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Karratha Apartments

Gregory Way Bulgarra

Stormwater Management Report

Issue Date: Friday, May 23, 2025
Revision: Shire Submission

1 PREAMBLE.

PJ Wright and Associates Pty Ltd (**PJWAA**) have been engaged by Developed Pty Ltd (**Project Managers**) to prepare a stormwater management plan for three proposed residential development sites in Bulgarra.

This Stormwater Management Plan outlines the requirements for DA-51 Gregory Way Street Bulgarra.

2 SITES AND CONDITIONS.

The proposed site is DA-51 Gregory Way Street, Bulgarra (**The Site**). Refer to Figure 1.

The proposed development consists of:

- 7,611 square metres site;
- 36 residential units.
- Zoning: R30

Figure 1: Location Plan

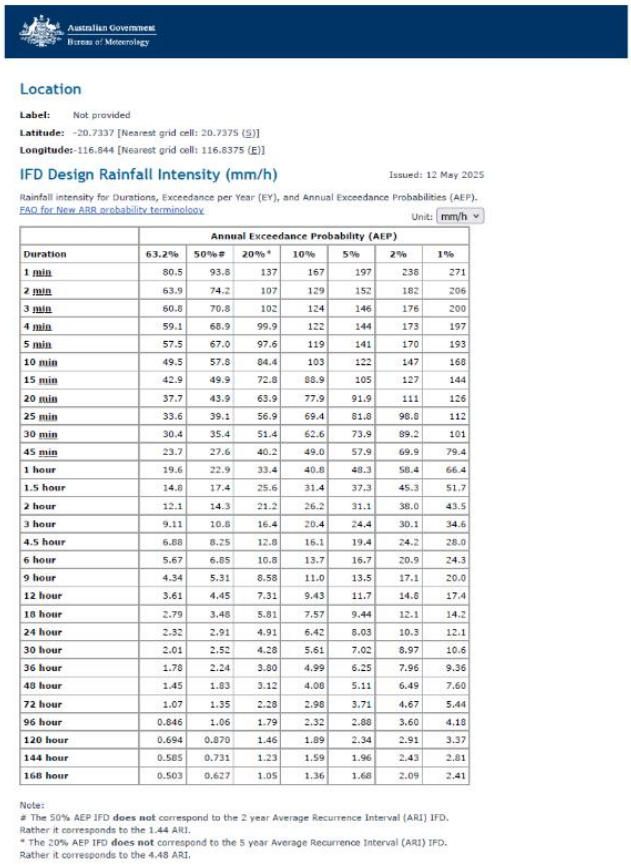
3 FLOOD DATA.

PJWAA have reviewed the City of Karratha *500 year Storm Surge Risk Policy* and confirm the proposed development is located between Gregory Way and Millstream Road.

The site located approximately 600m south of the Storm Surge Zone according to Storm Surge Risk Policy.

3.1 RAINFALL DATA.

PJWAA have the 1%AEP storm events based upon current Bureau of Meteorology (**BOM**) rainfall data for Karratha (refer to Figure 2 below).



Australian Government
Bureau of Meteorology

Location

Label: Not provided
Latitude: -20.7337 [Nearest grid cell: 20.7375 (S)]
Longitude: 116.844 [Nearest grid cell: 116.8375 (E)]

IFD Design Rainfall Intensity (mm/h) Issued: 12 May 2025

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology
Unit: mm/h

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	80.5	93.8	137	167	197	238	271
2 min	63.9	74.2	107	129	152	182	206
3 min	60.8	70.8	102	124	146	176	200
4 min	59.1	68.9	99.9	122	144	173	197
5 min	57.5	67.0	97.6	119	141	170	193
10 min	49.5	57.8	84.4	103	122	147	168
15 min	42.9	49.9	72.8	88.9	105	127	144
20 min	37.7	43.9	63.9	77.9	91.9	111	126
25 min	33.6	39.1	56.9	69.4	81.8	98.8	112
30 min	30.4	35.4	51.4	62.6	73.9	89.2	101
45 min	23.7	27.6	40.2	49.0	57.9	69.9	79.4
1 hour	19.6	22.9	33.4	40.8	48.3	58.4	66.4
1.5 hour	14.8	17.4	25.6	31.4	37.3	45.3	51.7
2 hour	12.1	14.3	21.2	26.2	31.1	38.0	43.5
3 hour	9.11	10.8	16.4	20.4	24.4	30.1	34.6
4.5 hour	6.88	8.25	12.8	16.1	19.4	24.2	28.0
6 hour	5.67	6.85	10.8	13.7	16.7	20.9	24.3
9 hour	4.34	5.31	8.58	11.0	13.5	17.1	20.0
12 hour	3.61	4.45	7.31	9.43	11.7	14.8	17.4
18 hour	2.79	3.48	5.81	7.57	9.44	12.1	14.2
24 hour	2.32	2.91	4.91	6.42	8.03	10.3	12.1
30 hour	2.01	2.52	4.28	5.61	7.02	8.97	10.6
36 hour	1.78	2.24	3.80	4.99	6.25	7.96	9.36
48 hour	1.45	1.83	3.12	4.08	5.11	6.49	7.60
72 hour	1.07	1.35	2.28	2.98	3.71	4.67	5.44
96 hour	0.846	1.06	1.79	2.32	2.88	3.60	4.18
120 hour	0.694	0.870	1.46	1.89	2.34	2.91	3.37
144 hour	0.585	0.731	1.23	1.59	1.96	2.43	2.81
168 hour	0.503	0.627	1.05	1.36	1.68	2.09	2.41

