Precise Planning

Preliminary Flood Study: 45 Noongah Street and 25 Gwynn Hughes Street, Bargo, NSW

martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P1504816JR04V01
July 2015

Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to provide a preliminary flood assessment at the subject site in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Precise Planning (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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Document and Distribution Status							
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Ben Ling			Jeffrey Fulton / Daniel Martens		Jeffrey Fulton		
			Document Location				
Revision No.	**Status**	**Release Date**	File Copy	Precise Planning			
1	Draft	07.07.15	1P, 1H	1P			

Distribution Types: F = Fax, H = hard copy, P = PDF document, E = Other electronic format. Digits indicate number of document copies.

All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 Introduction

1.1 Overview

Martens & Associates Pty Ltd has prepared this preliminary flood study to assess the flood extent and impact on the site known as 45 Noongah Street and 25 Gwynn Hughes Street, Bargo, NSW. This report has been prepared to support a proposed rezoning application for this site.

This report assesses the 1% Annual Exceedance Probability (AEP) and the Probable Maximum Flood (PMF) flood planning level.

1.2 Project Scope

Project scope and objectives are:

1. Prepare a hydrologic model (DRAINS) for the site to determine the peak flows for the 1% AEP and the PMF storm events.

2. Prepare a hydraulic model (1D/2D SMS Tuflow) for the site under existing conditions for the 1% AEP and the PMF.

3. Prepare relevant flood maps including flood extents and levels.

1.3 Relevant Guidelines

This report has been prepared in accordance with the following guidelines and policies:

- Institution of Engineers, Australia (2006) – *Australian Rainfall and Runoff*.

- Wollondilly Council (2008) – Stormwater Drainage Design "Design Specification D5".

- Wollondilly Shire Council (2010) 'Development Control Plan 2010';

- Wollondilly Shire Council (2008) 'Design Specifications: Sub-Division and Engineering Standards'.

- NSW Floodplain development manual (2005).

2 Hydrology Modelling

2.1 Overview

The DRAINS software package (version 2015.02 – 4 February 2015) was used with the RAFTS hydrological engine to assess the 1% AEP and the PMF peak flow rates for a range of storm durations between 5 mins and 4.5 hours.

2.2 Modelling Set-up

2.2.1 Hydrological Model parameters

The RAFTS (storage routing) engine was used given the rural nature of the site and upslope sub-catchments. Parameters used in the model are based on figures given in Wollondilly Shire Council (2008) Engineering Design Specifications, and are shown in Table 1.

Table 1: Hydrologic modelling setup.

Parameter	Element	Value
IFD Data	2 year ARI 1 hour rainfall intensity[1]	32.0
	2 year ARI 12 hour rainfall intensity[1]	7.7
	2 year ARI 72 hour rainfall intensity[1]	2.2
	50 year ARI 1 hour rainfall intensity[1]	65.3
	50 year ARI 12 hour rainfall intensity[1]	15.3
	50 year ARI 72 hour rainfall intensity[1]	4.8
	G (skewness factor) [2]	0.02
	F2[2]	4.29
	F50[2]	15.75
Soil Properties	Impervious Area Initial Losses	0.0
	Impervious Area Continuous Losses	0.0
	Pervious Area Initial Losses	10.0
	Pervious Area Continuous Losses	2.5

Notes:
[1] - Figures for Bargo from Wollondilly Shire Council (2008) Engineering Design Specification D5 - Drainage Design.
[2] - Typical figures for Bargo given in Engineers Australia (2006).

2.2.2 Sub-Catchment Properties

Sub-catchments used in the modelling were based on available topographic data provided by LPI and confirmed by site observations. Impervious area proportions were based on available aerial

photography. Sub-catchment boundaries used for modelling are provided in Attachment A. Catchment parameters are summarised below in Table 2.

Table 2: Details of catchments in RAFTS hydrological modelling.

