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Suite 201, Level 1, 1 Short Street
Southport QLD 4215, Australia
PO Box 208, Southport QLD 4215
1300 657 402
www.adgce.com

Infinite Aged Care (Developments) Pty Ltd

128 Bundall Road
Surfers Paradise, QLD 4217

Attention: Justin Smith

24792/C L001 rev 01

8th September 2021

ML / ds

ADG Gold Coast Office

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2021/1181
Date: 8 December 2021
Queensland Government

Dear Justin

RE: LUMINA – 48 VILLAGE BOULEVARD, SOUTHPORT
STORMWATER ADVICE LETTER

Please find below summary of advice for the abovementioned development regarding the stormwater quality and quantity aspects in support of a Development Application for the proposed development as described in the GJG Architects preliminary architectural plans (**Attachment 1**). The works described herein are subject to further approvals and cover works required to service the proposed development including earthworks and stormwater drainage.

Existing Site

The site is bound by Village Boulevard to the north-east and Innovation Drive to the north-west. The adjoining lot to the south-east (Lot 1 on SP275512) is occupied by a residential apartment complex whereas the lot to the south-west of the site (Lot 18 on SP275512) is partially bituminous and partially grass-covered land. Lot 18 on SP275512 is owned by Gold Coast Health and Hospital Service (GHHS).

The details of the property for the proposed development can be seen in **Table 1** below.

The existing site features can be seen in **Figure 1** below.

Table 1 - Property Details

Title	Lot 1 on SP275512
Street Address	48 Village Boulevard, Southport 4215 QLD
Site Area	3311 m^2

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Figure 1 - Site Layout (as accessed from Nearmap – image date 06.11.2020)

Proposed Development

The proposed development, as described in the GJG Architects preliminary architectural plans (**Attachment 1**) is for a 142 resident aged care facility which also includes a commercial office space on the top floor, communal facilities on the ground floor and a café and hair salon on the ground floor that will be accessible to the residents and the general public.

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Stormwater Drainage

Existing Drainage & Infrastructure

The detailed survey by Focus On Surveying (**Attachment 2**) and City of Gold Coast (CoGC) Infrastructure Assets Mapping has identified the following stormwater infrastructure relevant to the subject site:

- A field inlet pit (asset number: 4000275841) located in the eastern corner of the site that currently collects flows from the bituminous surface within the site and conveys the flows through a series of pits and pipes that pass underneath Village Boulevard and Hospital Boulevard and eventuate in a series of basins located in the adjacent park on Lot 901 on SP275512 to the north-east of the subject site;
- A field inlet pit (asset number: 4000275920) located within Lot 3 on SP309256, on the development side of Innovation Drive to the south-west of the site that collects and conveys flows to a network of stormwater pipes and pits within Innovation Drive that discharge into a system of Box Culverts to the north of the site which eventuate in the series of basins in Lot 901 mentioned above; and
- Existing gully pits adjacent to the site, including a gully pit on the development side of Innovation Drive (asset number: 4000275834) and a gully pit located in the median on the development side of Village Boulevard (asset number: 4000275800).

The existing road gully pit (asset number: 4000275834) adjacent the western corner of the property within Innovation Drive clashes with the proposed driveway crossover. To accommodate this and meet Council Land Development Guidelines, it is proposed to convert this road gully to a DN1050 maintenance hole and construct a new road gully pit downstream of the driveway crossover. These works are detailed in ADG Engineering Drawings in **Attachment 6**.

Lawful Point of Discharge (LPD)

CoGC Infrastructure Assets Mapping and the detailed site survey (**Attachment 2**) identify that there is an existing field inlet pit within the eastern corner of the site (asset number: 4000275841) that currently serves as the LPD for the site. Flows from this field inlet pit traverse through a series of pits and pipes that pass underneath Village Boulevard and Hospital Boulevard and eventuate in a series of basins located in the adjacent park on Lot 901 on SP275512 to the north-east of the subject site.

It is proposed to retain the existing LPD for the proposed development. From the CoGC Infrastructure Assets Mapping, it is noted that there is an existing DN450 reinforced concrete 'stub pipe' (asset number: 4000276090) that extends from the abovementioned field inlet pit into the site that will be utilised as a point of connection for the proposed development.

External Catchments

CoGC Interactive Mapping contours and site visit information have identified that an external catchment to the south-west of the site is currently flowing through the site and will impact on the proposed development. The external catchment is the product of the subdivision into what is now Lots 16 and 18 on SP275512. Lot 18 is an irregular shaped lot with very limited road frontage and is highly unlikely to be developed independently of the adjacent Lot 3 on SP309256. The external catchment comprises of Lot 18 on SP275512 and is approximately 1,230m^2.

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It is proposed that to divert the flows from the abovementioned upstream catchment, Lot 18 on SP275512 will be filled such that a swale can be constructed to capture the flows from the catchment and discharge to a newly constructed field inlet pit located in Lot 18. For further information regarding the filling of Lot 18 and the proposed swale, refer to **Figure 2** below.

As the diversion of the upstream catchment will result in an increase in peak flow to the stormwater pipe and pit network connected to the gully pit located in Innovation Drive (asset number: 4000275834), advice was sought from the original design consultant for the overall stormwater network (Cardno) regarding the impact of the additional flows on the downstream drainage system. In summary, Cardno have advised that the diversion of the catchment into the existing gully pit, as described in the preliminary design sketch in **Figure 2** below, will have no impact on the overall drainage system. For further information regarding the advice from Cardno, refer to **Attachment 3** of this letter.

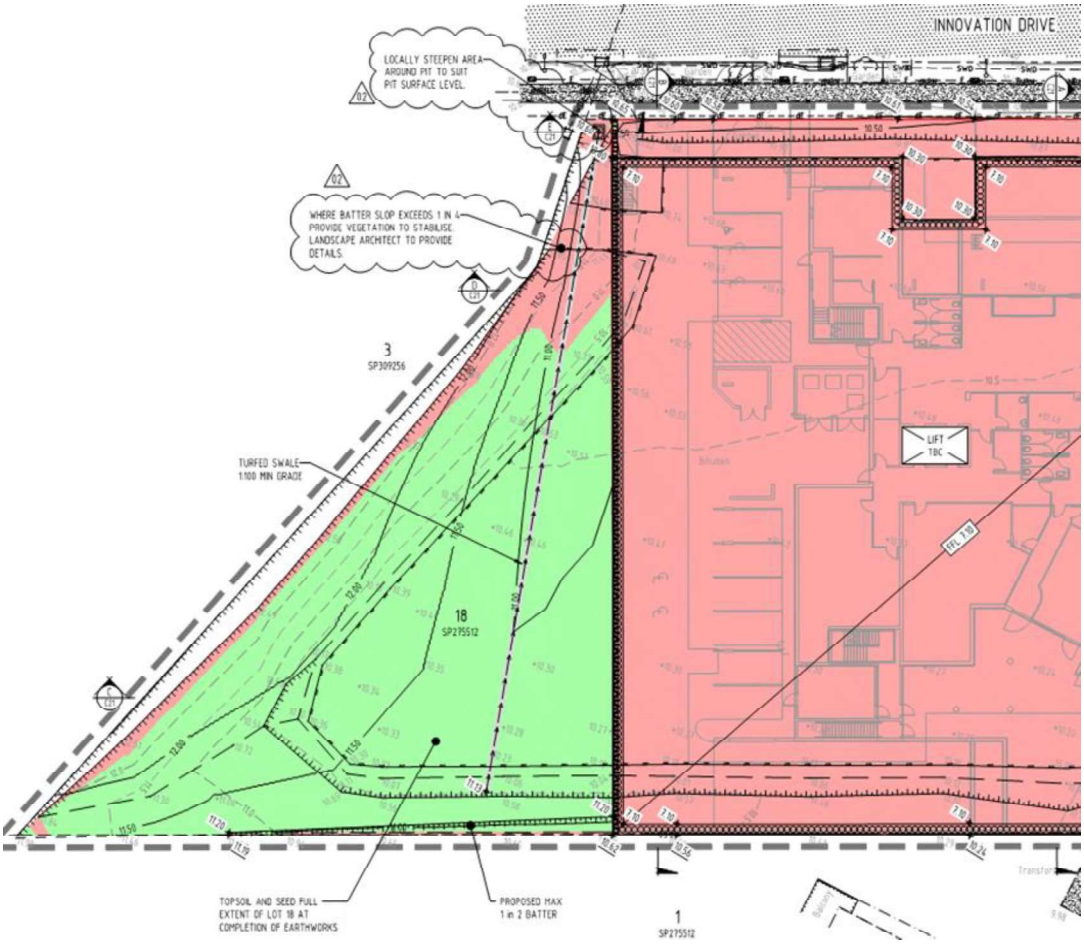


Figure 2 - Proposed filling of Lot 18 on SP275512

We have calculated the Lot 18 catchment runoff and designed the proposed swale with sufficient capacity to contain all events up to the Q100 peak flow. Refer to Attachment 7 for Rational Method flow calculations and Manning's equation channel diagrams confirming critical flow depth of 124mm for the Q10 peak flow and 150mm for the Q100 Peak Flow. The inlet pit surface level has been design to accommodate the full Q100 Peak Flow into the pit before flowing onto Innovation Drive. This will give the adjoining development site flood immunity for all events up to and including the Q100 peak flow. To further mitigate risk it is proposed

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the provide a small 400mm high wall along the boundary to ensure in a worst case scenario of 100% pit blockage, flows will surcharge to Innovation Drive. Refer section in Figure 3 below for details.

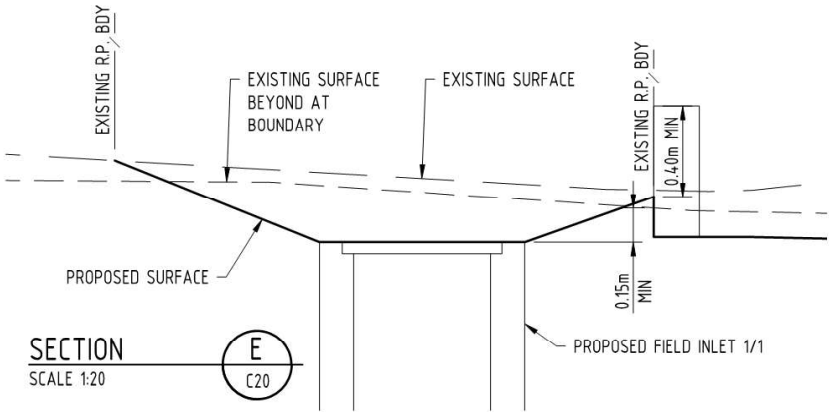


Figure 3 – Section through Lot 18 Swale at Inlet Pit

Stormwater Quality

The site is within the Parklands Priority Development Area (PDA) which is subject to an overall stormwater masterplan prepared by DesignFlow Pty Ltd for Economic Development Queensland (EDQ) (**Attachment 4**). The stormwater masterplan specified precinct-scale solutions for stormwater quality management for the fully developed case in the form of large-scale bioretention basins. As such, it is proposed that the abovementioned development will not provide any means of stormwater quality treatment.

Stormwater Quantity and Flooding Considerations

The site is within the Parklands PDA which is subject to an overall stormwater masterplan prepared by DesignFlow Pty Ltd (**Attachment 4**) and an overall flooding and hydraulics report prepared by Hyder (**Attachment 5**) for EDQ. The overall stormwater masterplan and flooding report detail precinct-wide stormwater quantity and flooding management measures for the Parkwood PDA that consider the fully developed case for the PDA precinct. As such, it is proposed that no stormwater detention will be required for the abovementioned development.

Should you require any additional information, please do not hesitate to contact us.

Yours sincerely,

ADG ENGINEERS (AUST) PTY LTD

MICHAEL LEPELAAR

Civil Team lead
RPEQ 11171

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Attachment 1
GJG Architectural Plans

Infin8 Lumina

142 Resident Aged Care Facility



GJG Architects

ABN 69 637 879 228

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Elanora QLD 4221

Telephone (07) 5520 1134

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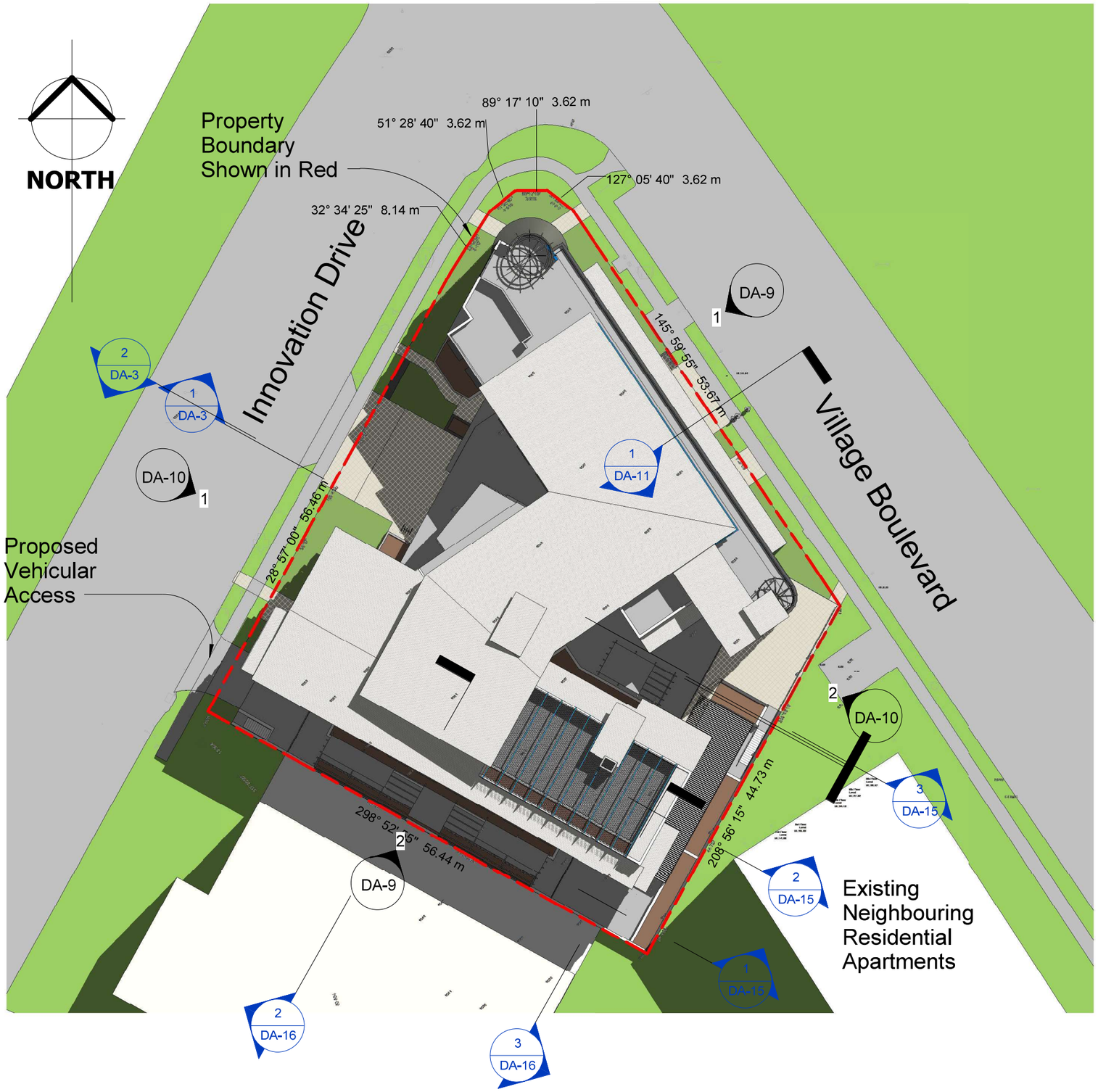
Project
Lumina Parklands Site

Client
Infin8

Issue	Date	Amendment
7	11.08.21	Prelim RFI Responses
6	27.07.21	General RFI Response
5	25.03.21	DA Submission Issue
4	12.03.21	Prelim Issue 3
3	8.03.21	Prelim Issue 2
1	19.02.21	Prelim Issue 1

Drawing Title	Drawing Number
Cover Sheet Scale @ A3 original	20-08-DA-1

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RPD
Lot 16 on SP275512

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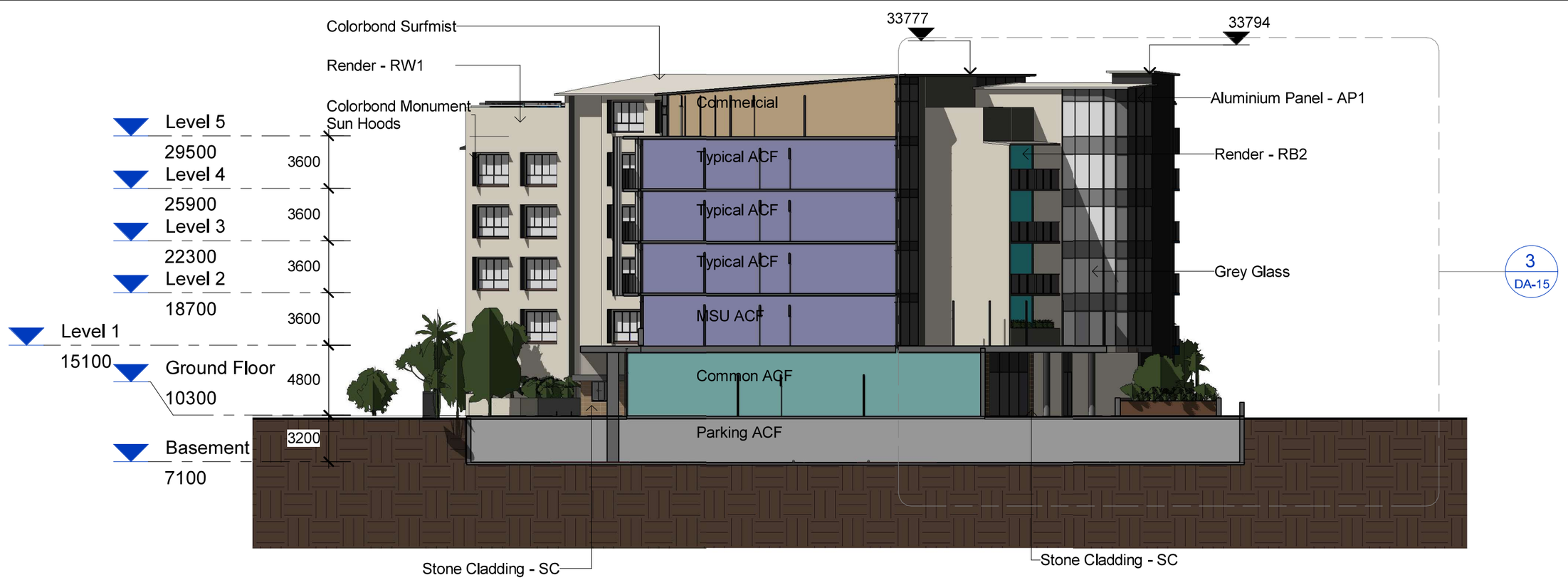
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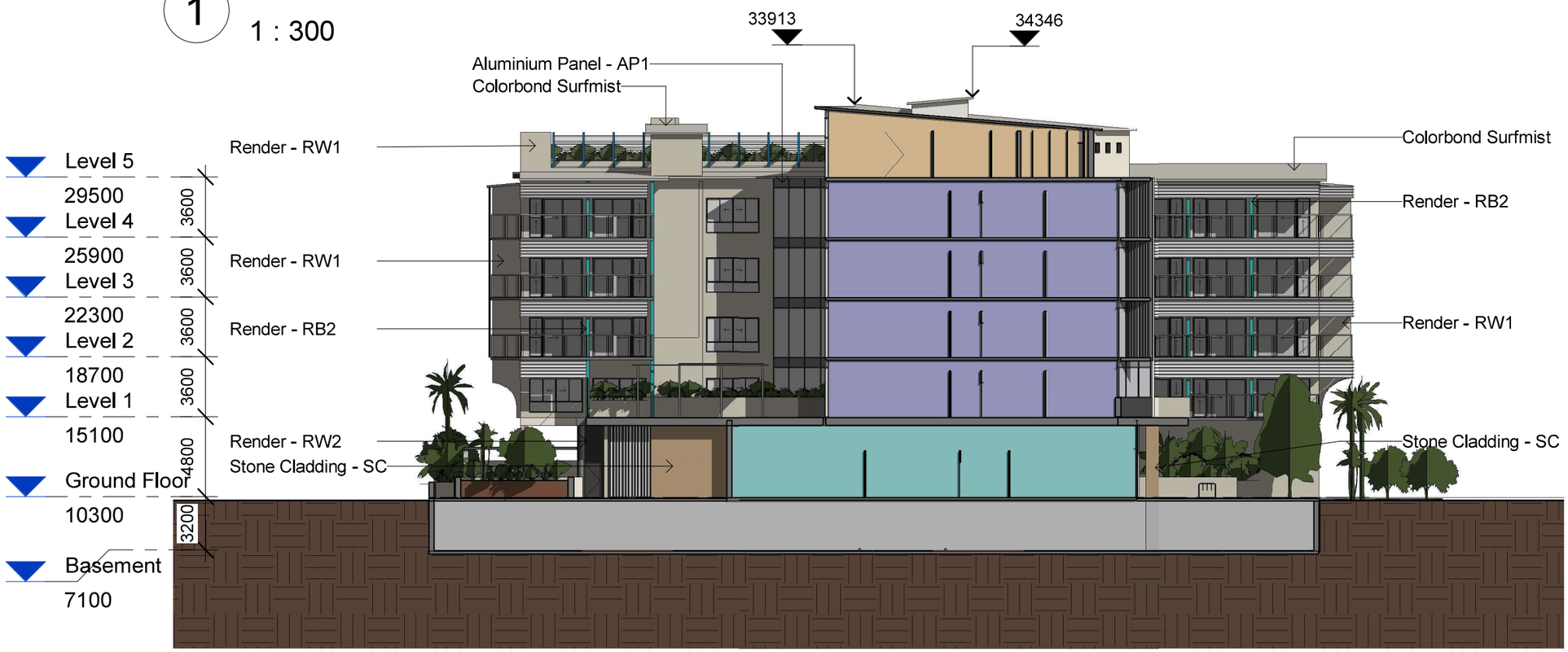
Drawing Title	Drawing Number
Site Plan Scale 1 : 500 @ A3 original	20-08-DA-2

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1 Section 1

1 : 300



2 Section 2

1 : 300

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Drawing Title	Drawing Number
Conceptual Sections Scale 1 : 300 @ A3 original	20-08-DA-3

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North

BOULEVARD

VILLAGE

DRIVE

INNOVATION

1 DA-11

Note on Seperate Commercial Lift
Generally this lift is for staff use only. Visitors to the top tenancy are generally considered to arrive through the main Aged Care Facility Entrance and use the main lift. In the event of a viral lockdown of the Aged Care Facility visitors to the Commercial tenancy will be directed via external notice around to this lift and foyer.