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

Figure 2: BOM Annual Exceedance Period (AEP) data.

3.2 COEFFICIENT OF RUNOFF.

The offsite catchments are based upon *Coefficient of Runoff* (**CoR**) of 0.65 as the land is un-developed.

All internal site catchments are based upon CoR of 0.8.

3.3 TIME OF CONCENTRATION.

PJWAA have undertaken the *Time of Concentration* (**TOC**) calculation based upon travel distance for each off site catchment area.

The TOC was calculated using an *Empirical version of the Rational Method* as appropriate to the scale of the development being a single property based upon Table 9.6.3 Book 9 of the ARR.

4 FLOOD CALCULATIONS.

PJWAA have utilised the survey and architectural drawings to calculate the catchment areas for each stormwater travel path.

Refer to Drawings P.01 and P.02 which form part of proposed the stormwater management plan for the development.

4.1 OFF SITE INFLOWS.

An un-development area of land is located to the south of the site which bound Millstream Street.

This land is elevated and has a natural slope towards the southern boundary of the site.

The land has been taken as single catchment area based upon existing topographic information provided on the site survey. Refer to Figure 3.

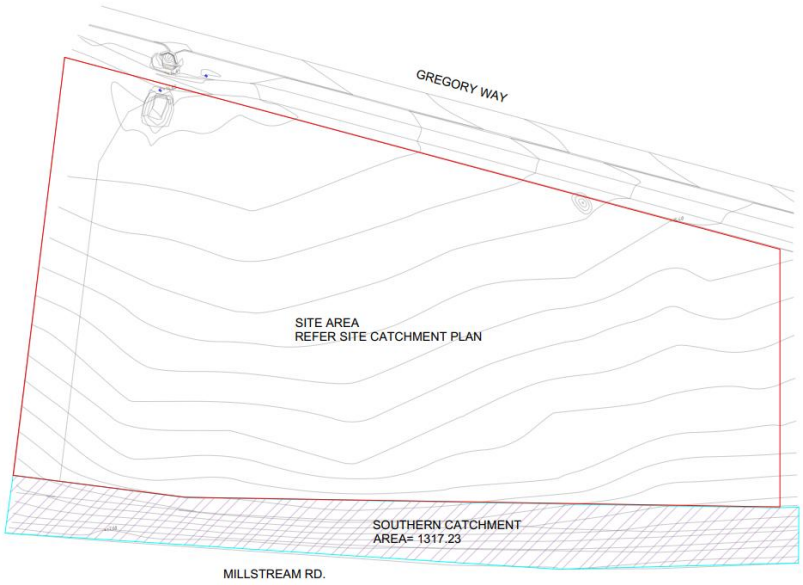


Figure 3 : Offsite Inflow Catchment

PJWAA have taken into account the predevelopment flows from this land and provided drainage channel to collect and diver the 1 % AEP flows around the development.

4.1.1 South Offsite Catchment

a) Catchment: 1,317 square meters.

b) Time of concentration: 20 mins.

The catchment has an estimated predevelopment 1% AEP design flow of 0.0554m^3/sec.

The existing flow path will require redirection to divert flow towards the west boundary.

The new flow path will be directed through a new 450 x 225 concrete culvert installed along the western boundary.

The culvert will discharge onto the Gregory Way.

This discharge characteristic will be as follows:

450 x 225 box culvert

i. Volume: 0.0558 m3/sec
ii. Slope: 1.85%
iii. Depth of 1% AEP flow: 78.75mm (35%).
iv. Velocity: 1.574m/sec
v. Maximum flow: 0.247 m3/sec @ 2.47m/sec.