Sub- Catchment	Area (ha)	Impervious (%)	Vectored Slope (%)	PERN Roughness
CAT 1	620.10	5	3	0.07
CAT 2	98.80	5	2.5	0.07
CAT 3	18.51	1	2.1	0.07
CAT 4	14.50	80	2.1	0.07
CAT 5	31.70	90	2	0.015
CAT 6A1[1]	3.34	0	1.5	0.07
CAT 6A2[1]	55.20	2.4	1.9	0.07
CAT 6A3[1]	120.12	5.7	2.6	0.07
CAT 6B1[1]	2.31	0	1.9	0.07
CAT 6B2[1]	92.48	10.2	1.2	0.07
CAT 6B3[1]	86.30	5	2.2	0.07
SITE	20.65	5	2.2	0.03

Notes:
[1] – Catchment details taken from previous modelling performed for 1A Kader Street, Bargo rezoning.

2.2.3 Results

DRAINS modelling results indicated that storm durations of 2 hours and 3 hours resulted in peak critical flows. Cat 1 produces its peak critical flow during the 3 hour storm, while the other catchments produce their peak critical flows during the 2 hour storm.

Results of peak flow rates for each catchment for the 1% AEP and PMF storms are summarised in Table 3.

Table 3: Details of catchments in RAFTS hydrological modelling.

Sub- Catchment	Storm Event	Duration (Hrs)	Peak Flow (m^3/s)
CAT 1	1% AEP	2	55.51
CAT 2	1% AEP	2	12.26
CAT 3	1% AEP	2	2.52
CAT 4	1% AEP	2	6.39
CAT 5	1% AEP	2	18.01
OF 6[1]	1% AEP	2	41.47
SITE	1% AEP	2	5.61
CAT 1	1% AEP	3	58.54
CAT 2	1% AEP	3	11.82
CAT 3	1% AEP	3	2.40
CAT 4	1% AEP	3	4.36
CAT 5	1% AEP	3	9.68
OF 6[1]	1% AEP	3	40.66
SITE	1% AEP	3	4.54
CAT 1	PMF	2	334.60
CAT 2	PMF	2	60.76
CAT 3	PMF	2	11.89
CAT 4	PMF	2	11.55
CAT 5	PMF	2	25.64
OF 6[1]	PMF	2	215.01
SITE	PMF	2	15.25
CAT 1	PMF	3	310.74
CAT 2	PMF	3	54.97
CAT 3	PMF	3	10.58
CAT 4	PMF	3	9.66
CAT 5	PMF	3	22.12
OF 6[1]	PMF	3	193.81
SITE	PMF	3	12.55

Notes:

[1] - OF6 refers to the cumulative flow generated by sub-catchments 6A1, 6A2, 6A3, 6B1, 6B2 and 6B3.

3 Hydraulic Modelling

3.1 Overview

The SMS Tuflow 1D/2D hydraulic model (SMS 11.2.9 13 Mar 2015) was used to determine existing condition flood water levels and extents for the 1% AEP and PMF storm events.

3.2 Topographic Data

2m topographic data provided by LPI was used to create a 3D surface for the site and the local floodplain environment used in the Tuflow model.

3.3 Modelling Set-up

Tuflow model construction consisted of:

1. Development of a 2.0m x 2.0m topographic grid for the 1% AEP storm event simulation, and a 4.0m x 4.0m topographic grid for the PMF storm event simulation.

2. Position inflow boundary conditions based on the 1% AEP critical storm duration and the PMF DRAINS model hydrographs.

3. Establishment of model boundary extents.

4. A 2% computed water slope for the downstream model boundary extent was defined, based on the floodplain slopes of the available topographic data.

5. Assigning manning's roughness coefficients based on SIX Maps Viewer Aerials (2014) for hydraulic modelling as shown in Table 4.

6. Incorporation of blockages to simulate existing buildings.

Table 4: Mannings roughness coefficients used in SMS Tuflow modelling.