Prop water meter easement through to street

Nominated Area for Water Meters 3450 x 1550 as nominated by engineer - completely outside of Basement zone as shown

Seperate Commercial Lift and Foyer

Access hatches (Concrete) for removal of Transformer if necessary

Proposed Transformer position in Basement Below

Visitor Bike Racks

2000 x 3000 Sight Triangle

2000 x 3000 Sight Triangle

Pedestrian sight tringles to be kept clear of obstructions to visibility. Landscaping up to 500mm in height only is permitted in this area.

1 DA-3

2 DA-3

2 DA-4

1 DA-17

Cafe Terrace
Cafe
Quar/Meet
Off/Int
Stair
DT Office
Off/Int
Admin.
Recept
CM Office
Office
Office
Recept
Control Point
Lounge Foyer
FFL 10.300
Air Curtain Open Wall?
Hair Salon
Function/ Training
Store
Lift
Foyer
Theatre
Wellness
Glazing
Landscaped Podium Court
Nominal FSL 10.250 in this area
Exit Path
Consult
Ferm
Male
Consult.
AWC
Store
Foyer
Air Lock
Open Forecourt
Grated Drain
Staff F
Staff M
Lift Foyer
Lift
Lift
BOH
Kitchen
Serv.
Exit Path
Stair
Staff Only
Staff
FFL 10.300
Kitch
Lockers
Shr
Stair
Lockers
Store
Chute
Laundry
Stair
24 Bike Class 2 Secured Bike Enclosure
Bin
Loading (Waste/ Loading and MRV)
Circ.
Bollard
G1
G2
G3
Ambulance Bay
Store
Parking
G4
G5
G6
G7
G8
Ramp to Basement
Boosters
Driveway
EV Charging Bays
Nominal FSL 10.250 in this area
Fire Loading Mass
Stair
Boosters
3450
1550
2995
3000
2700
2700
6000
5400
6170
5945
3136
3100
+10.300
+10.300
+10.130
+10.120
+10.110
+10.280
+10.280
+10.280
+9.900
+10.400
+10.180+
+10.400
10.180+
10.280+
+10.430
10.180+
10.280+
+10.510
+10.580
10.200+
10.200+

Cafe Terrace
FSL 10.270

500 500 500
500 500 500 500
1100l Bin
1100l Bin
1100l Bin
1100l Bin
5720
3640

2 Bin Room
1 : 150

1 Ground Level
1 : 300

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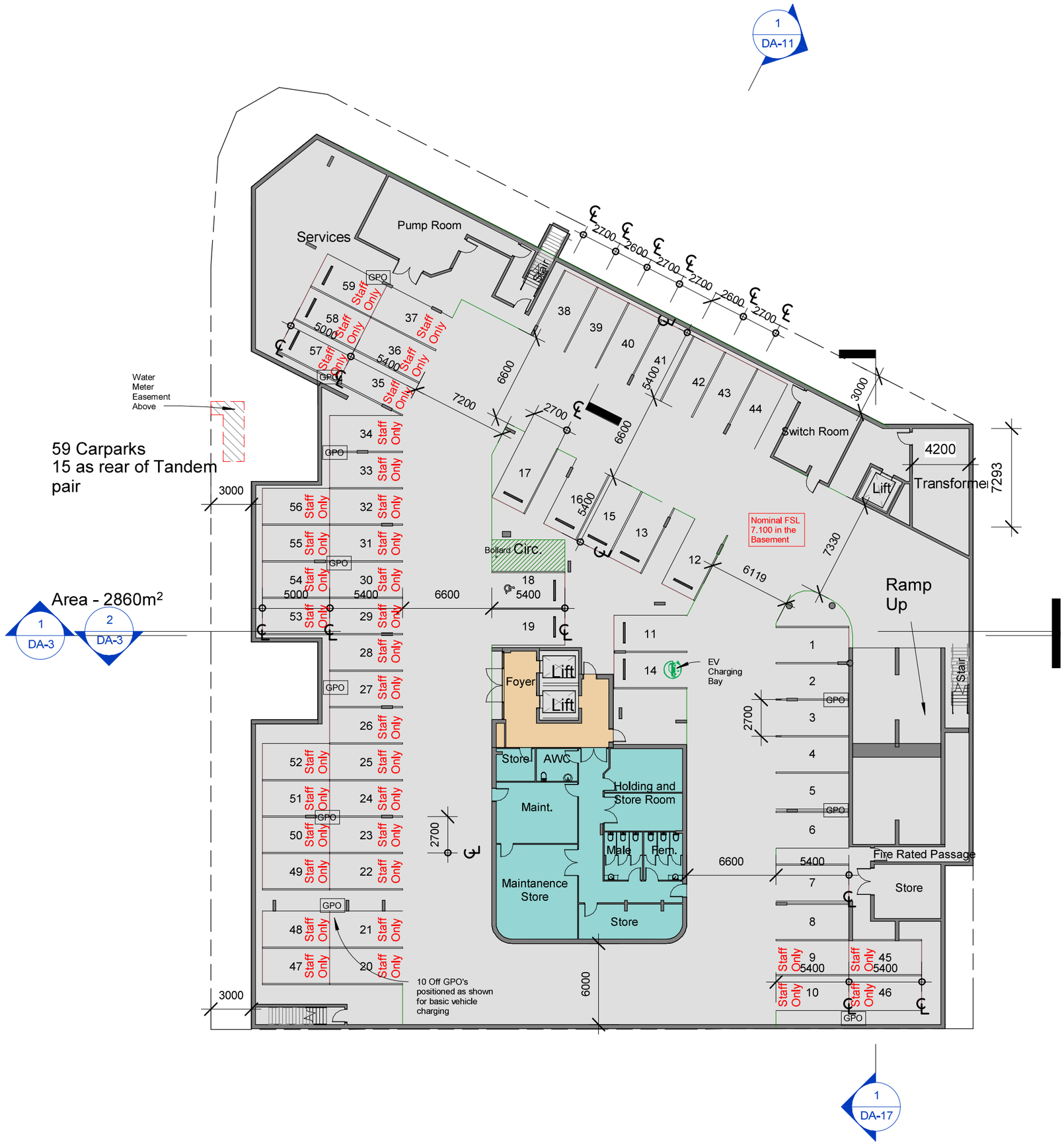
Project
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Issue	Date	Amendment
7	11.08.21	Prelim RFI Responses
6	27.07.21	General RFI Response
5	25.03.21	DA Submission Issue
4	12.03.21	Prelim Issue 3
3	8.03.21	Prelim Issue 2
2	1.03.21	Booster Pos Shown

Drawing Title	Drawing Number
Ground Floor Plan Scale As indicated @ A3 original	20-08-DA-4

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Issue	Date	Amendment
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4	12.03.21	Prelim Issue 3
3	8.03.21	Prelim Issue 2
1	19.02.21	Prelim Issue 1

Drawing Title
Basement Floor Plan

Scale 1 : 300 @ A3 original

Drawing Number
20-08-DA-5

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North

34 Resident MSU (Memory Support Unit) dividable into 2 operational nodes.



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1	19.02.21	Prelim Issue 1

Drawing Title
Level 1 - Floor Plan

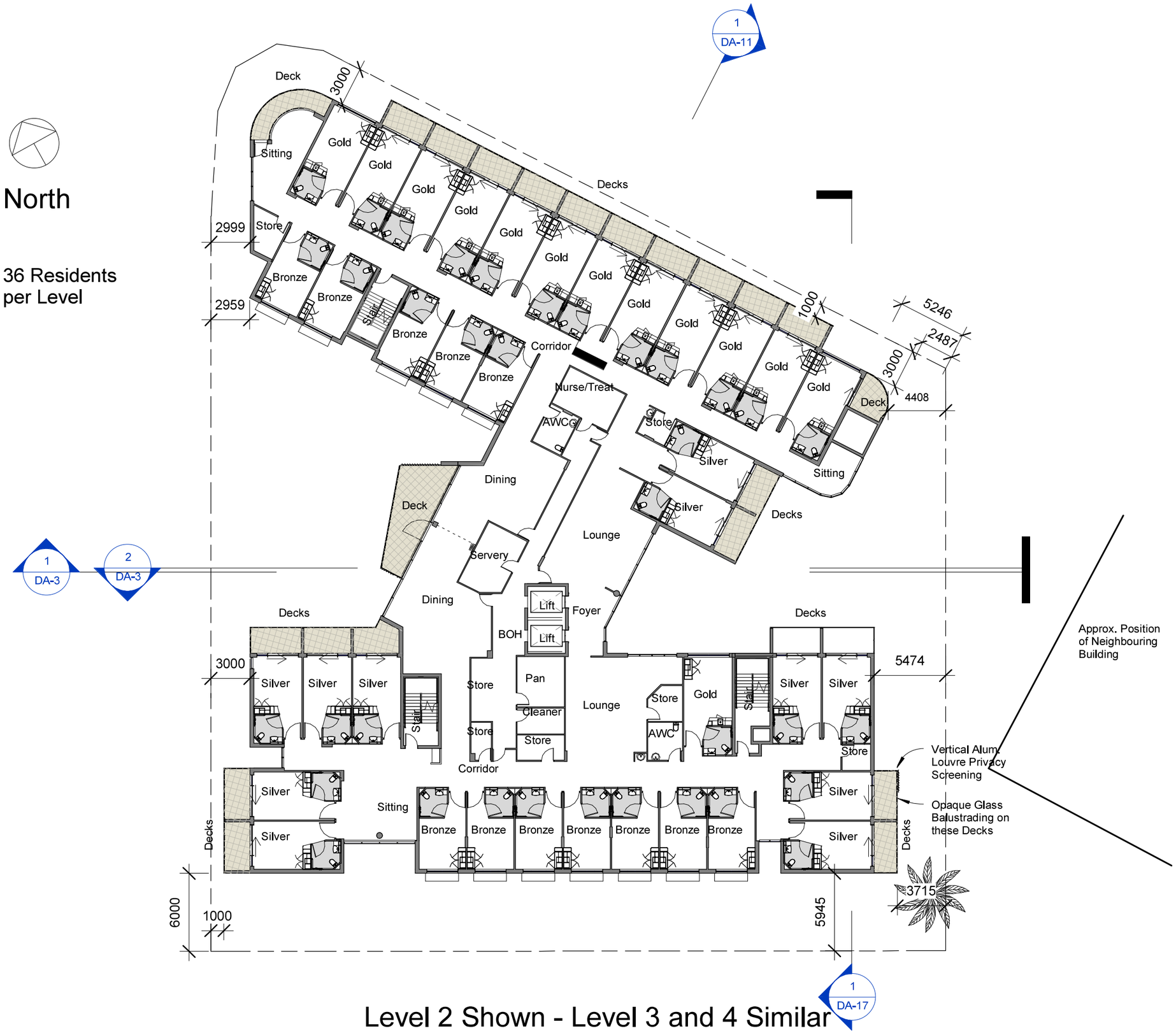
Scale 1 : 300 @ A3 original

Drawing Number
20-08-DA-6

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North

36 Residents
per Level



Level 2 Shown - Level 3 and 4 Similar

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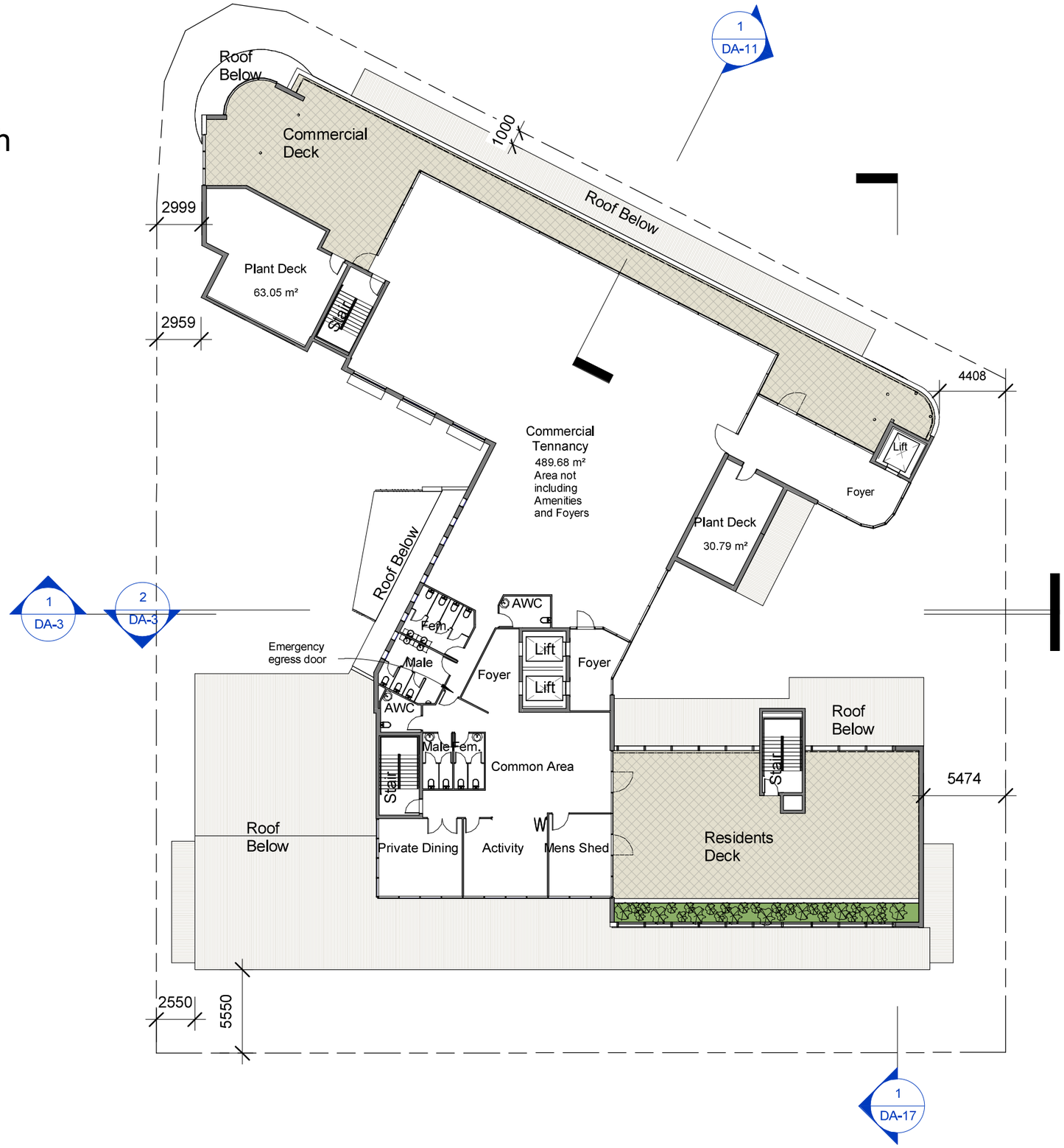
Drawing Title
Typical - L2-L4 Plan

Scale 1 : 300 @ A3 original

Drawing Number
20-08-DA-7

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North



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1	19.02.21	Prelim Issue 1

Drawing Title
Level 5 - Floor Plan

Scale 1 : 300 @ A3 original

Drawing Number
20-08-DA-8

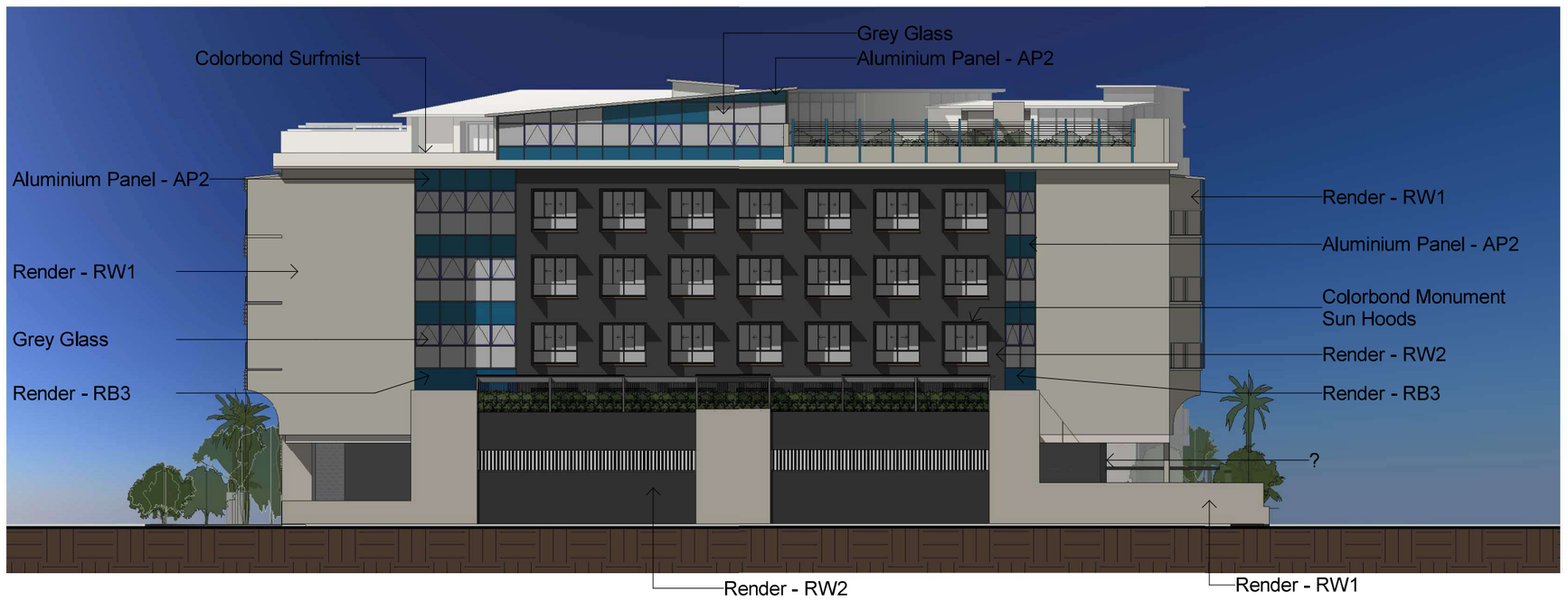
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1