4.2 SITE FLOWS.

The site has a high point located at the rear boundary with natural falls towards Gregory Way.
The site has been broken into 9 main catchment areas. Refer to Figure 4.

a) Catchment A : Southern Side
b) Catchment B : Central area of the site
c) Catchment C : South-Western side.
d) Catchment D : North-Western side
e) Catchment E : Eastern Side
f) Catchment F : West side of Pool area
g) Catchment G : Northern Side
h) Catchment H : Right side on Entrance
i) Catchment I : Western side

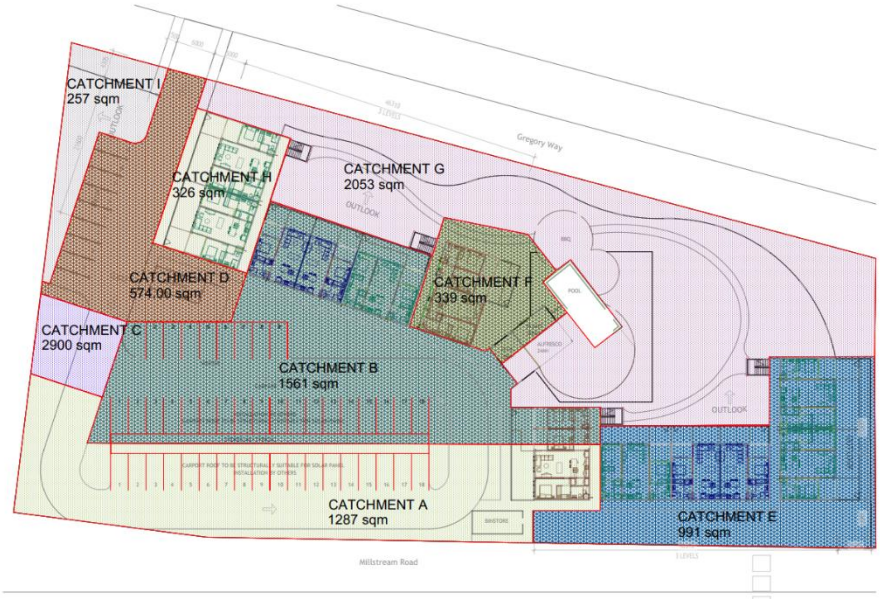


Figure 4: Site Catchment Areas.

The flows from Catchment D have been directed to flow down the centre of the roadways to discharge via crossovers onto Gregory Way.

Catchment A, B, and C have been directed to flow down the centre of the roadways to the collection sump and piped to the spill way sump in catchment area I.

The discharge from catchment G is collected by stormwater swale and is piped to spill way sump in catchment I.
The discharge from the catchment E, F and H are collected by stormwater swales and is piped towards stormwater swale at catchment G.
The discharge from Catchment G will be collected via stormwater swale and is piped to spill way located at catchment area I.
The discharge from the catchment I will be collected in the spill way sump and discharged into the drainage system.

4.3 CATCHMENT A

Catchment A is 1287 square meters in area. The storm flow path will run down the centre of the driveway towards the collection sump located in catchment C.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to collection sump as shown in drawing P.02.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 28.11 l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100-year ARI) design stormwater flow has been calculated at 55.47 l/second and has been designed to the driveway width of 6.0m.

The flow characteristics at the collection sump has been calculated as follows:

4.4 CATCHMENT B

Catchment B is 1561 square meters in area. The storm flow path will run down the centre of the driveway towards the collection sump located in catchment C.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to collection sump as shown in drawing P.02.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 34.08L/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 67.26 l/second and has been designed to the driveway width of 6.0m.

4.5 CATCHMENT C

Catchment C is 2900 square meters in area (Areas from catchment A and B added) . The storm flow path will run down the centre of the driveway and will be graded to collection sump.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to collection sump.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 63.34l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 125.02 l/second and has been designed to the driveway width of 6.0m.

4.6 CATCHMENT D

Catchment D is 574 square meters in area. The storm flow path will run down the centre of the driveway.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to Gregory Way.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 12.52l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 24.71l/second and has been designed to the driveway width of 6.0m.

4.7 CATCHMENT E

Catchment E is 991 square meters in area.

The stormwater will be collected by a 1000 x 140 mm deep gravel lined swale flows as shown in drawing P.02 with a collection pit and piped discharge to swale in catchment G.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 21.63L/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 42.70 l/second

4.8 CATCHMENT F

Catchment F is 339 square meters in area.

The stormwater will be collected by a 1000 x 100 mm deep gravel lined swale flows as shown in drawing P.02 with a collection pit and piped discharge to the swale in catchment G.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 5.87 L/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 11.59 l/second.

4.9 CATCHMENT G

Catchment G is 2053 square meters in area.