Catchment Material	Manning's Roughness Applied
Building	0.2
Forest Riparian	0.07
Grassed	0.035
Road	0.012
Urban	0.1

3.4 Results

Results of flood levels and extents for the 1% AEP and PMF critical storm events for existing conditions are given in Attachment C.

4 References

Institution of Engineers, Australia (2006) – *Australian Rainfall and Runoff*

Land and Property Information NSW (2014) – *SIX Maps Viewer*

NSW Floodplain development manual (2005).

O'Loughlin, G., Stack, B., (2014) - *DRAINS User Manual*

Wollondilly Council (2008) – *Stormwater Drainage Design "Design Specification D5*".

Wollondilly Shire Council (2010) '*Development Control Plan 2010*';

Wollondilly Shire Council (2008) '*Design Specifications: Sub-Division and Engineering Standards*'.

5 Attachment A: Catchment Plan & Existing Site Survey

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W E
S

REV.	DESCRIPTION	DATE	ISSUED
A	FOR REZONING	07.07.2015	JF

BAR SCALE

0 250 500 750 1000 1250 1500

UNITS - METRES

DESIGNED:	DATUM:
BL	mAHD
REVIEWED:	HORIZONTAL RATIO:
JF	1:15000
PAPER SIZE:	VERTICAL RATIO:
A1	1:15000

CLIENT / PROJECT

Preliminary Flood Study:
45 Noongah Street and
25 Gwynn Hughes Street,
Bargo, NSW

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All measurements in mm unless otherwise specified

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TITLE: CATCHMENT PLAN

DRAWING ID: **SK001**

PROJECT MANAGER:	PROJECT NO.:	FILE:	REVISION:
JF	P1504816	JD02V01	A

M.M.

DP 619150

GWYNN HUGHES STREET

HEAVILY VEGETATED

APPROX. CREEK LINE

LOT 94
DP 13116

LOT 95
DP 13116
3.265ha

LOT 22
DP 619150
17.43 HA by DP

NOONGAH STREET

SINGLE STOREY BRICK RESIDENCE TILE ROOF No. 35

SINGLE STOREY BRICK RESIDENCE TILE ROOF No. 45 RIDGE RL 330.21 FL 321.87

SINGLE STOREY BRICK RESIDENCE TILE ROOF No. 36

METAL SHED

SHED

BENCHMARK NAIL IN PP RL 333.79 A.H.D.

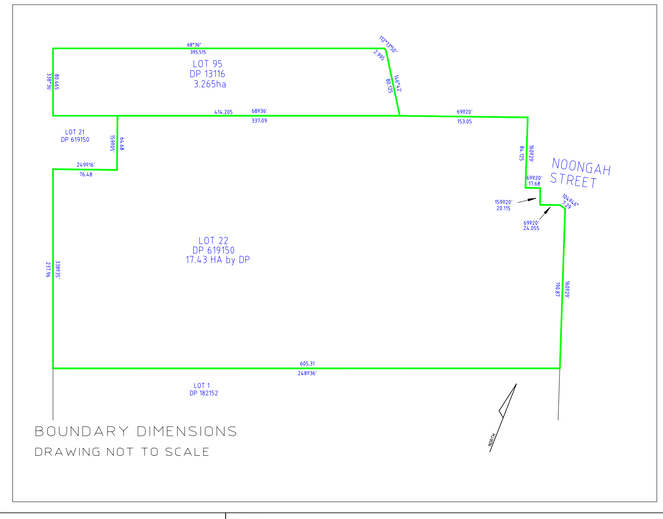
BENCHMARK NAIL IN PP RL 336.45 A.H.D.

BENCHMARK NAIL IN PP RL 330.53 A.H.D.