Village Boulevard Elevation

1 : 300



2

SW Boundary Elevation

1 : 300

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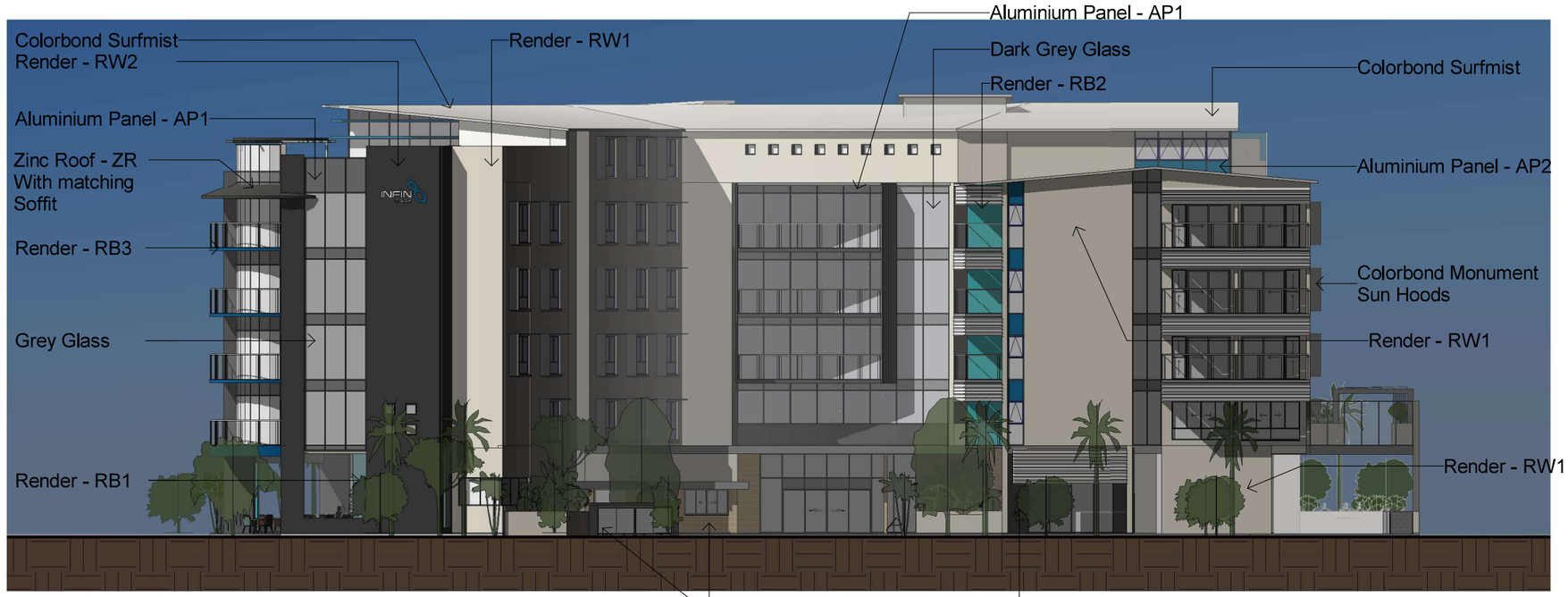
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Lumina Parklands Site

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Drawing Title	Drawing Number
Elevations 1 Scale 1 : 300 @ A3 original	20-08-DA-9

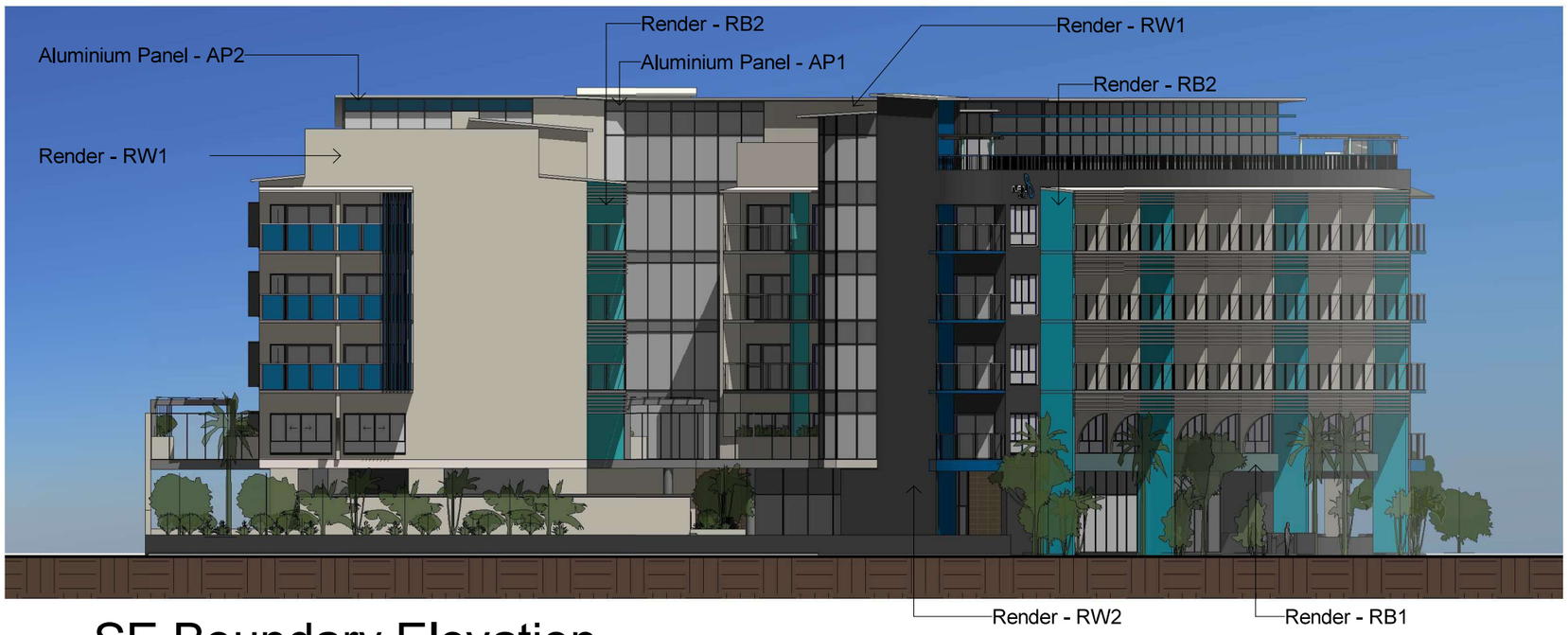
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1

Innovation Drive Elevation

1 : 300



2

SE Boundary Elevation

1 : 300

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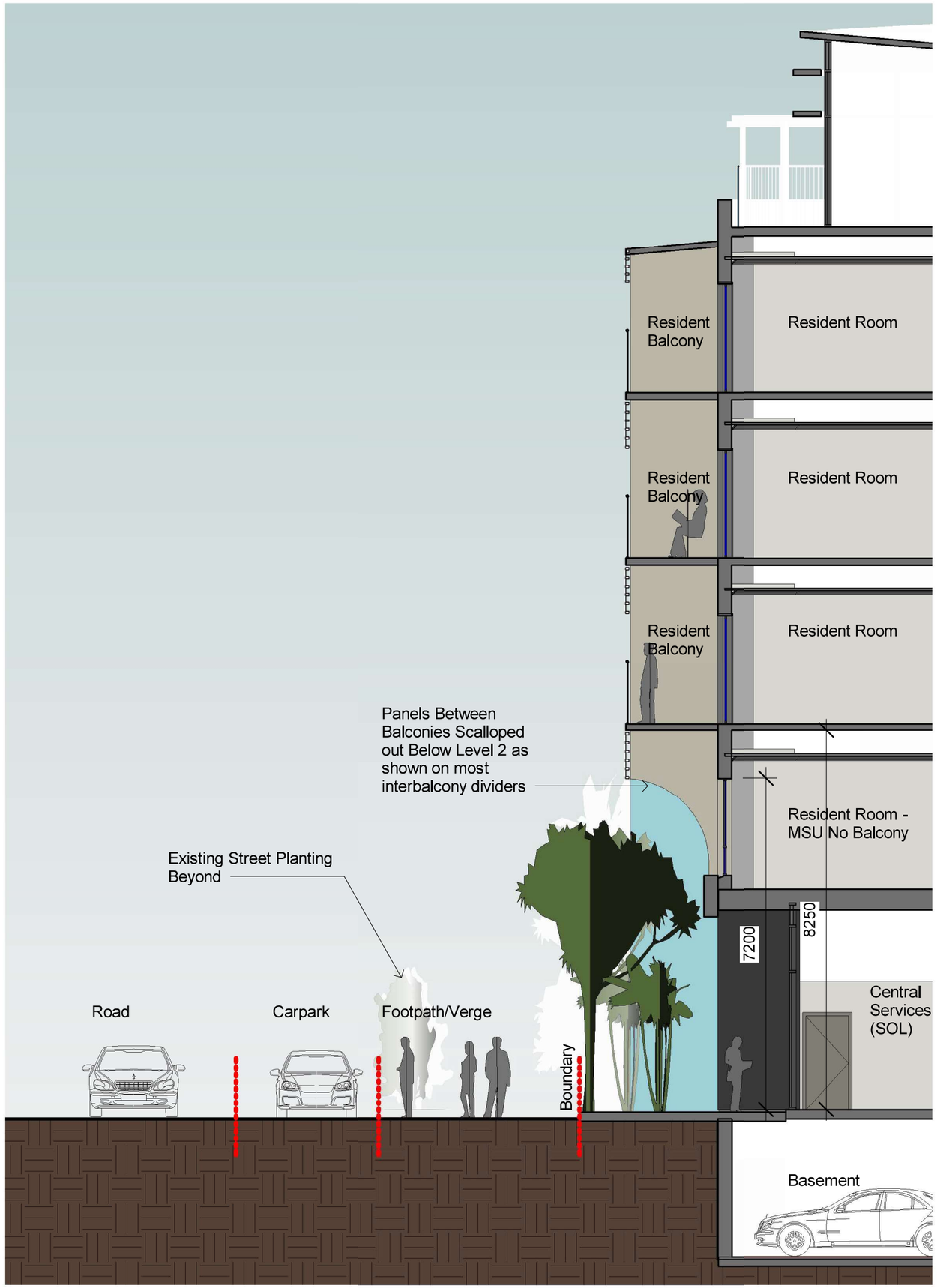
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Issue	Date	Amendment
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Drawing Title	Drawing Number
Elevations 2 Scale 1 : 300 @ A3 original	20-08-DA-10

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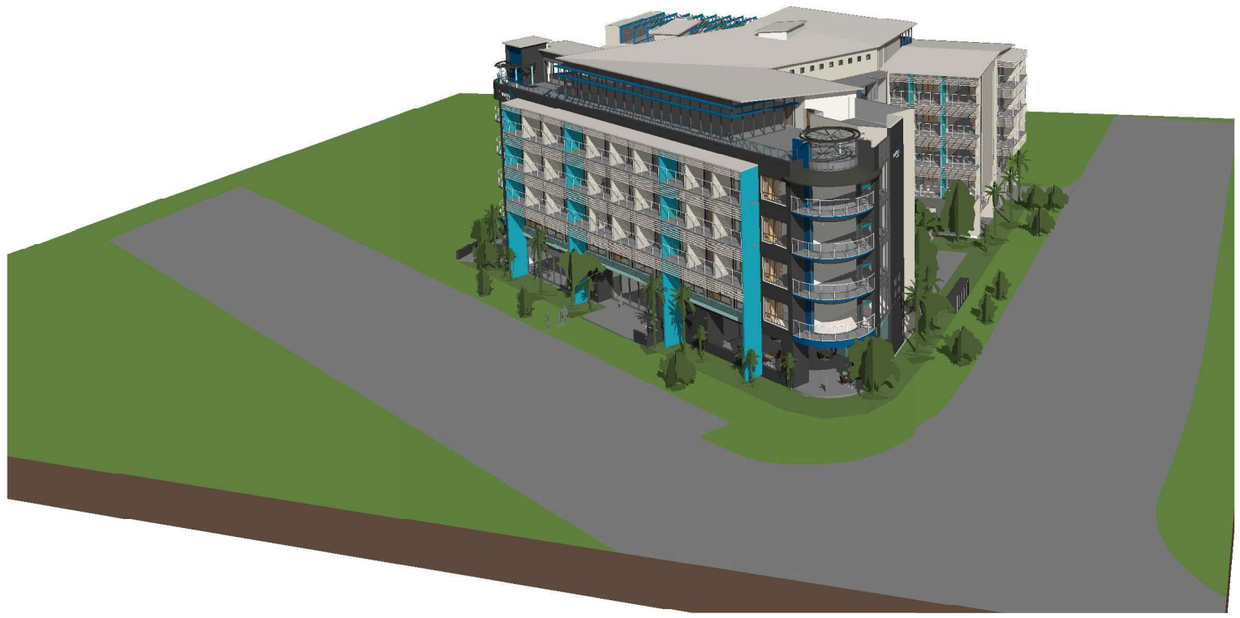
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Drawing Title
Street Planting/Footpath Section
Scale 1 : 100 @ A3 original

Drawing Number
20-08-DA-11

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1 Northern Corner



2 Eastern Corner



3 Western Corner Showing Basement

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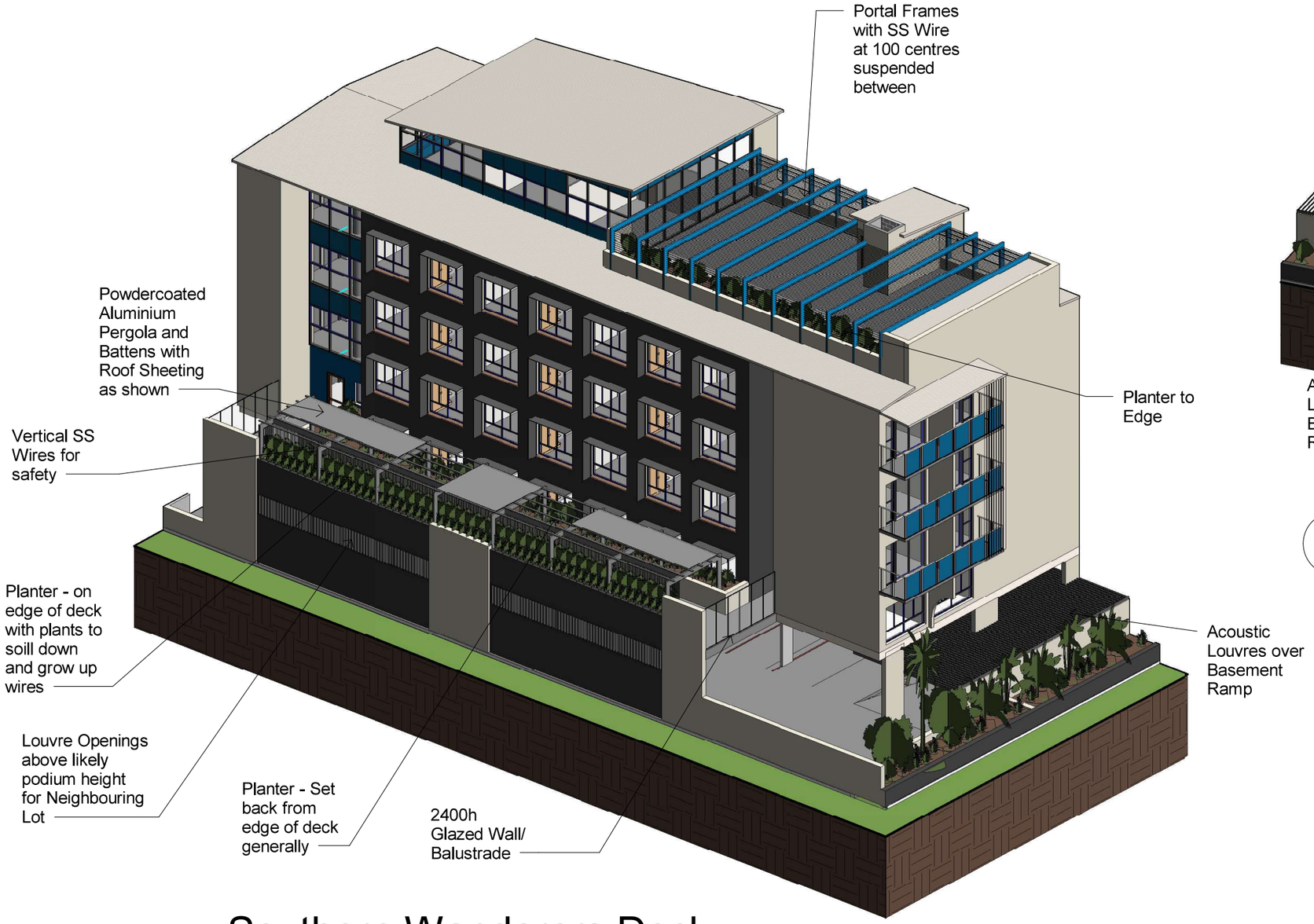
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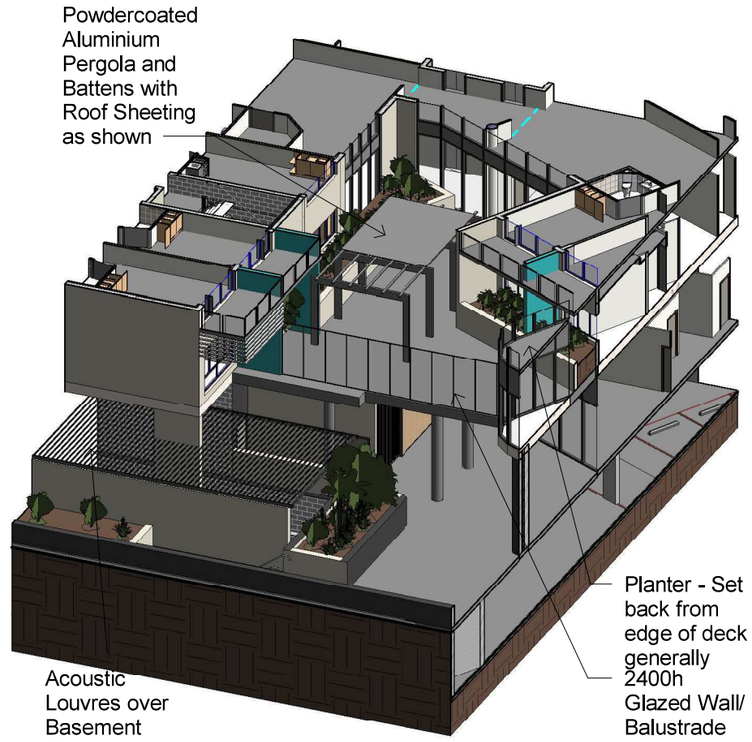
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Drawing Title	Drawing Number
Massing Scale @ A3 original	20-08-DA-12

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1 Southern Wanderers Deck and Roof Deck



2 Central Wanderers Deck

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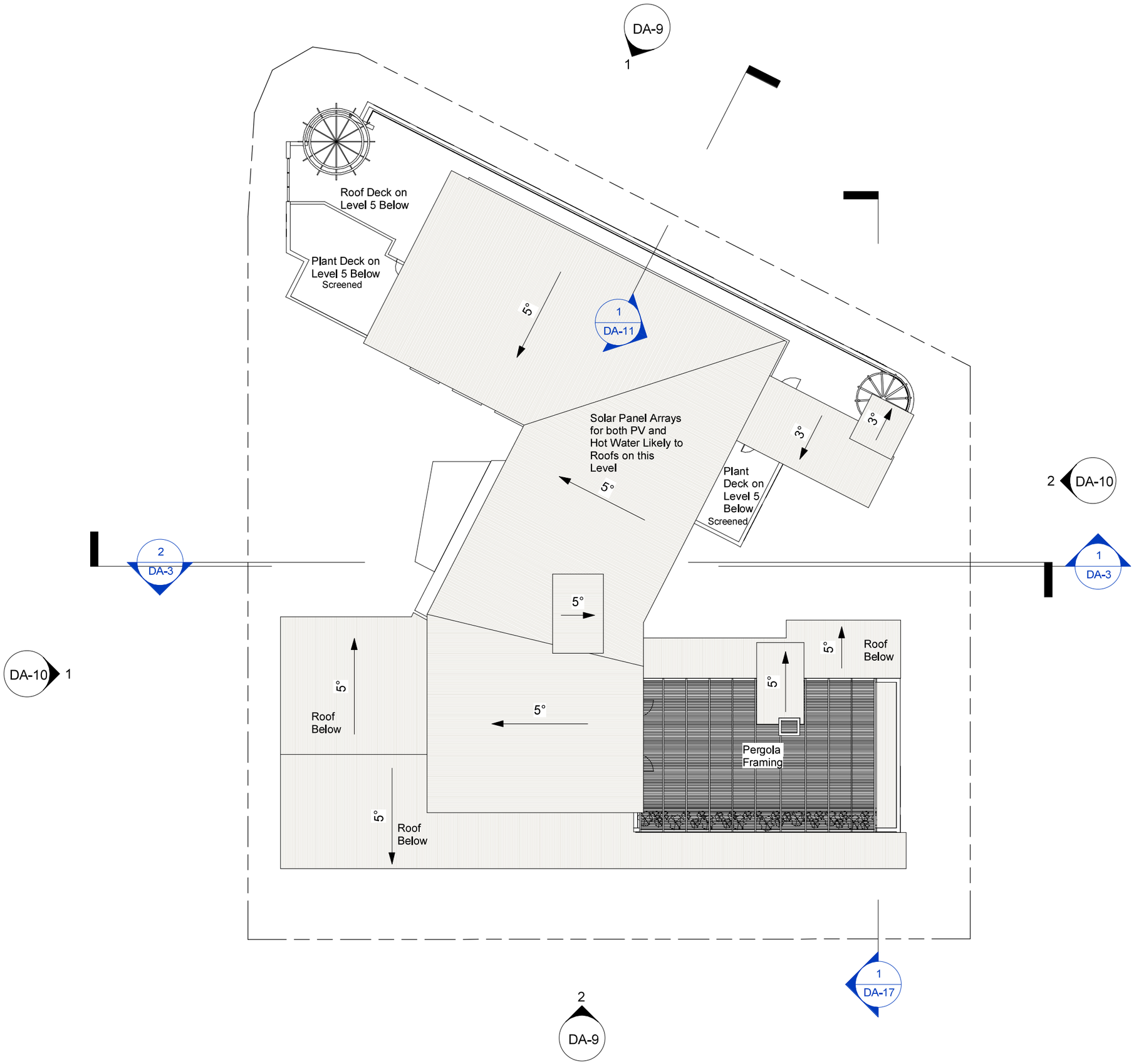
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Lumina Parklands Site

