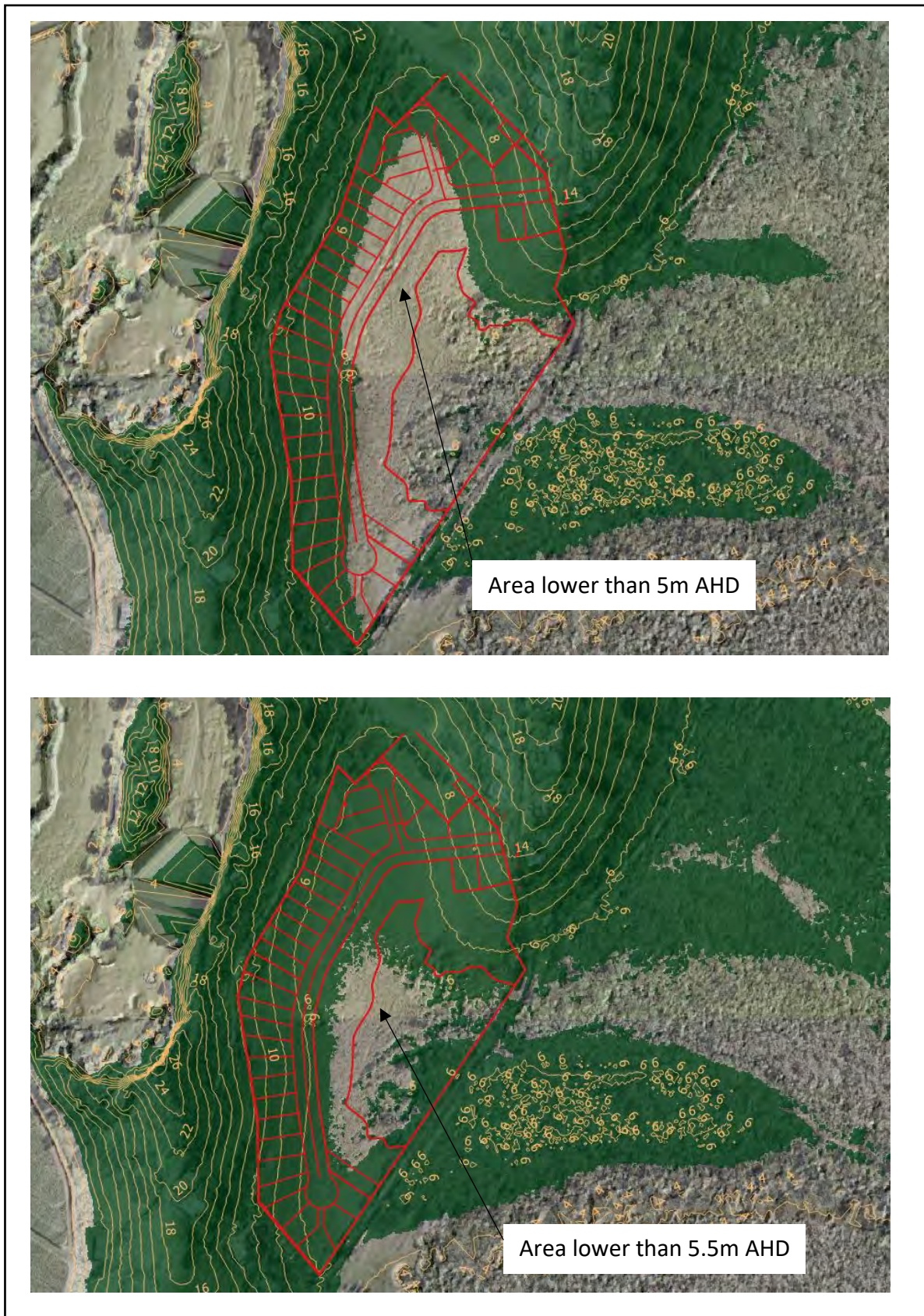


Figure 2.1: Areas lower than 100y ARI flood level and minimum floor level

4. Flood Emergency Management

4.1. Site Flooding Potential

Richmond River is the main source of flooding for the site. With the proposed fill levels all parts of the site will be immune from the river 100 year ARI floods. Furthermore, except five lots, the rest of the development will be located above 500 year flood and the site is located in walking distance to urban parts of the village with elevations above the PMF level.