N

W E

S



NOTE:
SURVEY RECEIVED FROM SYDNEY REGISTERED SURVEYORS PLAN REFERENCE 1056 NOONGAH

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PAPER SIZE:	VERTICAL RATIO:
A1	1:1500

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TITLE: EXISTING SITE SURVEY

DRAWING ID: **SK002**

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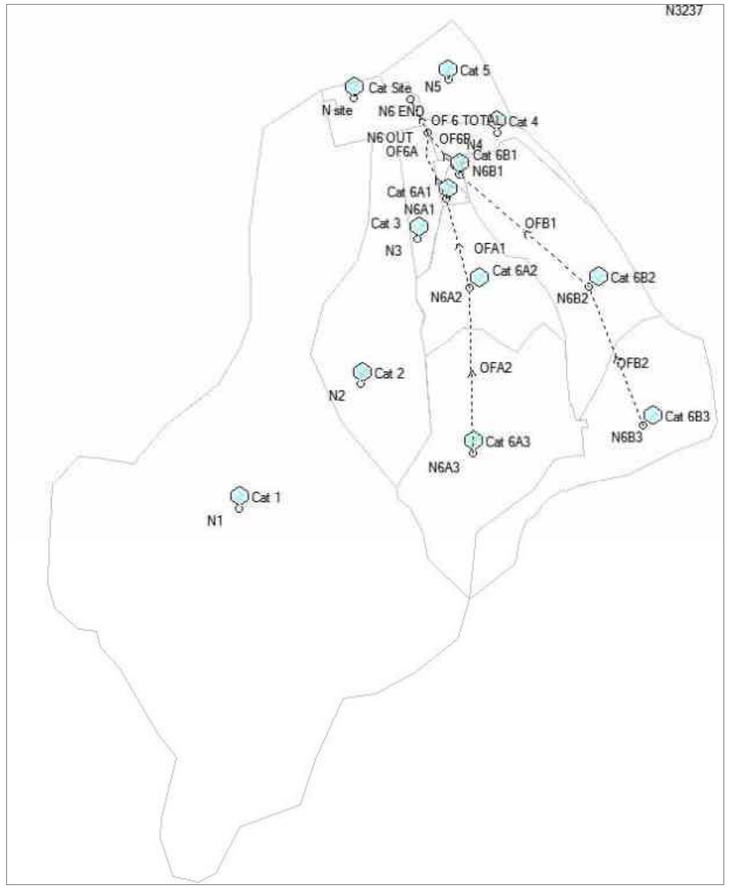
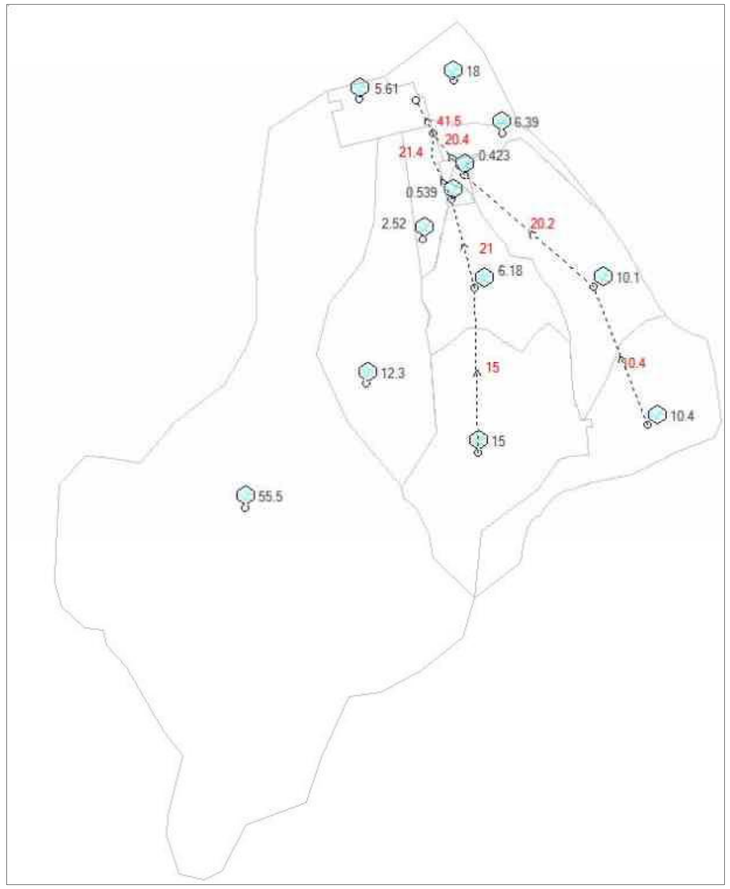
JF	P1504816	JD02V01	A

