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Our Reference:
PDS30032020:22COORAAV-BELROSE

Ms Deborah Cooper
22 Coora Avenue,
Belrose, 2102

29/05/2020

Re: Flood Management Report for 22 Coora Avenue, Belrose.

Dear Deborah,

1.0 INTRODUCTION

The proposed development at 22 Coora Avenue Belrose (Lot 4 DP 227151 referred to as the *site*) is to construct Additions and swimming pool as shown in Figures 4, 5 and 6. Northern Beaches Council (NBC) has determined that the *site* is Medium to Low Risk Precinct as shown in Appendix B Map D. NBC DCP Section B3.11 and B3.13 applies to this development proposal.

This Flood Management Report is submitted for your and Council consideration as part of the overall Development Application (DA).

2.0 SITE INSPECTION

An inspection of the *site* and catchment was undertaken on 19th February 2020 by Mr Stephen Wyllie to develop an understanding of the catchment and drainage systems. Several important features were observed and conceptualised. These were:

1. The catchment boundary of the *site* is shown in Figure 1. There is a network of roads that intercept and distribute catchment runoff through NBC drainage and road network.
2. The catchment is predominately residential with a shopping Mall and playing fields. From the topography, overland and street flows could develop as shown in Figure 2.
3. There is a kerb drainage pit adjacent to the *site* as shown in Figure 2. The pipeline from the pit traverses near the western boundary of the *site*.
4. The *site* is located approximately 100 metres north of the Haigh Tributary as shown in Figure 1.

5. Flooding of the *site* is potentially from the Haigh Tributary and overland flows.

3.0 EXISTING INFORMATION

The *site* was surveyed by Total Surveying Solutions Reference No 200295 dated 27th February 2020. (Figure 3). Contours and catchment boundaries as shown in Figure 1 and 2 where generated by Pittwater Data Services Pty Ltd from the NSW Government Land and Property Lidar 2014 data Sydney North 3486274 using a Global Mapping Graphical Information System (GIS).

The flood study relevant to this investigation was undertaken by, DHI, 2010 (Ref 1), on behalf of the then Warringah Council. This study used complex hydrological and a numerical model to generate design flood conditions. The objective of this study was to determine flooding hazards under various rainfall criteria, this included the overland flow processes. Flood data for the *site* based on Ref 1 simulations, were obtained from NBC as shown in Appendix B. Relevant data from this study are:

1. 1%AEP time of concentration for this *site* is approximately 10-20 minutes (Ref 1).
2. 1%AEP 20 min rainfall intensity is approximately 160mm/hr (Ref 1 and 2 IFD).
3. At the *site* flood level predictions for the 1%AEP 142.5 AHD (Appendix B page 1).
4. The PMF flood level approximately 143m AHD (Appendix B Map C). This level was estimated from the contours, as no value was provided by NBC.

4.0 RESULTS OF THIS INVESTIGATION

The catchment characteristics for the *site* as discussed in Section 2 and the numerical modelling results, highlights several aspects of the natural and built infrastructure for the 1% AEP flood process. These are:

1. Overland flows to the *site* are distributed by the pipelines and road networks. The *site* is on the alignment of those flow processes as shown in Figure 2.
2. Overland flows at the *site* are a result of the pipe/pit drainage and road network reaching its capacity and/or choking. Appendix B Maps A and Figure 3 shows the flood extent at the *site*. Note that Figure 1 is a more accurate representation of the inundation area of the *site*.
3. The PMF level was adopted at 143m AHD (in excess of 10,000years recurrence). PMF level was not provided by NBC. However from my experience for small catchments on the northern Beaches, these catchments generally develop a PMF level similar to the Flood Planning Level (FPL) ie 0.5 metres above the 1%AEP predicted level. 143m AHD was adopted as the FPL. This allowance is covered in amendment box of Form A/A1.

In summary the 1%AEP and PMF flood events inundates the *site* from two processes of overtopping /choking process of the Roads and the drainage networks and flooding from Haigh Tributary. The flood velocities are predicted to be minimal in the portion of the site, where the proposed developments are to be located. This area is Low Risk Precinct : fringe flooding. However the inundation depth is approximately 0.5 metres for the 1%AEP and 1metre for the PMF.

5.0 REVIEW OF PROPOSED ADDITIONS

The proposed additions and alterations in relation to NBC DCP Flood Standards as detailed in Figure 4,5 and 6 are as follows:

1. The Kitchen additions are at the same floor level as the existing GFL ie 143.2 m AHD (Figure 3). This level is above the adopted FPL/PMF of 143.0 m AHD
2. The decking level is at the same level as GFL.
3. The decking sub floor consisting of piers and beams. will cause minimal loss of flood storage. Note that the existing pergola and solid stairs will be removed to compensate to lesser degree for minor flood storage losses.
4. The swimming pool coping is at approximately ground level as shown in Figure 6.

Item 2: constructed of flood compatible materials.

6.0 FLOOD RISK ANALYSIS AND PLAN

The access to any flood free haven away from the *site* is not considered as a viable option: considering the rate of rise of the flood levels, general frequency of warnings from BoM and the low levels of surrounding access Roads. As such, the Dwelling should be used as a “Shelter- in-Place” (SiP) and be used as the *only action* for flood planning. Access is not available along Coora Avenue.

During the lead up to this event there are a number of flood prediction services available which should be used to ensure sufficient planning and action. The sequence of information available are:

1. This report provides information on the flooding processes of the *site*. The residents of the *site* should be aware of this information and the Action Plan should be posted in a visible location: BoM warning process, inundation process of the *site* and an action plan. The Action plan is in Appendix A.
2. Severe flood warnings for the Northern Beaches predicted by the Bureau of Meteorology (BoM), should prepare for a potential flooding at the *site*. This information is broadcasted on ABC radio and TV and is available on BoM website. Typically, rainfall intensities in an excess of 40mm/hr over a period of 1 hr will generate flooding.