Based on the above, no risk to life due to flooding of the site is expected. However, the site along with the rest of Riley's Hill village can potentially be isolated from the other urban areas due to flooding of the village main access from Riley's Hill Road.

The flood emergency plan provided in this section has been included to promote a satisfactory awareness of expected flood behaviour and risks, identify measures to become flood prepared, and recommend a course of action during the flood events. The long flood warning time at the site ensures implementing the proposed plan is practical.

4.2. Lead Time to Flooding

Based on the Richmond River Flood Mapping Report dated April 2010, the 48 and 72 hour events result in the highest flood levels across the river for all storm events including the PMF. The flood hydrographs included in the flood mapping report shows a typical flood duration of 5 to 7 days for Richmond River can be expected. This means that in a major event of 100 year ARI or larger flooding of Riley's Hill village for a duration of 2 to 4 days should be expected.

Richmond River has a large catchment and as a result the flooding would occur gradually providing hours of lead time to inundation of the Riley's Hill Road. RVC and SES have not published a general recommendation regarding evacuation of Riley's Hill in storm events. The SES maintains headquarters at Woodburn and Broadwater providing evacuation orders to the local communities if necessary.

Considering the above, in a major flood event the site residents can evacuate the site or be prepared for namely three days of isolation. In this regard taking the advises received from RVC and SES regarding the proper course of action in any specific storm event is strongly recommended.

4.3.BoM and SES Warnings

A network of rainfall gauge stations is maintained by Bureau of Meteorology (BOM). This network provide data to the BOM flood warning system. The BOM should issue one of five types of warnings through local radio, television and their website – <http://www.bom.gov.au> . In addition, the State Emergency Service (SES) may issue a flood bulletin, evacuation warning or evacuation order. The different warning types as defined by SES are as follows:

- **Flood Watch:** is issued by the BOM and provides a 'heads up' that flooding is likely.
- **Flood Warning:** is issued by the BOM and warns a community of flooding at a predicted height, time, and location.
- **Flood Bulletin:** is issued by the NSW SES to warn a community of flooding at a predicted height, time, and location and the expected risks, impacts, consequences, and the safest actions to take.
- **Evacuation Warning:** is issued by the NSW SES to warn a community of the potential to evacuate properties, risks to life and property, and the safest actions to take.
- **Evacuation Order:** is issued by the NSW SES to immediately evacuate at risk sections of the community from a flood threatened area and advises the safest actions to take.
- **All Clear:** is issued by the NSW SES to advise the evacuated community that it is safe for people to return to the area and any residual risks.

4.4.Evacuation Procedure – If Requested by SES or Preferred by Site Occupants

The evacuation route is shown in Figure 4.1. Evacuation by car is possible through A1 Highway. A suitable assembly point is also available at Broadwater Community Hall which is located 4km from the site.

Riley's Hill Road which has to be used for possible evacuation is susceptible to flooding. Parts of this road is located lower than the 20 year ARI flood level and as such evacuation of the site is an option only at initiation of a major flood event. If evacuation of the site is the preferred option or is instructed by SES, the residents must prepare themselves for evacuation before and during an 'evacuation warning' and evacuate the site as soon as possible after issue of an 'evacuation order'. It is expected that a time period of 12 hours between issue of an 'evacuation warning' and 'evacuation order' will be available for the residents.