The stormwater will be collected by a 2500 x 230 mm deep gravel lined swale flows as shown in drawing P.02 with a collection pit and piped discharge to the spill way sump in catchment I.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 44.83 l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 88.48 l/second.

4.10 CATCHMENT H

Catchment H is 326 square meters in area.

The stormwater will be collected by a 1500 x 150 mm deep gravel lined swale flows as shown in drawing P.02 with a collection pit and piped discharge to the spill way sump in catchment I.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 7.10 l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 14.02 l/second.

4.11 CATCHMENT I

Catchment I is 257 square meters in area.

The stormwater will be collected by spill way sump in catchment I.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 5.61 l/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 11.074 l/second.

5 SITE DISCHARGES

5.1 DIVEWAY OUTFALL

The driveway will be limited to the discharges from Catchment D.

The flow characteristics at the crossover has been calculated as follows:

a) 5% AEP
    i. Volume:0.012m3/sec
    ii. Slope : 3.235 % (1:31)
    iii. Depth of 5% AEP flow: 5.1 mm across driveway
    iv. Velocity: 0.409m/sec
b) 1% AEP
    i. Volume:0.0247m3/sec
    ii. Slope: 3.235% (1:31)
    iii. Depth of 1% AEP flow: 8mm mm across driveway
    iv. Velocity: 0.539/sec

5.2 NORTHERN OUTFALL

The northern outfall is a bubble up pit which receives discharges from all other catchments.

The flow characteristics at the discharge point has been calculated as follows:

a) 5% AEP
    i. Volume:0.108 m3/sec
    ii. Slope 4.173% (1:24)
    iii. Depth of 5% AEP flow: 35 mm across spillway
    iv. Velocity: 0.1.581 m/sec
b) 1% AEP
    i. Volume:0.282m3/sec
    ii. Slope 4.173% (1:24)

iii. Depth of 1% AEP flow: 59 mm across spillway

iv. Velocity: 2.29m/sec

6 BUILDING FINISHED FLOOR LEVELS

The stormwater Management Plan drawing is based upon the current survey levels and indicate the minimum gradients and levels to achieve discharge to Gregory Way.

Final design verifications will be undertaken during the working drawing phase to allow for transitions between the apartment blocks.

At this stage, the ground floor levels will be no less than 200mm above the adjacent kerbing levels.

Floor levels will also need to be adjusted to ensure gravity connection to sewer.

If you require further information or clarification, please do not hesitate to contact this office.

Anthony R Serek
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Dip.Hyd.Serv.Design;
Dip. Eng. (Const.Hyd.);
Cert.Arch.Draft;
LCIBSE,Eng.Tech(UK); SoPHE
LMAHSCA; MIPA.

7 APPENDIX A

References

1 Stormwater Management Manual of Western Australia, Department of Water; Chapter 9 Structural Controls. 2007.

2 Policy DP 19Karratha 500-year Storm Surge Risk Policy 2012, City of Karratha

3 Australian Rainfall and Runoff Book 9 – A Guide to Flood Estimation, Commonwealth of Australia (Geoscience Australia), 2016 ; Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M , Testoni I.

8 APPENDIX B. SHEETS AND CHARTS.

DRAINAGE CALCULATIONS

Address	DA-51 Gregory way Bulgarra	**Date**	21.05.25

PRE DEVELOPMENT

Site Area	1317.23	m^2
Pervious Area	1317.23	m^2
Impervious Area	0	m^2
$^{1}I_{10}$	27.5mm/hr	
F_i	0	
F_y	1	
C_{10}	0.5	
$C_y = F_y C_{10}$	0.65	

Time of concentration

$t = (107nL^{0.333})/s^{0.2}$ where

t =	20.64 mins	t =	time (mins)
		n = (bare soil)	0.0275
$^{15}I_{10}$	120 mm/hr	L = (m)	136.75
		s = (%)	0.2
		F = (m)	0.29

Flow

Q_o = CIA/3600 where

Q_o =	28.54 L/s	Q_o =	?
	0.0285 m^3/s	C =	0.65
		I =	120
		A =	1317.2

AEP	Fy	C10	Cy
100%	0.8	0.65	0.52
50%	0.85	0.65	0.5525
20%	0.95	0.65	0.6175
10%	1	0.65	0.65
5%	1.05	0.65	0.6825
2%	1.15	0.65	0.7475
1%	1.2	0.65	0.78

PRE DEVELOPMENT		FLOWS	
AEP	**Cy**	**Iy**	**Qy**
63.20%	0.52	57.90	11.02 L/s
50%	0.5525	67.50	13.65 L/s
20%	0.6175	98.3	22.21 L/s
10%	0.65	**120**	**28.54** L/s
5%	0.6825	141	35.21 L/s
2%	0.7475	171	46.77 L/s
1%	0.78	194	55.37 L/s

Spreadsheet based upon RAMWADE flow calculator.