6 Attachment B: DRAINS Model layout and results



MODEL LAYOUT



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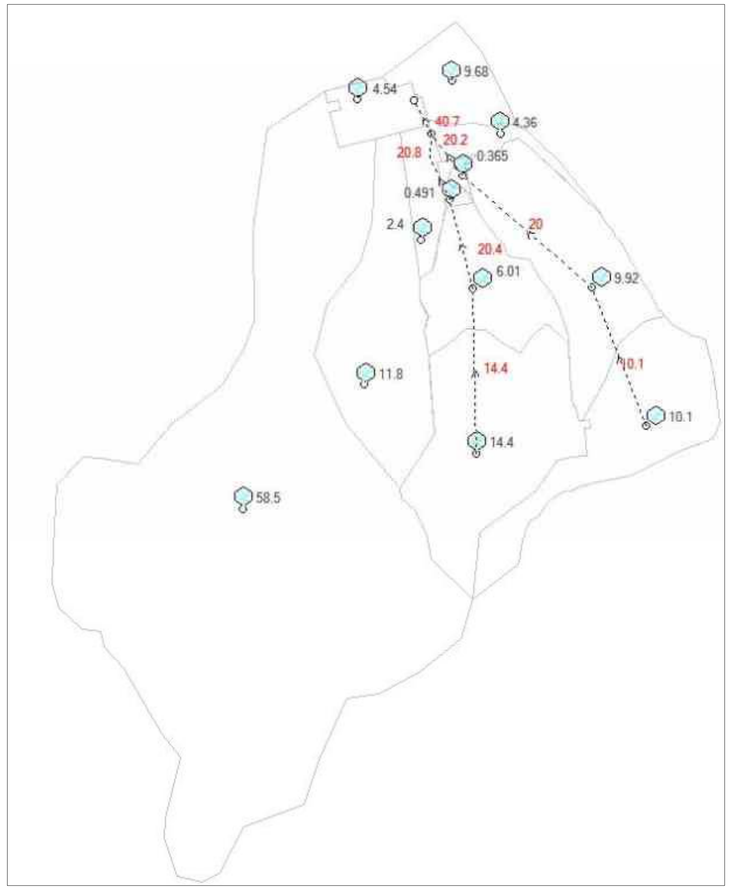