4.5.Preparation for Isolation

It is recommended that all future residents prepare and keep an emergency kit in their property. The emergency kit needs to as a minimum include:

- A waterproof bag containing important documents like passports, ID and insurance documents.
- Portable, battery operated AM/FM radio.
- Waterproof torch with new and spare batteries
- First aid kit with manual
- Medications, toiletries and sanitary supplies.
- Special requirements for infants, elderly, injured, disabled people and pets.
- Mobile phone and charger.
- Cash and bank cards.
- Emergency contact numbers.
- Spare house and car keys.
- Combination pocket knife.
- Drinking water – at least 12 litres per person.
- Canned food – enough for 4 days.
- A can opener, cooking gear and eating utensils.
- Portable gas stove or BBQ.
- Water container for storing washing and cooking water.



Figure 4.1: Site Optional Evacuation Routes

4.6. Contacts

While it is natural to be apprehensive during flood events, the residents are asked to only use these contacts where there is a clear threat to safety so as not to congest control centres.

State Emergency Services (SES) 79 Pacific Hwy, Broadwater NSW 2472	132500
Police - Woodburn 98 River Street WOODBURN 2472	Ph (02) 6627 6440
Bureau of Meteorology Rainfall Radar http://mirror.bom.gov.au/products/IDR282.loop.shtml Northern Rivers Rainfall and River Conditions http://www.bom.gov.au/hydro/flood/nsw/northcoast_clickable.shtml	

5. Scope of Engagement

This report has been prepared by Ardill Payne & Partners (APP) at the request of Monal Pty Ltd for the purpose of flood investigation at Hills Road, Riley's Hill and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. APP accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

No part of this report may be reproduced, stored or transmitted in any form without the prior consent of APP.

APP declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately it is recommended that you consult with APP before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

6. Attachments

Attachment 1	Site Survey and Development Master Plan
Attachment 2	Figures
Attachment 3	On-Site Flood Levels Provided by RVC

ATTACHMENT 1

Attachment 1: Site Survey and Development Master Plan

Note – Level Datum

Level Datum: AHD
 Origin: PM.85800 (RL 2.682 AHD)
 Contour Interval: 0.5m

NOTE: For Surveyed Points, refer to Autocad Layers:
 "X-MARK" "X-CODE" & "X-RL"