Sheet 1 Predevelopment South Off Site inflow.

Flow Volume: 57.393L/s

Flow Velocity: 1.589m/s

Flow Depth: 80.28mm

Flow Depth: 36%

Maximum Flow Volume: 243.949L/s

Maximum Flow Velocity: 2.431m/s

Input

Invert Width (mm): 450

Width at top (mm): 450

Depth of Channel (mm): 223

Surface Type (Manning's n): Concrete, trowel finished

Roughness (n): 0.013

Slope of Invert (%): 1.85

Design Flow Rate (L/s): 55.37

Submit

Chart 1: Western Culvert Predevelopment flow

Depth of Channel: 10mm

Flow Volume: 12.53L/s

Flow Velocity: 0.409m/s

Flow Depth: 5.1mm

Flow Depth: 51%

Maximum Flow Volume: 38.446L/s

Maximum Flow Velocity: 0.641m/s

Input

Invert Width (mm)

6000

Width at top (mm)

6000

Depth of Channel (mm)

channel depth

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

3.235

Design Flow Rate (L/s)

12.52

Submit

Chart 2: Driveway 5% flow.

Depth of Channel: 10mm

Flow Volume: 24.882L/s

Flow Velocity: 0.539m/s

Flow Depth: 7.7mm

Flow Depth: 77%

Maximum Flow Volume: 38.446L/s

Maximum Flow Velocity: 0.641m/s

Input

Invert Width (mm)

6000

Width at top (mm)

6000

Depth of Channel (mm)

channel depth

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

3.235

Design Flow Rate (L/s)

24.7

Submit

Chart 3: Driveway 1% flow.

Depth of Channel: 35mm

Flow Volume: 109.201L/s

Flow Velocity: 1.581m/s

Flow Depth: 32.9mm

Flow Depth: 94%

Maximum Flow Volume: 120.908L/s

Maximum Flow Velocity: 1.645m/s

Input

Invert Width (mm)

2100

Width at top (mm)

2100

Depth of Channel (mm)

channel depth

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

4.173

Design Flow Rate (L/s)

108

Submit

Chart 4: Northern Outfall 5% flow.

Depth of Channel: 60mm

Flow Volume: 282.935L/s

Flow Velocity: 2.291m/s

Flow Depth: 58.8mm

Flow Depth: 98%

Maximum Flow Volume: 292.413L/s

Maximum Flow Velocity: 2.321m/s

Input

Invert Width (mm)

2100

Width at top (mm)

2100

Depth of Channel (mm)