3. A flood waters inundating Coora Avenue should be a trigger to prepare. When rain is predicted to continue a major event may occur, particularly if flood warnings continue to be issued by BoM.
4. As discussed in Section 3, the 1%AEP flood will rise to its peak value in 10 minutes. During that time the final preparations should be concluded to secure items on the *site* and ensure the safety of all persons at the GFL of the Dwelling. Chemicals and any loose equipment is to be stored on the GFL. The vehicles should secured.

7.0 CONCLUSIONS

Considering the flooding processes at the *site* the design of the Alterations /Additions and Swimming pool as detailed in Figures 4,5,and 6, it is my opinion the design and this flood evacuation plan will satisfy NBC DCP Section B3.11 and B3.13 .

Yours Faithfully,



Stephen Wyllie Bsc (Eng) FMA Member

Director

Pittwater Data Services Pty Ltd

29/05/2020

8.0 REFERENCES

1. DHI Water and Environment, Frenchs Creek Flood Study, April 2010.
2. Bureau of Meteorology Intensity Frequency Duration Curves.

Appendix A

FLOODING WARNING

AWARENESS

- Heavy rain predicted by the Bureau of Metrology (BoM): flood warning /flash flooding for the Northern Beaches.
- Monitor media reports for flood warnings in the Sydney Metropolitan Area.
- Observe local rainfall and flood levels in a Coora Avenue (Figure 2).
- Coora Av. overtopped triggers Action Plan.

ACTION BoM WARNINGS ISSUED

- Account for all residents and visitors. Inform all residents and visitors of the potential flood situation and this Plan.
- Any items transportable by flood waters move to Ground Floor Level (GFL).
- Secure the vehicles.
- Observe inundation on the *site*.
- Continue to monitor BoM reports and tide.
- If rainfall is intense and warnings continue evacuate and remain at GFL.

POST FLOOD

- Account for all residents and visitors.
- Inspect vehicles and *site* generally for safety particularly electrical problems.
- Monitor BoM reports to ensure no further flood warnings.

22 Coora Avenue, Belrose

APPENDIX B

FLOOD INFORMATION REQUEST - BASIC

Property: 22 Coora Ave, Belrose

Lot DP:

Issue Date: 17/02/2020

Flood Study Reference: Frenchs Creek Flood Study 2010, DHI

Flood Information for lot:

Flood Life Hazard Category – Not Available

1% AEP – See Flood Map A

1% AEP Maximum Water Level³: 142.5 m AHD

1% AEP Maximum Peak Depth from natural ground level³: 0.2 m

1% AEP Maximum Velocity: Not Available

1% AEP Hydraulic Categorisation: Not Available

Flood Planning Area – See Flood Map B

Flood Planning Level (FPL) ^{1, 2, 3 & 4}: Varies – refer to FPL extent mapped below

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level²: Varies – refer to PMF extent mapped below

PMF Maximum Depth from natural ground level: 0.5 m

PMF Maximum Velocity: Not Available

Flood Risk Precinct – See Map D

¹The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.

²Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site.

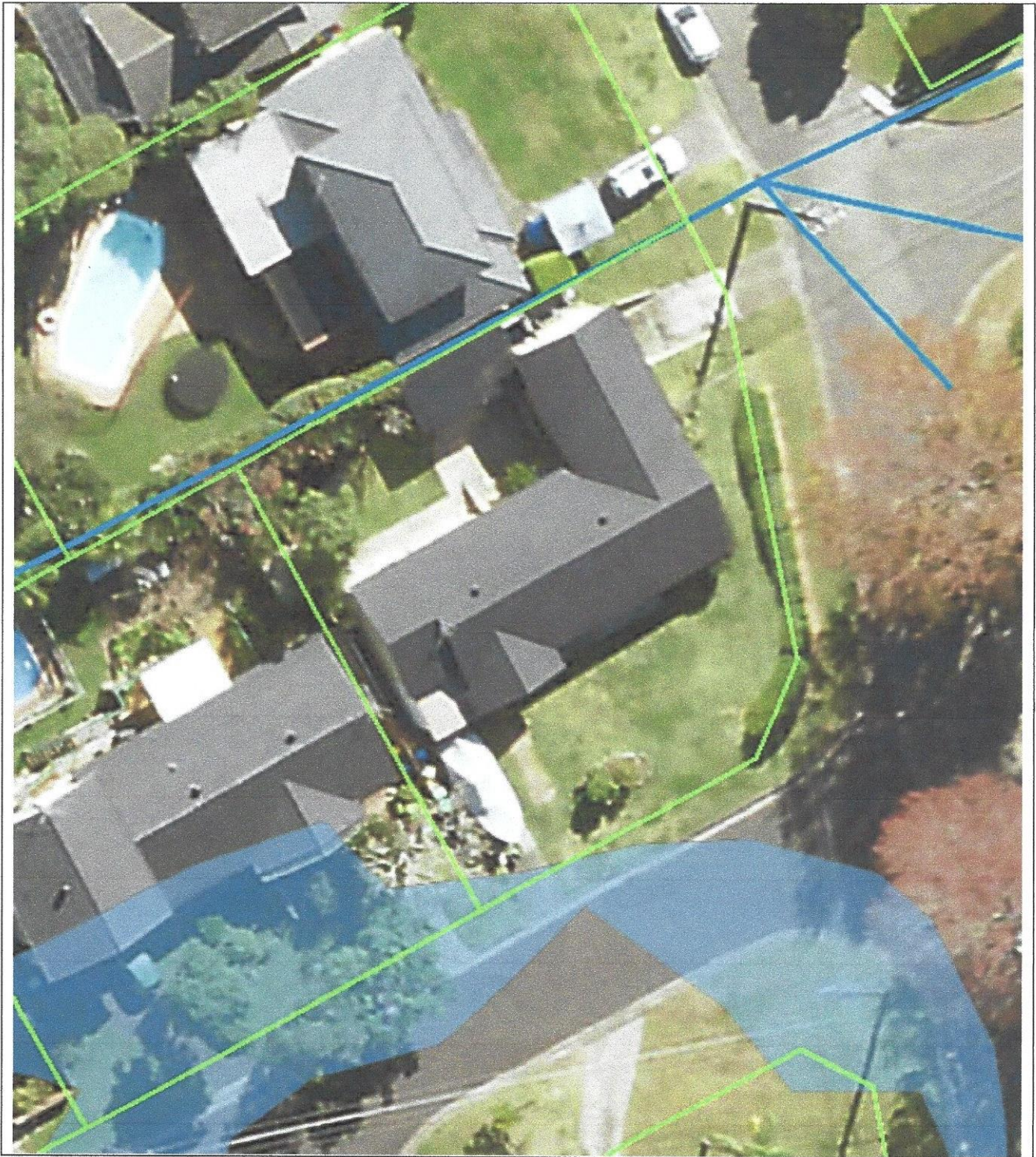
³Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.