Client
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Issue	Date	Amendment
7	11.08.21	Prelim RFI Responses
6	27.07.21	General RFI Response
5	25.03.21	DA Submission Issue
4	12.03.21	Prelim Issue 3

Drawing Title	Drawing Number
Cover for Podium Decks (Wanderers) Scale @ A3 original	20-08-DA-13

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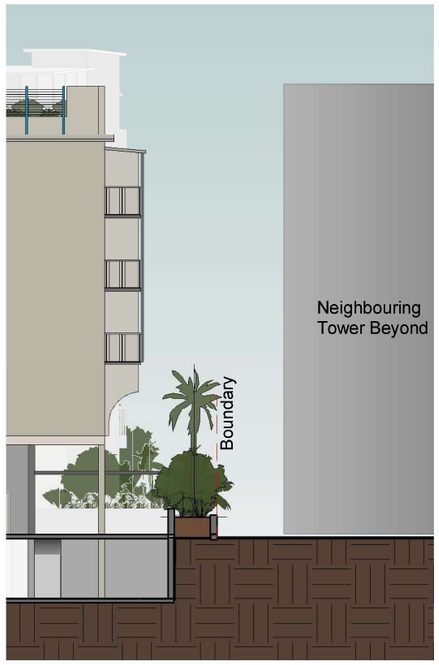
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Drawing Title	Drawing Number
Roof Plan Scale 1 : 300 @ A3 original	20-08-DA-14

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1 SE Section 1

1 : 300



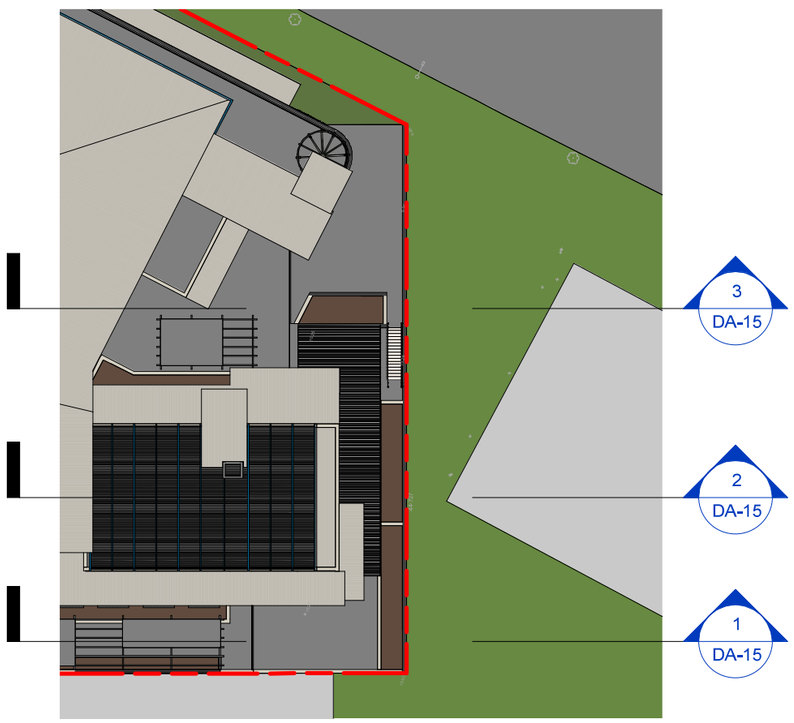
2 SE Section 2

1 : 300



3 SE Section 3

1 : 300



4 SE Boundary Section Key

1 : 500

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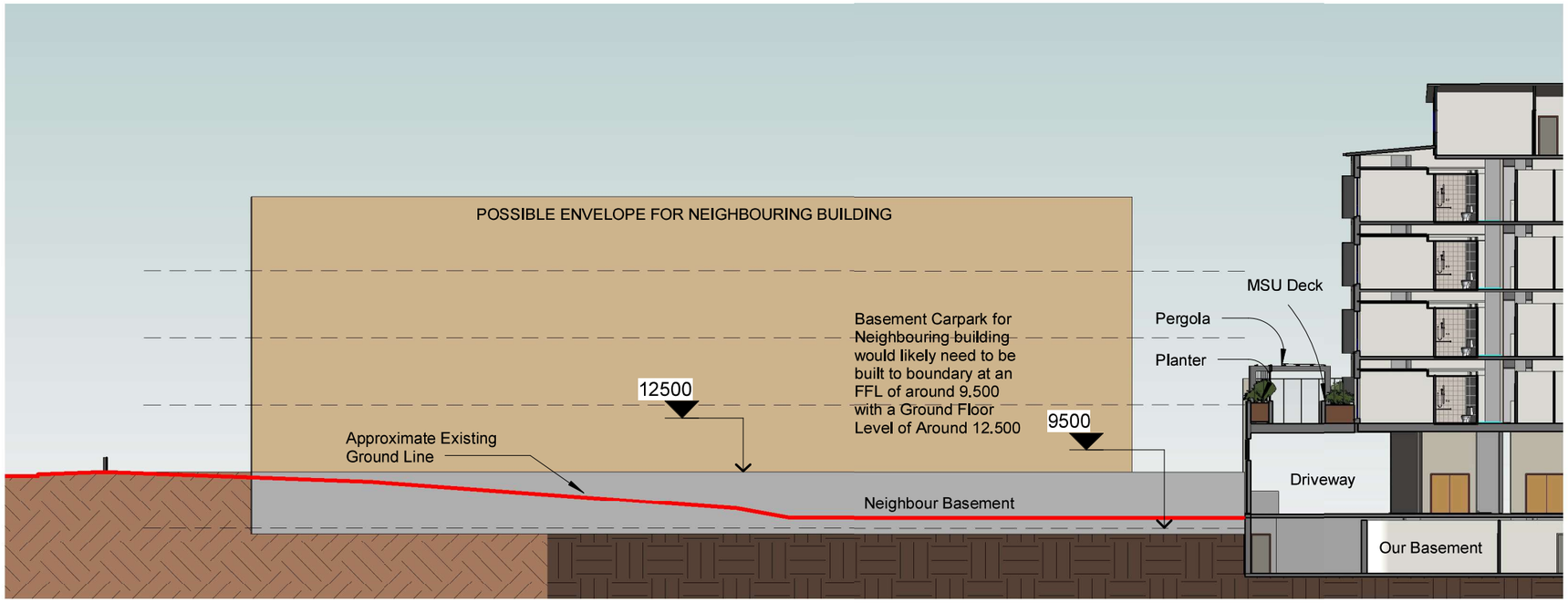
Project
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Client
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Issue	Date	Amendment
7	11.08.21	Prelim RFI Responses
6	27.07.21	General RFI Response

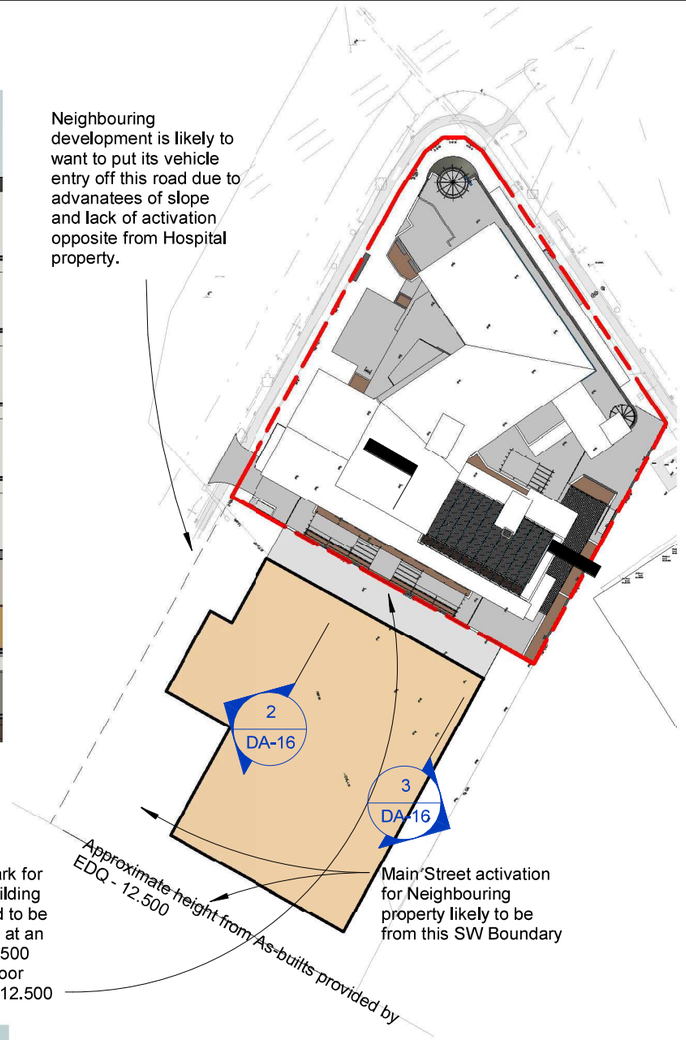
Drawing Title	Drawing Number
SE Boundary Sections Scale As indicated @ A3 original	20-08-DA-15

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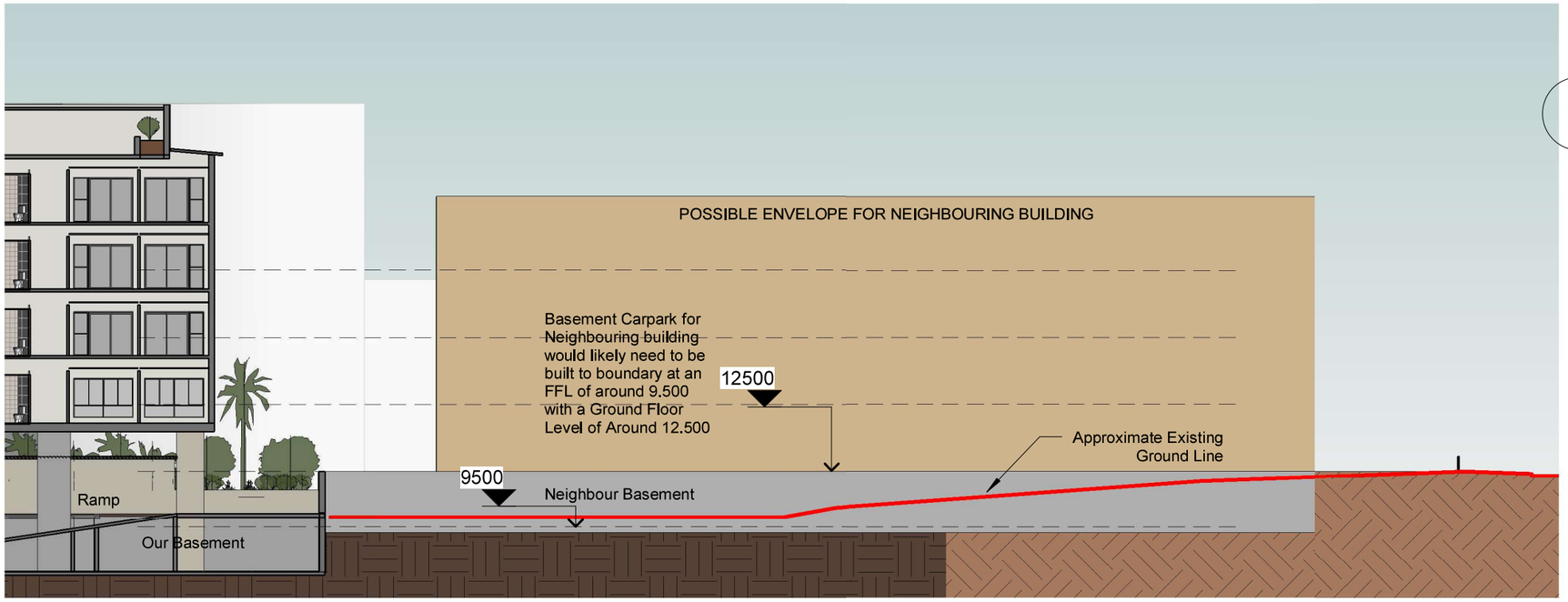
2 SW Boundary Section 1

1 : 300



1 SW Neighbour Development Potential

1 : 1000



3 SW Boundary Section 2

1 : 300

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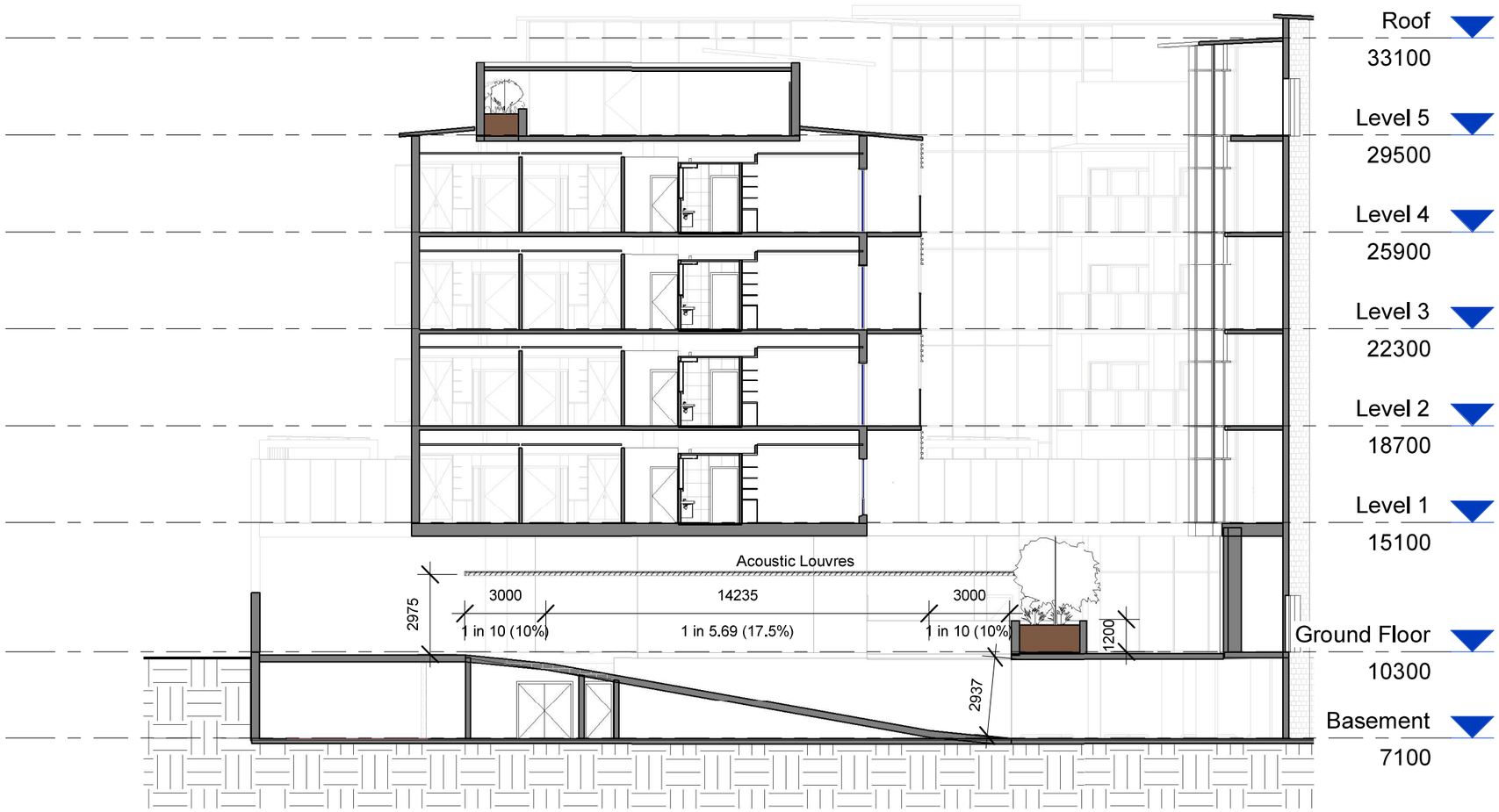
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7	11.08.21	Prelim RFI Responses
6	27.07.21	General RFI Response

Drawing Title	Drawing Number
SW Boundary - Sections and Potential Neighbour Scale As indicated @ A3	20-08-DA-16

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Carpark Ramp Section Scale 1 : 200 @ A3 original	20-08-DA-17

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7	11.08.21	Prelim RFI Responses

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Photo Montage 1 Scale @ A3 original	20-08-DA-18

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Issue	Date	Amendment
7	11.08.21	Prelim RFI Responses

Drawing Title	Drawing Number
Photo Montage 2 Scale @ A3 original	20-08-DA-19

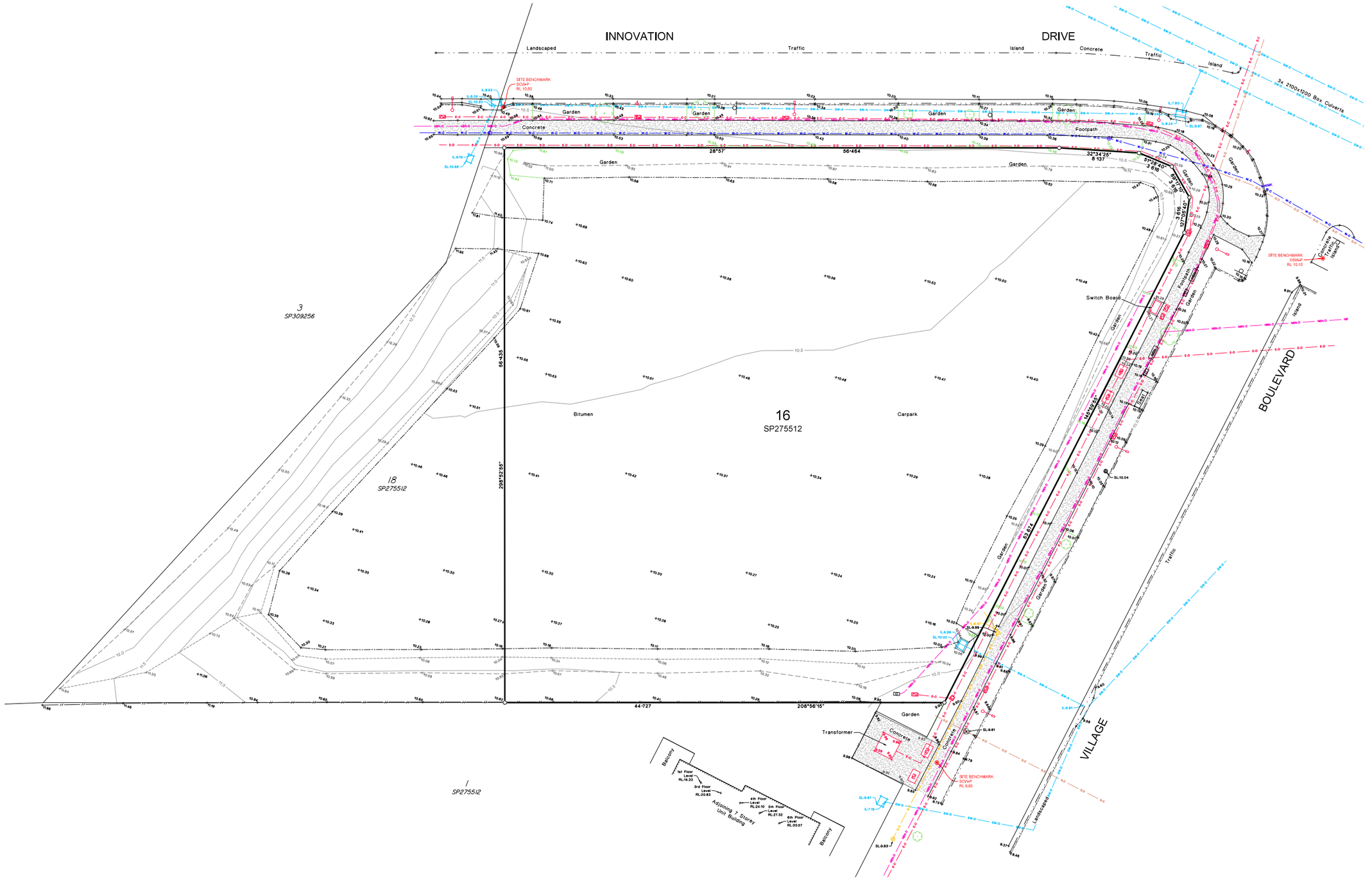
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Attachment 2
Detailed Survey



Client

Infin8care

Project

Detail Survey of 48 Village Boulevard, Southport

Described as Lot 16 on SP275512

Scale: 1:200 at A1

Datum: AHD vide PSM6869 — Locality: Southport
RL: 1.954 — LGA: Gold Coast C.C.
Contour Int: 0.5m — Cadfile: TDP-312.DET.01

Issue	Description	Drw	Date	Appd
A	INITIAL ISSUE	SSD	01.03.21	MP

Notes

The title boundaries shown hereon were not marked at the time of survey and have been compiled from previous survey.
Services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

LEGEND

BB	Bottom of bank	
BU	Building	
COMS	Communication Pit	
EBT	Edge of bitumen	
EBX	Electricity Box	
ECM	Electricity cable marker	
ECO	Edge of concrete	
ELP	Light Pole	
EMH	Electricity Pit	
ETG	Electricity transformer	
FHY	Fire Hydrant	
FL	Floor level	
FNX	Fence	
FX	Footpath	
GB	Garden	
GMH	Gas Manhole	
GMK	Gas Marker	
KCL	Kerb lip	
KIN	Kerb invert	
KTB	Kerb top back	
MHU	Manhole Unknown	
NBN	NBN Pit	
SGN	Traffic sign	
SMH	Sewer Manhole	
TB	Top of bank	
TEP	Telstra Pit	

SERVICES NOTE: Services have been compiled from council records and As Constructed drawings supplied by the client.

