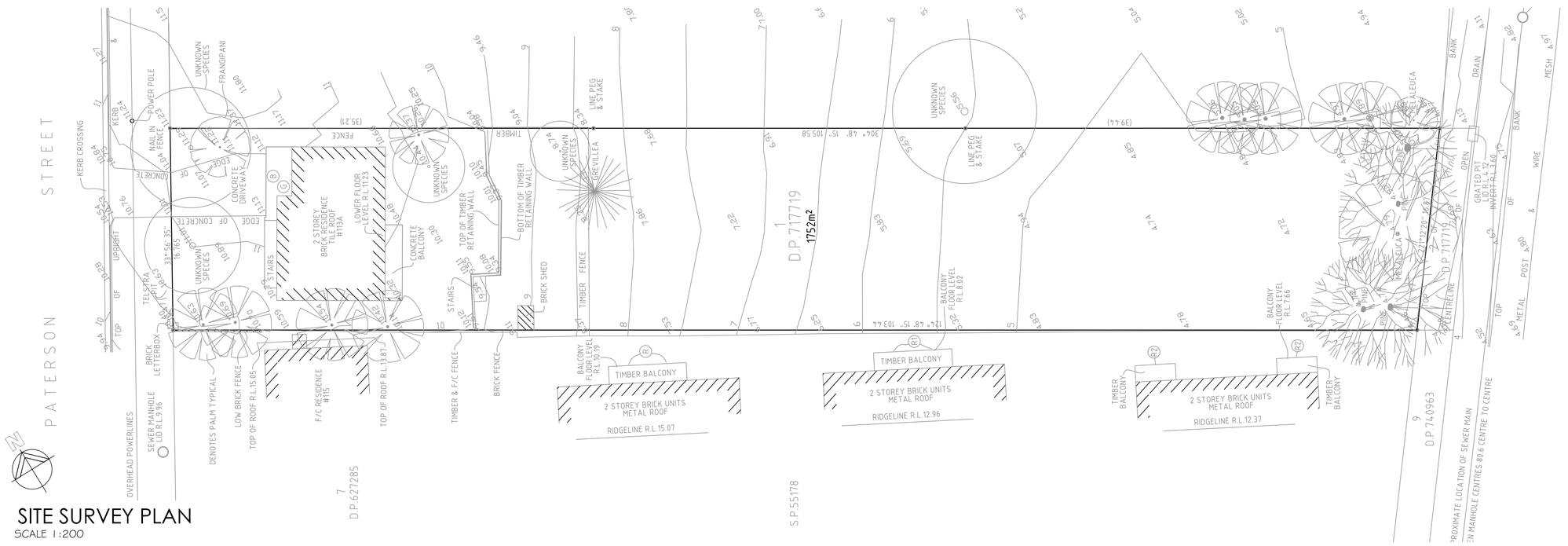
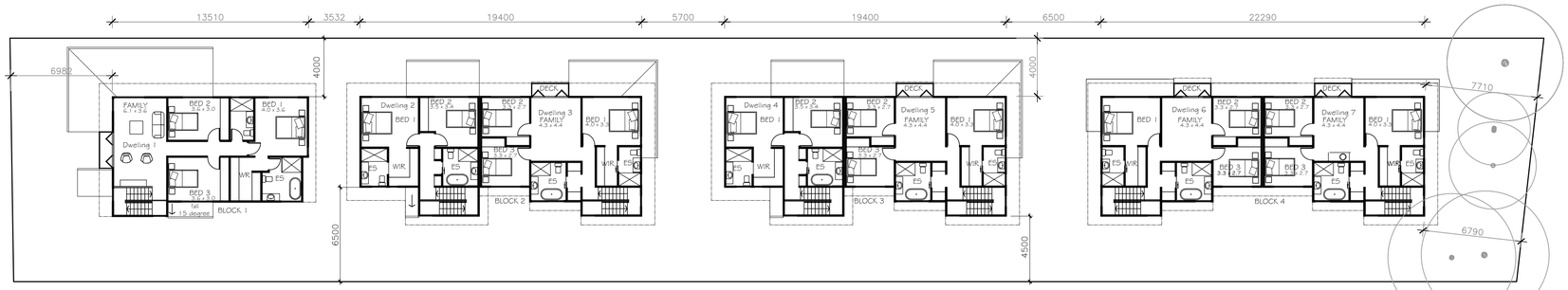
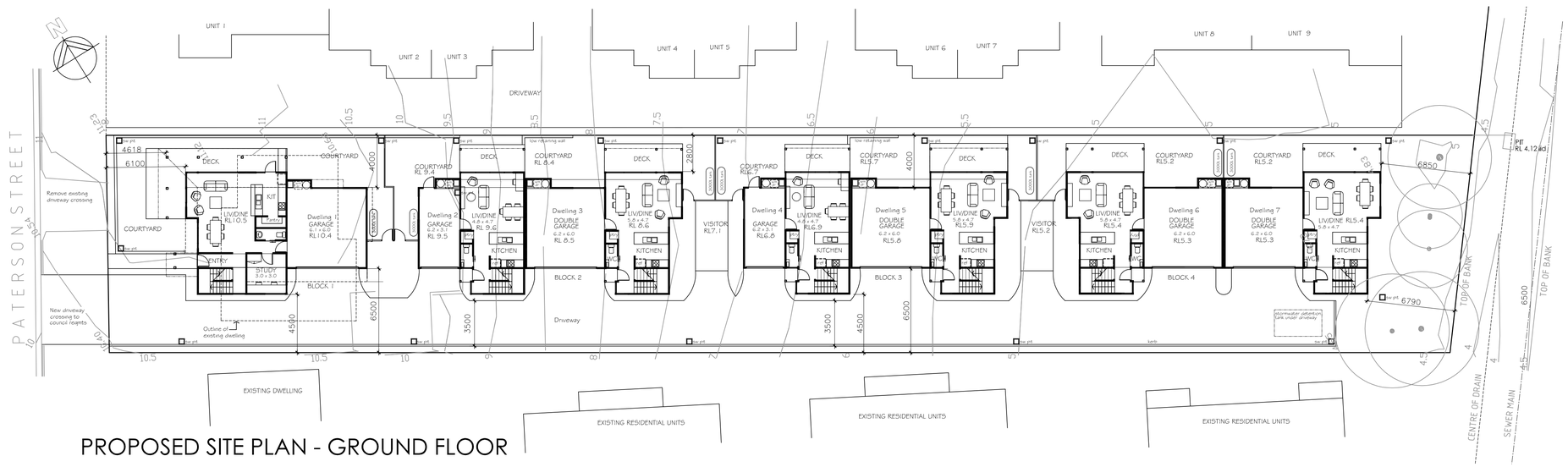


SITE SURVEY PLAN
SCALE 1:200



PROPOSED SITE PLAN - FIRST FLOOR



PROPOSED SITE PLAN - GROUND FLOOR

no	amendment	date
B	DA	10/04/20
A	Prelim Design	13/03/20

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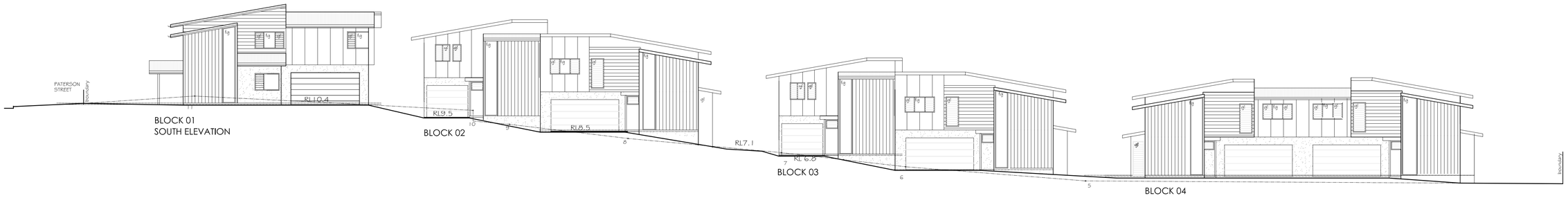
Proposed Medium Density Residential Development
At No.113 A Patterson Street
At Lot 1, DP 717719
Byron Bay, NSW

SITE PLAN

scale ***1:200 at A1*** *date* ***03/20***

job no ***1950*** *drawn* ***BA/AL*** *dwg no* ***01***

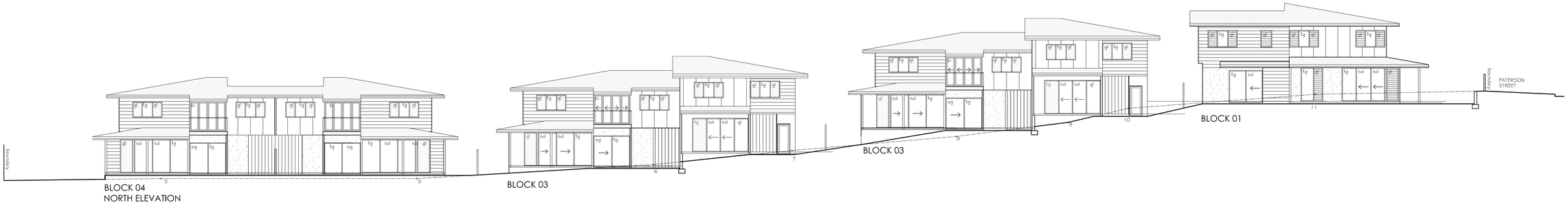


BLOCK 01
SOUTH ELEVATION

BLOCK 02

BLOCK 03

BLOCK 04



BLOCK 04
NORTH ELEVATION

BLOCK 03

BLOCK 03

BLOCK 01

B	DA	10/04/20
A	Prelim Design	13/03/20
no	amendment	date

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Proposed Medium Density Residential Development

At No.113 A Patterson Street
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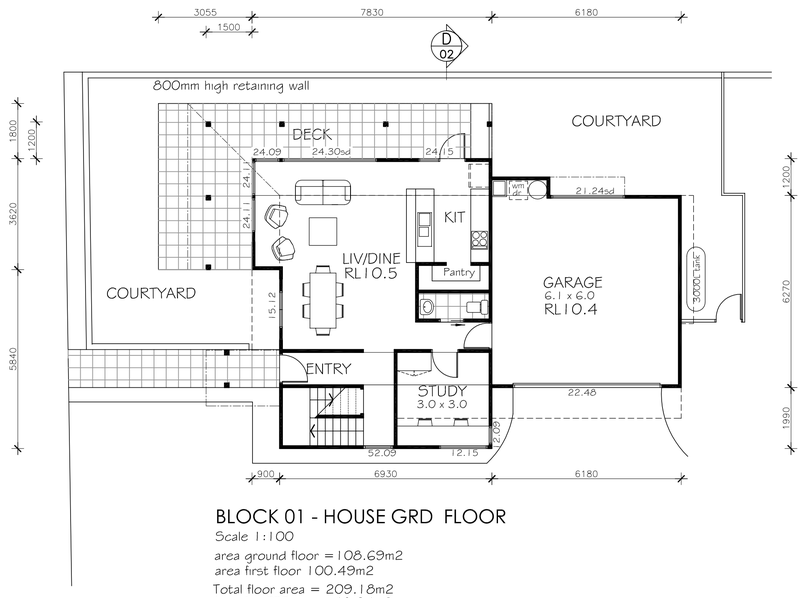
Byron Bay, NSW