⁴Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

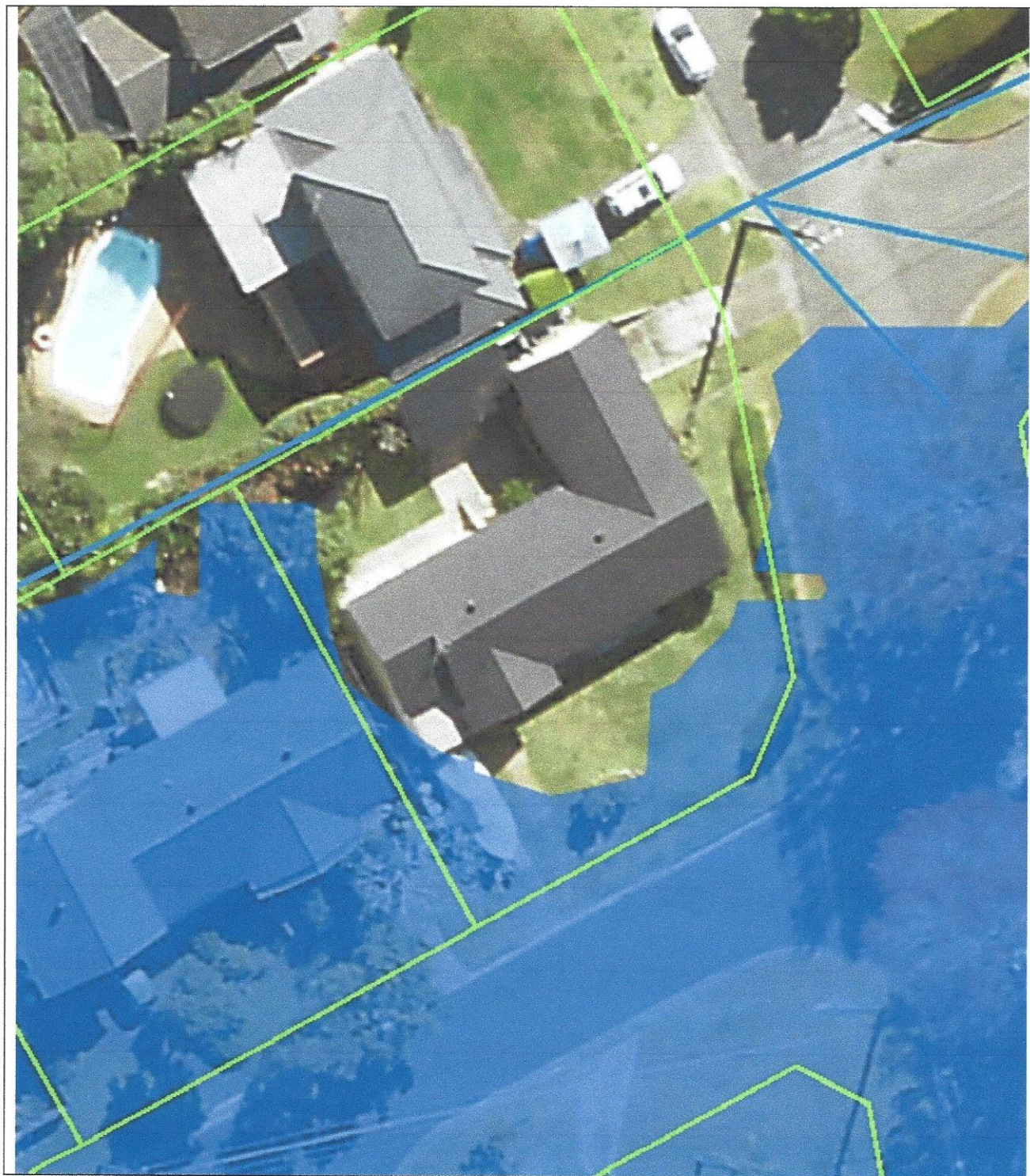
FLOOD MAP A: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Frenchs Creek Flood Study 2010, DHI) and aerial photography (Source: NearMap 2014) are indicative only.