Note – Underground Services

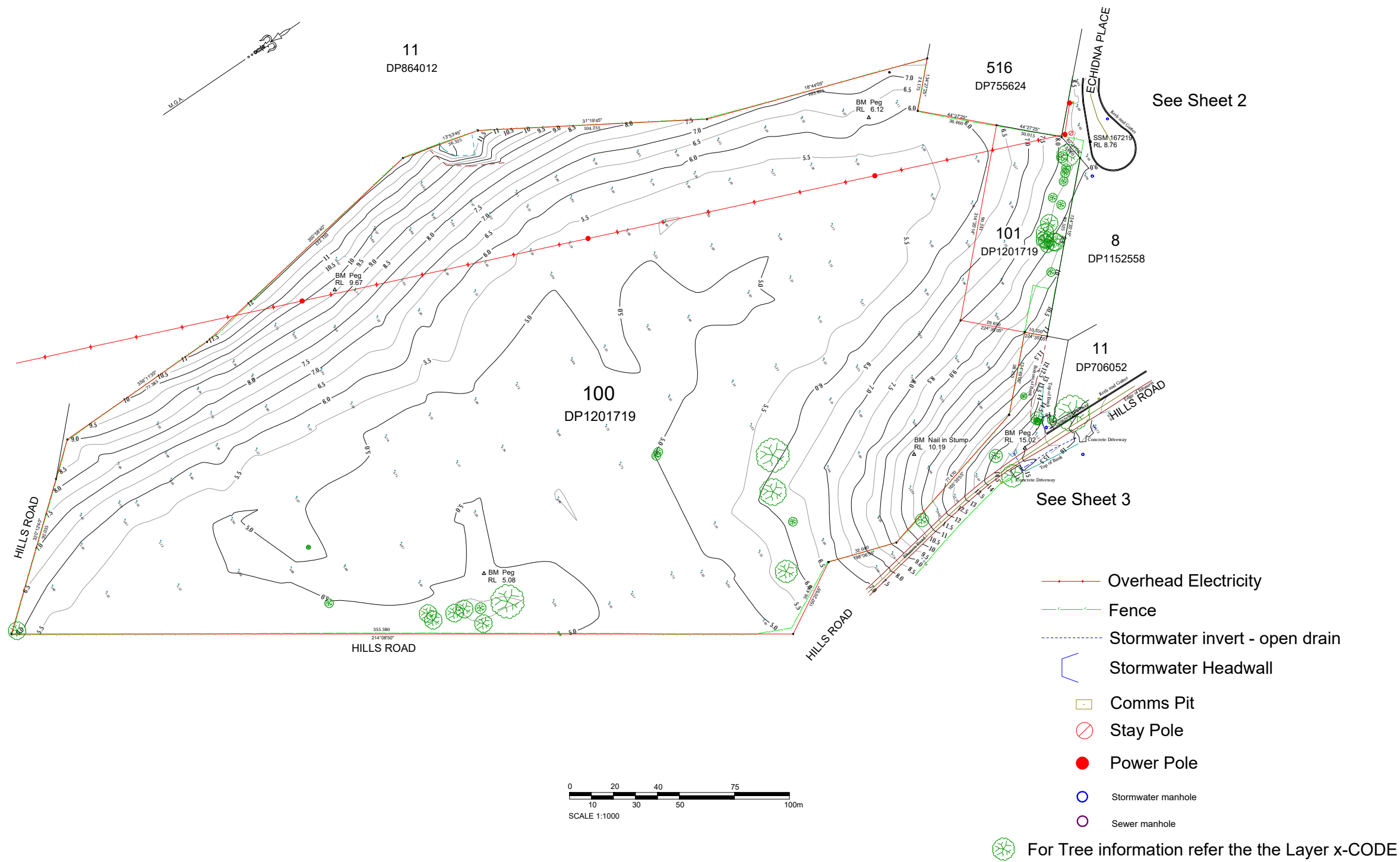
The location of the services shown hereon have been derived from the field survey of visible components. The exact location of these services has not been investigated, and any others may therefore vary and should be verified with the relevant authorities and or the "Dial before you Dig" service prior to any works being undertaken.

Should any work be undertaken on or adjacent to the site to which this survey refers it is the responsibility of the person doing the work to locate any service that may be affected by that work.

Whilst due care was used in compiling this information, no responsibility will be accepted or taken by Ardill Payne & Partners for any inaccuracies or omissions shown or not shown hereon.

Note – Survey Intent

This survey was undertaken to locate the visible site features, including the topography & improvements thereon. As such, no boundary fixation was undertaken to accurately determine the parcel boundaries, the available land area or it's dimensions. The dimensions shown have been derived from the relevant registered plans held by the Land Titles Office. No work was undertaken to verify these dimensions. Should accurate boundary locations be required, further survey work would need to be undertaken to accurately locate the boundaries, which may include the registration of a survey redefining the property.



See Sheet 2

See Sheet 3

Issue	Date	Amendment	App'd

Client:
ALAN CARDY

Project:
Proposed Rezoning & Subdivision
 Hills Road, Rileys Hill
 Lot 100 DP 1201719

Title:
CONTOUR & DETAIL SURVEY
 Sheet 1 of 3

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Surveyed	BJ /LT	Scale at A1	1:1000	Date	17/8/16
Drawn	BJ	Datum	A.H.D.		
Checked	RJJ	Acad File	8174_DS.DWG		
Approved		Coad File	8174_DS.mjo		
Job No.	8174	Dwg No.	S01	Issue	