SITE ELEVATIONS

scale ***: 1:150 AT A1*** *date* ***03/20***

job no ***1950*** *drawn* ***BA/AL*** *dwg no* ***01A***

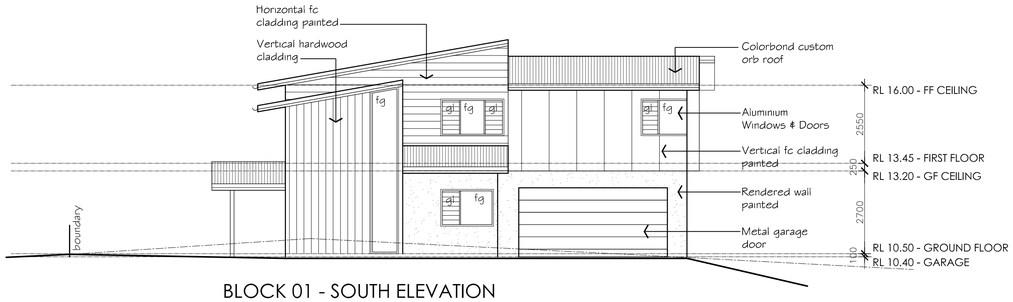


BLOCK 01 - HOUSE GRD FLOOR

Scale 1:100

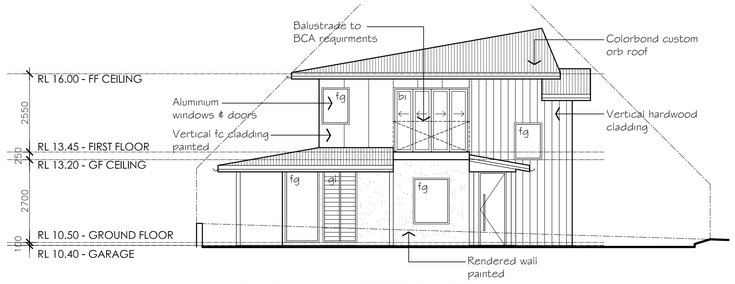
area ground floor = 108.69m2
area first floor 100.49m2

Total floor area = 209.18m2
Area for FSR = 148.34m2



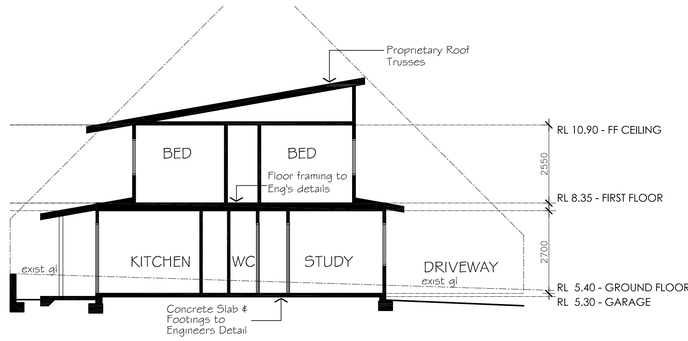
BLOCK 01 - SOUTH ELEVATION

Scale 1:100

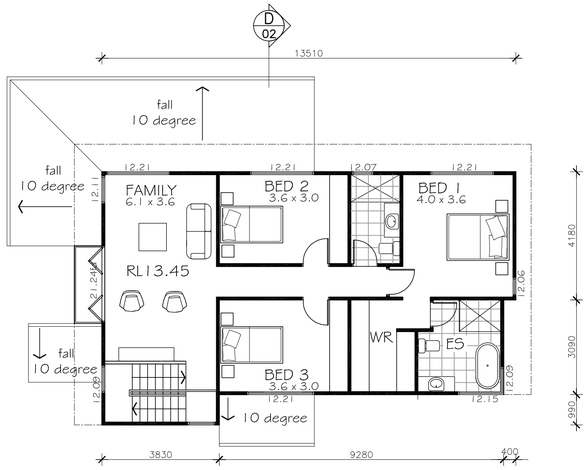


BLOCK 01 - WEST ELEVATION

Scale 1:100

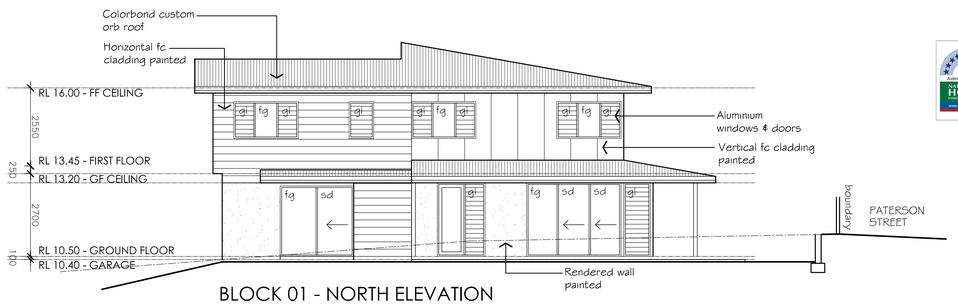


SECTION DD



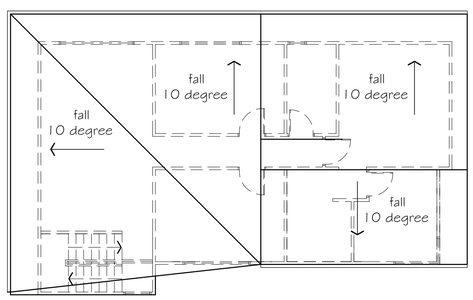
BLOCK 01 - HOUSE FIRST FLOOR

Scale 1:100



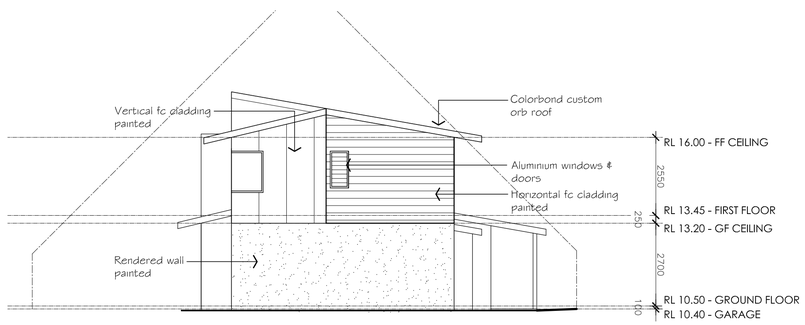
BLOCK 01 - NORTH ELEVATION

Scale 1:100



BLOCK 01 - ROOF PLAN

Scale 1:100



BLOCK 01 - EAST ELEVATION

Scale 1:100

no	amendment	date
B	DA	10/04/20
A	Prelim Design	13/03/20

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At No.113 A Patterson Street
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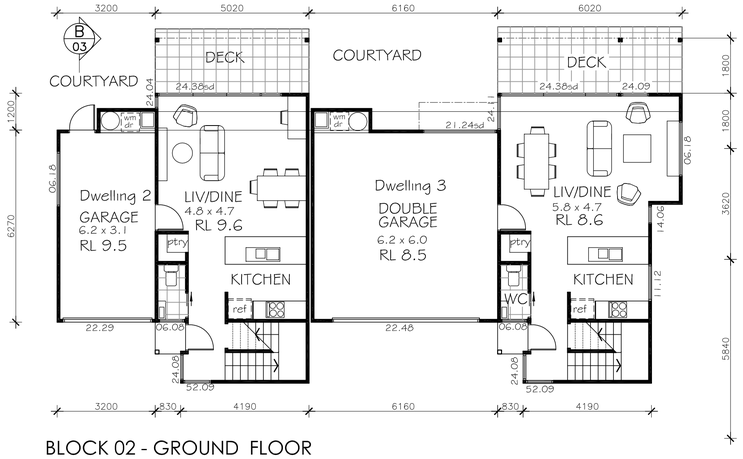
BLOCK 01 DRAWINGS

scale **as shown on drawing** date **03/20**

job no **1950** drawn **BA/AL** dwg no **02**



BLOCK 02 - GROUND FLOOR

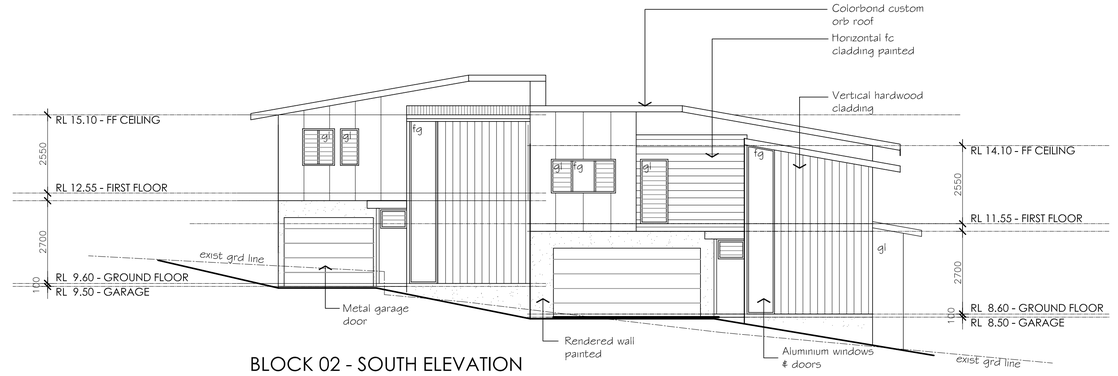
Scale 1:100

2 bed dwelling

Ground floor area =67.02m2
First floor area =59.87m2
Total floor area =126.89m2
Area for FSR =84.24m2

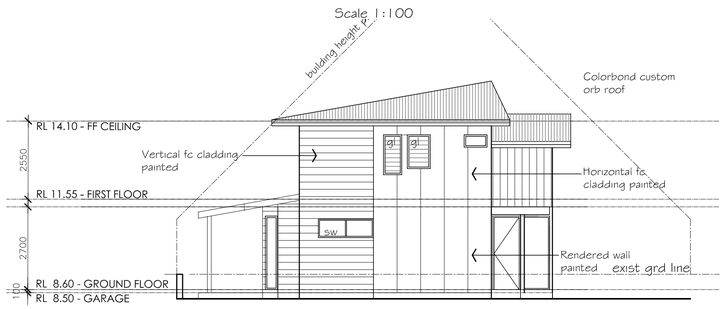
3 bed dwelling

Ground floor area =88.87m2
First floor area =81.52m2
Total floor area = 170.39m2
Area for FSR = 108.81m2