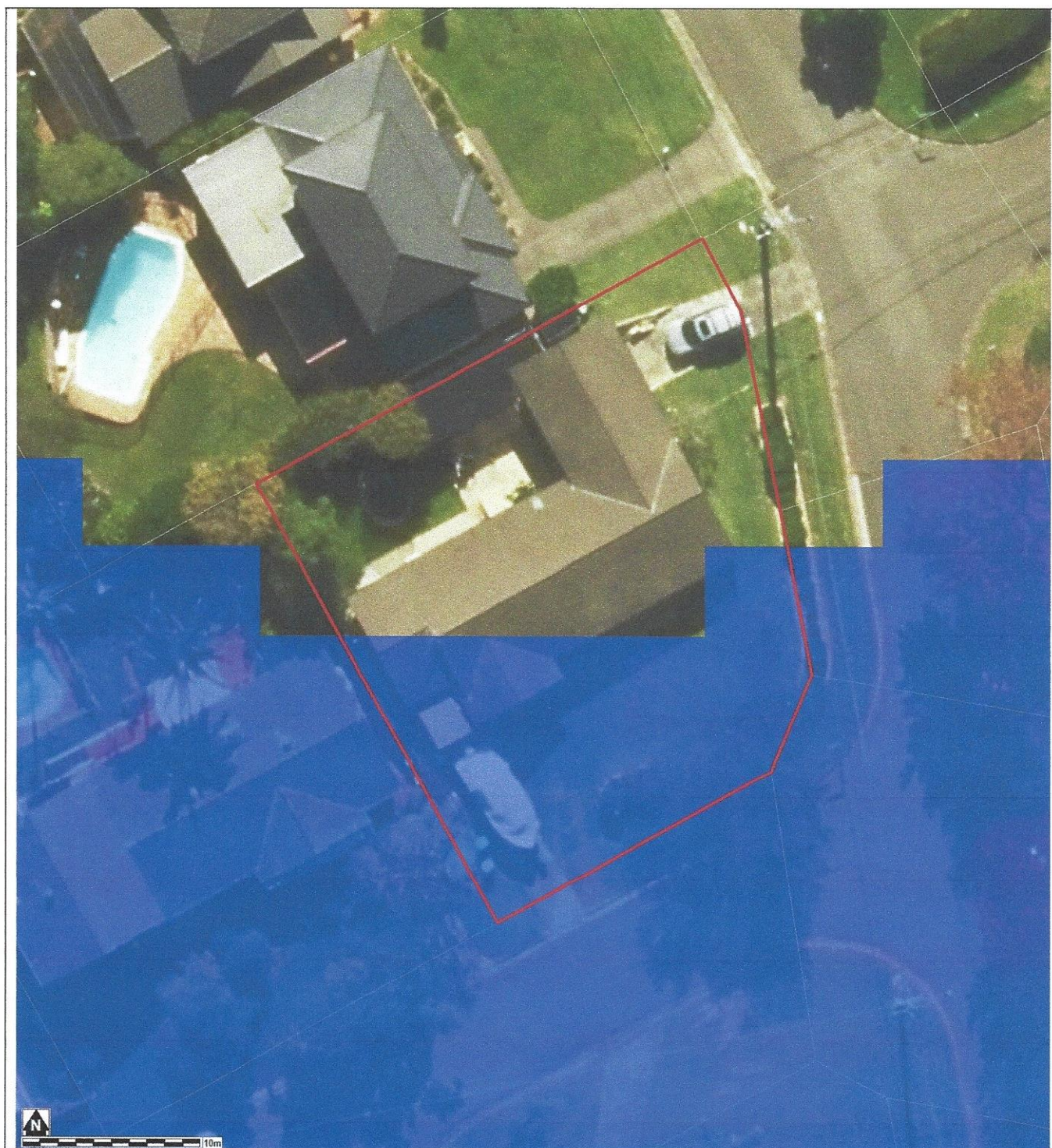
FLOOD MAP B: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Frenchs Creek Flood Study 2010, DHI) and aerial photography (Source: NearMap 2014) are indicative only.

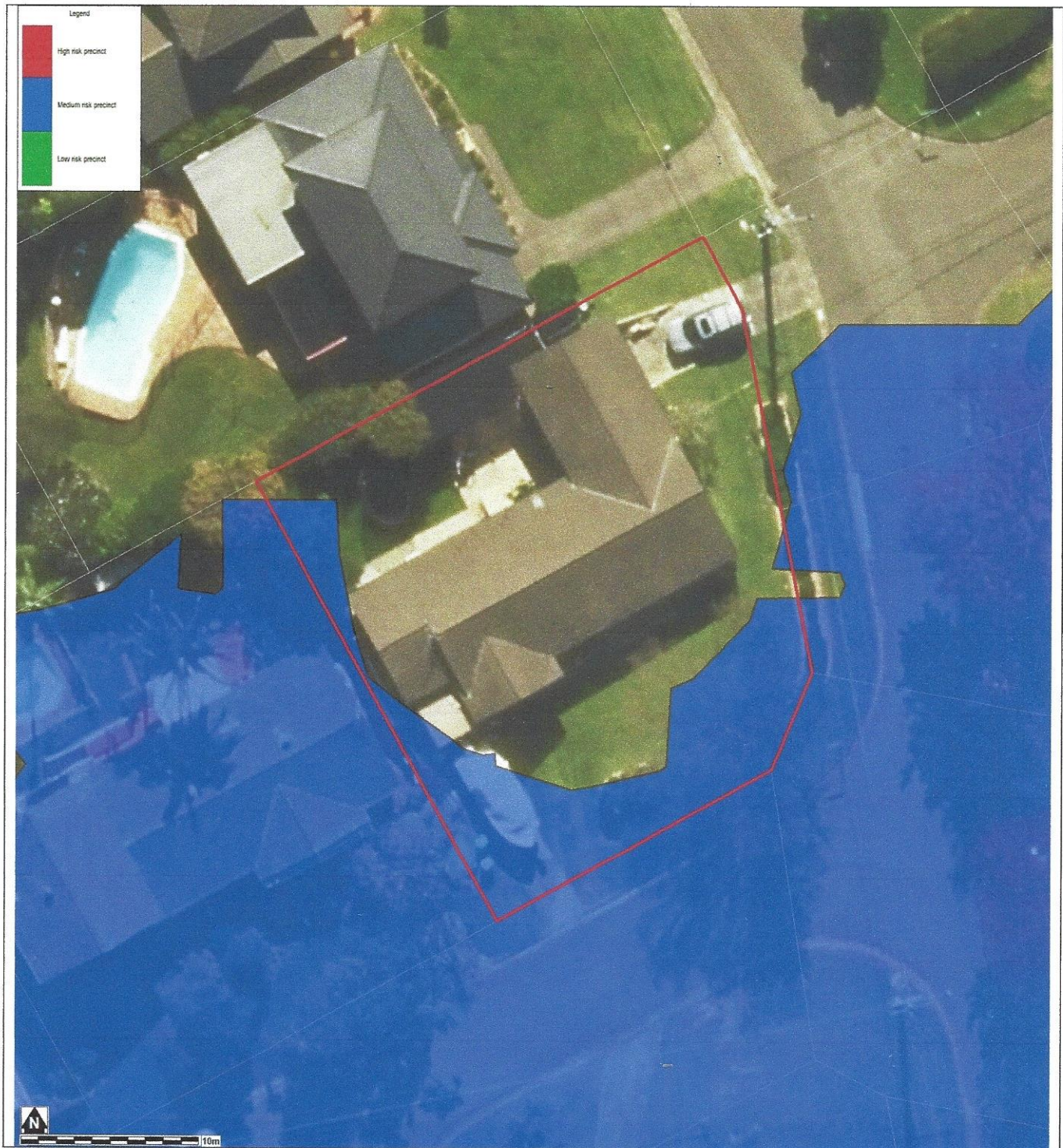
FLOOD MAP C: PROBABLE MAXIMUM FLOOD EXTENT



Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Frenchs Creek Flood Study 2010, DHI) and aerial photography (Source: NearMap 2014) are indicative only.