UNDERGROUND SERVICES - ALPHA CLASSIFICATION AS PER AUSTRALIAN STANDARD AS5488.

Sewer main	S-0
Stormwater drainage	SW-0
Water main	W-0
Telstra service	T-0
NBN service	NBN-0
Gas supply	G-0
Electricity supply	E-0

0 — 6 — 12 m

SCALE 1:200 (A1)

FOCUS ON SURVEYING
w www.focussurvey.com.au
e info@focussurvey.com.au ph 3338 5095
a Suite 6, 214 Waterworks Road, Ashgrove , QLD , 4060

Sheet No.	Surveyed By:	Date Surveyed:
1 of 1	RWB	23.02.2021

Dwg. No. **TDP-312.DET.01** — Issue **A**

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Attachment 3
Cardno Stormwater Advice Email

FW: Lumina - Site 8A - Proposed Filling of Lot 18

Wednesday, 17 March 2021 10:08 AM

From: Sean Colloty <Sean.Colloty@cardno.com.au>
Sent: Tuesday, 23 February 2021 9:59 AM
To: Steve Dolores <Steve.Dolores@dsdti.qld.gov.au>
Subject: RE: Lumina - Site 8A - Proposed Filling of Lot 18

Hi Steve

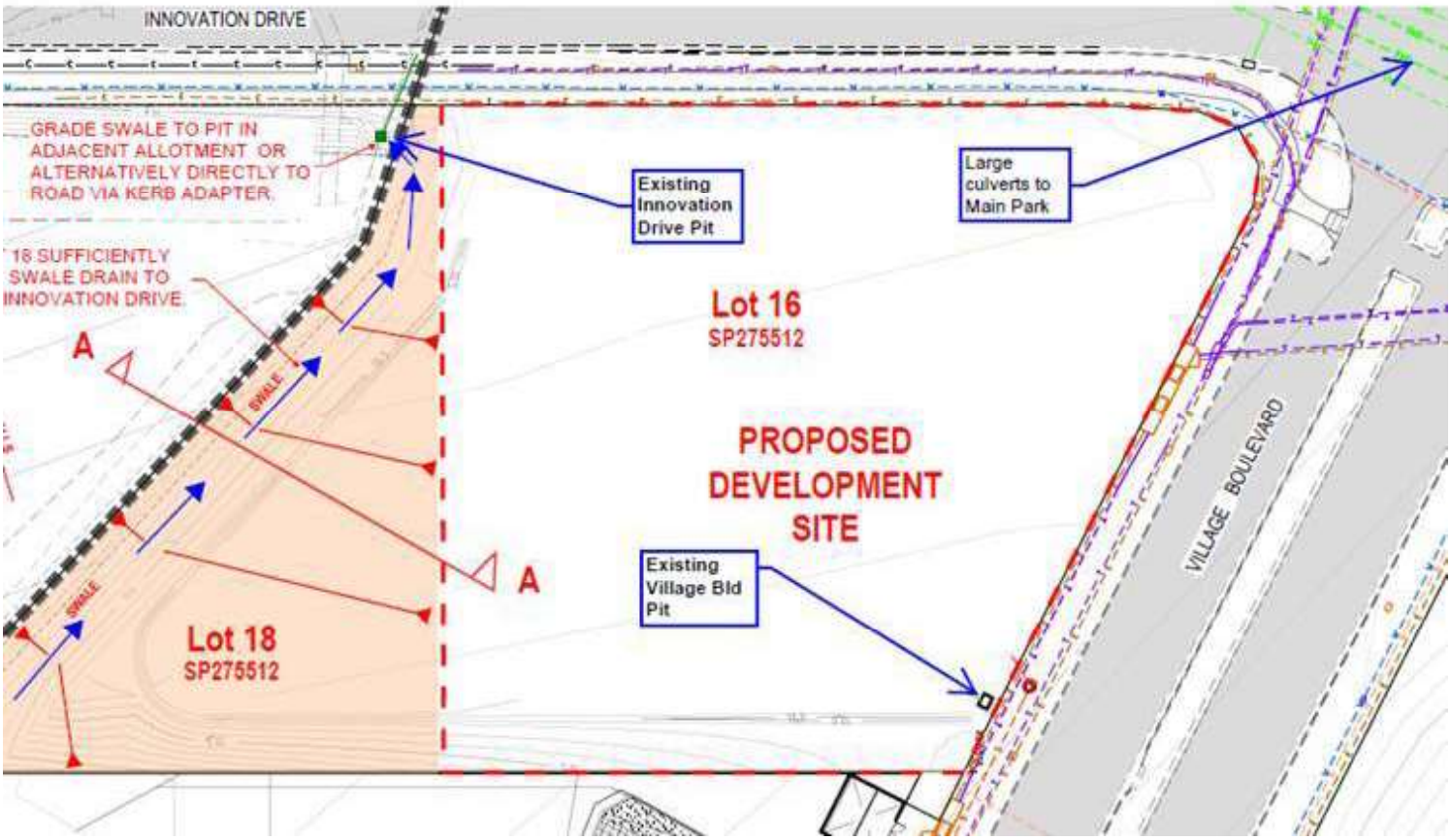
Further to below email and discussion on Friday, we can confirm that diverting part of the catchment on Site 8A (Lot 16) from the Village Bld drainage pit, to the existing pit located along Innovation Drive will have no impact on the overall drainage system. We also confirm that the Innovation Drive pit and pipe system to the large culverts from the GCUH to the outfall in the Main Park has adequate capacity to accept these flows.

We would recommend that the Innovation Drive pit have a bund placed behind (downstream side) of 150 to ensure surcharge allows ponding depth to be increased by 50mm (should already be depressed by 100mm). This creates head over the open pit to force flow in and maintain capacity. These works can be timed with the swale diversion shown on ADG Sketch.

In summary we have no issue to the proposal indicated on ADG's Sketch provided.

Happy to discuss further as required.

Regards
Sean



Sean Colloty
SENIOR PROJECT MANAGER
CARDNO

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Email sean.colloty@cardno.com.au Web www.cardno.com
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From: Steve Dolores <Steve.Dolores@dsdti.qld.gov.au>
Sent: Friday, 19 February 2021 9:39 AM
To: Sean Colloty <Sean.Colloty@cardno.com.au>
Subject: FW: Lumina - Site 8A - Proposed Filling of Lot 18

Hi Sean,

Can you please call to discuss when you have a moment?

Kind Regards,

Steve Dolores
Senior Development Manager
Economic Development Queensland
Department of State Development, Tourism and Innovation

P 07 3452 7174 **M** 0409 425 456
Level 14, 1 William Street, Brisbane QLD 4000
GPO Box 2202, Brisbane QLD 4001
https://www.dsdti.qld.gov.au/
https://www.luminagoldcoast.com.au/
https://www.cohortspace.com.au/

Unite & Recover

Queensland Government

I acknowledge the traditional custodians of the lands and waters of Queensland. I offer my respect to elders past, present and emerging as we work towards a just, equitable and reconciled Australia.

From: Peter Burke <peter.burke@infin8care.com.au>
Sent: Thursday, 18 February 2021 8:41 PM
To: David Saul <dsaul@adgce.com>; Steve Dolores <Steve.Dolores@dsdti.qld.gov.au>
Cc: Michael Hemmings <michael.hemmings@gjgarchitects.com.au>; Justin Smith <justin@infin8care.com.au>; Steve Morton <smorton@zoneplanning.com.au>; Josh Frew <jfrew@adgce.com>

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Subject: RE: Lumina - Site 8A - Proposed Filling of Lot 18

Hi Gents,

Sorry I missed today's discussion.

The legal point of discharge for Lot 18 would be to the kerb and channel in Innovation Drive not via overland flow across Lot 16 in the absence of a registered drainage easement as I'm sure Steve and EDQ would readily agree.

The current shaping of the carpark which includes lots 16 and 18 look to have been shaped for the purpose of the temporary use as a carpark during the Comm Games.

The proposed filling over lot is like to be temporary as in all likelihood lot 18 may also have a future basement.

Presumably EDQ will assist with the attainment of the necessary consent of the owner of lot 18 which I understand might be Qld Health?

Regards

Peter

Peter Burke
Project Manager
07 5667 0800 | peter.burke@infin8care.com.au
1800 INF IN8 | infin8care.com.au
Mobile: 0408 752765









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From: David Saul <dsaul@adgce.com>
Sent: Thursday, February 18, 2021 5:50 PM
To: Steve.Dolores@dsdti.qld.gov.au
Cc: Michael Hemmings <michael.hemmings@gjgarchitects.com.au>; Justin Smith <justin@infin8care.com.au>; Peter

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Burke <peter.burke@infin8care.com.au>; Steve Morton <smorton@zoneplanning.com.au>; Josh Frew <jfrew@adgce.com>
Subject: Lumina - Site 8A - Proposed Filling of Lot 18

Hi Steve

Thanks for your time earlier today. As promised, please see attached sketch of proposed filling to adjacent lot 18.

Regards

David Saul

Civil Project Lead

ADG Engineers (Aust) Pty Ltd

T: 1300 657 402 **D:** 07 5552 4702 **M:** 0411 340 341

E: dsaul@adgce.com

A: Suite 201/Level 1, 1 Short Street Southport QLD 4215

P: PO Box 208 Southport QLD 4215

W: https://www.adgce.com/

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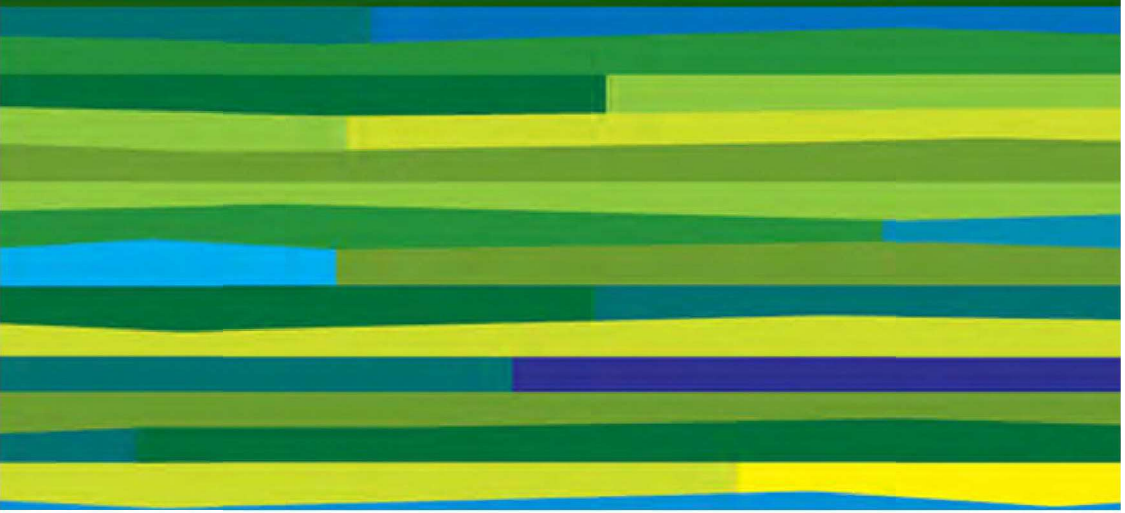
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Attachment 4
DesignFlow Stormwater Masterplan – Parkwood PDA

GOLD COAST PARKLANDS REDEVELOPMENT (COMMONWEALTH GAMES VILLAGE) STORMWATER MANAGEMENT PLAN

DesignFlow
Department of State Development, Infrastructure and Planning
August 2013



Document Control Sheet

Report Title:	Gold Coast Parklands Redevelopment Stormwater Management Plan
Suggested Reference:	Gold Coast Parklands Redevelopment Stormwater Management Plan (DesignFlow, 2013)
Version:	Final 02
Client:	Department of State Development, Infrastructure and Planning
Author(s):	Shaun Leinster, Andrew Cook
Reviewed By:	Shaun Leinster
Approved By:	Shaun Leinster
Date:	21/08/2013
File Location:	S:\Projects\4209 GC Parklands Early Works
Circulation:	Electronic Copies:
	Printed Copies:

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Acronyms + Glossary

AHD	Australian height datum
ARI	Annual recurrence interval – a term used to describe the statistical probability of a flood occurring (i.e. one every 100 years).
Attenuation	In the context of flooding, this means to slow and delay flood flows such that the maximum flow rate is reduced.
Bioretention	A depressed vegetated system that accepts stormwater and filters it through a sandy soil mix.
Bund	Raised earth that holds water permanently or temporarily.
DSDIP	Department of State Development, Infrastructure and Planning
GCCC	Gold Coast City Council
GCHKP	Gold Coast Knowledge and Health Precinct
ha	Hectare
NWL	Normal water level
RL	Relative level – describes the elevation of the particular item in meters above Australian Height Datum
SPP	State Planning Policy – State Government policy.

1 INTRODUCTION

Since the mid 2000's, the Parklands site (29.4 ha) has been identified as a key redevelopment site within the emerging Gold Coast Health and Knowledge Precinct (GCHKP). The GCHKP is approximately 200 hectares in area and is shown in Figure 1. The GCHKP includes the Gold Coast Campus of Griffith University and the recently constructed Gold Coast University Hospital.

The Queensland Government intends to fully redevelop the Parklands component of the GCHKP into a knowledge-based business and a transit-oriented community. Furthermore, in August 2009, Parklands was selected as the preferred location for an Athletes Games Village (Games Village) in Queensland's bid to host the Gold Coast 2018 Commonwealth Games. On 11 November 2011, it was announced that the Gold Coast would host the 2018 Commonwealth Games and the Parklands would be the site of the Games Village. It is proposed that the Parklands will ultimately be developed into the following:

- 1.6 ha of buildings delivered by the Games Village
- 8.7 ha of health and knowledge industries
- 5.6 ha of residential
- 6.9 ha of open space
- 6.6 ha of road

The land use split listed above is conceptual at this stage and subject to refinement over the design development of the site. The stormwater management strategy presented in this report allows for changes in land use as part of future design.

The central 6.9 ha public open space is a prominent feature in the plans for the site. Located within the existing harness track the public open space will provide the primary recreation space for the Parklands as well as playing key roles stormwater and flood management.

In 2012, the Major Projects Office within Department of State Development, Infrastructure and Planning (DSDIP) prepared a Business Case and implementation strategies for the full redevelopment of Parklands. As part of this work, DesignFlow established a conceptual stormwater management strategy for the Parklands site which included drainage design, stormwater quality management, feature lake, flood management and parkland integration. The findings of this work are presented in the following:

- *Gold Coast Parklands Redevelopment Business Case – Water Sensitive Urban Design Technical Report* (DesignFlow, July 2012)
- *Gold Coast Parklands Redevelopment Business Case Phase 3 – Open Space, WSUD and Public Realm Planning Concept* (Lat27, DesignFlow July 2012)
- *Gold Coast Health and Knowledge Precinct – Preliminary Flooding Assessment* (Final Revision 3, SKM May 2012)

Since the release of the Business Case investigations, DSDIP have commenced the design of the early works associated with the Parklands. This has involved the design of the earthworks across the site, the major roads and the central public open space which includes the stormwater management infrastructure. Importantly, as part of the early works the design of the central public open space has changed as a result of direction from DSDIP and Council. The primary focus of the central open space is to increase the active open space areas (i.e. playing field opportunity) through the removal of the lake and reduction in the size of the stormwater management infrastructure (i.e. adoption of bioretention systems rather than wetlands and allowing flooding onto active open space).

This document presents the new stormwater strategy in the form of a Stormwater Management Plan. The document describes the stormwater management objectives for the site, presents the stormwater management initiatives and summarises the performance assessment undertaken to meet the objectives. The *Gold Coast Parklands—Early Works & Trunk Infrastructure Flooding and Hydraulics Report* (Hyder, 2013) must be read with this Stormwater Management Plan as it provides the flood modelling for the site.

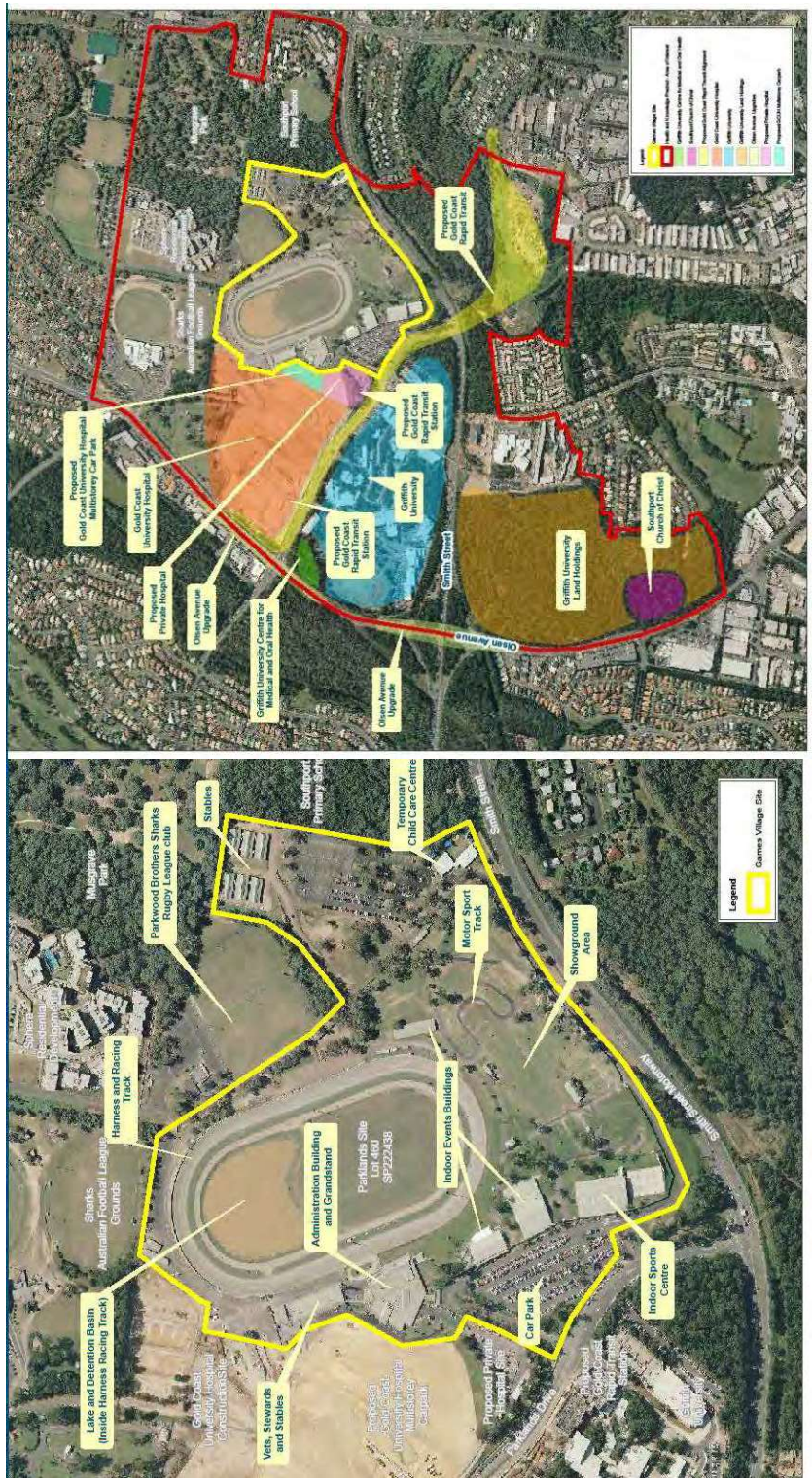


Figure 1– Gold Coast Health and Knowledge Precinct & Parklands Site

Date: 10/07/13
Scale: NTS

Project: Parklands

Associated consultants: DesignFlow

Queensland Government
Department of Infrastructure and Planning

2 THE SITE

2.1 TOPOGRAPHY

The site has rolling topography with gentle grade between 1% and 6% (refer Figure 2). The high point of the site is the entry to the car park from Parklands Drive (RL 24.5). The site slopes to the east around the southern side of the harness racing track, meeting up with the channel from the south-west corner (RL 12.5). The ground slopes down to the drain which runs along the east side of the harness racing track (RL 4.5). At the eastern boundary (RL 15), the site slopes down to the west to meet this drain at approximately RL 8.

The high side of the harness racing track is approximately RL 9.5 to 10, with internal ground levels at RL 8.5 to RL 9.0. The internal ground slopes to the north towards the existing lake (normal water level RL 7.3).

2.2 PARKLANDS STORMWATER

2.2.1 Regional Catchments

Broadly there are six sub-catchments across the GCHKP and Parklands site as illustrated in Figure 3. We have divided these into Western (B-D), Eastern (A & E) and the Harness Racing track (F).