3 HOUR STORM EVENT

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A1	1:20000

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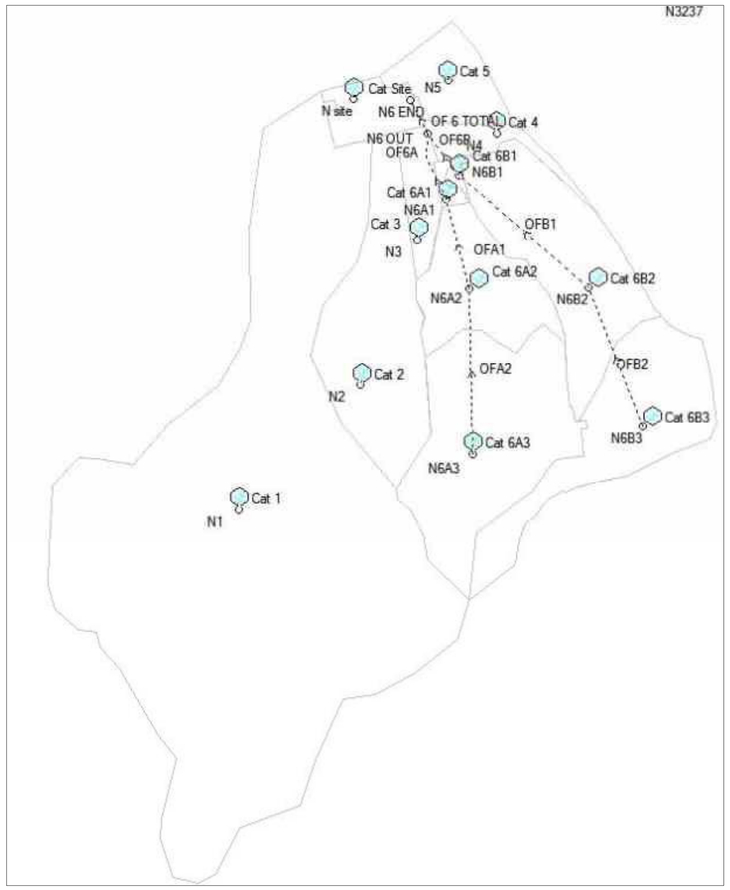
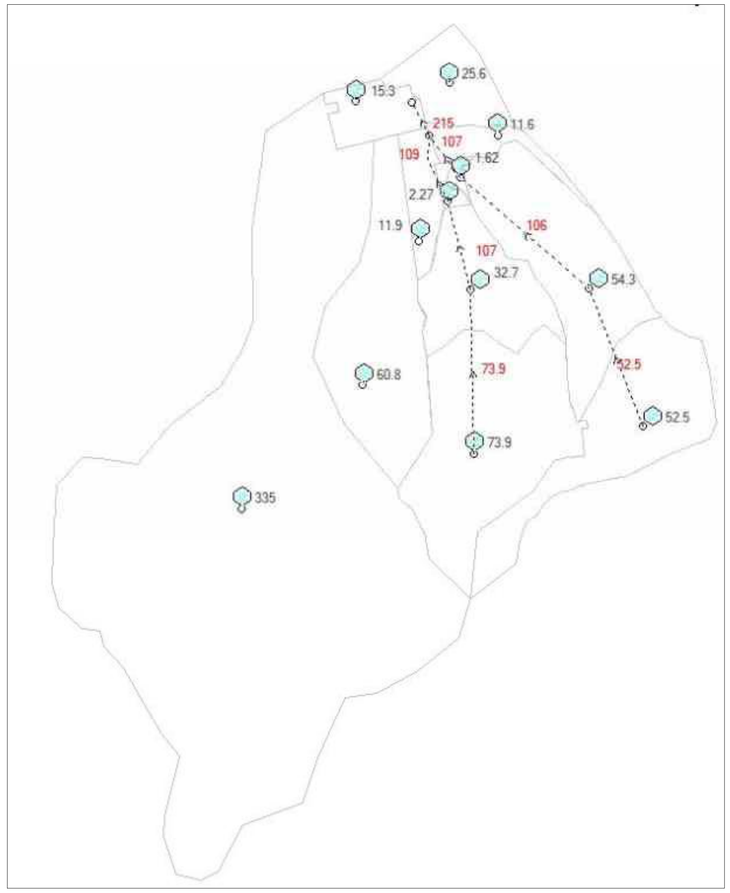
TITLE:
1% AEP FLOOD:
DRAINS MODEL LAYOUT & RESULTS