FLOOD MAP D: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 and or H6 Life Hazard Classification)



SITE CATCHMENT

- LEGEND
- SITE
 - SITE CATCHMENT BOUNDARY
 - - - THALWEGS OF HAIGH TRIBUTARY
 - > OVERLAND FLOWS



SITE BACK OF DWELLING: AREA TO BE DEVELOPED



FIGURE 2

LEGEND

EG - EDGE OF GARDEN
TK - TOP OF KERB
EC - EDGE OF CONCRETE
TOW - TOP OF WALL
TW - TOP OF WINDOW
BW - BOTTOM OF WINDOW
AWN - AWNING
TG - TOP OF GUTTER
RR - ROOF RIDGE
DS - DOOR STEP
D/S/D/H/16 - TREE DIAMETER/SPREAD/HEIGHT

LEGEND

BENCH MARK	▲
TELSTRA PIT	TEL
ELECTRIC LIGHT POLE	LP
POWER POLE	PP
SIGN POST	SP
SEWER INSPECTION PIT	SIP
SEWER VENT	SEWER
MANHOLE	MH
SEWER MANHOLE	SMH
STOP VALVE	SV
WATER HYDRANT	HYD
WATER METER	WM
GAS METER	GM
STATE SURVEY MARK	SSM

Paul Johnston
Registered Surveyor
N° 5878

NOTE:

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REVISION No.

REVISION DATE:

COMMENT:

PLAN SHOWING DETAIL & LEVELS
OVER LOT 4 IN DP 227151

CLIENT: DEBORAH COOPER

PROJECT: BELROSE

ADDRESS: 22 COORA AVENUE, BELROSE

JOB No.: 200295

LGA: NORTHERN BEACHES

PLAN No.: 200295-1

DATUM: AHD

DATE: 27/02/2020

SCALE: 1:100@A2

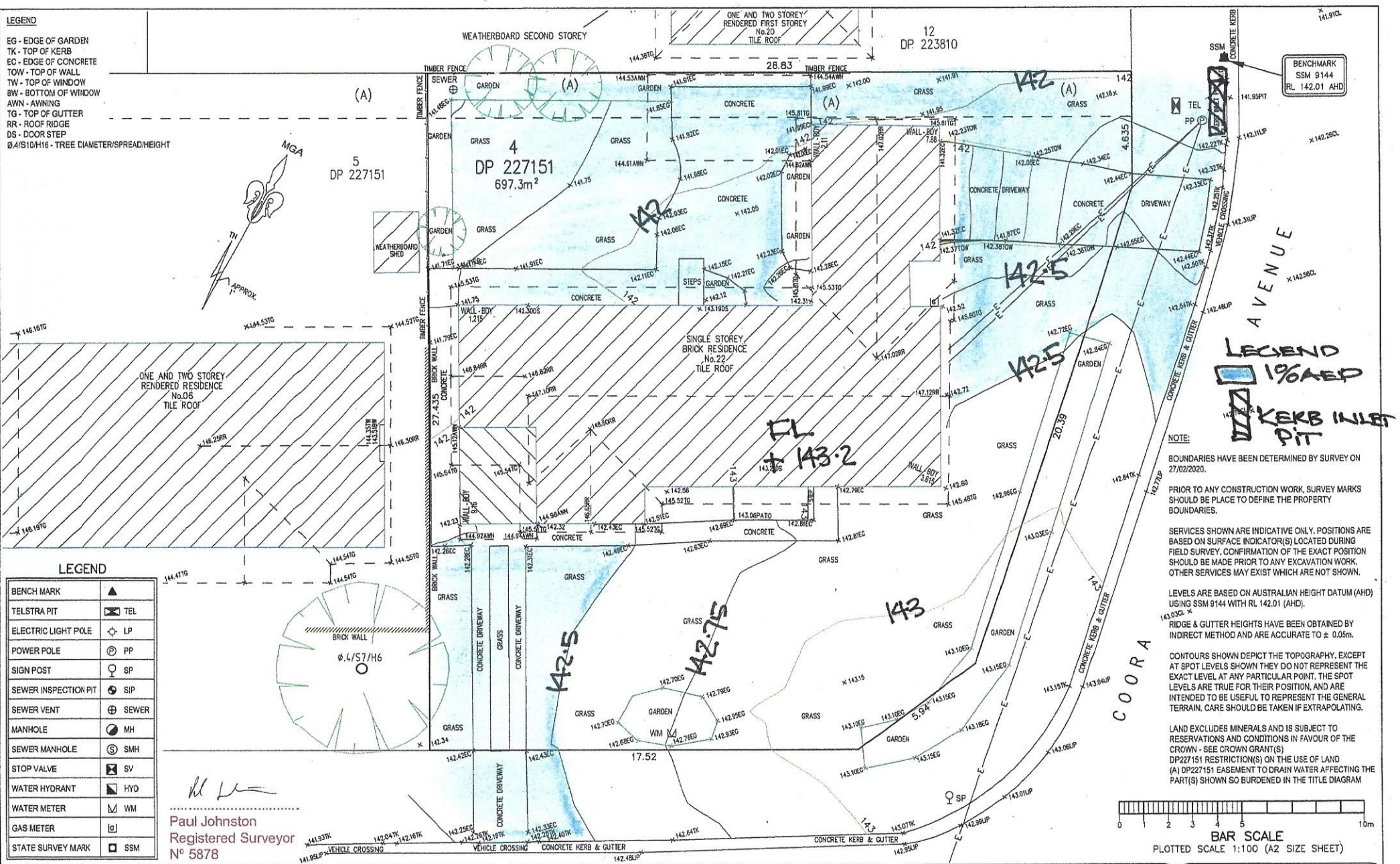
DRAWN: RC

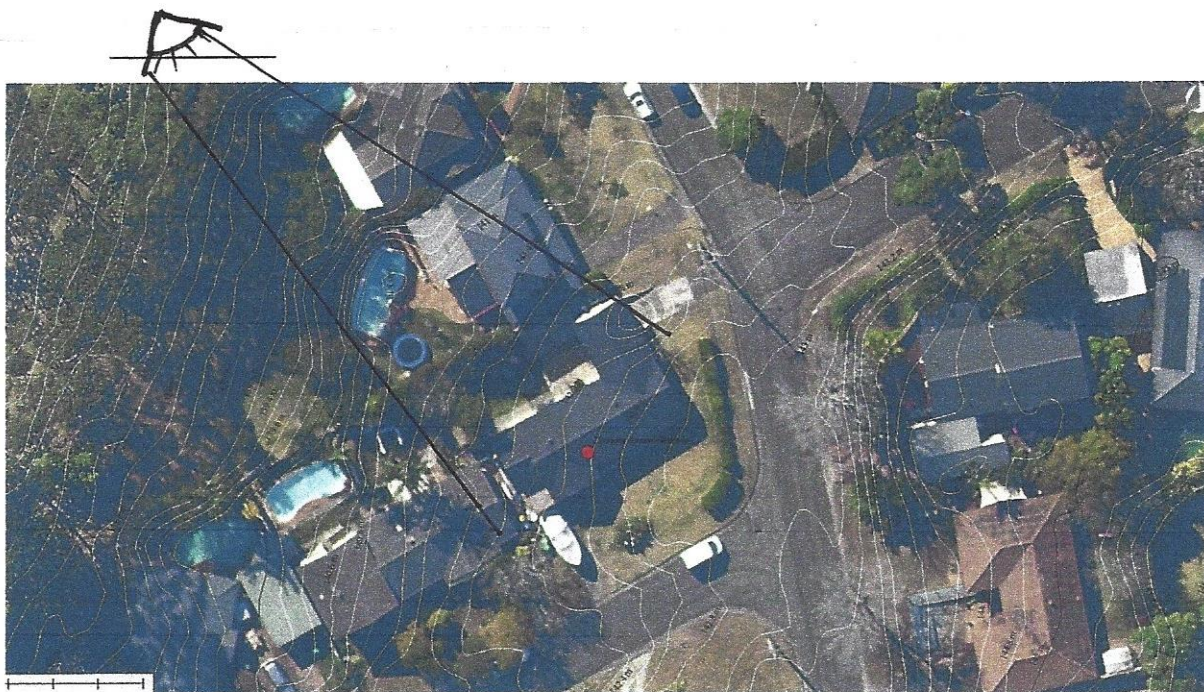
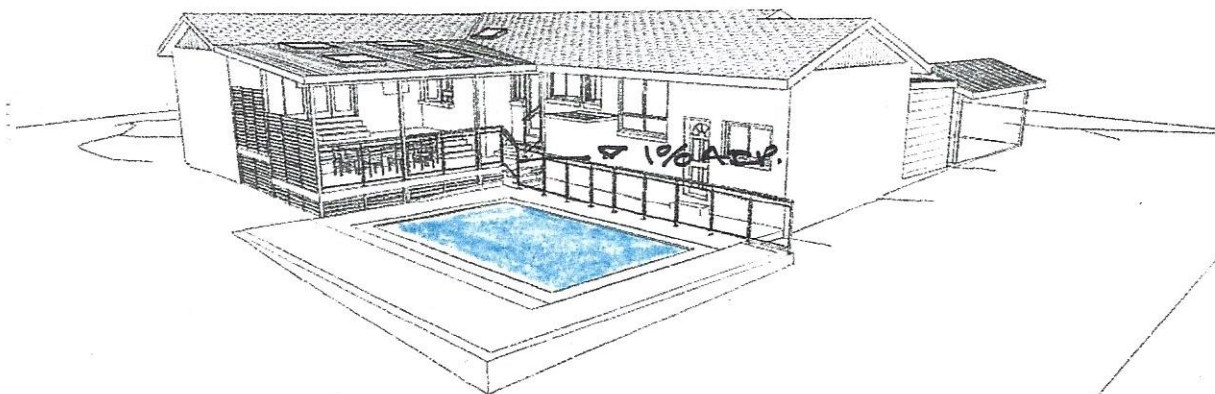
CONT. INTERVAL: 0.25m