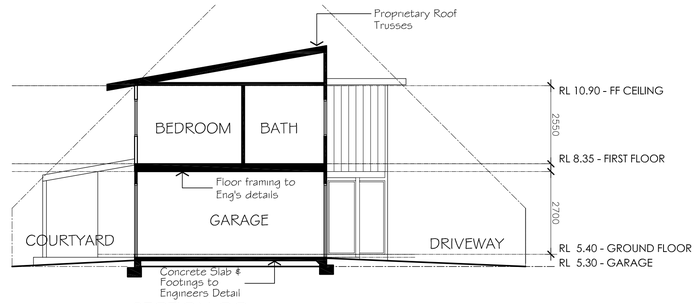
BLOCK 02 - SOUTH ELEVATION

Scale 1:100

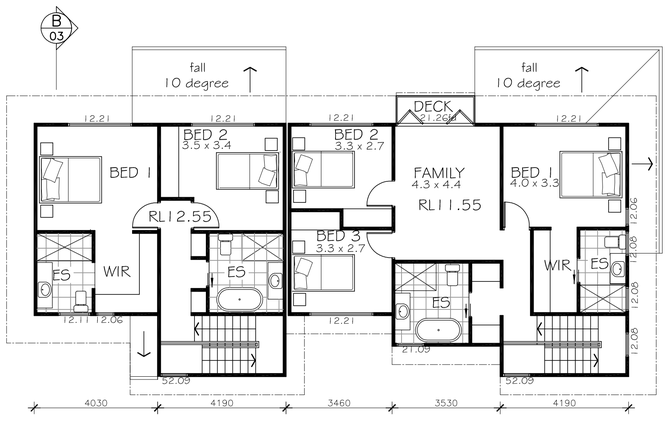


BLOCK 02 - WEST ELEVATION

Scale 1:100



SECTION CC

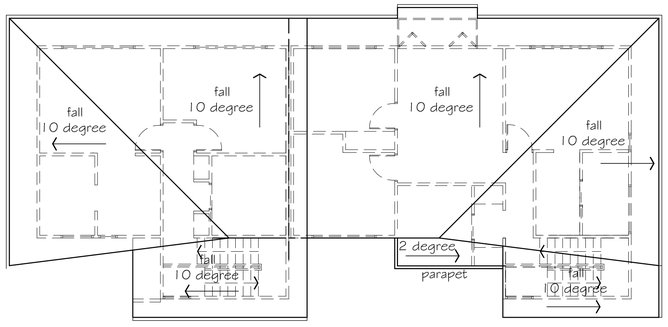


BLOCK 02 - FIRST FLOOR

Scale 1:100

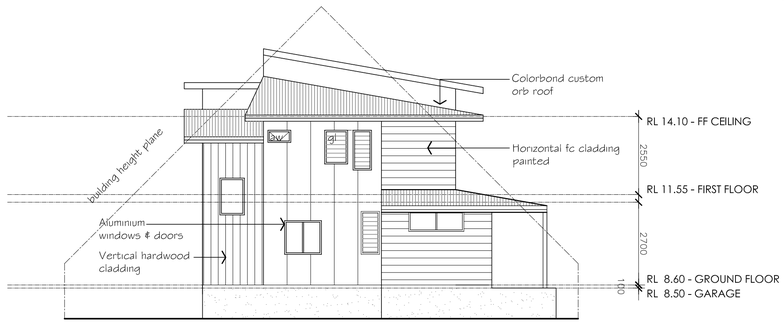
BLOCK 02 - NORTH ELEVATION

Scale 1:100



BLOCK 02 - ROOF PLAN

Scale 1:100



BLOCK 02 - EAST ELEVATION

Scale 1:100

no	amendment	date
B	DA	10/04/20
A	Prelim Design	13/03/20

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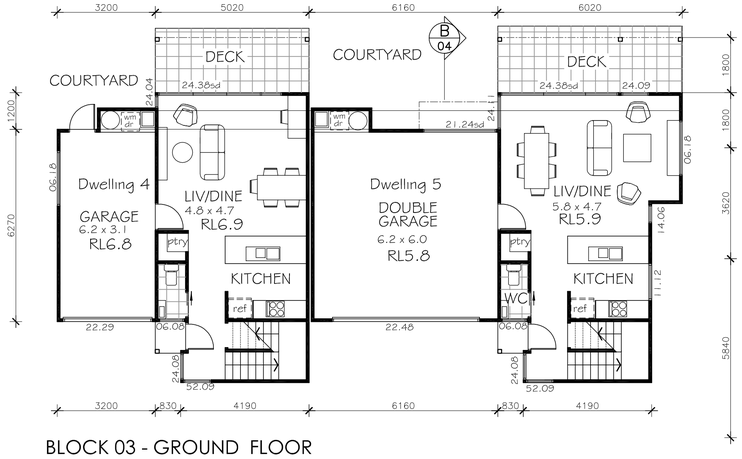
BLOCK 02 DRAWINGS

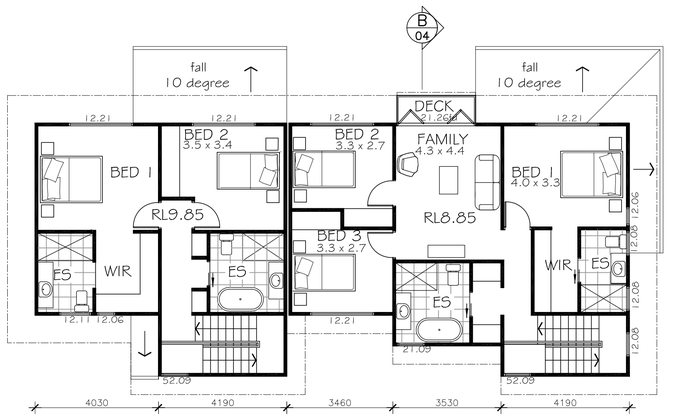
scale **as shown on drawing** date **03/20**

job no **1950** drawn **BA/AL** dwg no **03**



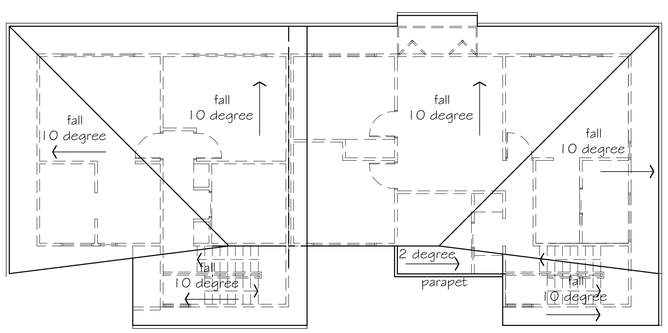
BLOCK 03 - GROUND FLOOR

Scale 1:100



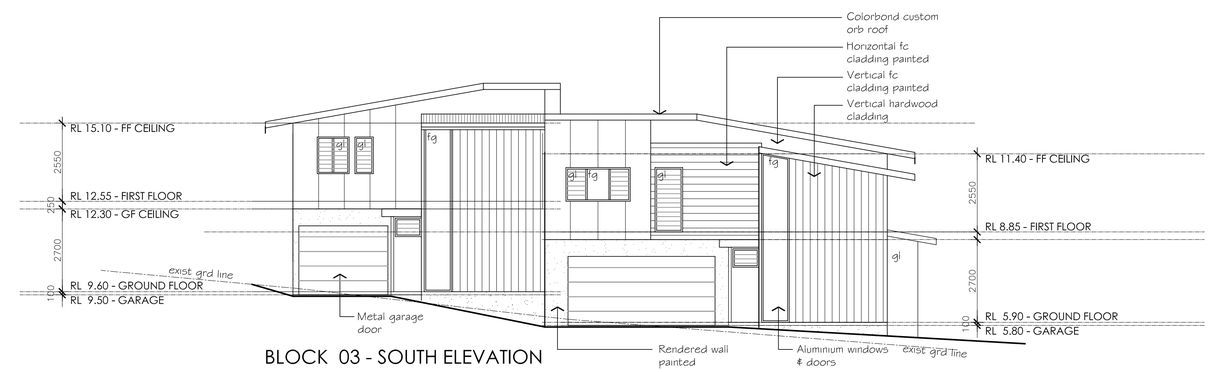
BLOCK 03 - FIRST FLOOR

Scale 1:100



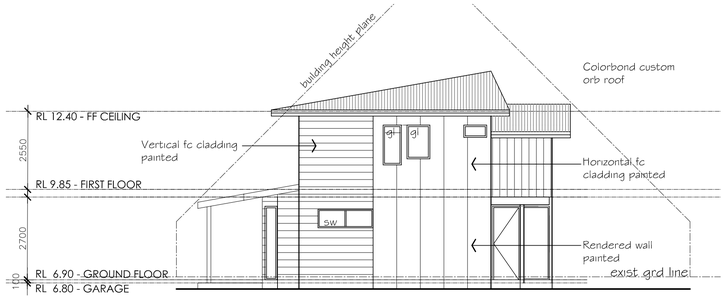
BLOCK 02 - ROOF PLAN

Scale 1:100



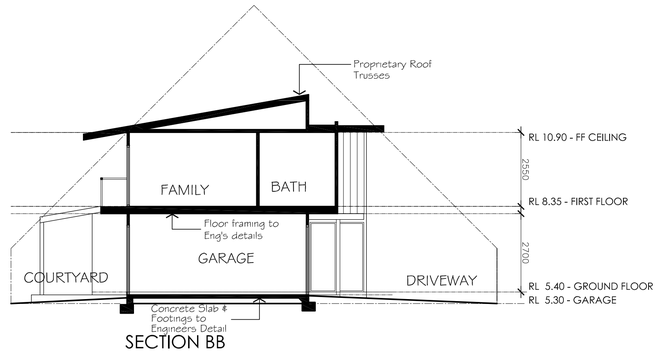
BLOCK 03 - SOUTH ELEVATION

Scale 1:100

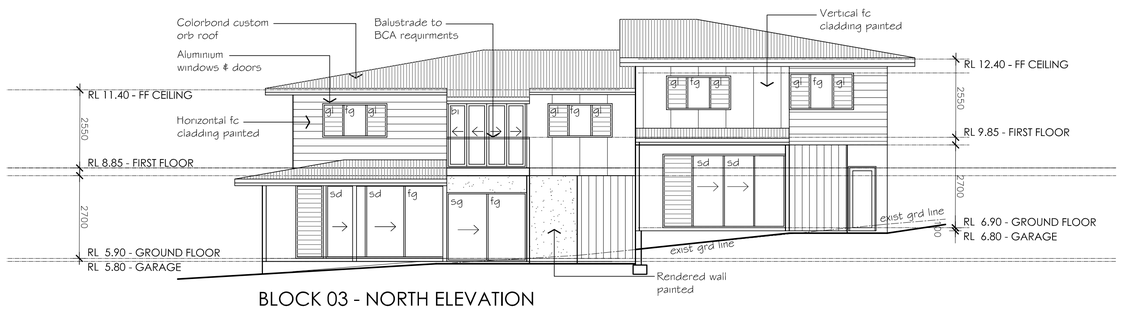


BLOCK 03 - WEST ELEVATION

Scale 1:100

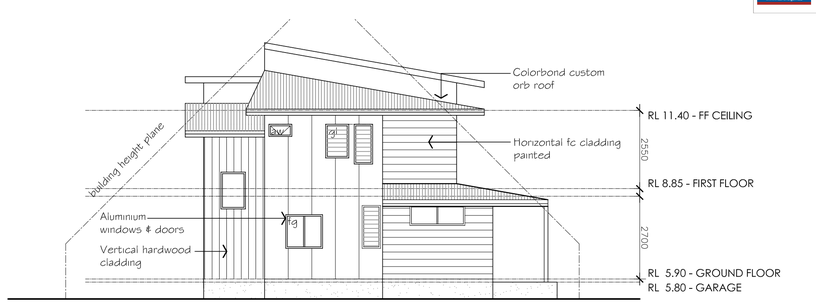


SECTION BB



BLOCK 03 - NORTH ELEVATION

Scale 1:100



BLOCK 03 - EAST ELEVATION

Scale 1:100

B	DA	10/04/20
A	Prelim Design	13/03/20
no	amendment	date

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Proposed Medium Density Residential Development
At No.113 A Patterson Street
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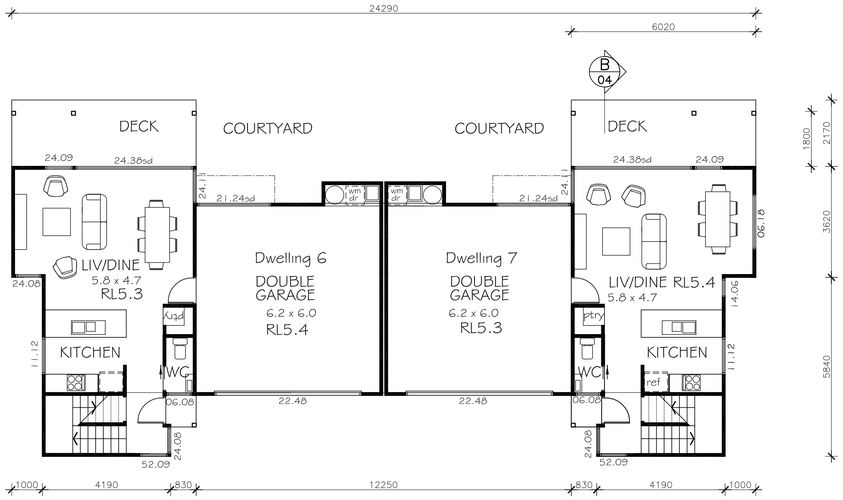
Byron Bay, NSW