DRAWING ID: **SK101**

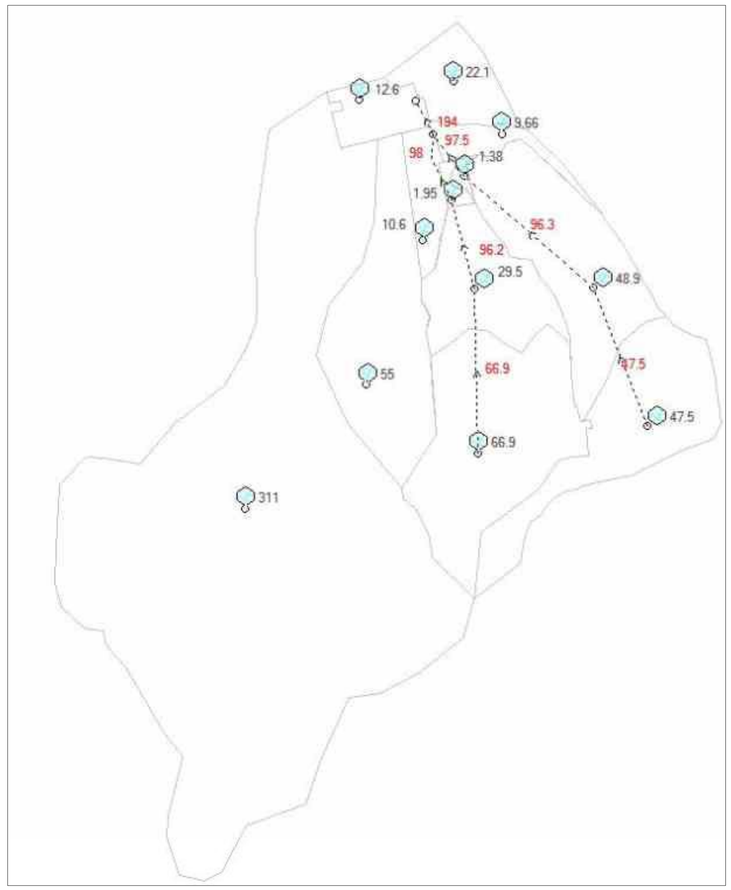
PROJECT MANAGER:	PROJECT NO.:	FILE:	REVISION:
JF	P1504816	JD02V01	A



MODEL LAYOUT



2 HOUR STORM EVENT



3 HOUR STORM EVENT

REV.	DESCRIPTION	DATE	ISSUED
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REVIEWED:	HORIZONTAL RATIO:
JF	1:20000
PAPER SIZE:	VERTICAL RATIO:
A1	1:20000