CHK: SF

SHEET 1 OF 1

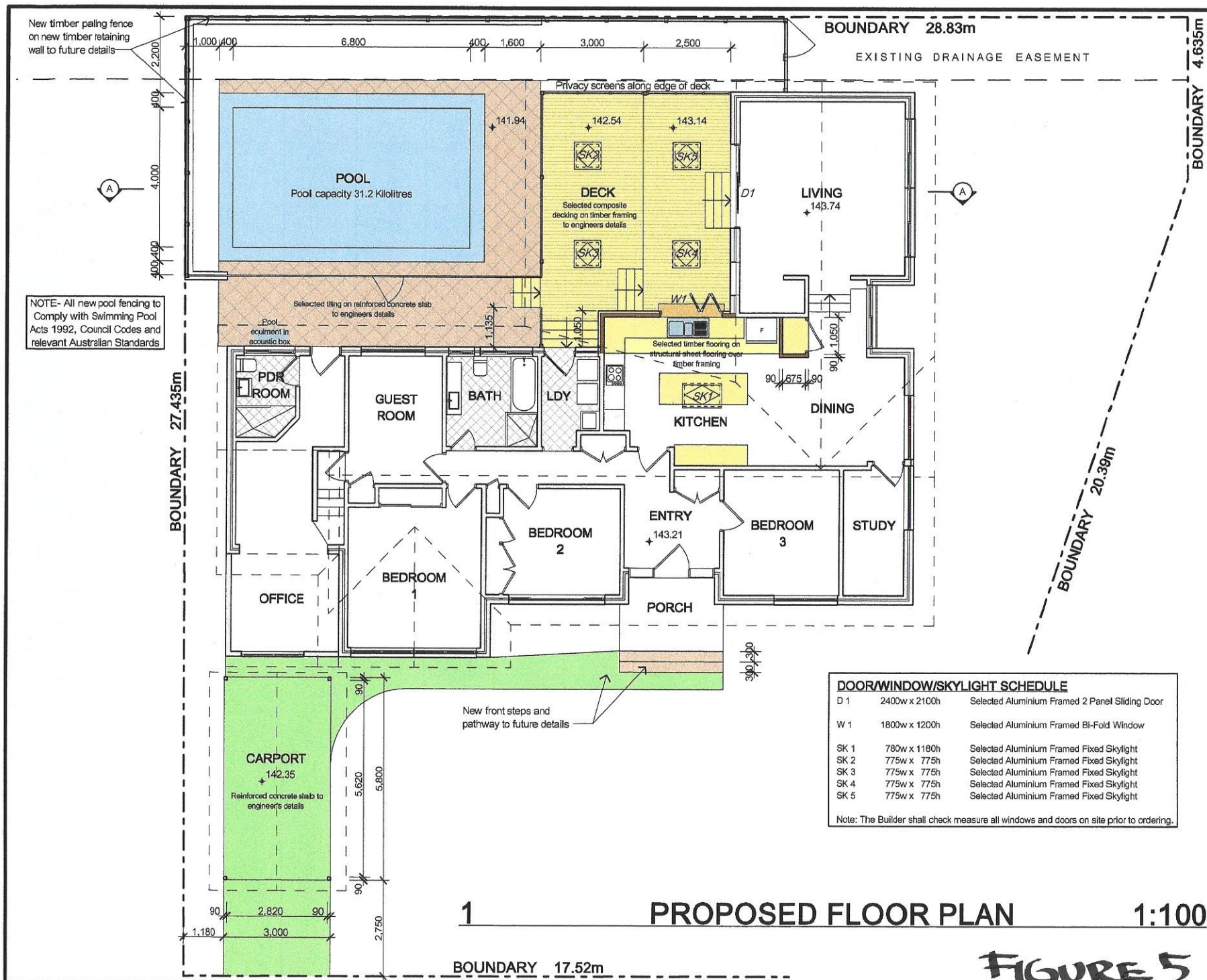
FIGURE 3





N

FIGURE 4



NOTES

All work is to comply with the Building Code of Australia, the requirements of the local council, the requirements of the legally constituted Authorities for services and the relevant standards by the Standards Association of Australia.

The Builder is to give all notices, obtain all permits and pay all fees.

Finished ground levels on the plan are subject to site conditions.

Do not scale from drawings. Use figured dimensions only and report any discrepancies to the designer prior to commencement.

All figured dimensions to be checked on site.

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Client

MS. D. COOPER

Project Name

PROPOSED ALTERATIONS + ADDITIONS

22 COORA AVENUE

LOT 4, DP 227161

BELROSE NSW 2085

JAH

DESIGN SERVICES

ASN 22 630 690 634

9 LOCKWOOD AVENUE, FRENCHS FOREST NSW 2086

PH. 0410 410 094 EMAIL jah@jahdesign.com.au

Drawing Title:

PROPOSED FLOOR PLAN

Scale: 1:100 @ A3

Date: MAY 2020

Status: DA submission

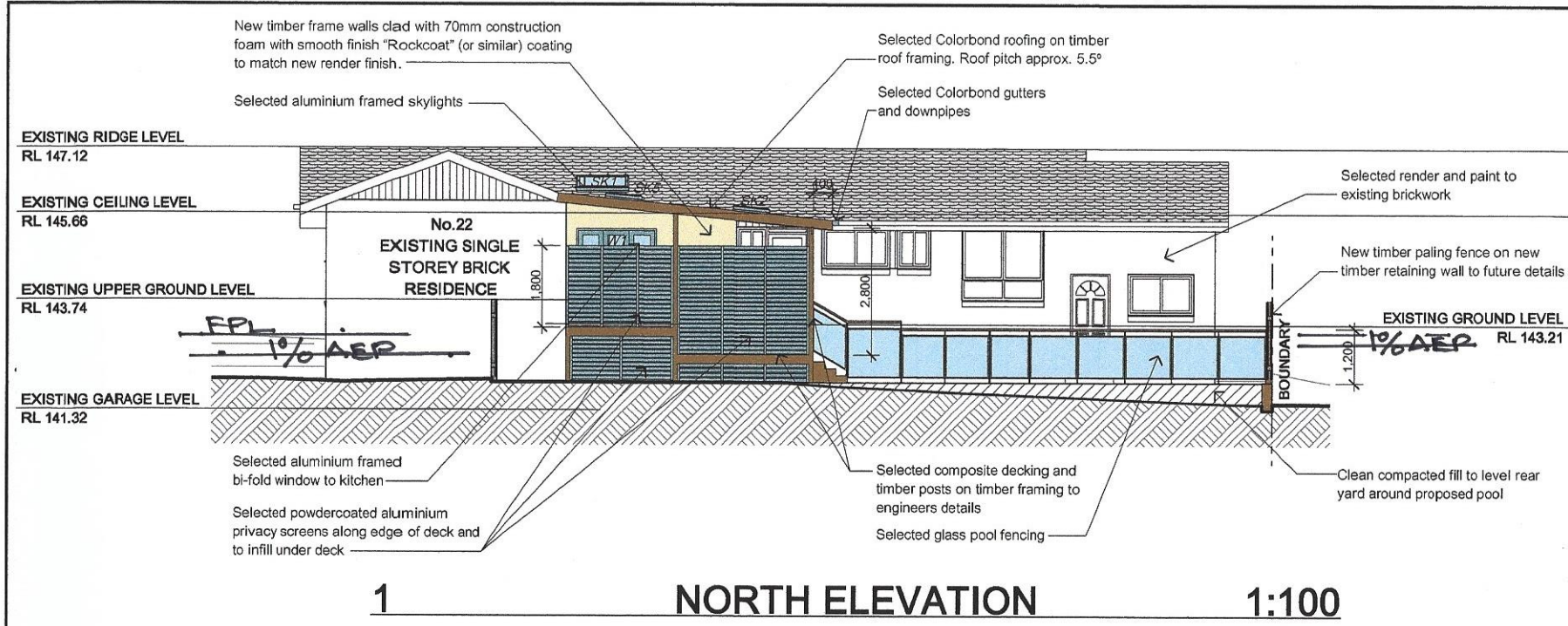
Checked By: JAH

Project No: 2001

Drawing No.: DA03

Plot Date: 28/05/2020

FIGURE 5



NOTE- All new pool and boundary fencing to Comply with Swimming Pool Acts 1992, Council Codes and relevant Australian Standards

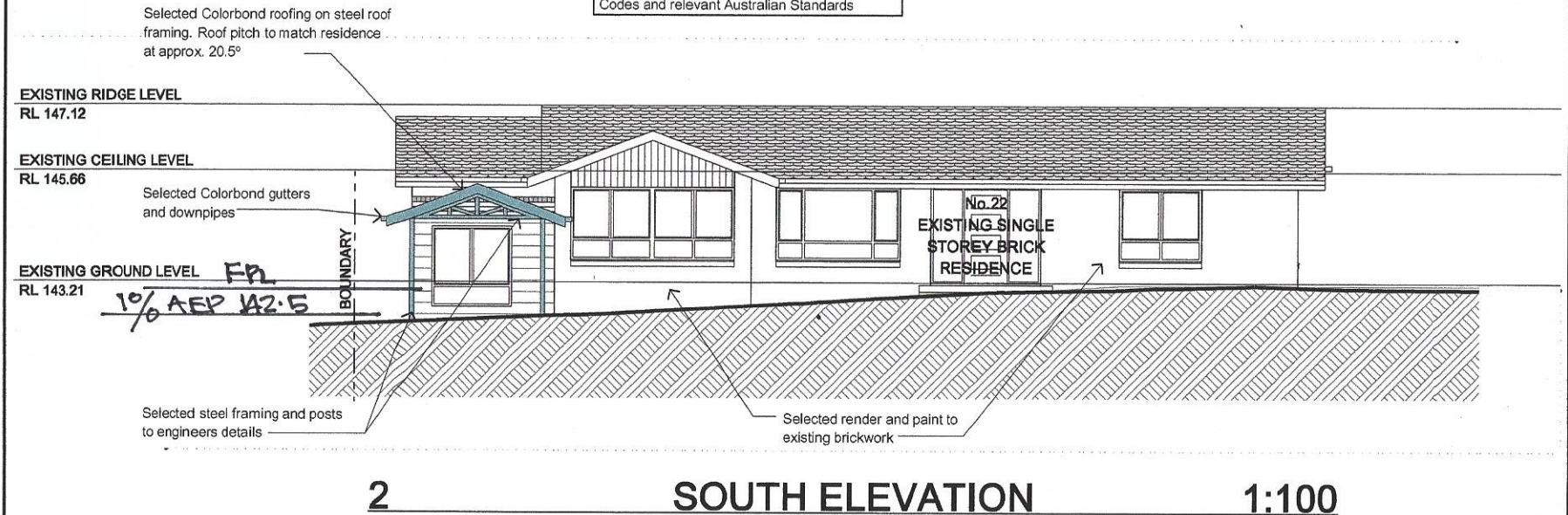


FIGURE 6

NOTES

All work is to comply with the Building Code of Australia, the requirements of the local council, the requirements of the legally constituted Authorities for services and the relevant standards by the Standards Association of Australia.

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Client

MS. D. COOPER

Project Name

PROPOSED ALTERATIONS + ADDITIONS

22 COORA AVENUE

LOT 4, DP 227151

BELROSE NSW 2085

JAH

DESIGN SERVICES

ABN 22 630 650 834

9 LOCKWOOD AVENUE, FRENCHS FOREST NSW 2085

PH: 0410 410 064 EMAIL: jah@jahdesigns.com.au

Drawing Title:

NORTH & SOUTH ELEVATIONS

Scale: 1:100 @ A3 **Date:** MAY 2020

Status: DA submission **Checked By:** JAH

Project No: 2001 **Drawing No.:** DA04

Plot Date: 28/05/2020

Attachment A

NORTHERN BEACHES COUNCIL STANDARD HYDRAULIC CERTIFICATION FORM

FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: 22 COORA AVENUE, BELROSE

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, STEPHEN WYLLIE on behalf of PITTWATER DATA SERVICES PTY LTD
(Insert Name) (Trading or Business/ Company Name)

on this the 2nd MAY - 2020 certify that I am engineer or a
(Date)

professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least \$2 million.

Flood Management Report Details:

Report Title: Flood Management Report for 22 Coora Avenue.
Belrose
Report Date: 29/05/2020
Author: STEPHEN WYLLIE
Author's Company/Organisation: PITTWATER DATA SERVICES PTY LTD

I: STEPHEN WYLLIE
(Insert Name)

Please tick all that are applicable (more than one box can be ticked)

☒ have obtained and included flood information from Council (must be less than 12 months old) (This is mandatory)

☒ have followed Council's Guidelines for Preparing a Flood Management Report

☒ have requested a variation to one or more of the flood related development controls. Details are provided in the Flood Management Report. PMF ADOPTED AS FPL

Signature: Stephen Wyllie
Name: STEPHEN WYLLIE BSC(EVG) FMA MEMBER