ATTACHMENT 2

Attachment 2: Figures

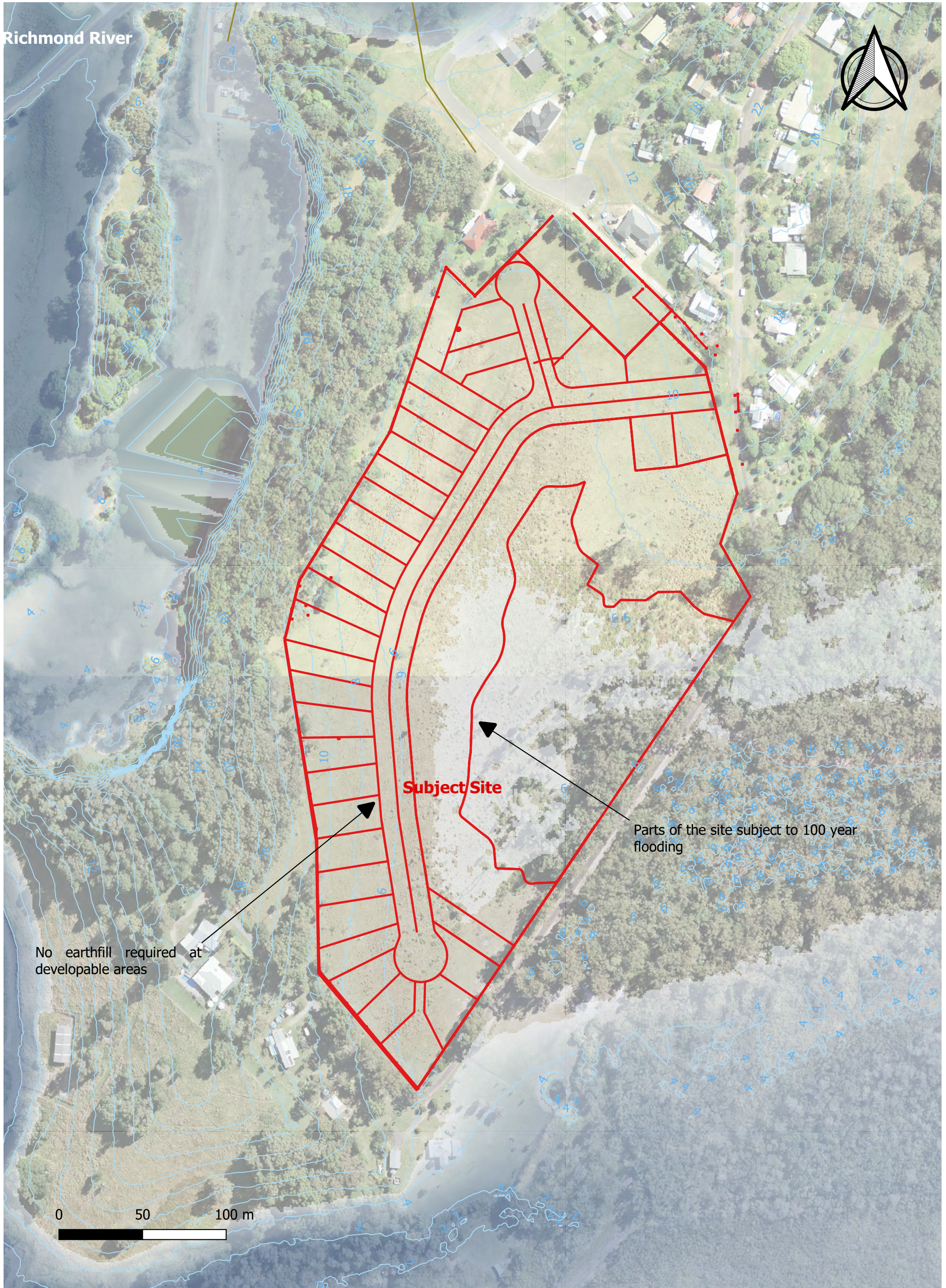


Figure 1: Site Flooded Areas in a 100 Year Design Flood and Development Footprint