CLIENT / PROJECT
Preliminary Flood Study:
45 Noongah Street and
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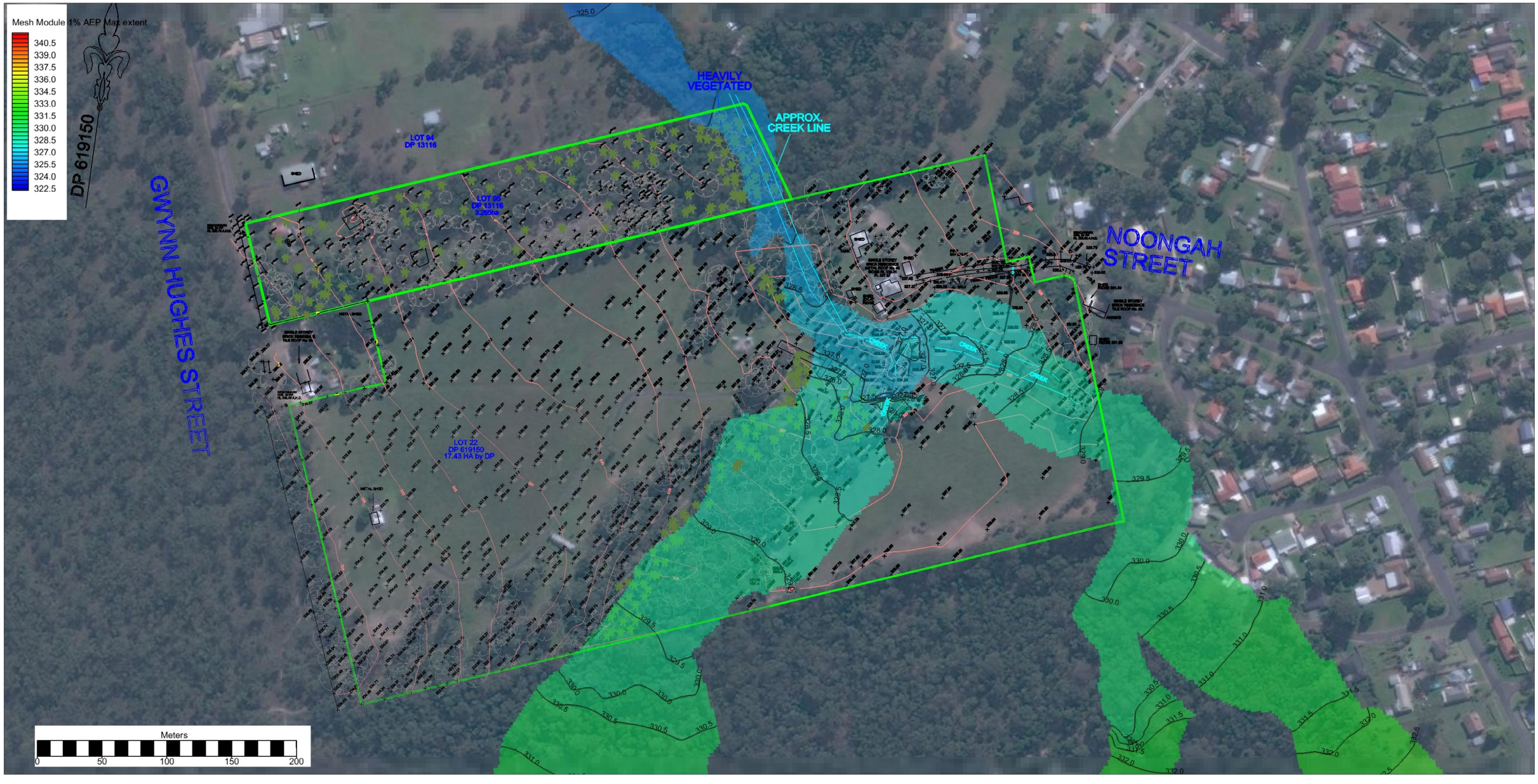
TITLE:
PMF FLOOD:
DRAINS MODEL LAYOUT & RESULTS

DRAWING ID: **SK102**

PROJECT MANAGER:	PROJECT NO.:	FILE:	REVISION:
JF	P1504816	JD02V01	A

7 Attachment C: Flood Images



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TITLE:
1% AEP CRITICAL STORM:
TUFLOW MODEL MAP RESULT

DRAWING ID: **SK201**

PROJECT MANAGER:	PROJECT NO.:	FILE:	REVISION:
JF	P1504816	JD02V01	A

N
W E
S

Mesh Module PMF max extent
340.5
339.0
337.5
336.0
334.5
333.0
331.5
330.0
328.5
327.0
325.5
324.0
322.5

DP 619150

GWYNN HUGHES STREET

NOONGAH STREET

HEAVILY VEGETATED

APPROX. CREEK LINE

LOT 94
DP 13116

LOT 95
DP 13116
3.26Ha

LOT 22
DP 619150
17.43 HA by DP

METAL SHED

Meters
0 50 100 150 200

REV.	DESCRIPTION	DATE	ISSUED
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BAR SCALE
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DATUM: mAHD
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HORIZONTAL RATIO: 1:1500
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TITLE:
PMF CRITICAL STORM:
TUFLOW MODEL MAP RESULT

DRAWING ID: SK202

PROJECT MANAGER: JF
PROJECT NO.: P1504816
FILE: JD02V01
REVISION: A