BLOCK 03 DRAWINGS

scale ***as shown on drawing*** date ***03/20***

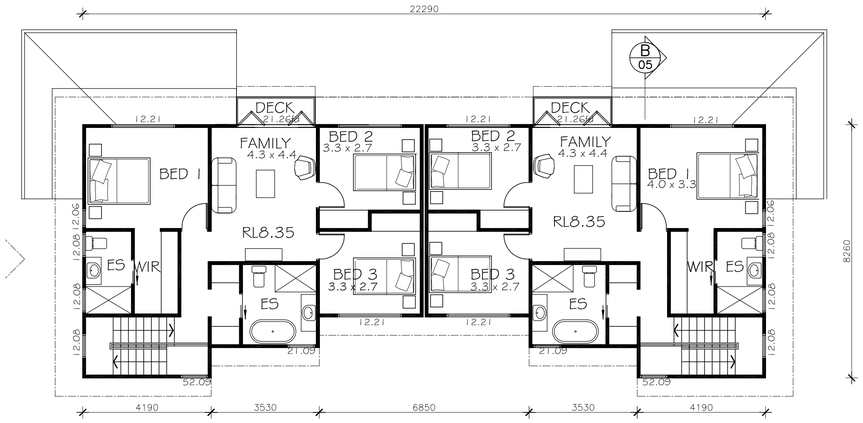
job no ***1950*** drawn ***BA/AL*** dwg no ***04***



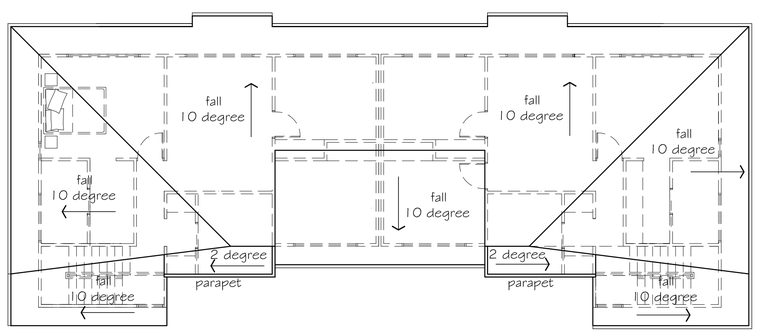
BLOCK 04 GROUND FLOOR

Individual dwelling

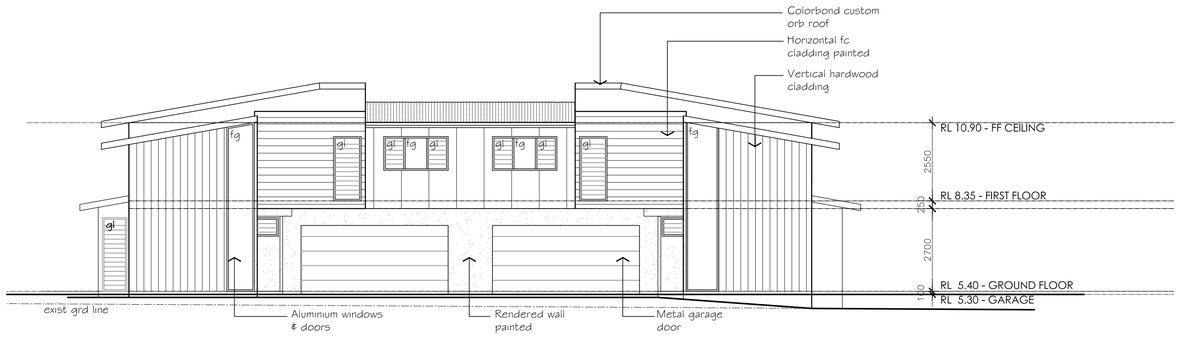
Ground floor area =88.87m2
First floor area =81.52m2
Total floor area = 170.39m2
Area for F5R = 108.81m2



BLOCK 04 FIRST FLOOR

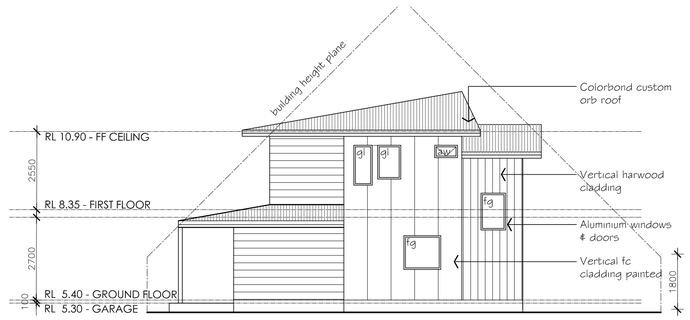


BLOCK 04 ROOF PLAN



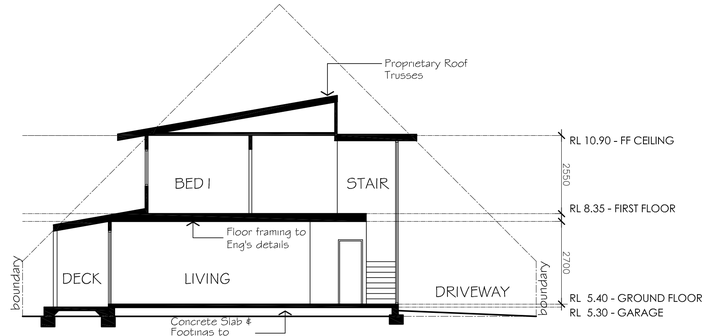
BLOCK 04 - SOUTH ELEVATION

Scale 1:100

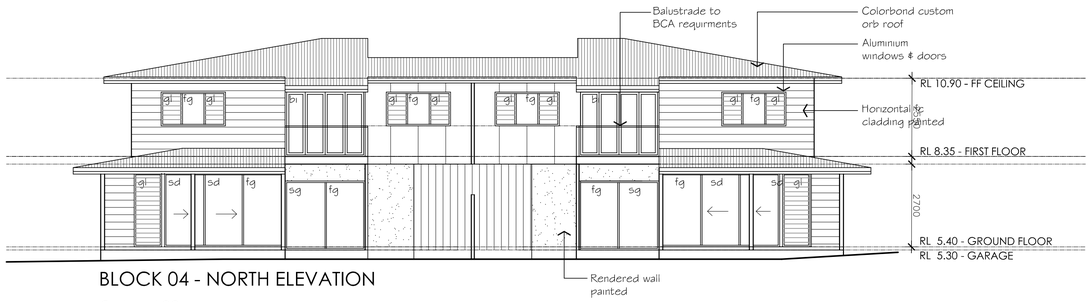


BLOCK 04 - WEST ELEVATION

Scale 1:100

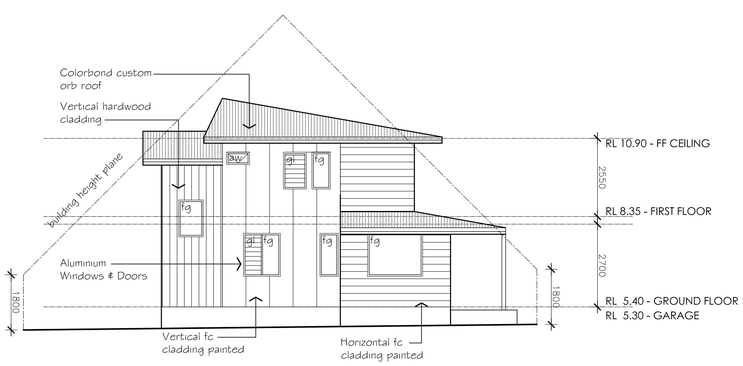


SECTION AA



BLOCK 04 - NORTH ELEVATION

Scale 1:100



BLOCK 04 - EAST ELEVATION

Scale 1:100

no	amendment	date
B	DA	10/04/20
A	Prelim Design	13/03/20

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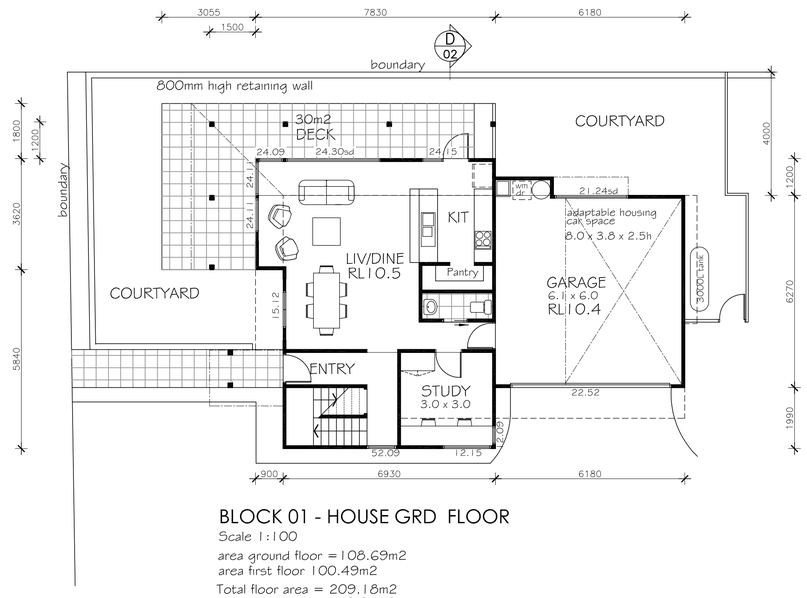
BLOCK 04 DRAWINGS

scale ***as shown on drawing*** *date* ***03/20***

job no ***1950*** *drawn* ***BA/AL*** *dwg no* ***05***

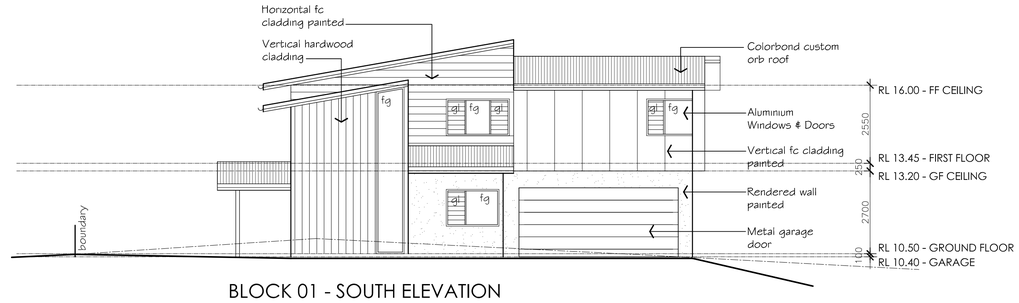


BLOCK 01 - HOUSE GRD FLOOR

Scale 1:100

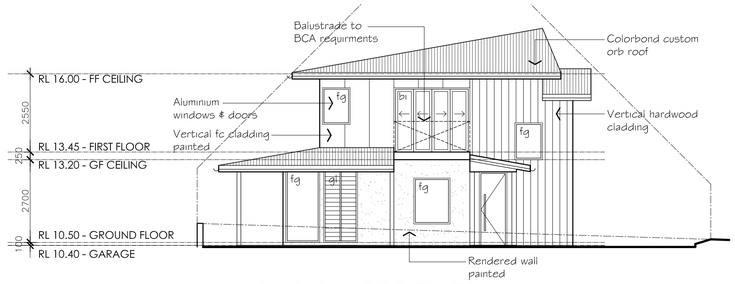
area ground floor =108.69m2
area first floor 100.49m2