channel depth

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

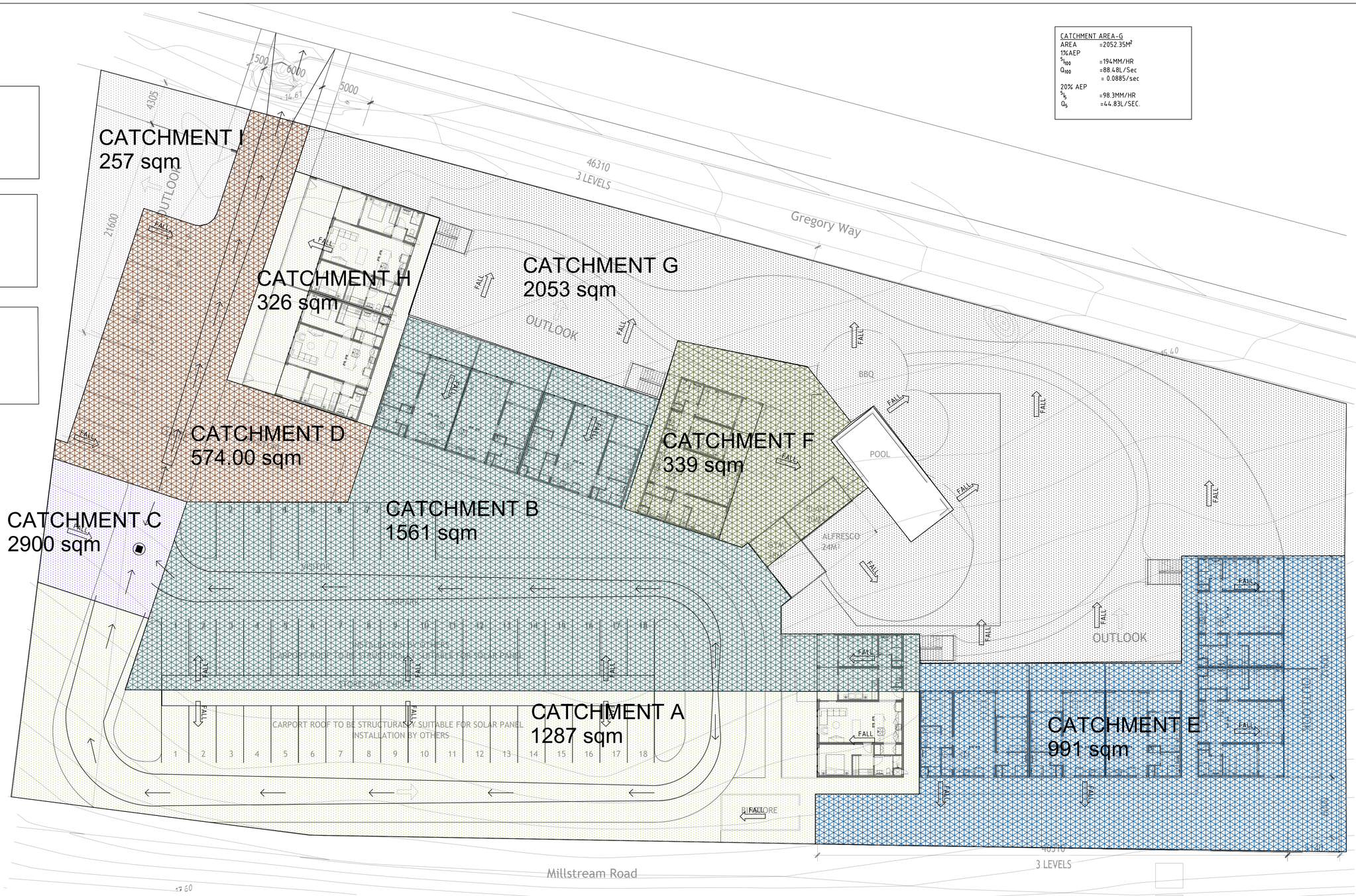
4.173

Design Flow Rate (L/s)

282

Submit

Chart 5: Northern Outfall 1 % flow.



CATCHMENT AREA-I
AREA =256.88M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} =11.074L/Sec
= 0.0111/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =5.61L/SEC.

CATCHMENT AREA-H
AREA =325.21M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} =14.02L/Sec
= 0.0140/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =7.10L/SEC.

CATCHMENT D
AREA =573.22M²
1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =24.71L/SEC.
20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =12.52L/SEC.

CATCHMENT C
AREA =2899.89M²
1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =125.02L/SEC.
20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =63.34L/SEC.

CATCHMENT AREA-G
AREA =2052.35M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} =88.48L/Sec
= 0.0885/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =44.83L/SEC.

CATCHMENT AREA-F
AREA =338.57M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} = 14.60L/Sec
= 0.0115/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =7.40L/SEC.

CATCHMENT AREA-E
AREA =990.37M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} = 42.70L/Sec
= 0.0427/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =21.63L/SEC.

CATCHMENT B
AREA =1560.10M²
1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =67.26L/SEC.
20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} =34.08L/SEC.

CATCHMENT A
AREA =1286.79M²
1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =55.47L/SEC.
20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} = 28.11L/SEC.

1 P.01 SITE PLAN - CATCHMENT PLANS
SCALE 1:200

DESIGN CERTIFICATION
ISSUED FOR APPROVAL PURPOSES

00	23.05.25	ISSUED FOR SUBMISSION TO SHIRE

P.J. WRIGHT
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AHSCA
THE ASSOCIATION OF HYDRAULIC SERVICES CONSULTANTS AUSTRALIA INCORPORATED

NORTH POINT

DESIGN CERTIFICATION
This drawing the referenced copy and issue as noted in the Technical Design Certification as issued in compliance with the Building Act 2011.
Refer to Design Certificate dated same for reference design standards
Subsequent revisions after the date of certification must be referenced by the installing contractor when submitting final certification.

Authorized Engineering Staff For PJ Wright& Assoc. Date

Project
KARRATHA APPARTMENTS
DA-51 GREGORY WY
BULGARRA WA 6017

Drawing Title
HYDRAULIC SERVICES
STORMWATER CATCHMENT PLAN

Date	MAY 2025
Scale	1:200 @ A1
Drawn	TRS/MC

Drawing Number P.01

Revision 00

2100WIDE CONCERET SPILLWAY FORMED FROM BUBBLE UP PIT GRADED TO ROADWAY.