Catchment A drains to the north east under the Smith Street Motorway to Catchment E which in turn drains to the north along the eastern side of the Harness Racing Track. Catchments B & C drain to the north through the hospital site (D) and into the Lake at the northern end of the Harness racing track (refer Section 2.2.1). Catchment F discharges to the existing channel to the east.

All stormwater ultimately drains to the upper reaches of Biggera Creek which for the most part is an unlined freshwater stream which transitions to a small tidal creek. Ultimately all runoff from the site discharges to the Broadwater. Waterway stability objectives should apply to Biggera Creek to limit scour but given the poor ecological condition of this waterway frequent flow objectives should not apply. However, the high environmental values associated with the Broadwater will require that water quality will need to be carefully managed during construction and operational phases of the development.

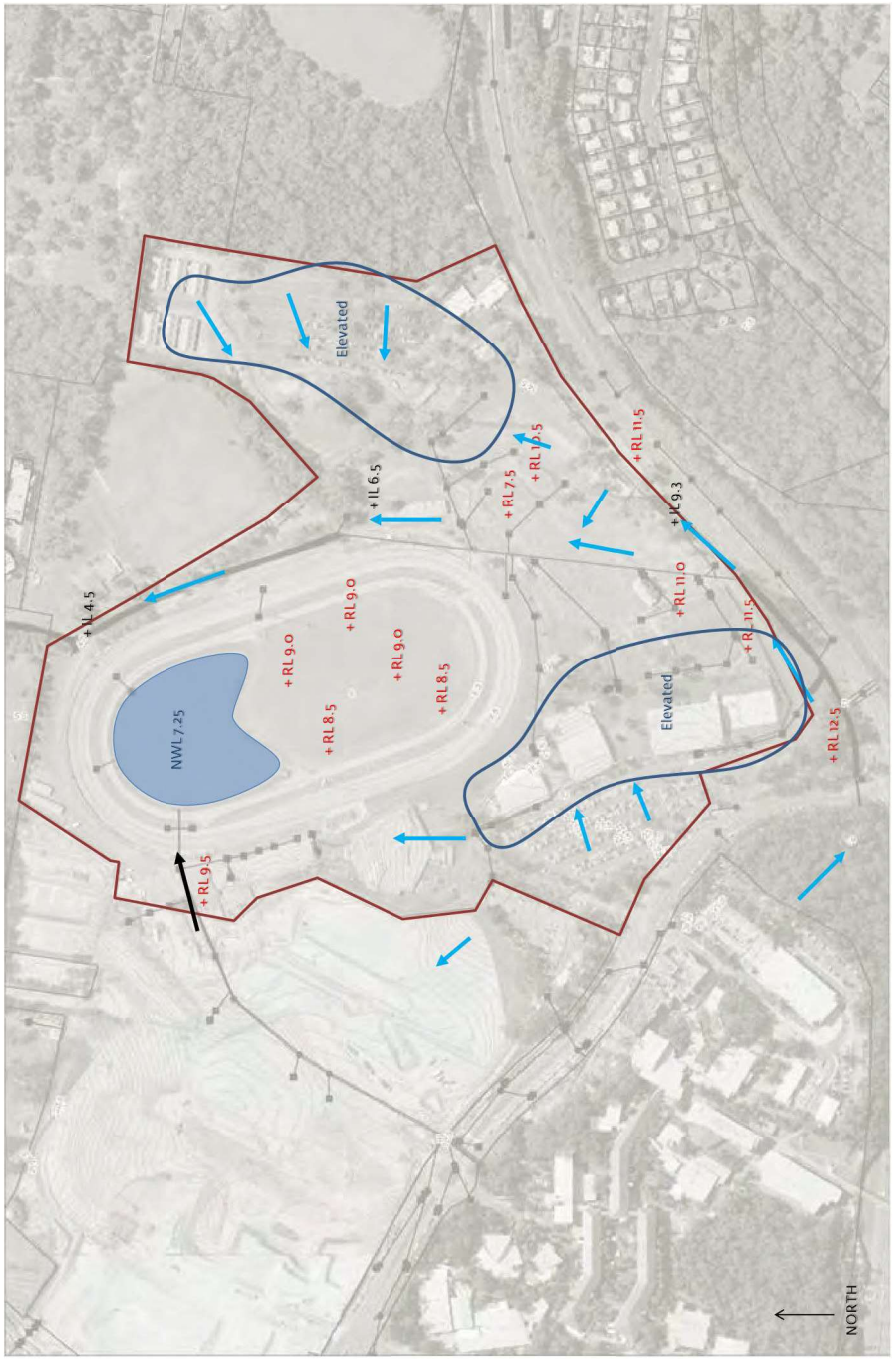


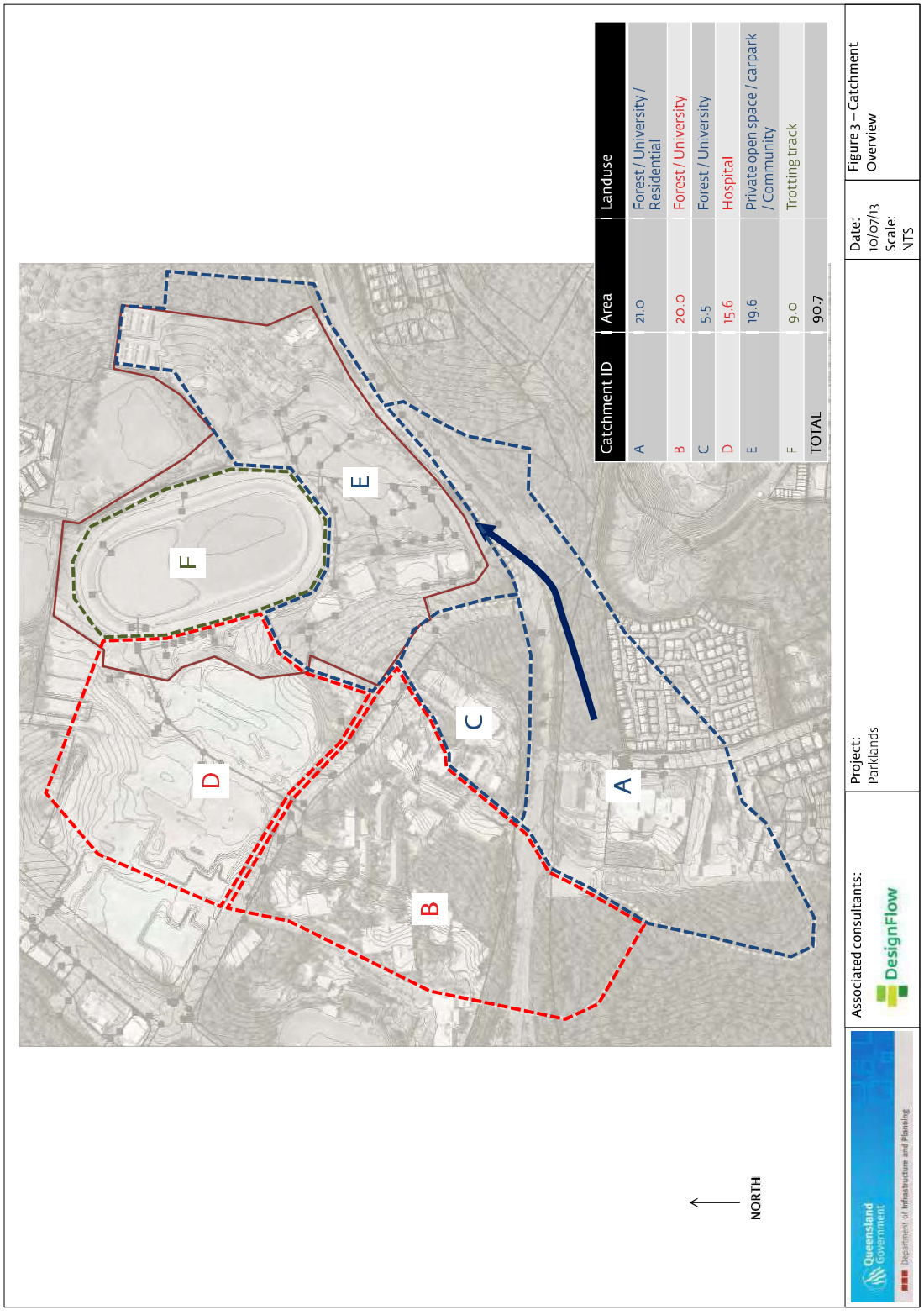
Figure 2 – Topography

Date: 10/07/13
Scale: NTS

Project: Parklands

Associated consultants: DesignFlow

Queensland Government
Department of Infrastructure and Planning



2.2.2 Parklands catchments and drainage

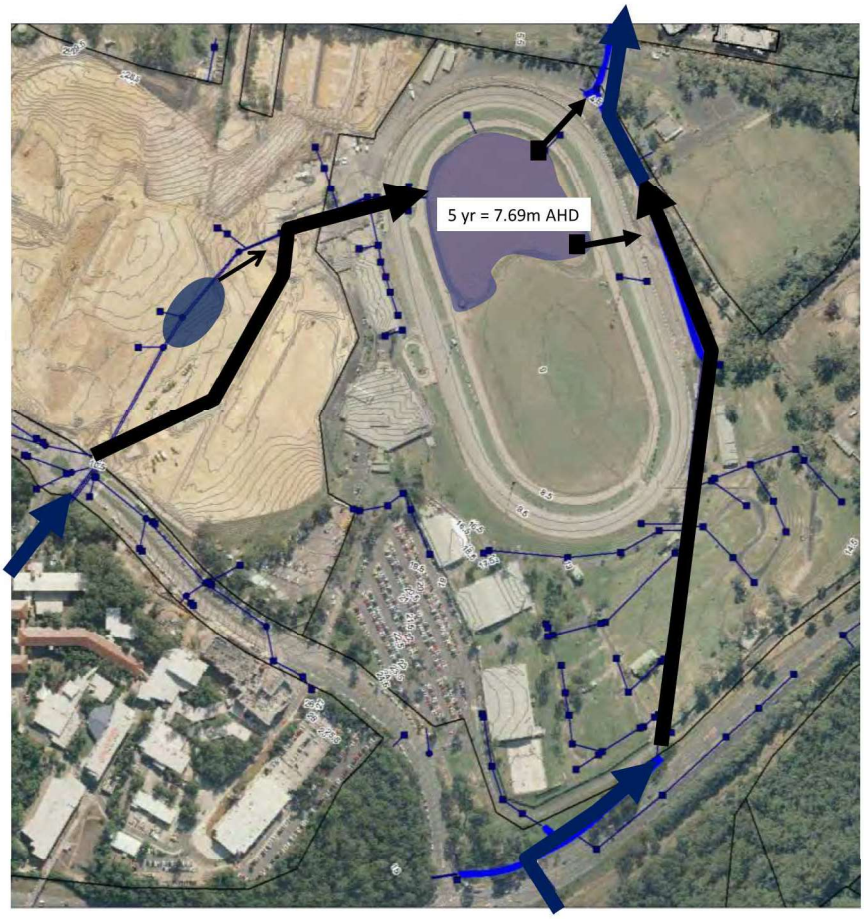
The existing drainage through the Parklands site is split into two parts.

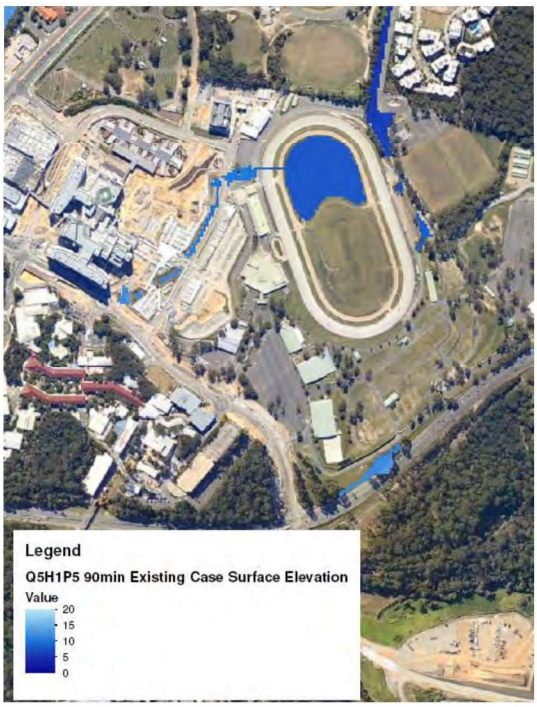
1. The main Parklands catchment (Catchment E) and the external catchments (Catchments A and C) currently drain via a network of underground pipes, culverts and overland flow paths to the eastern side of the harness track. The main features of the drain system are listed below:
   - 2400 mm x 1500 mm box culvert which conveys up to 100 year ARI flows from Smith Street to the eastern side of the harness track.
   - Stormwater then enters a series of different culvert systems and open channels along the eastern side of the track.
   - At the northern end of this drainage path, filling for the harness track has created a 'constrained' area between the embankment for the harness track and the boundary of the site. This causes flooding onto the Sharks Rugby League oval during 5 year ARI events and larger.
2. Catchment F is the harness track and this accepts runoff from the University and Hospital site as well (Catchments B and D). The lake and low area within the harness track provide flood storage up to 7.9m AHD for these catchments.

In terms of drainage and flood management the following applies under existing conditions:

- During small flood events (1yr ARI), the underground system described above conveys stormwater without any significant overland flow or flooding.
- During minor storm events (5yr ARI), the underground system described above conveys stormwater with some overland flow and flooding (Figure 4).
- During major storm events (100yr ARI), there is overland flow and flooding in many locations (Figure 5). Importantly:
  - The majority of the flow in the southern part of the site (Catchment E) occurs within the large box culverts. The overland flow is simply local catchment flows accumulating on the surface that cannot physically enter the field inlet pits rather than the pipe flows surcharging to surface.
  - All of the flow from Catchments A, C and E flow to the east of the harness track resulting in flooding to the adjacent football fields to the east.
  - The flood storage located within the harness track attenuates flood flows from the hospital site and harness track only (Catchments B, D and F). The bypassing of Catchments A, C and E means the harness track flood storage is under-utilised.

Please refer to Appendix A and *Gold Coast Parklands—Early Works & Trunk Infrastructure Flooding and Hydraulics Report* (Hyder, 2013) for further description of the existing flood behaviour across the Parklands site. Note that as part of this investigation, some deficiencies were identified in the previous Council and Sinclair Knight Merz modelling. This was resolved and improved as part of this investigation in collaboration with Hyder.





LEGEND

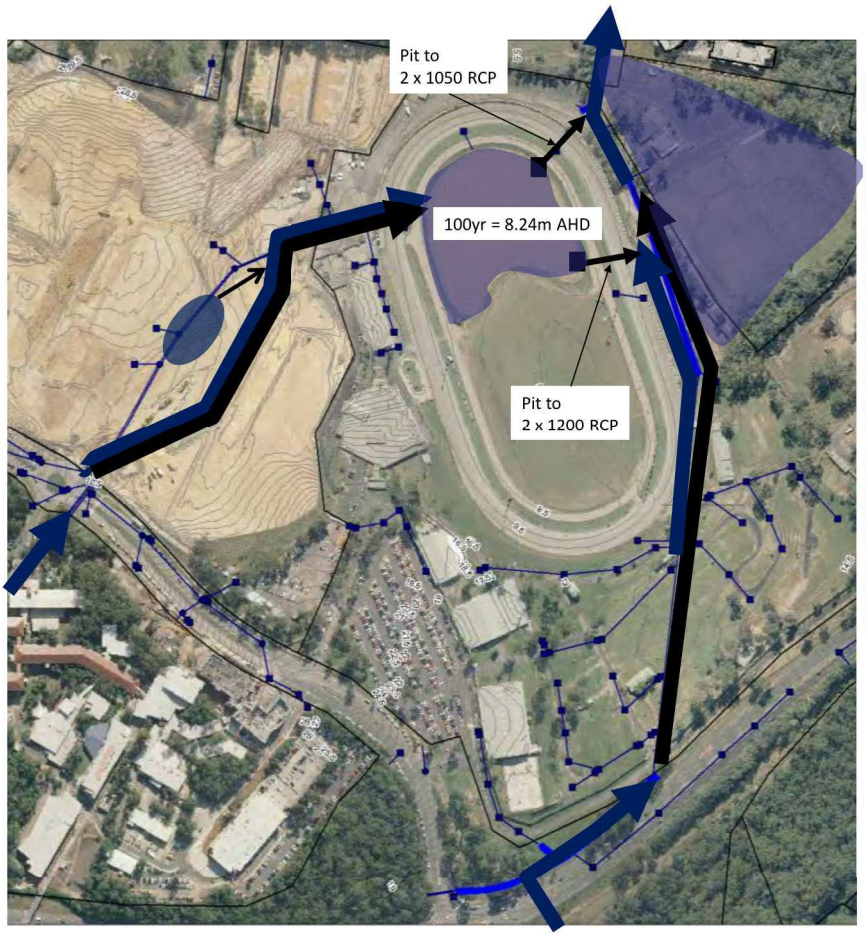
Flood Detention

Pipe Flows

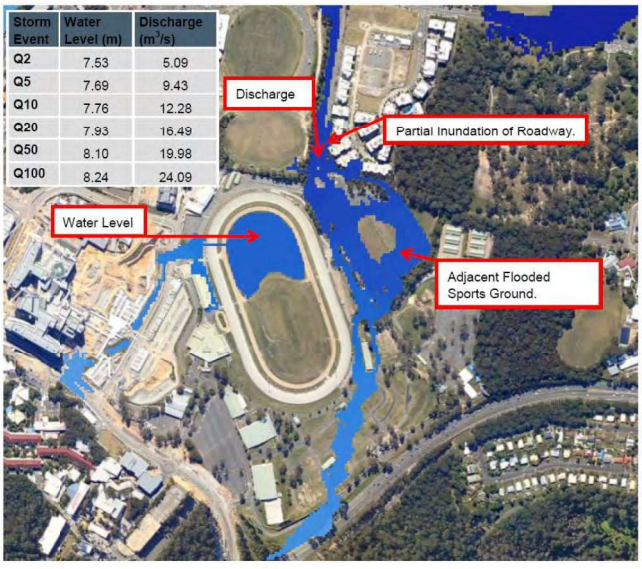
Overland Flows

NORTH

Queensland Government, Department of Infrastructure and Planning	Associated consultants: DesignFlow	Project: Parklands	Date: 21/08/13 Scale: NTS	Figure 4– Existing Minor Storm Flooding



Storm Event	Water Level (m)	Discharge (m^3/s)
Q2	7.53	5.09
Q5	7.69	9.43
Q10	7.76	12.28
Q20	7.93	16.49
Q50	8.10	19.98
Q100	8.24	24.09



LEGEND

Flood Detention

Pipe Flows

Overland Flows

NORTH

Queensland Government, Department of Infrastructure and Planning	Associated consultants: DesignFlow	Project: Parklands	Date: 21/08/13 Scale: NTS	Figure 5 – Existing Major Storm Flooding

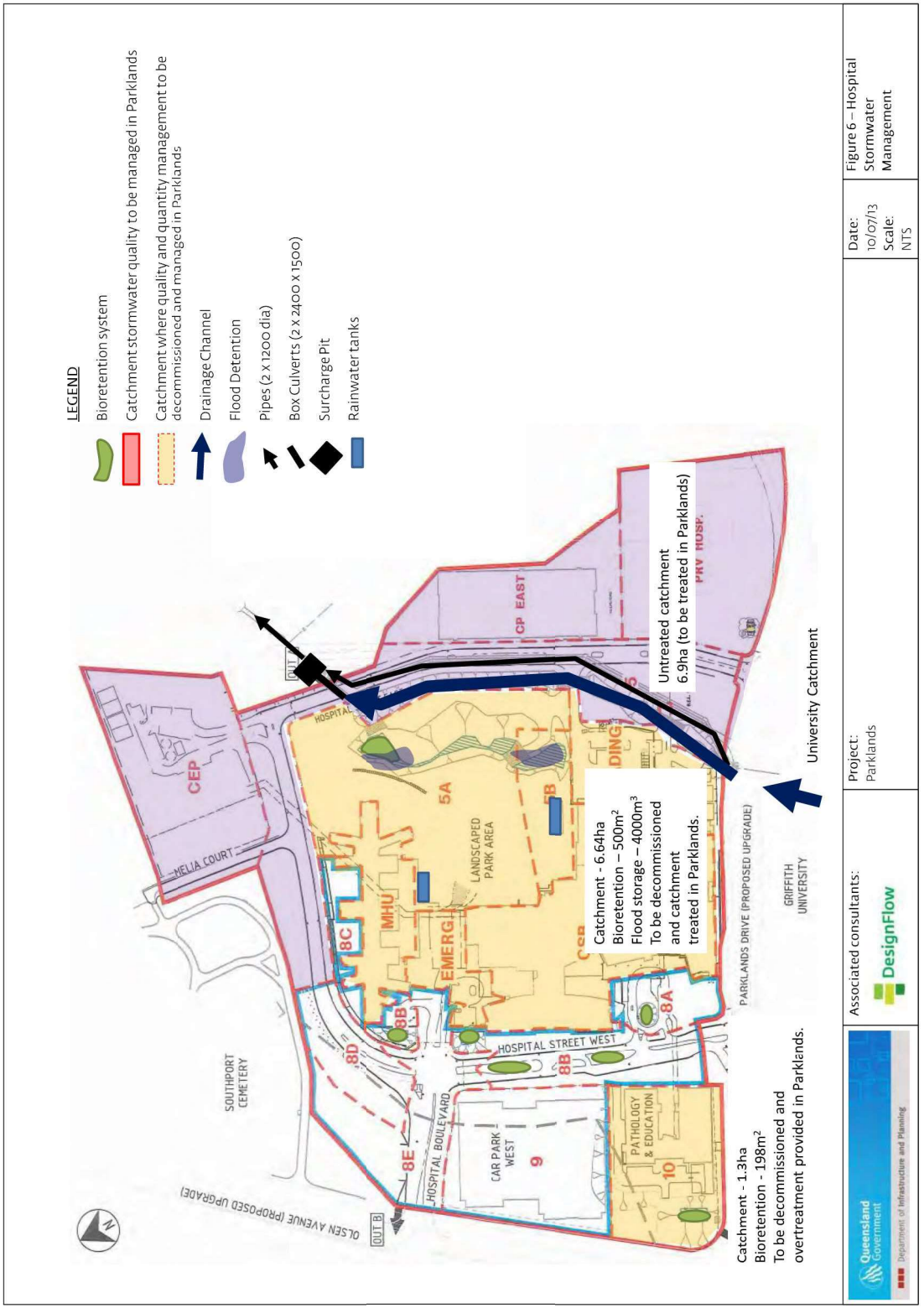
2.3 HOSPITAL STORMWATER MANAGEMENT

As part of the Hospital development, a stormwater management strategy was resolved which involves (refer Figure 6):

- Creation of a large open channel which conveys stormwater from Griffith University, the Hospital site and related catchments through to the Parklands lake system.
- Attenuation of flood flows within the Hospital site to ensure peak flood flows entering the Parklands site do not increase. This has required the creation of ~4,000m^3 of flood storage.
- Tanks, bioretention (500m^2) and flood storage to manage runoff from the main Hospital site.
- Tanks and gross pollutant traps for the remaining catchment (private hospital and health precinct) which provide only partial treatment of stormwater.