Total floor area = 209.18m2
Area for FSR = 148.34m2



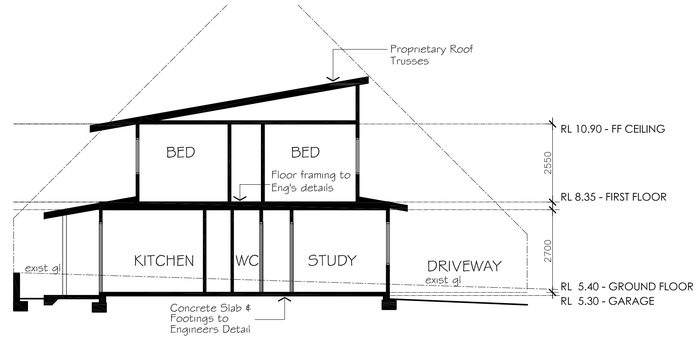
BLOCK 01 - SOUTH ELEVATION

Scale 1:100

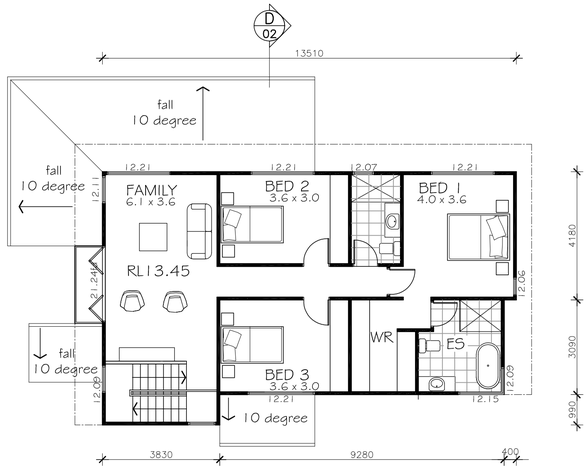


BLOCK 01 - WEST ELEVATION

Scale 1:100

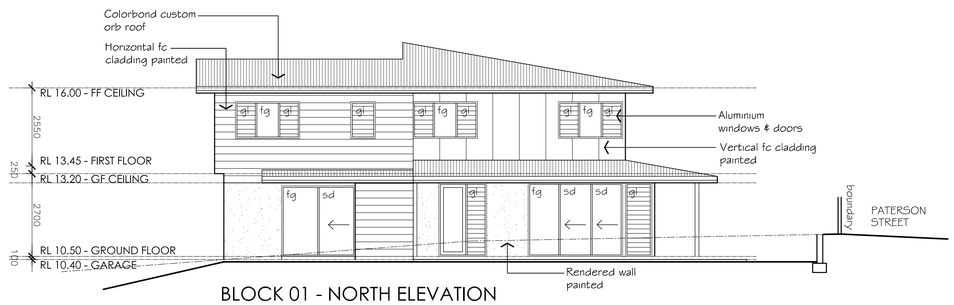


SECTION DD



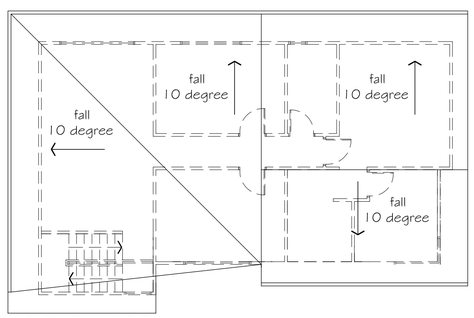
BLOCK 01 - HOUSE FIRST FLOOR

Scale 1:100



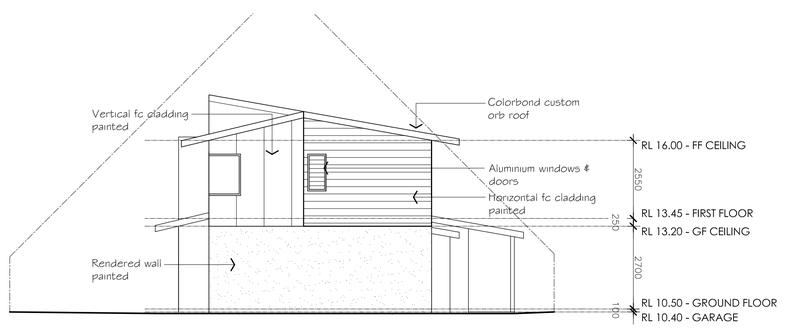
BLOCK 01 - NORTH ELEVATION

Scale 1:100



BLOCK 01 - ROOF PLAN

Scale 1:100



BLOCK 01 - EAST ELEVATION

Scale 1:100

no	amendment	date
C	adpatable car space shown dwelling 1	14/05/20
B	DA	14/05/20
A	Prelim Design	13/03/20

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BLOCK 01 DRAWINGS

scale **as shown on drawing** date **03/20**

job no **1950** drawn **BA/AL** dwg no **02**

PATERSON STREET

EXTENT OF RETAINING WALLS ALONG BOUNDARY TO BE CONFIRMED ONSITE

UNIT 1 RL10.5 | UNIT 2 RL 9.6 | UNIT 3 RL 8.6 | UNIT 4 RL6.9 | UNIT 5 RL5.9 | UNIT 6 RL5.4 | UNIT 7 RL5.4

GARAGE RL10.4 | GARAGE RL 9.5 | GARAGE RL 8.5 | GARAGE RL6.8 | GARAGE RL5.8 | GARAGE RL5.3 | GARAGE RL5.3

VISITOR RL7.1 | VISITOR RL5.2

1752m²

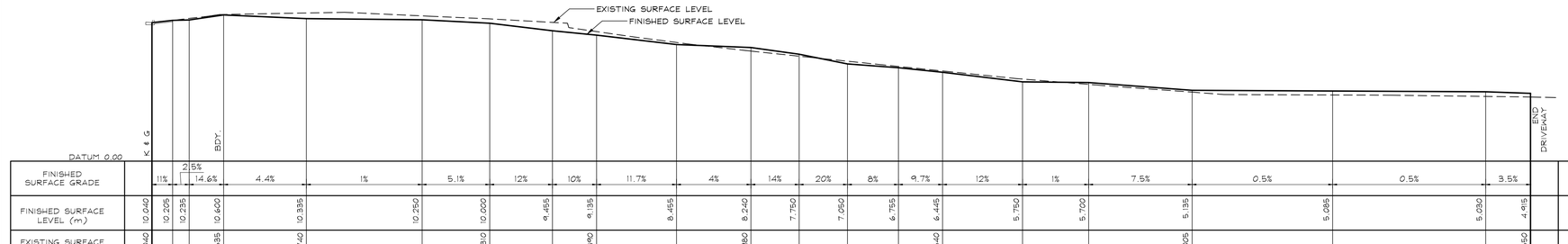
EXISTING GRATED PIT I.D S.L. 4.42m IL 3.60

DCP

150 H KERB | 150 LL KERB

CH 0.000 | CH 1.500 | CH 2.700 | CH 5.200 | CH 11.200 | CH 19.600 | CH 24.500 | CH 29.050 | CH 32.250 | CH 38.050 | CH 43.450 | CH 46.950 | CH 50.450 | CH 54.150 | CH 57.350 | CH 63.150 | CH 67.950 | CH 75.450 | CH 85.650 | CH 96.750 | CH 100.000

DRIVEWAY LAYOUT
SCALE - 1:200



FINISHED SURFACE GRADE		11%	2.5% / 14.6%	4.4%	1%	5.1%	12%	10%	11.7%	4%	14%	20%	8%	9.7%	12%	1%	7.5%	0.5%	0.5%	3.5%		FINISHED SURFACE GRADE
FINISHED SURFACE LEVEL (m)	10.040	10.205	10.235	10.600	10.335	10.250	10.000	9.455	9.135	8.455	8.240	7.750	7.050	6.755	6.445	5.750	5.700	5.135	5.085	5.030	4.915	FINISHED SURFACE LEVEL (m)
EXISTING SURFACE LEVEL (m)	10.040			10.635	10.740		10.310		9.390		7.980				6.540			5.005			4.650	EXISTING SURFACE LEVEL (m)
CHAINAGE (m)	0.000	1.500	2.700	5.200	11.200	19.600	24.500	29.050	32.250	38.050	43.450	46.950	50.450	54.150	57.350	63.150	67.950	75.450	85.650	96.750	100.000	CHAINAGE (m)
		1.5m	1.2m	2.5m	6.0m	8.4m	4.9m	4.55m	3.2m	5.8m	5.4m	3.5m	3.5m	3.7m	3.2m	5.8m	4.8m	7.5m	10.2m	11.1m	3.25m	

DRIVEWAY LONGITUDINAL SECTION
HORIZONTAL SCALE - 1 : 200
VERTICAL SCALE - 1 : 200

PATERSON STREET

3,000 LITRE SLIMLINE WATER TANK.
1,500 LITRE DETENTION
1,500 LITRE BASIX
500mm CHOKE PIPE
MID HEIGHT OF TANK

3,000 LITRE SLIMLINE WATER TANK.
1,100 LITRE DETENTION
1,900 LITRE BASIX
400mm CHOKE PIPE
750 BELOW TOP OF TANK

3,000 LITRE SLIMLINE WATER TANKS.
1,100 LITRE DETENTION
1,900 LITRE BASIX
400mm CHOKE PIPE
750 BELOW TOP OF TANK

3,000 LITRE SLIMLINE WATER TANKS.
1,100 LITRE DETENTION
1,900 LITRE BASIX
400mm CHOKE PIPE
750 BELOW TOP OF TANK

SIP SI. 10.250 IL 6.650
SIP SI. 9.350 IL 8.700
SIP SI. 8.350 IL 7.100
SIP SI. 6.650 IL 6.050
SIP SI. 5.300 IL 5.100
SIP SI. 5.200 IL 4.650
SIP SI. 5.000 IL 4.450
SIP SI. 4.720 IL 3.620
SIP SI. 10.300 IL 9.700
SIP SI. 10.300 IL 8.800
SIP SI. 7.050 IL 6.550
SIP SI. 6.735 IL 6.235
SIP SI. 5.100 IL 4.700
SIP SI. 4.815 IL 3.750
DCP SI. 4.720 IL 3.720

EXISTING GRATED PIT I.D S.L. 4.42m IL 3.60

NEW 600 SQ. STORMWATER PIT. BREAK INTO EXISTING LINE. PIT INVERT TO MATCH EXISTING PIPE INVERT.

900 SQ. DISCHARGE CONTROL PIT. 1100 mm ORIFICE CONTROL PLATE & STEEL WEIR INSERT

27 x ATLANTIS FLO-TANK (685 x 408 x 450 DEEP).
3 x 9 TANKS (2055mm x 3672mm).
YIELDS 3226 litres
INLET IL 3.75
OUTLET IL 4.20

STORMWATER LAYOUT
SCALE - 1:200

CATCHMENT AREA SUMMARY	
ROOFED AREA	815.0 m²
PAVED AREA	25.0 m²
CONCRETE DRIVEWAY	470.0 m²
VEGETATED AREA UNCONTROLLED	442.0 m²
TOTAL CATCHMENT AREA	1752.0m²

LEGEND

'SIP' - 600 SQ. SURFACE INLET PIT

'DCP' - 900 SQ. DISCHARGE CONTROL PIT

'RDT' - DENOTES RAINWATER DETENTION TANK (LOCATION TO BE DETERMINED ON SITE)

REVISIONS			
B	REVISION	09.03.21	
A	FOR CONSTRUCTION	24.04.20	
ISSUE	DESCRIPTION	DATE	

PRINCIPAL ENGINEERS SIGNATURE

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PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT

AT
113A PATERSON STREET, BYRON BAY

FOR
LOGAN ARCHITECTURE

DRAWING TITLE
DRIVEWAY & STORMWATER LAYOUT

DESIGN	DRAWN	DRAWING SCALE	SHEET SIZE
DM	WSA	1:200	A1

PROJECT REF No	DRAWING No	REVISION
200320	C01	B

DRIVEWAY

ON-SITE STORMWATER DETENTION (OSD) DESIGN SUMMARY SHEET FOR SITES UNDER 2,500m² LOCATED WITHIN THE BYRON SHIRE

PRE DEVELOPMENT		
ROOFED AREA (A_r)	0.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	454.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v) AS PER AS3500.3, EQUATION 5.4.6.
TOTAL AREA	**454.0 m²**	
STORMWATER FLOWS (5 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (5I_5)	190 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
STORMWATER FLOW (Q_5)	**16.72 L/s**	Q_5 = PERMISSIBLE SITE DISCHARGE ('PSD')
POST DEVELOPMENT		
ROOFED AREA (A_r)	0.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	454.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	0.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v = (0.013x70)-0.233)
TOTAL AREA	**454.0 m²**	(C_v = (0.013x70)-0.233)*1.05 FOR Q20
STORMWATER FLOWS (20 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (20I_5)	240 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
ROOF FLOW	0.00 L/s	CONTROLLED
PAVED FLOW	27.24 L/s	UNCONTROLLED
VEGETATED FLOW	0.00 L/s	UNCONTROLLED
STORMWATER FLOW (Q_{20})	**27.24 L/s**	
CHOKE PIPE CALCULATIONS		
HEAD (H)	0.45 m	MAX. WATER LEVEL TO TAILWATER LEVEL
LENGTH (L)	0.50 m	
INTERNAL DIAMETER (D)	0.04 m	
FRICTION LOSSES (Kf)	0.28 mm	
COMPONENT HEAD LOSSES (Kp)	1.50 mm	PIPE ENTRY: 0.5mm + PIPE EXIT: 1.0mm
TOTAL PIPE LOSSES (Kt)	1.78 mm	COLEBROOK-WHITE ROUGHNESS COEFFICIENT
MAX. FLOW RATE (Q_u)	2.27 L/s	MUST BE LESS THAN PSD
TANK INLET FLOW	24.97 L/s	Q_{20} TOTAL FLOW - Q_u MAX. FLOW RATE
DETENTION VOLUME REQUIRED	**3.15 m³**	(Q20-Q5)x5x60/1000

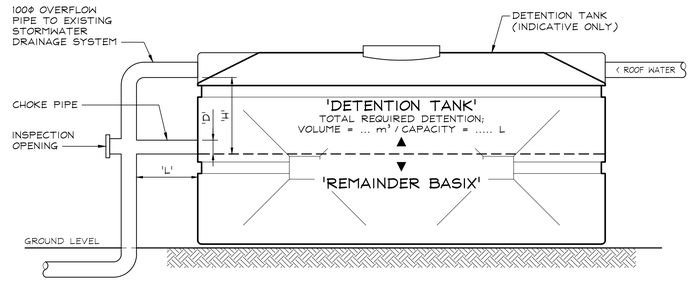
Q =Area x 0.62 x sqr(2 x g x h) h = 0.395m Q =16.39 L/s therefore Orifice plate (at discharge control pit) = 110mm Dia.

2 BED UNIT - SINGLE GARAGE

ON-SITE STORMWATER DETENTION (OSD) DESIGN SUMMARY SHEET FOR SITES UNDER 2,500m² LOCATED WITHIN THE BYRON SHIRE

PRE DEVELOPMENT		
ROOFED AREA (A_r)	0.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	93.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v) AS PER AS3500.3, EQUATION 5.4.6.
TOTAL AREA	**93.0 m²**	
STORMWATER FLOWS (5 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (5I_5)	190 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
STORMWATER FLOW (Q_5)	**3.43 L/s**	Q_5 = PERMISSIBLE SITE DISCHARGE ('PSD')
POST DEVELOPMENT		
ROOFED AREA (A_r)	93.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	0.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v = (0.013x70)-0.233)
TOTAL AREA	**93.0 m²**	(C_v = (0.013x70)-0.233)*1.05 FOR Q20
STORMWATER FLOWS (20 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (20I_5)	240 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
ROOF FLOW	6.20 L/s	CONTROLLED
PAVED FLOW	0.00 L/s	UNCONTROLLED
VEGETATED FLOW	0.00 L/s	UNCONTROLLED
STORMWATER FLOW (Q_{20})	**6.20 L/s**	
CHOKE PIPE CALCULATIONS		
HEAD (H)	1.00 m	MAX. WATER LEVEL TO TAILWATER LEVEL
LENGTH (L)	0.50 m	
INTERNAL DIAMETER (D)	0.04 m	
FRICTION LOSSES (Kf)	0.28 mm	
COMPONENT HEAD LOSSES (Kp)	1.50 mm	PIPE ENTRY: 0.5mm + PIPE EXIT: 1.0mm
TOTAL PIPE LOSSES (Kt)	1.78 mm	COLEBROOK-WHITE ROUGHNESS COEFFICIENT
MAX. FLOW RATE (Q_u)	3.38 L/s	MUST BE LESS THAN PSD
TANK INLET FLOW	2.82 L/s	Q_{20} TOTAL FLOW - Q_u MAX. FLOW RATE
DETENTION VOLUME REQUIRED	**0.83 m³**	(Q20-Q5)x5x60/1000

USE 40 I.D. CHOKE PIPE / 3000 L DETENTION TANK

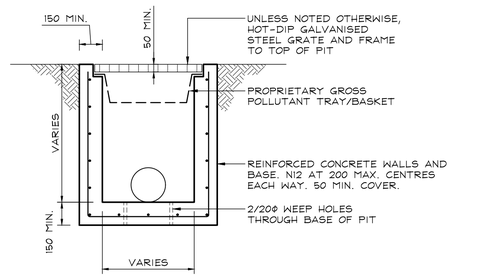


NOTES

1. REFER CALCULATIONS FOR DETAILS OF CHOKE PIPE.
2. PARAMETERS ARE INDICATIVE ONLY BASED ON ASSUMED CHOKE HEAD TO CHOKE PIPE. CHOKE PIPE SIZE AND LOCATION MAY NEED TO BE RECALCULATED DEPENDING ON CHOSEN TANK SIZE, CONTACT ENGINEER IF REQUIRED.

ABOVE GROUND DETENTION TANK DETAIL

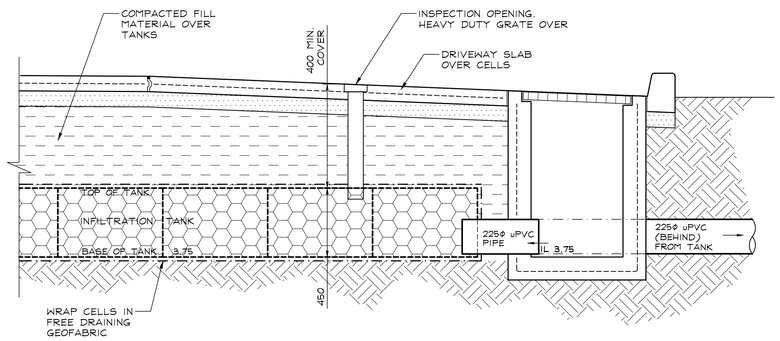
NOT TO SCALE



STORMWATER PIT (SIP) DETAIL

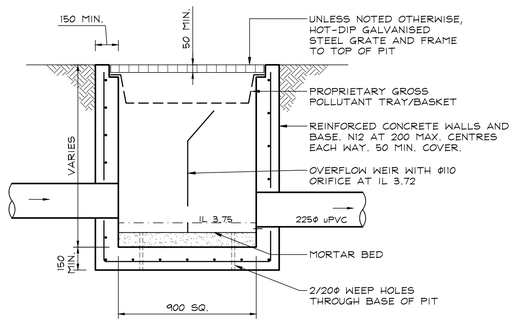
ALTERNATIVELY, USE PROPRIETARY PRE-CAST REINFORCED CONCRETE OR HDPE PIT WITH HOT-DIP GALV. STEEL GRATE

SCALE 1:20



INFILTRATION TANK DETAIL

SECTION SHOWN DIAGRAMATICALLY
SCALE 1:20



DISCHARGE CONTROL PIT (DCP) DETAIL

ALTERNATIVELY, USE PROPRIETARY PRE-CAST REINFORCED CONCRETE OR HDPE PIT WITH HOT-DIP GALV. STEEL GRATE

SCALE 1:20

3 BED UNIT

ON-SITE STORMWATER DETENTION (OSD) DESIGN SUMMARY SHEET FOR SITES UNDER 2,500m² LOCATED WITHIN THE BYRON SHIRE

PRE DEVELOPMENT		
ROOFED AREA (A_r)	0.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	168.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v) AS PER AS3500.3, EQUATION 5.4.6.
TOTAL AREA	**168.0 m²**	
STORMWATER FLOWS (5 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (5I_5)	190 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
STORMWATER FLOW (Q_5)	**6.19 L/s**	Q_5 = PERMISSIBLE SITE DISCHARGE ('PSD')
POST DEVELOPMENT		
ROOFED AREA (A_r)	168.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	0.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v = (0.013x70)-0.233)
TOTAL AREA	**168.0 m²**	(C_v = (0.013x70)-0.233)*1.05 FOR Q20
STORMWATER FLOWS (20 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (20I_5)	240 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
ROOF FLOW	11.20 L/s	CONTROLLED
PAVED FLOW	0.00 L/s	UNCONTROLLED
VEGETATED FLOW	0.00 L/s	UNCONTROLLED
STORMWATER FLOW (Q_{20})	**11.20 L/s**	
CHOKE PIPE CALCULATIONS		
HEAD (H)	1.00 m	MAX. WATER LEVEL TO TAILWATER LEVEL
LENGTH (L)	0.50 m	
INTERNAL DIAMETER (D)	0.05 m	
FRICTION LOSSES (Kf)	0.21 mm	
COMPONENT HEAD LOSSES (Kp)	1.50 mm	PIPE ENTRY: 0.5mm + PIPE EXIT: 1.0mm
TOTAL PIPE LOSSES (Kt)	1.71 mm	COLEBROOK-WHITE ROUGHNESS COEFFICIENT
MAX. FLOW RATE (Q_u)	6.13 L/s	MUST BE LESS THAN PSD
TANK INLET FLOW	5.07 L/s	Q_{20} TOTAL FLOW - Q_u MAX. FLOW RATE
DETENTION VOLUME REQUIRED	**1.50 m³**	(Q20-Q5)x5x60/1000

USE 50 I.D. CHOKE PIPE / 3000 L DETENTION TANK

2 BED UNIT - DOUBLE GARAGE

ON-SITE STORMWATER DETENTION (OSD) DESIGN SUMMARY SHEET FOR SITES UNDER 2,500m² LOCATED WITHIN THE BYRON SHIRE

PRE DEVELOPMENT		
ROOFED AREA (A_r)	0.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	120.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v) AS PER AS3500.3, EQUATION 5.4.6.
TOTAL AREA	**120.0 m²**	
STORMWATER FLOWS (5 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (5I_5)	190 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
STORMWATER FLOW (Q_5)	**4.42 L/s**	Q_5 = PERMISSIBLE SITE DISCHARGE ('PSD')
POST DEVELOPMENT		
ROOFED AREA (A_r)	120.0 m²	1.00 COEFFICIENT OF RUN OFF (C_r)
PAVED/IMPERVIOUS AREA (A_u)	0.0 m²	0.90 COEFFICIENT OF RUN OFF (C_u)
VEGETATED/PERVIOUS AREA (A_v)	0.0 m²	0.70 COEFFICIENT OF RUN OFF (C_v = (0.013x70)-0.233)
TOTAL AREA	**120.0 m²**	(C_v = (0.013x70)-0.233)*1.05 FOR Q20
STORMWATER FLOWS (20 YEAR STORM EVENT):		
DURATION	5 min	
RAINFALL INTENSITY (20I_5)	240 mm/hr	AS PER SECTION 6.3 - BYRON SHIRE COUNCILS 'COMPREHENSIVE GUIDELINES FOR STORMWATER MANAGEMENT'
ROOF FLOW	8.00 L/s	CONTROLLED
PAVED FLOW	0.00 L/s	UNCONTROLLED
VEGETATED FLOW	0.00 L/s	UNCONTROLLED
STORMWATER FLOW (Q_{20})	**8.00 L/s**	
CHOKE PIPE CALCULATIONS		
HEAD (H)	0.75 m	MAX. WATER LEVEL TO TAILWATER LEVEL
LENGTH (L)	0.50 m	
INTERNAL DIAMETER (D)	0.04 m	
FRICTION LOSSES (Kf)	0.28 mm	
COMPONENT HEAD LOSSES (Kp)	1.50 mm	PIPE ENTRY: 0.5mm + PIPE EXIT: 1.0mm
TOTAL PIPE LOSSES (Kt)	1.78 mm	COLEBROOK-WHITE ROUGHNESS COEFFICIENT
MAX. FLOW RATE (Q_u)	2.93 L/s	MUST BE LESS THAN PSD
TANK INLET FLOW	5.07 L/s	Q_{20} TOTAL FLOW - Q_u MAX. FLOW RATE
DETENTION VOLUME REQUIRED	**1.07 m³**	(Q20-Q5)x5x60/1000