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE. AT 15.00

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE. CONSTRUCT 500 WIDE X 100 MORTAR BEDDED ROCK SPAL AROUND COVER

GRATE LEVEL IS AT 15.09M.

2 X 225PVC FLAT

Q_{100} 0.157CUSEC

Q_{100} 0.247CUSEC

Q_{100} 0.282CUSEC

Q_{100} 0.125CUSEC

500 WIDE X 100MM DEEP WITH 150 BOTTOM WITH GRAVEL LINED CHANNEL GRADED AT 1 % .

2500WIDE X 350MM DEEP WITH 350 BOTTOM WITH GRAVEL LINED CHANNEL GRADED AT 0.25 % .

Q_{100} 0.0115CUSEC

150PVC 14.45 16.92%

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE. CONSTRUCT 500 WIDE X 100 MORTAR BEDDED ROCK SPAL AROUND COVER

GRATE LEVEL IS AT 16.36M.

1000 WIDE X 100MM DEEP WITH 150 BOTTOM WITH GRAVEL LINED CHANNEL GRADED AT 1 % .

Q_{100} 0.0427CUSEC

150PVC 28.8 13.46%

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE. CONSTRUCT 500 WIDE X 100 MORTAR BEDDED ROCK SPAL AROUND COVER

GRATE LEVEL IS AT 16.150M.

1000WIDE X 140MM DEEP WITH 400 BOTTOM WITH GRAVEL LINED CHANNEL GRADED AT 0.73 % .

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE SET WITH GRATE AT 16.275

Q_{100} 0.055CUSEC

1500 WIDE X 250MM DEEP GRAVEL LINED SWALE AT 2.778% QMAX 0.0343 VELOCITY 1.061m/sec

CUT EXISTING EMBANKMENT AND BATTER TO DAYLIGHT AT 1 IN 4

FORM SHALLOW BASIN OVER EXCAVATE AND INSTALL STONE PITCHING WITH OUTFALL TO 450 X 225 CULVERT.

Gregory Way

Millstream Road

46310 3 LEVELS

OUTLOOK

BINSTORE

GARAGE

CARPARK

VISITOR

POOL

BBQ

PLANT 20M²

GYM 28M²

ALFRESCO 24M²

FFL 16.80

FFL 16.85

INSTALLATION BY OTHERS
CARPORT ROOF TO BE STRUCTURALLY SUITABLE FOR SOLAR PANEL

STORES 4M² TYPICAL

+BOC 16.00

+BOC 16.58

BOC 16.52

BOC 16.54

CATCHMENT AREA-I

AREA	=256.88M²
1%AEP	
$^5I_{100}$	=194MM/HR
Q_{100}	=11.074L/Sec
	= 0.0111m³/sec
20% AEP	
$^5I_5$	=98.3MM/HR
Q_5	=5.61L/SEC.

CATCHMENT AREA-H

AREA	=325.21M²
1%AEP	
$^5I_{100}$	=194MM/HR
Q_{100}	=14.02L/Sec
	= 0.0140m³/sec
20% AEP	
$^5I_5$	=98.3MM/HR
Q_5	=7.10L/SEC.

SWALE DESIGN CHARACTERISTICS

INVERT WIDTH	=150mm
TOP WIDTH	=500mm
DEPTH OF SWALE	=100MM
SLOPE	=01%
VELOCITY	=0.966m/sec

CATCHMENT D

AREA	=573.22M²
1% AEP STORM DARTA	
$^5I_{100}$	=194MM/HR
Q_{100}	=24.71L/SEC.
	=0.0247m³/sec
20% AEP STORM DATA	
$^5I_5$	=98.3MM/HR
Q_5	=12.52L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS

WIDTH OF FLOW PATH	=6.0M
DEPTH OF FLOW	=80MM
SLOPE	= 3.235%
VELOCITY	= 1.456m/sec
Q MAXIMUM	=29.99L/SEC

WESTERN CULVERT:

SITE AREA	= 1,317.23m²
RUN-OFF CO-EFFICIENT	= 0.65
1% AEP FOR 5 MINS	=194mm/HR
PREDEVELOPMENT FLOW	= 55.37L/SEC
	=0.0554m³/sec

PRECAST CONCRETE CULVERT
450mm x 250mm .
GRADIENT 1.85%
MAX CULVERT FLOW 0.248m³/sEC

CATCHMENT C

AREA	=2899.89M²
1% AEP STORM DARTA	
$^5I_{100}$	=194MM/HR
Q_{100}	=125.02L/SEC.
	=0.125m³/sec
20% AEP STORM DATA	
$^5I_5$	=98.3MM/HR
Q_5	=63.34L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS

WIDTH OF FLOW PATH	=6.0M
DEPTH OF FLOW	=200MM
SLOPE	= 0.553%
VELOCITY	=1.125m/sec
Q MAXIMUM	=140.182L/SEC

CATCHMENT B

AREA	=1560.10M²
1% AEP STORM DARTA	
$^5I_{100}$	=194MM/HR
Q_{100}	=67.26L/SEC.
20% AEP STORM DATA	
$^5I_5$	=98.3MM/HR
Q_5	=34.08L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS

WIDTH OF FLOW PATH	=6.0M
DEPTH OF FLOW	=190MM
SLOPE	= 0.241%
VELOCITY	= 0.707m/sec
Q MAXIMUM	=82.212L/SEC

CATCHMENT A

AREA	=1286.79M²
1% AEP STORM DARTA	
$^5I_{100}$	=194MM/HR
Q_{100}	=55.47L/SEC.
20% AEP STORM DATA	
$^5I_5$	=98.3MM/HR
Q_5	= 28.11L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS

WIDTH OF FLOW PATH	=6.0M
DEPTH OF FLOW	=190MM
SLOPE	= 0.175%
VELOCITY	=0.594m/sec
Q MAXIMUM	=70.056L/SEC

CATCHMENT AREA-G

AREA	=2052.35M²
1%AEP	
$^5I_{100}$	=194MM/HR
Q_{100}	=88.48L/Sec
	= 0.0885/sec
20% AEP	
$^5I_5$	=98.3MM/HR
Q_5	=44.83L/SEC.

SWALE DESIGN CHARACTERISTICS

INVERT WIDTH	=350mm
TOP WIDTH	=2500mm
DEPTH OF SWALE	=230MM
SLOPE	=0.25%
VELOCITY	=1.019m/sec

CATCHMENT AREA-F

AREA	=338.57M²
1%AEP	
$^5I_{100}$	=194MM/HR
Q_{100}	= 14.60L/Sec
	= 0.0146m³/sec
20% AEP	
$^5I_5$	=98.3MM/HR
Q_5	=7.40L/SEC.

SWALE DESIGN CHARACTERISTICS

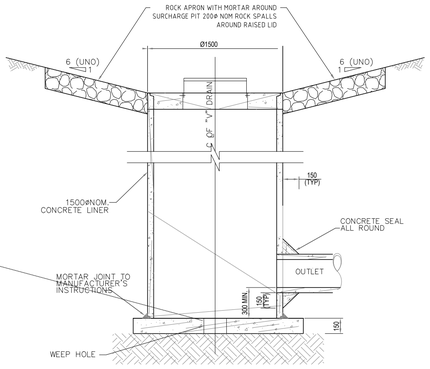
INVERT WIDTH	=150mm
TOP WIDTH	= 1000mm
DEPTH OF SWALE	=100MM
SLOPE	= 1%
VELOCITY	= 0.985m/sec
Q MAXIMUM	=20.74l/sec

CATCHMENT AREA-E

AREA	=990.37M²
1%AEP	
$^5I_{100}$	=194MM/HR
Q_{100}	= 42.70L/Sec
	= 0.0427m³/sec
20% AEP	
$^5I_5$	=98.3MM/HR
Q_5	=21.63L/SEC.

SWALE DESIGN CHARACTERISTICS

INVERT WIDTH	=400mm
TOP WIDTH	= 1000mm
DEPTH OF SWALE	=140MM
SLOPE	=0.56&%
VELOCITY	=1.142m/sec



2 STORMWATER MANHOLE
P.02 NTS

1 SITE PLAN - 1% AEP FLOOD PLAN
P.02 SCALE 1:200

00	23.05.25	ISSUED FOR SUBMISSION TO SHIRE

DESIGN CERTIFICATION
ISSUED FOR APPROVAL PURPOSES

NORTH POINT

DESIGN CERTIFICATION
This drawing the referenced copy and issue as noted in the Technical Design Certification as issued in compliance with the Building Act 2011.
Refer to Design Certificate dated same for reference design standards
Subsequent revisions after the date of certification must be referenced by the installing contractor when submitting final certification.

Authorized Engineering Staff For PJ Wright& Assoc. Date

P.J. WRIGHT
& ASSOCIATES PTY LTD
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AHSCA
THE ASSOCIATION OF HYDRAULIC SERVICES CONSULTANTS AUSTRALIA INCORPORATED

Project
KARRATHA APPARTMENTS
DA-51 GREGORY WY
BULGARRA WA 6017

Drawing Title
HYDRAULIC SERVICES
STORMWATER DRAINAGE PLAN

Date	MAY 2025	*Drawing Number*	*Revision*
Scale	1:200 @ A1	P.02	00
Drawn	TRS/MC		