Even though the bioretention systems within the Hospital site have been over-sized, the lack of stormwater treatment in the remainder of the catchment means that the strategy does not achieve the required stormwater quality objectives (refer Section 3). Therefore, as part of the Hospital approval it was agreed with Council that additional treatment would be provided in the Parklands site to ensure the objectives are achieved prior to flows exiting Parklands.

As outlined later in this report, the stormwater management strategy for the Parklands site will capture and manage all stormwater (quality and flooding) to ensure the objectives from the Hospital site and Parklands are managed. This will allow the stormwater management systems within the Hospital site (bioretention systems and flood storage) to be decommissioned in the future and allow the Hospital site to expand.

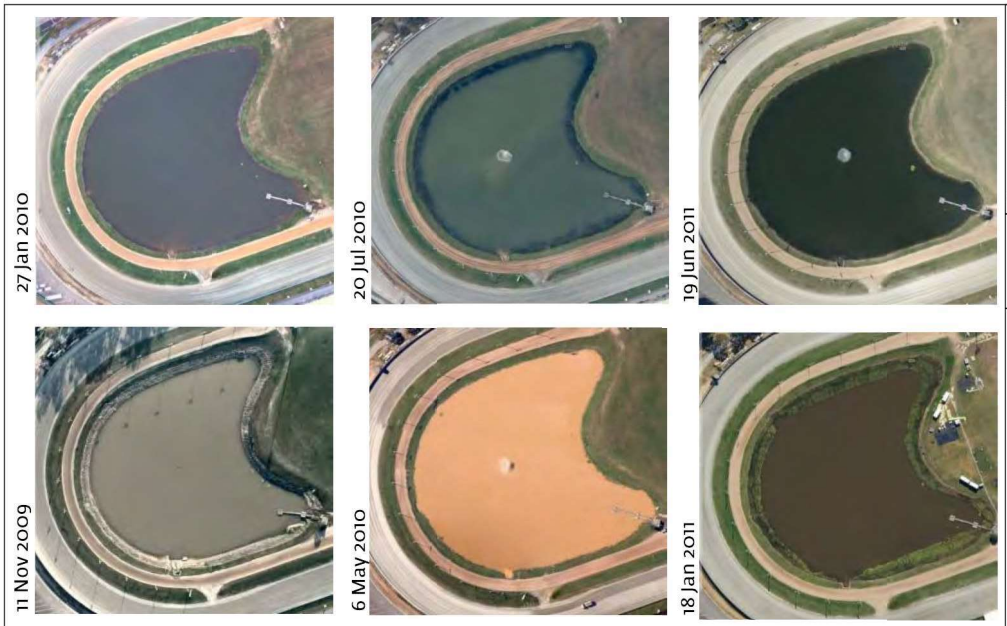


2.4 LAKE

A large lake exists within the harness racing track at the northern end. Features of the lake include:

- 1.5 ha surface area
- normal water level at 7.3 m AHD
- 4m depth
- stormwater flows into the lake via two 1200 mm diameter pipes from University and Hospital catchments (i.e. B and D)
- during flood events the lake provides flood attenuation
- lake water used for track watering
- 1 – 1.5 m variation in water level during dry periods due to track watering and evapotranspiration (according to the harness racing club the lake experiences)
- an aerator / fountain in the middle of lake which has presumably been placed to reduce stratification and manage water quality problems and algal blooms.

Review of air photos (Figure 7) for the site indicates the lake undergoes large changes in water quality through the climatic seasons. Importantly the lake appears to be subject to algal blooms and floating weed growth which is an indication of poor lake health. Discussion with DSDIP and Council as part of the early works design confirmed there is little desire within government to retain the lake. Therefore, the parkland design will not keep the lake but rather fill it in to create other open space function.



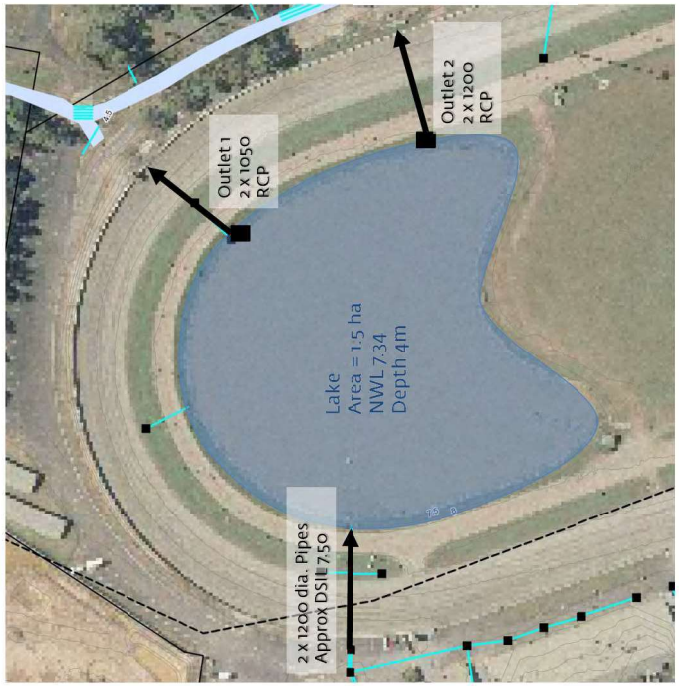


Figure 7 – Parklands
Lake Air Photo History

Date: 10/07/13
Scale: NTS

Project: Parklands

Associated consultants: DesignFlow

Queensland Government
Department of Infrastructure and Planning

2.5 LANDSCAPE/PARKLAND FUNCTION

Contextually the Parklands is set at the centre of a cluster of open space and recreation assets for the City. The key issue for this public resource is the lack of inter-connectivity due in some part to the study area's existing fenced perimeter.

Adjoining open space and recreation facilities within 1km of the study area includes:

- Griffith University Campus (Sports and campus facilities)
- Parkwood Heights Scout Group and associated Biggera Creek corridor bushland to the west across Olsen Avenue
- Southport Sharks AFL, Rugby League and Touch Football clubs immediately to the north
- Keith Hunt Park north of Musgrave Avenue including Labrador Hockey Club and links to Biggera Creek corridor bushland
- Musgrave Park directly to the north east of the study area containing a range of passive recreation opportunities
- remnant bushland to the south across the Smith Street Motorway that is a valued local resource for walking and cycling and part of the Loder Creek corridor bushland.

Pedestrian and cycle access in-between these facilities will remain an ongoing Council priority to maximise community value and awareness.

A specific problem with the current site is the lack of access into the site from Musgrave Avenue to the north. The current Sharks Lane access and the associated Rugby League ovals are prone to flooding meaning safe access is not available. In this regard, Council and DSDIP wanted the stormwater management strategy for the Parklands to reduce flooding in these areas to create a viable flood free access along Sharks Lane.

2.5.1 Vegetation

The study area is largely cleared for its primary function as a harness racing track with clear views required across the entire track area. Where trees do exist they are typically following perimeter and internal fence lines. Refer to *Gold Coast Parklands—Early Works & Trunk Infrastructure Flooding and Hydraulics Report* (Hyder, 2013) for more details.

3 DESIGN OBJECTIVES

The following stormwater management design objectives have been adopted for the site.

3.1 EROSION AND SEDIMENT CONTROL

The management of stormwater runoff during the construction phase is a critical part of protecting not only the stability and volume of in-situ soils but minimising the potential impact of sediment loads on downstream waterways. A few months of poor quality construction runoff is the equivalent of many years of operational phase stormwater runoff and can have irreparable damage to ecosystems. Construction phase design objectives have been the focus of much attention in the last few years with the release of the *State Planning Policy 4/10 (Healthy Waters)* and the new draft single SPP.

The primary focus of stormwater management during the construction phase is erosion and sediment control. The stormwater management objectives for the construction phase take the form of best-practice concentration-based discharge standards. The performance criteria are limited to those parameters that are directly linked to construction site activities. As the criteria are discharge standards, they apply to runoff events or pumped discharges (during dewatering of siltation basins) from the development site. These objectives will be applied to the study area as listed in Table 1 and will require compliance during construction.

Table 1: Construction phase stormwater discharge criteria

POLLUTANT/ISSUE	STORMWATER DESIGN OBJECTIVES[1]
Coarse sediment	Retain coarse sediment on site
Fine sediment (Total Suspended Solids -TSS)	Reasonable and practical measures should be taken to capture runoff from disturbed areas. Concentrations of TSS in water discharged (either by runoff or dewatering of siltation basins) should be less than 50mg/l.
Turbidity[2]	Turbidity in discharge waters should be <10% higher than receiving water turbidity (measured directly upstream of discharge point).
Nutrients (eg. N and P)	Construction phase nutrient management should occur via appropriate sediment management.
pH	Subject to the mobility of specific elements that may be present on site, pH of waters discharged from site must be between 6.5 and 8.5.
Dissolved oxygen	Dissolved oxygen concentration > 80% saturation.
Litter and gross pollutants	Prevent discharge of litter from site entering stormwater system/internal watercourses by ▪ Minimising litter production ▪ Containing litter on site by the provision and maintenance of rubbish bins with appropriate lids

POLLUTANT/ISSUE	STORMWATER DESIGN OBJECTIVES[1]
Hydrocarbons and other contaminants[3]	Discharge of hydrocarbons and other contaminants should be prevented from site by: ▪ At-source control of contaminants. ▪ Preventing entry of contaminants into stormwater system or internal watercourses. ▪ Disposing of waste must to authorised facilities. ▪ Storing hydrocarbons according to Australian Standard AS1940. ▪ Ensuring that discharged waters have no visible oil or grease sheen
Wash down areas	Prevent entry of wash down water into stormwater system or internal watercourses that discharge from site.
Cations and anions	As required under an approved Acid Sulfate Soil Management Plan, including aluminium, iron and sulphate.
Stormwater Quantity	Take all reasonable and practical measures to minimise changes to the hydrology of the receiving environment. Protection of in stream habitat and flood characteristics by: ▪ managing peak flows for the 1-year and 100-year ARI event ▪ managing run-off volumes entering receiving waters ▪ preventing uncontrolled release of contaminated stormwater.

1 Compliance release limits for rainfall events less than the design storm event – (based on the 80%ile 5 day rainfall depth).
2 Site-specific calibration of turbidity must be performed.
3 Refer to the contaminant list in the *Environmental Protection Regulation 1999*.

3.2 STORMWATER QUALITY OBJECTIVES

The State Planning Policy for Healthy Waters (DERM, 2011) requires the management of stormwater quality in accordance with the Urban Stormwater Quality Planning Guidelines (DERM, 2011). The stormwater quality objectives contained in the policy are the load based objectives presented in Table 2 which are consistent with Council objectives. The stormwater management strategy for Parklands must achieve these objectives.

As outlined in Section 2.3, not all of the stormwater from the Hospital site is managed in accordance with these objectives. Therefore, additional treatment will be required within the Parklands site to ensure both the Parklands and the Hospital site achieve the objectives listed in Table 2.

Table 2: Stormwater quality objectives

Pollutant	Discharge Criteria (% reduction in mean annual load)
Total suspended solids (TSS)	80%
Total phosphorous (TP)	60%
Total nitrogen (TN)	45%
Gross Pollutants (GP)	90%

3.3 WATERWAY STABILITY OBJECTIVE

Given the nature of Biggera Creek downstream of the site, the management of erosion-causing flows is important and required by State Planning Policy for Healthy Waters (DERM, 2011):

> Limit the post-development peak 1 year Average Recurrence Interval (ARI) event discharge within the receiving waterway to the pre-development peak 1-year ARI event discharge.

The Parkland site must achieve this objective by providing appropriate flood storage to preserve the 1 year ARI at the downstream point of the site at current levels.

3.4 FLOODING OBJECTIVES

Flood detention must be provided on the site to ensure there is no increase in the peak flood flows and levels downstream of the site for the 1 – 100 year ARI storm events.

A secondary flood objective for the site is to reduce flood flows where possible to ensure greater immunity to Sharks Lane and Musgrave Avenue downstream of the site.

3.5 PARKLAND OBJECTIVES

In keeping with the projected uses for this site it is critical to ensure the drainage, flood and stormwater management system compliment the urban and landscape design for the Parklands. Given the likely scale of the stormwater related infrastructure careful consideration of placement, form and interaction of active open space zone is required. Furthermore the flood storage design in the parkland must be configured to maximise the flood free open space with the parkland.

4 STORMWATER MANAGEMENT STRATEGY

In order to achieve the design objectives for the Parklands, DesignFlow worked closely with the project team to ensure that the stormwater management strategy compliments the urban design and includes:

- An upgraded drainage system
- Stormwater quality management
- Flood management
- Parkland integration

The stormwater strategy will not only managed flows from the Parkland site but will also manage flows from most of the Hospital site. This will allow the stormwater management infrastructure within the Hospital site to be decommissioned in the future as part of Hospital expansion.

The following sections and figures describe the strategy. Conceptual earthworks for the central parkland are also provided which illustrate how the stormwater infrastructure was carefully integrated into the urban and landscape design.

4.1 EROSION AND SEDIMENT CONTROL

The design objectives outlined in Section 3.1 are to be achieved during the construction phase through implementation of the methods outlined in the *Best Practice Erosion and Sediment Control Guideline* (IECA, 2008).

The existing lake is proposed to be utilised as the primary sediment capture device during the construction phase of the Parklands development. The lake will be retained while the major earthworks are completed across the site and then stabilised. The lake will then be decommissioned as part of the central open space construction. The key design and operational requirements for the sediment basin are outlined in Table 3 with additional design assessment provided in Section 5.1.

The staging of the lake and sediment basin function will be resolved as part and the Operational Works design and also by the contractor for the Early Works.

Table 3: Sediment basin design parameters

Design Parameters	Details
Type	Wet sediment basin (Type F/D)
Design objective	Design objectives outlined in Section 3.1
Operation	The sediment basin will be actively managed. The normal water level will be 5.5m AHD and be controlled by adjusting the existing outlet pit and pipes. During storm events the basin will fill to 7.3m AHD. Following rainfall the basin will be treated (flocculated as required) to ensure the design objectives are achieved and drained down to 5.5m AHD within 3-5 days following rainfall.
Sediment basin area	1.5 ha
Total Depth	Total design 3-4 m (varies). Sedimentation depth 1.8m
Outlet Control	Riser pipe outlet to allow dewatering to 5.5m AHD High flow via existing pit and pipe system
Operating Volume	27,000 m^3 (with ability to include to ~52,500 m^3 if lowered below 5.5m AHD)
Construction Area	~30.0 ha (Construction activities)
Total online catchment (ha)	100 ha (where possible diversion of upslope clean water to minimise uncontaminated water flowing through the basin)

Prior to construction activities commencing site-specific Erosion and Sediment Control Plans are to be developed, which will document best practice 'at source' erosion control measures (such as silt fences, stabilisation of stockpiles and minimisation of disturbed areas) as well as detailed sediment control strategies (such as diversion drains and sediment basins).

4.2 DRAINAGE SYSTEM

The stormwater drain system for the Parklands site has been designed to divert all external and internal catchment to the central parkland. The benefit of this is that it ensures all stormwater flows can be attenuated through the proposed flood storage (refer Section 4.4) thus significantly reducing flows down Sharks Lane.

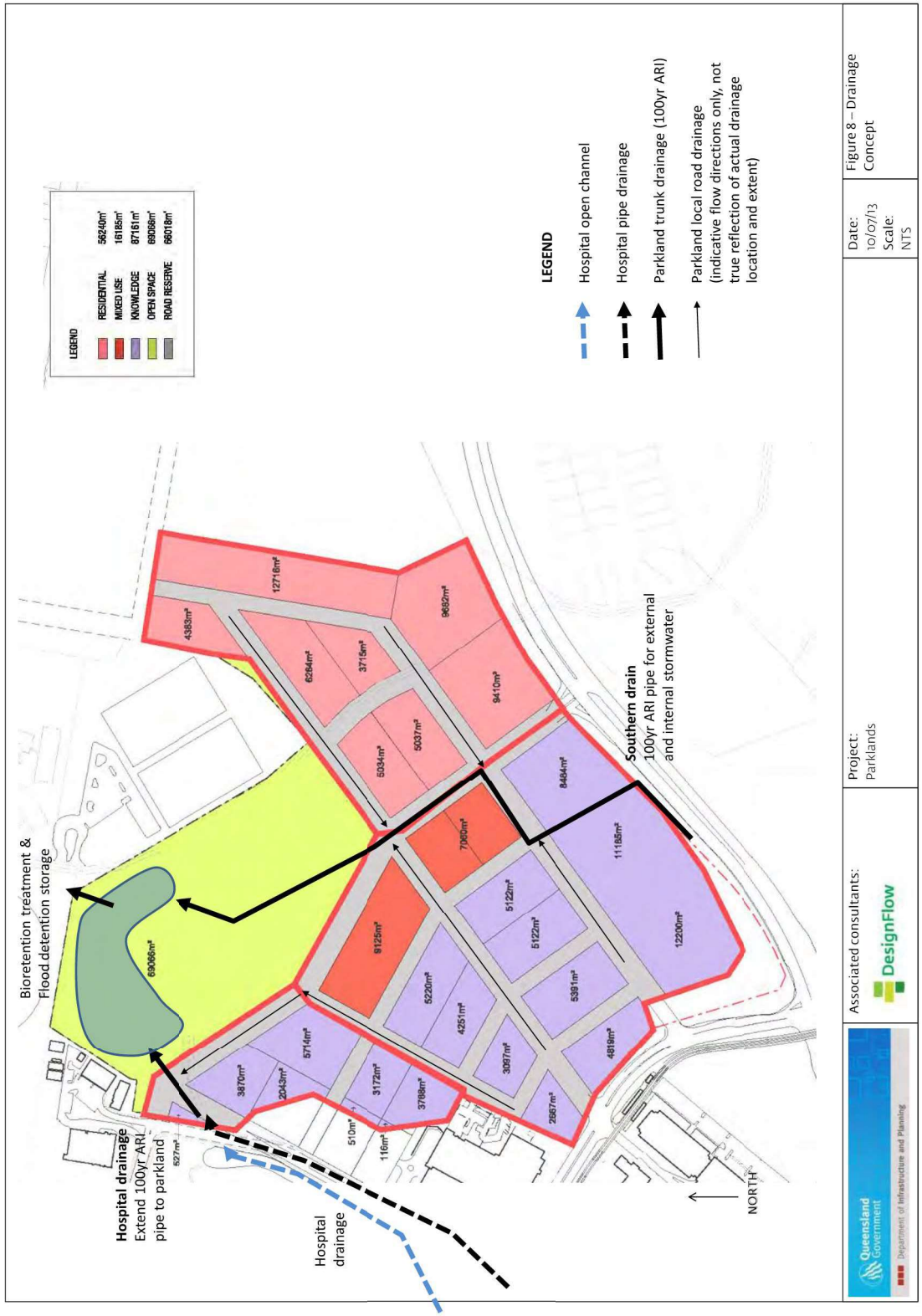
A number of drainage options were considered for the trunk drainage through the site including naturalised waterway, a combined pipe and waterway system and 100 year ARI pipe system. It was decided to drain through the development footprint of the Parklands site using underground pipes. Once in the central parkland the stormwater is daylighted into inlet ponds (sediment basins) and bioretention systems for treatment and flood attenuation. This strategy both maximises development yield while also expressing water in the landscape. The drainage system will consist of two trunk drains (Figure 8):

- **Hospital Site Drainage –** The hospital site drainage caters for the 100 year ARI flows to the western edge of the Parkland site. Currently within the Parkland site the pipe system converts from a large pipe system (2x 2700 x 1200 box culvert and 2 x 1200

pipes) to a much smaller pipe system (2 x 1200 pipes) and at this point a surcharge pit exists. During large flood events, surcharge of flows occurs at this pit and flow overland along the road that passes around the northern perimeter of the harness track. This is considered to be a hazardous flow path due to the high velocity of flow. As part of the Parklands redevelopment the 2 x 1200 pipes will be replaced with 2 x 2400 x 1500 box culverts to ensure the 100 year ARI flows continue within pipes to Inlet Pond 1 and the associated bioretention systems in the central parkland. The pipe infrastructure will be located within road reserve.