USE 40 I.D. CHOKE PIPE / 3000 L DETENTION TANK

REVISIONS

ISSUE	DESCRIPTION	DATE
B	REVISION	09.03.21
A	FOR CONSTRUCTION	24.04.20

PRINCIPAL ENGINEERS SIGNATURE

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PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT

AT
113A PATERSON STREET, BYRON BAY

FOR
LOGAN ARCHITECTURE

DRAWING TITLE
STORMWATER DETAILS

DESIGN	DRAWN	DRAWING SCALE	SHEET SIZE
DM	WSA	1:20	A1

PROJECT REF No	DRAWING No	REVISION
200320	C02	B

Lucena
CIVIL & STRUCTURAL ENGINEERS

ADDITIONAL STORMWATER INVESTIGATION

for unit development at 113a Paterson Street, Byron Bay NSW 2481

21 January 2021

for

Alan Logan
Logan Architecture
PO Box 233
Byron Bay NSW 2481

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Contents

Document Control

Rev No	*Date*	*Revision Details*	*Prepared*	*Verified*	*Approved*
V1	21-1-2021	Original	DD	PL	

1. Introduction

Lucena Engineers Pty Ltd (LE) have been engaged to analyse behaviour of the stormwater system adjacent to and serving this site, at 113a Paterson Street. Council has assessed LE's report of 10 October 2020 and now requires an additional report that *includes an afflux plan for the whole drain at the rear of the development site up to Coopers Street showing the extent of flooding to affected properties along the drain and Coopers Street. The report shall include details to demonstrate that the earthworks and structures of the development will not result in adverse impacts elsewhere*.

A straight constructed stormwater channel (or "drain") runs along the south-east boundary of the site. It was constructed probably in the 1980s to serve a catchment of about 16 hectares (ha) to Shelley Drive, at the upstream end of the channel. Additional area increases that catchment to about 20ha at Cooper Street.

Catchments are shown in Appendix A of LE's original report. Survey of the property itself appears as Appendix B1. Survey of the stormwater system downstream of Shelley Drive appears as Appendices B2 & B3 and Photos at Appendix F.

LE's original investigation analysed flood behaviour for the full reach of the trunk system from Shelley Drive to Bangalow Road. It used DRAINS to estimate flood flows and then estimated flood levels and extents under existing conditions. Flood profiles were checked in more exact backwater calculations using HEC-RAS. The attenuating effects of the existing detention basin on the left bank of the channel were included.

Stormwater floods the flat lower part of #113a, to very low levels and at low or no velocity. Flow on much of the right-bank floodplain of the channel is impeded by fill on several properties upstream of #113a, starting with #107 and including the immediate neighbouring property at #113 Paterson Street.

Minimum floor levels can be set from the calculations in the original report.

This additional report responds to Council's points on afflux and extent of flooding for the channel. It demonstrates that earthworks and structures proposed on the subject site do not result in adverse impacts elsewhere.

2. Historical Investigations

Council advised in 2017 that a previous flood investigation for the channel was done under DA 5.1992.475.1 for "Victoria House", on the channel's left bank (across from #113a).

That investigation was limited in that overbank landform was assumed (not surveyed). Section 4.3 of the 1992 Report states "The overbank flow area has been assumed level and taken from the site survey to extend for a distance of 30 metres each side of the drainage swale".

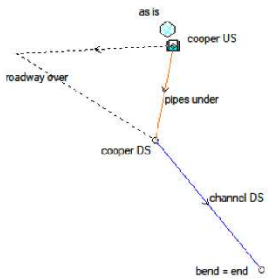
This and other extracts from the 1992 Report appear below as Appendix C in LE's report of 10 October 2020.
A multi-dwelling development has been constructed at 107 Paterson Street under the DA 5.1996.250.1. It is understood the stormwater design for that development relied on the historical 1992 flood investigation

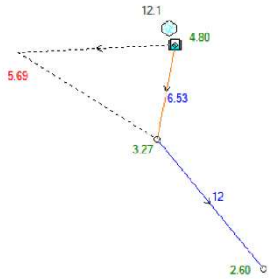
3. New DRAINS modelling in this report

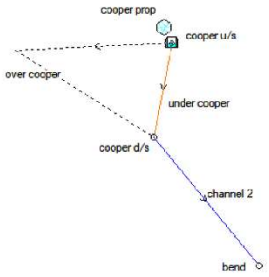
The DRAINS model used in LE's original investigation doesn't lend itself to examining the impact of hard surfaces on #113a because the 16ha and 4ha catchments do not include the site itself. A new and simpler DRAINS model is therefore used, with one catchment of 20ha upstream of Cooper Street. This enables the impacts of development to be modelled.

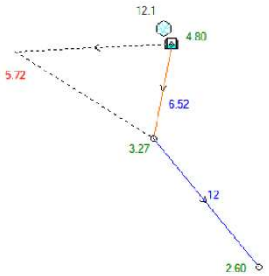
This new model uses the same hydrologic factors as that for the original report (see its Section 3).

The new model has two parts (*as is* and *proposed*) as shown in the following model diagram. The *proposed* 20ha catchment has "Paved area" increased from 40% to 40.65%. The addition 0.65% of 20 ha corresponds to an extra 1,300 m^2 of hard surface, taken from LE's drawing C01. It is important to note that while the full hard surface is applied, the development will include stormwater detention storages to reduce peak site flows to original.









the new DRAINS model

Q_{100} results (Q_{10} not printed)

Flows in the new DRAINS model match the old model reasonably well.

Flow over Cooper Street was 4.57 m^3/s for Q_{100} on the old model. This compares with 5.72 m^3/s in the new model - higher because the new model ignores the detention basin on the left bank upstream of Cooper Street, as well as on-site detention. Water levels match even better in the two models. For example, the old model (DD4) gives Q_{10} & Q_{100} peak flood levels of 4.62m & 4.76m AHD at Cooper Street. The new model (DD6) gives levels of 4.67m & 4.80m (5cm & 4cm higher, due to higher flows in this model).

DRAINS input and output files appear below as Appendices G and H.

The new model enables before and after comparisons, as follow.
Q_{10} peak flow rises from 8.606 to 8.640 m^3/s (0.39% rise) due to this development, with a slight increase in flow over Cooper Street and reduction within the pipes (due to pipe entrance subtleties). Q_{100} flows are 12.105 and 12.136 m^3/s for as is and proposed cases (0.25% rise)

4. New HEC-RAS model

This new HEC-RAS model is a truncated version of the previous model. Cross-sections below at Riverstation 5 (RS5) are removed and tailwater levels there adopted as follow (established by trial & error): Q_1 = 2.4m AHD; Q_2 = 2.5m; Q_5 = 2.6m; Q_{10} = 2.7m; Q_{20} = 2.8m; Q_{50} = 2.9m; Q_{100} = 3.0m. Any error in assuming these levels is likely to be 'lost' within the channel from RS 5 to RS 8 and is unlikely to affect results, especially as the results are being used for comparison purposes.

RS12 is located near the north-east corner of #107 Paterson Street and RS11 near the south-east corner of #107. The site boundary corresponds to the downstream half of the reach from RS11 to RS10.

The main change with this HEC-RAS modelling is the model is run twice, for the *as is* and *proposed* cases. Variations between them are:

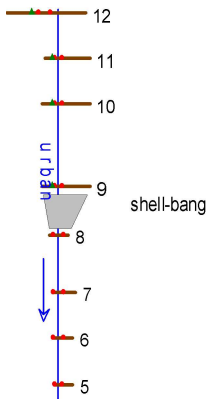
(i) the *as is* case has airspace (but an ineffective flow area) on the development site, while the *proposed* case has fill;

(ii) the *as is* case has original flows, while the *proposed* case has flows increased by the %-ages derived in Section 2 above. Q_{10} increases by 0.39% from 7.38 to 7.41 m^3/s for RS10 onwards; Q_{100} increases by 0.25% from 10.9 to 10.93 m^3/s.

Fill on #107 remains expressed on RS12 as ineffective flow starting 2m from top of bank, which equates to the property boundary. Fill at RS11 is accounted for in the 2017 survey. RS10 includes ineffective flow from 2m from top of bank (= property boundary) to account for the paling fences on #113 Paterson and on #7 Cooper Street. While the former development is recent and correctly includes wire mesh below flood level, it has internal fencing without mesh. This would stop the flow intended by the wire mesh.

The grey area between RS8 and RS9 represents the 'deck' of Cooper Street above its three 900Ø pipes.

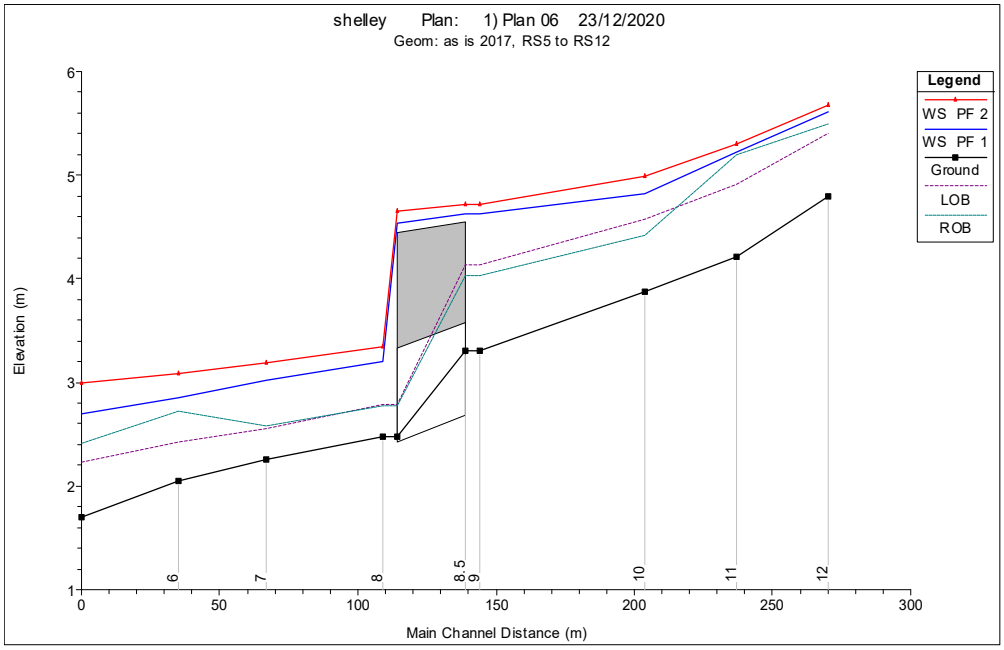
The HEC-RAS geometry includes the current (filled) right-bank shape at RS11 (downstream end of #107). The small green triangles on RS9 to 12 indicate the start of “ineffective flow areas” on the HEC-RAS diagram.



HEC-RAS layout, *proposed* case (*as is* case is almost identical)

Hydraulic factors like Mannings 'n', contraction & expansion coefficients are the same as used in the previous HEC-RAS modelling.

Water surface profiles for the 10-year (PF1) & 100-year (PF2) appear below. There is no perceptible difference between plots for *as is* and *proposed*. The tables below the profiles show the data plotted.