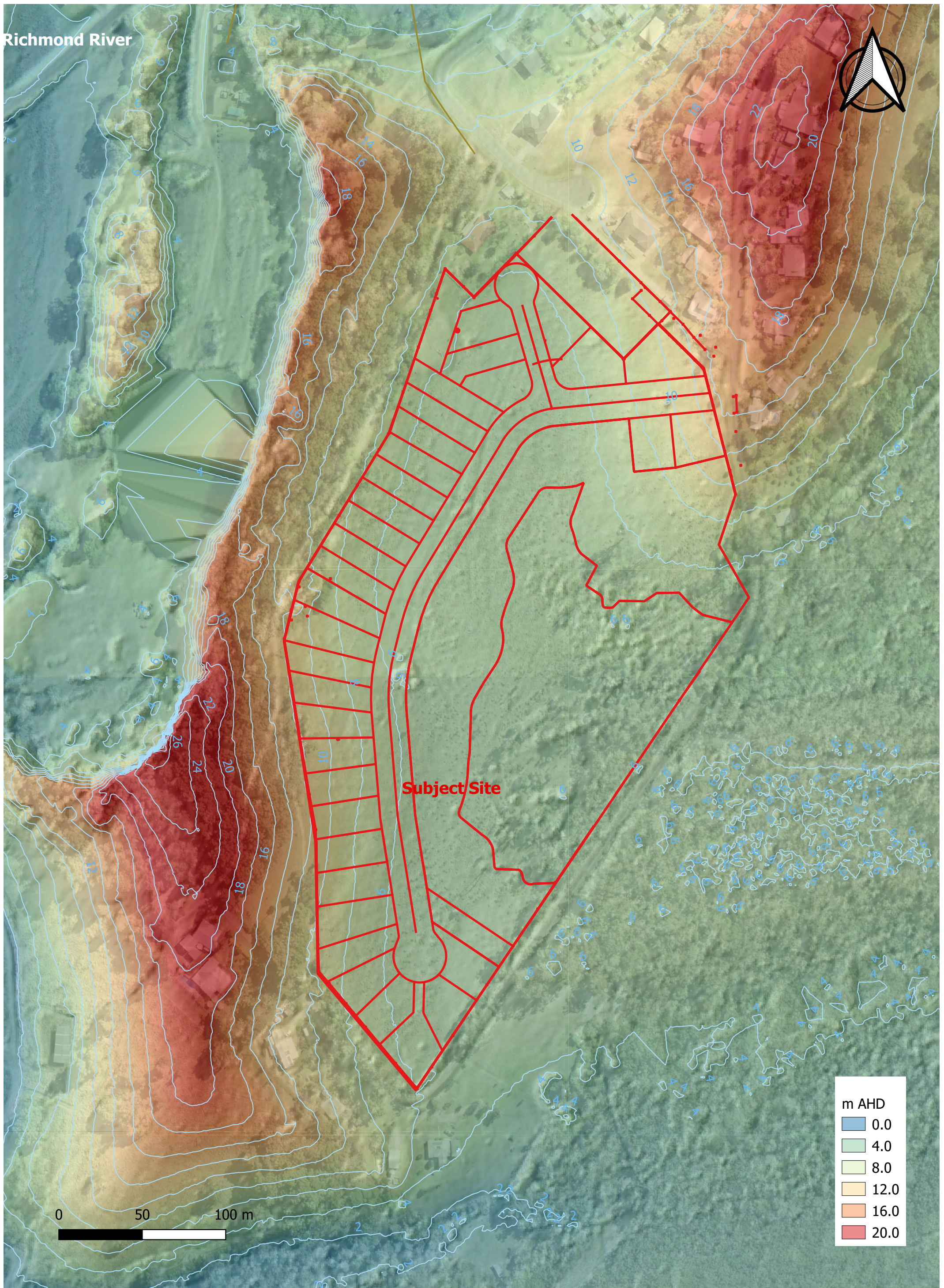


Figure 2: Site Topography

ATTACHMENT 3

Attachment 3: On-Site Flood Levels Provided by RVC