AS IS	River Sta	Q Total (m3/s)	Min Ch El (m)	**W.S. Elev (m)**	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Vel Right (m/s)	Flow Area (m2)	Top Width (m)
PF1 = 10-year	12	6.86	4.8	**5.62**	5.62	5.72	0.0116	1.65	0.40	6.7	44.00
	11	6.86	4.21	**5.22**	5.22	5.34	0.0094	1.66	0.08	6.2	29.50
	10	7.38	3.87	**4.82**	4.72	4.95	0.0086	1.69	0.79	5.7	31.40
	9	7.38	3.31	**4.62**	4.25	4.68	0.0025	1.15	0.55	8.1	25.40
	8.5	Culvert									
	8	7.38	2.48	**3.2**		3.26	0.0046	1.16	0.57	7.6	15.00
	7	7.38	2.26	**3.02**		3.08	0.0043	1.13		8.2	19.00
	6	7.38	2.05	**2.85**		2.91	0.0063	1.27	0.21	7.3	17.10
	5	7.38	1.7	**2.7**	2.46	2.75	0.0034	1.10		8.5	15.00
					average for RS10 to RS 12:		0.0068	1.50	0.47	6.6	28.77
PF2 = 100-year	12	9.66	4.8	**5.68**	5.68	5.8	0.0128	1.87	0.56	8.5	44.00
	11	9.66	4.21	**5.29**	5.29	5.43	0.0099	1.84	0.23	8.4	31.20
	10	10.9	3.87	**4.99**	4.93	5.09	0.0061	1.66	0.85	10.4	40.00
	9	10.9	3.31	**4.72**	4.4	4.82	0.0036	1.49	0.74	10.5	40.00
	8.5	Culvert									
	8	10.9	2.48	**3.35**		3.43	0.0046	1.35	0.68	9.7	15.00
	7	10.9	2.26	**3.19**		3.25	0.0035	1.20		11.4	19.00
	6	10.9	2.05	**3.08**		3.14	0.0035	1.21	0.37	11.5	18.00
	5	10.9	1.7	**3**	2.55	3.04	0.0020	1.05		13.1	15.00
					average for RS10 to RS 12:		0.0096	1.79	0.55	9.1	38.40

PROPOSED	River Sta	Q Total (m3/s)	Min Ch El (m)	**W.S. Elev (m)**	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Vel Right (m/s)	Flow Area (m2)	Top Width (m)
PF1 = 10-year	12	6.86	4.8	**5.62**	5.62	5.72	0.0116	1.65	0.40	6.7	44.00
	11	6.86	4.21	**5.22**	5.22	5.34	0.0094	1.66	0.08	6.2	29.50
	10	7.41	3.87	**4.83**	4.72	4.96	0.0085	1.69	0.79	5.7	31.80
	9	7.41	3.31	**4.63**	4.25	4.69	0.0024	1.15	0.55	8.2	26.20
	8.5	Culvert									
	8	7.41	2.48	**3.21**		3.26	0.0046	1.17	0.57	7.6	15.00
	7	7.41	2.26	**3.02**		3.08	0.0043	1.13		8.2	19.00
	6	7.41	2.05	**2.85**		2.91	0.0063	1.27	0.21	7.3	17.10
	5	7.41	1.7	**2.7**	2.46	2.75	0.0035	1.10		8.5	15.00
					average for RS10 to RS 12:		0.0068	1.50	0.47	6.7	29.17
PF2 = 100-year	12	9.66	4.8	**5.68**	5.68	5.8	0.0128	1.87	0.56	8.5	44.00
	11	9.66	4.21	**5.29**	5.29	5.43	0.0099	1.84	0.23	8.4	31.20
	10	10.93	3.87	**4.99**	4.93	5.1	0.0061	1.66	0.86	10.4	40.00
	9	10.93	3.31	**4.72**	4.4	4.82	0.0035	1.48	0.74	10.6	40.00
	8.5	Culvert									
	8	10.93	2.48	**3.35**		3.43	0.0046	1.35	0.68	9.8	15.00
	7	10.93	2.26	**3.19**		3.25	0.0035	1.20		11.4	19.00
	6	10.93	2.05	**3.08**		3.14	0.0035	1.22	0.37	11.5	18.00
	5	10.93	1.7	**3**	2.55	3.04	0.0021	1.05		13.1	15.00
					average for RS10 to RS 12:		0.0096	1.79	0.55	9.1	38.40

5. Conclusions and Recommendations

Flows vary due to the proposal by 0.25 % at Q_{100} to 0.39% at Q_{10}, but less if on-site detention measures are effective. Even if they are not, peak water levels vary due to the above increases by 1cm at Q_{10} and by zero at Q_{100}. These figures are taken from the Tables above. For RS 9, the Q_{10} level rises from 4.62 to 4.63m AHD due to the proposal, and compares to 4.61m determined in LE's previous investigation. Such variations may be real or may be computational. For RS9, the Q_{100} level remains at 4.72m and compares to 4.74m previously. We recommend the original result.

For RS10, the Q_{10} level rises from 4.82 to 4.83m AHD due to the proposal, and compares to 4.81m determined in LE's previous investigation. The Q_{100} level remains 4.99m, the same as the original result, which we recommend.

We conclude that the proposal has no measurable adverse impacts on flooding anywhere in this system.

Flood extent for the reach from the development downstream to Cooper Street is plotted on the accompanying Drawing.

As before, LE recommends no works in or near the channel.
LE recommends that, if paling fences are proposed, they be raised similarly to those on #113 (see Photo 5

Appendix G – DRAINS Input

PIT / NODE DETAILS — Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Depth (m)	Major Safe Pond Depth (m)
cooper u/s	Headwall				0.5	4.5		0.00		209.2	-380.80		961							
cooper d/s	Node					2.48		0.00		190.0	-478.00		1084		No					
bend	Node					1.6		0.00		299.2	-611.20		985		No					
cooper US	Headwall				0.5	4.5		0.00		224.0	-36.00		592887							
cooper DS	Node					2.48		0.00		205.0	-134.00		592904		No					
bend = end	Node					1.6		0.00		315.0	-268.00		592916		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	rest Length(n	id

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
cooper prop	cooper u/s	20	40.7	59.3	0	5	10.0000	5.00										0				1
as is	cooper US	20	40	60	0	5	10.0000	5.00										0				1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
under cooper	cooper u/s	cooper d/s	25	2.68	2.43	1	er roads, 1% r	900.00	900.00	0.0	Existing	3	cooper u/s	0					
pipes under	cooper US	cooper DS	25	2.68	2.43	1	er roads, 1% r	900.00	900.00	0.0	Existing	3	cooper US	0					

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	eight of Servi (m)	Chg (m)	Bottom Elev (m)	eight of Servi (m)	Chg (m)	Bottom Elev (m)	eight of Servi (m)	etc
										etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed
channel 2	cooper d/s	bend	Irregular	120	2.48	1.7							
channel DS	cooper DS	bend = end	Irregular	120	2.48	1.7							

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %		id			
over cooper	cooper u/s	cooper d/s	0.3	4.5	20	1.7	low point - p	0.05	0.00	0.6	5.00	0		1043			25
roadway over	cooper US	cooper DS	0.3	4.5	20	1.7	low point - p	0.05	0.00	0.6	5.00	0		592898			25

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m	Cover (m)	
under cooper	er roads, 1% r	900	0.6	-0.92	Unsafe
pipes under	er roads, 1% r	900	0.6	-0.92	Unsafe

This model has no pipes with non-return valves

Appendix H1 DRAINS 10-year results

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
cooper u/s	4.67		8.64		-0.17	2.475	Headwall height/system capacity
cooper d/s	3.15		2.475				
bend	2.3		8.477				
cooper US	4.67		8.606		-0.17	2.443	Headwall height/system capacity
cooper DS	3.15		2.443				
bend = end	2.3		8.444				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
cooper prop	8.64	4.8	3.863	5	10	5	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3
as is	8.606	4.723	3.905	5	10	5	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3

Outflow Volumes for Total Catchment (16.1 impervious + 23.9 pervious = 40.0 total ha)

Storm	Total Rainfall cu.m	Total Runoff	pervious Run	Pervious Runoff
nutes storm, avera	10933.33	u.m (Runoff % 634.16 (60.7%	u.m (Runoff % 247.57 (96.3%	cu.m (Runoff %) 2386.59 (36.6%)
nutes storm, avera	13800	820.01 (63.9%	403.55 (97.1%	3416.46 (41.5%)
nutes storm, avera	18166.66	888.25 (65.4%	164.41 (97.8%	4723.84 (43.6%)
utes storm, avera	24300	885.99 (65.4%	637.68 (98.4%	6248.31 (43.1%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
under cooper	6.248	3.48	3.621	3.233	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3
pipes under	6.363	3.53	3.618	3.237	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
channel 2	8.477	2.03	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3
channel DS	8.444	2.03	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
over cooper	2.475	2.475	0	0.093	0.23	16.01	2.5000	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3
roadway over	2.443	2.443	0	0.093	0.23	15.95	2.4900	AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 10 year, 25 minutes storm, average 109 mm/h, Zone 3

Node	Inflow (cu.m)	Outflow (cu.m)	torage Chang (cu.m)	Difference %
cooper u/s	5960.13	5963.06	0	0
cooper d/s	5963.06	5969.9	0	-0.1
bend	5969.9	5969.9	0	0
cooper US	5928.12	5932.83	0	-0.1
cooper DS	5932.83	5938.93	0	-0.1
bend = end	5938.93	5938.93	0	0

Run Log for DD6 run at 09:49:20 on 23/12/2020 using version 2020.033

The maximum flow in these overflow routes is unsafe: roadway over, over cooper

Appendix H2 DRAINS 100-year results

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
cooper u/s	4.8		12.136		-0.3	5.72	Headwall height/system capacity
cooper d/s	3.27		5.72				
bend	2.6		12.011				
cooper US	4.8		12.105		-0.3	5.69	Headwall height/system capacity
cooper DS	3.27		5.69				
bend = end	2.6		11.978				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
cooper prop	12.136	6.086	6.049	5	10	5	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3
as is	12.105	5.989	6.116	5	10	5	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3

Outflow Volumes for Total Catchment (16.1 impervious + 23.9 pervious = 40.0 total ha)

Storm	Total Rainfall cu.m	Total Runoff	pervious Run	Pervious Runoff
		u.m (Runoff %	u.m (Runoff %	cu.m (Runoff %)
nutes storm, aver	15333.33	)922.36 (71.2%	021.87 (97.4%	4900.50 (53.6%)
nutes storm, aver	19500	1333.56 (73.5%	702.08 (97.9%	6631.49 (57.0%)
nutes storm, aver	25666.66	9052.60 (74.2%	0188.78 (98.4%	8863.82 (57.9%)
nutes storm, aver	34501	5751.07 (74.6%	1751.24 (98.8%	11999.84 (58.3%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
under cooper	6.516	3.52	3.707	3.268	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3
pipes under	6.527	3.53	3.763	3.267	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
channel 2	12.011	1.93	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3
channel DS	11.978	1.93	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
over cooper	5.72	5.72	0.644	0.138	0.44	20.28	3.1700	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3
roadway over	5.69	5.69	0.644	0.137	0.44	20.24	3.1800	AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 100 year, 25 minutes storm, average 154 mm/h, Zone 3

Node	Inflow (cu.m)	Outflow (cu.m)	torage Chang (cu.m)	Difference %
cooper u/s	9543.22	9553.82	0	-0.1
cooper d/s	9553.82	9558.07	0	0
bend	9558.07	9558.07	0	0
cooper US	9509.38	9513.08	0	0
cooper DS	9513.08	9524.65	0	-0.1
bend = end	9524.65	9524.65	0	0

Run Log for DD6 run at 09:56:58 on 23/12/2020 using version 2020.033

The maximum flow in these overflow routes is unsafe: roadway over, over cooper