- **Southern Drain –** Flows from the external Smith Street catchment will be conveyed through drainage easements and road via large box culverts for flows up to the 100 year ARI (i.e. culverts will be design to convey 100 year ARI). The Hyder modelling indicates this pipe will be a 4m x 1.5m box culvert. Local drainage from the Parklands site will enter the trunk drainage as it passes through the site. The heights of the roads and lots along the route of the proposed southern drain have been designed to facilitate the overland flow paths in case the pipes become blocked. The overland flow capacity has been design to cater for the 100 year ARI flow minus the 10 year ARI flow in accordance with Council requirements. The box culvert will extend into the central parkland ensuring the southern section of the park is flood free and discharge into Inlet Pond 2.

All local stormwater runoff will enter the local pit and pipe drainage to be conveyed to the Hospital Site Drain or Southern Drain.



4.3 STORMWATER QUALITY MANAGEMENT

Stormwater quality management will be achieved through a number of approaches as summarised in Figure 9 and below:

- **Hospital site** – The following changes are proposed for the Hospital Site stormwater management systems:
  - A 400 kL rainwater tank has been installed on the hospital site to collect rainwater and supply outdoor taps and toilet flushing. The tank will be retained as part of the stormwater management strategy.
  - A 500m² bioretention system has been constructed in the eastern landscape zone of the Hospital Site to treat runoff from a 6.84ha hospital catchment. This bioretention system will be decommissioned as part of the proposed stormwater management strategy and the stormwater from this catchment treated in the bioretentions systems located within the Parklands. The hospital site bioretention system will be decommissioned when the hospital expands.
  - A 198m² bioretention systems has been constructed on the western side of the Hospital Site to manage stormwater from the 1.3ha Pathology catchment. This bioretention system will be decommissioned as part of the proposed stormwater management strategy and the bioretentions systems designed to over treat stormwater to offset no treatment within the Pathology catchment. The Pathology bioretention system will be decommissioned when the hospital expands.
- **Gross pollutant traps** – GPTs will be placed on all commercial catchments within the Parklands site to capture litter. At this stage is it proposed to use approximately two or three small CDS units to intercept and manage flows prior to entering the trunk drainage system.
- **Inlet ponds** – Inlet ponds (sediment basins) will be installed upstream of the bioretention systems to provide primary treatment of coarse sediments and to facilitate an even distribution of flows between each smaller bioretention treatment cell. Inlet ponds will be sized at 400-500 m². During small events (up to 1.4m³/s) flows will enter the bioretention systems. During larger events flows will discharge to the high flow bypass system.
- **Bioretention Systems** – A total of 2600m² of bioretention will be integrated into the central parkland to accept runoff from Parklands and Hospital site. The bioretention systems will be configured in three cells to help achieve an even distribution of stormwater inflow across the treatment areas.
  - Bioretention 1 has a 1180m² vegetated treatment area and will treat stormwater from the Hospital site via Inlet Pond 1.
  - Bioretention 2 has a 520m² vegetated treatment area to treat runoff from both the Hospital site and Parklands via Inlet Ponds 1 and 2.

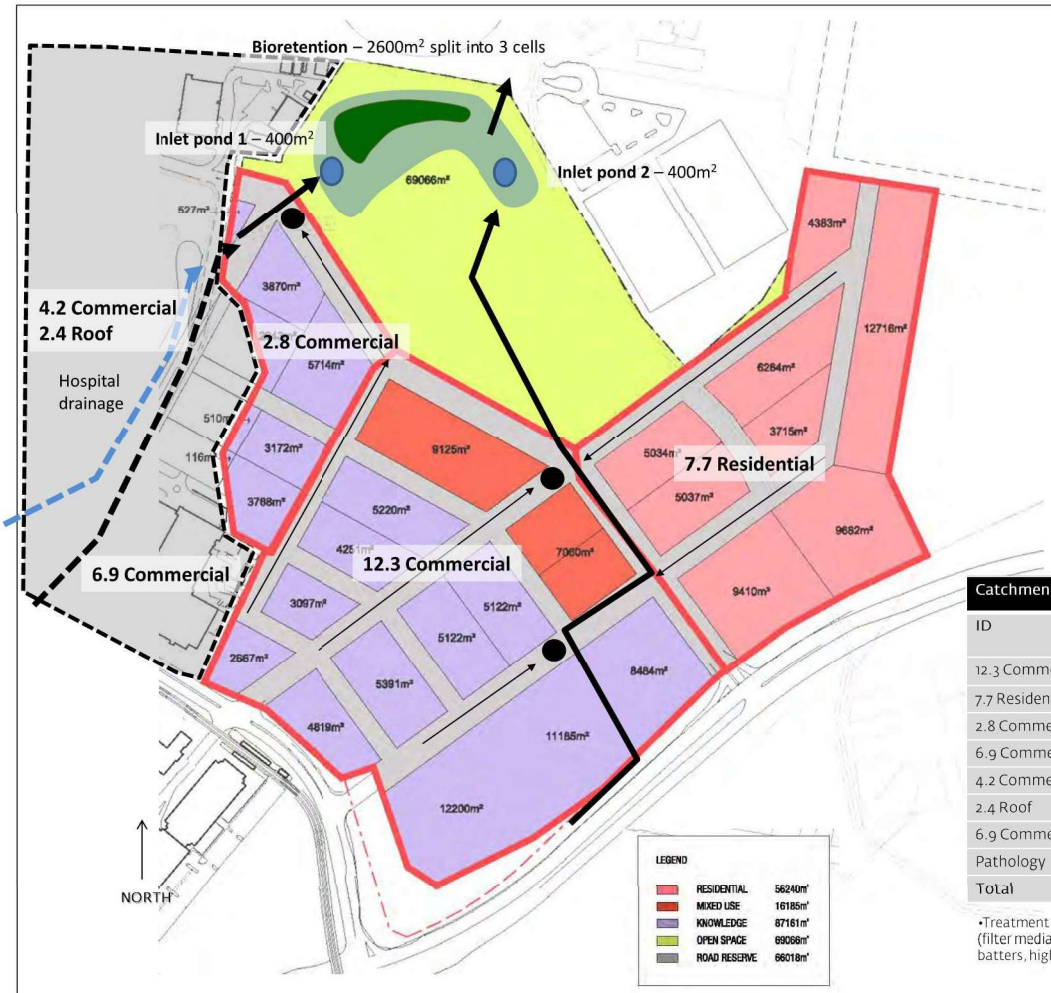
  - Bioretention 3 has a 900m² vegetated treatment area to treat runoff from Parklands. Figure 10 and Photo 2 illustrates integration of the bioretention in the central park.

Conceptual stormwater quality modelling has been undertaken to confirm the required sizes of the bioretention (refer Section 5.2). All the systems have been designed to achieve the stormwater quality objective prior to discharge to the downstream waterway including the 6.84ha and 1.3ha Hospital catchments.

Note the areas provided above are the 'treatment areas' only. An additional area is required for high flow bypass, maintenance access and batters which typically increases the footprint. Refer to the conceptual earthworks in Figure 12 for total footprint requirements.



Photo 2 – Bioretention system in public open space area



LEGEND

- Hospital open channel
- Hospital pipe drainage
- Parklands truck drainage
- Gross Pollutant Traps
- Inlet Pond
- Bioretention
- Flood detention
- Parklands catchments
- Hospital catchments treated in Parklands

Catchment		Treatment element	
ID	Area (ha)	Type	Bioretention Area (m²)*
12.3 Commercial	12.33	GPT (commercial) + Inlet pond 2	Bioretention 2600 m²
7.7 Residential	7.7		
2.8 Commercial	2.8	GPT + Inlet pond 1	
6.9 Commercial	6.9	Inlet pond 1	
4.2 Commercial	4.2		
2.4 Roof	2.4	Tanks + Inlet pond 1	
6.9 Commercial	6.9	Inlet pond 1	
Pathology	1.3	-	-
Total	37.4		

*Treatment area required to meet SPP 4/04 Healthy Waters objectives (filter media surface only, does not include allowances for bunds, batters, high flow bypass zones and inlet pond)

Queensland Government, Department of Infrastructure and Planning	Associated consultants: DesignFlow	Project: Parklands	Date: 10/07/13 Scale: NTS	Figure 9 – Stormwater Management Strategy



LEGEND

- Parklands truck drainage
- Inlet Pond
- Bioretention
- Flood detention
- High Flow bypass

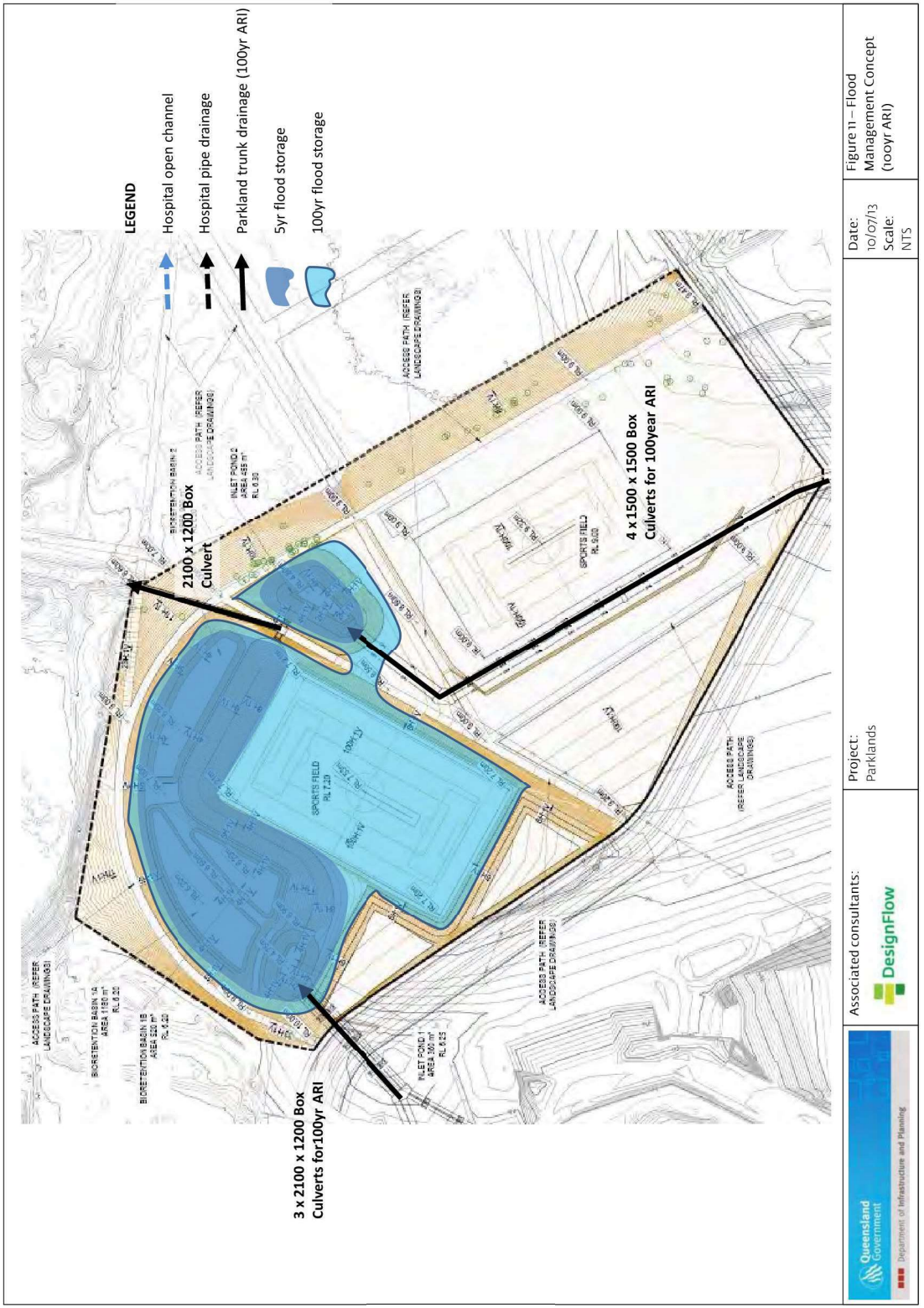
Queensland Government, Department of Infrastructure and Planning	Associated consultants: DesignFlow	Project: Parklands	Date: 10/07/13 Scale: NTS	Figure 10 – Central Parkland Stormwater Management Concept

4.4 FLOOD MANAGEMENT AND WATERWAY STABILITY

Management of flooding within the Parklands site will involve the following (refer Figures 11and 12):

- Diverting all flows from the hospital site (Catchments B and D) and from the Smith Street catchment (Catchments A, C and E) into the central parkland using 100yr ARI trunk drainage (refer Section 4.1).
- Central parkland flood detention – Once floodwaters are within the parkland flood attenuation will occur over the high flow bypass system, bioretention systems and northern playing field. This will involve:
    - A perimeter bund along the alignment of the existing harness track will be established at minimum level of 9.0m AHD.
    - Filling the bioretention systems during small events (<1.4m^3/s per inlet pond).
    - Filling the high flow bypass and ponding over the bioretention systems up to the 5 year ARI event.
    - Ponding over the northern playing field during events greater than 5 year ARI up to 100 year ARI.
    - During the 100 year ARI flood levels reach 8.38m AHD and engage a storage of ~32,000m^3.
    - Flows will exit the parkland via a piped outlet structure which has been designed in accordance with QUDM and Council safety standards.

Performance assessment of the flood management strategy was undertaken by Hyder in the regional flood model for the Parklands site. The details of the modelling are provided in Appendix A including flood mapping which confirms that the strategy significantly reduces flood flows along Sharks Lane (24m^3/s down to 11m^3/s for 100 year ARI) and ensures the Rugby League oval to the east is flood free.



4.5 PARKLAND INTEGRATION

The proposed inlet ponds and bioretention systems provide a range of landscape opportunities. The inlet ponds will provide open water areas and the bioretention cells will form a critical vegetated landscape element in the parkland.

The opportunity here is to design recreation opportunities around and between the treatment systems that can become emblematic of the site itself (refer sketch 1).

The landscape design and the flood management requirements are integrated to ensure the high use recreational zones are flood free but the 'wet' zone are multiple use and provide interesting recreation opportunities. Essentially a series of terraces are to be developed linked to known flood levels and appropriate land uses/ facilities.



Sketch 1 – Bioretention landscape opportunities (Lat27 sketch)

4.6 PARKLAND LEVELS

Based on the strategy presented above, conceptual drainage and parkland earthworks levels were developed by DesignFlow and DBI in collaboration with Hyder. The purpose of the earthworks were to confirm the stormwater and landscape strategy worked in terms of levels, to allow more accurate flood modelling and to assess construction costs. Figure 12 provides the conceptual earthworks for the parkland.

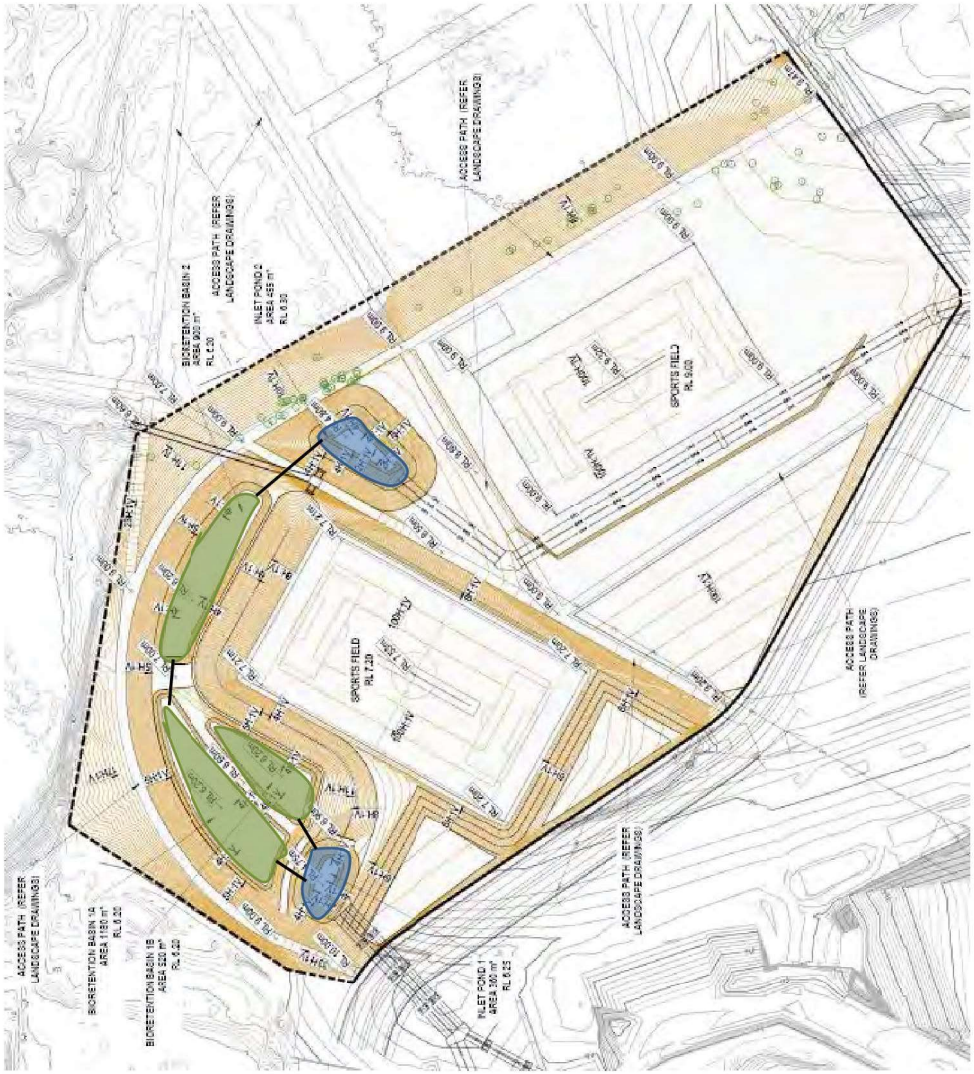


Figure 12– Earthworks and indicative Design Levels

Date: 10/07/13
Scale: NTS

Project: Parklands

Associated consultants: DesignFlow

Queensland Government
Department of Infrastructure and Planning

5 STORMWATER MODELLING AND ASSESSMENT

The following subsections assess the performance of the proposed stormwater management strategy against the established design objectives.

5.1 EROSION AND SEDIMENT CONTROL (SEDIMENT BASIN)

As discussed in Section 4.1, the existing lake is intended to be used as the primary sediment capture device during the construction phase activities. This section provides conceptual design details for the sediment basin to demonstrate sufficient space and sediment storage volume is available to manage runoff during the construction phase of the Parklands.

The conceptual design of the sediment basin was undertaken using the design requirements outlined in *Appendix B – Sediment Basin Design and Operation* from the *Best Practice Erosion and Sediment Control (IECA, 2008)* guidelines. Table 4 presents the key design information used to develop a conceptual sediment basin design. Conservative design parameters where adopted (e.g. highly dispersive soils and using the 85th percentile 5-day rainfall storage depth). Calculation of the required sediment basin volume included two scenarios, a 'worst case' scenario (assuming the full 100 ha upstream catchment is online) and the second scenario included only the Parklands construction site (30 ha).

The required storage volume (settlement + storage volume) based on the adopted parameters above ranged from 9,700m^3 to 48,500 m^3. The calculated storage volume available within the current lake footprint was estimated at 52,500 m^3 (based on preliminary existing lake volume estimate of 3.5m average depth over 1.5ha lake surface area). Therefore the conceptual design assessment demonstrates that sufficient storage volume is available to manage potential sediment loads from construction activities.

Notwithstanding the above conceptual design, the sediment basin will need be adaptively managed during the construction phase to ensure that the design objectives are being met and the sediment basin is of an appropriate size. It is anticipated that the existing lake footprint will be used initially and will then be gradually downsized as the site is constructed and external catchments can be diverted. The phasing of the lake and sediment management is to be resolved with the site superintendent based on the proposed earthworks staging. This will be documented as part of the site-specific Erosion and Sediment Control Plans.

Complete compliance with the construction phase design objectives will need to be demonstrated through site-specific Erosion and Sediment Control Plans, which are to be developed prior to construction activities commencing.

Table 4. Summary of the sediment basin conceptual design.

Parameter	Type F Basin
Soil characteristic	Type F: Clay sand. Assumed worse case for initial sizing assessment. Soil testing to be completed in support of site-specific Erosion and Sediment Control Plan.
Design Catchment	Parklands Construction catchment = 30 ha Total Connected Catchment = 100 ha
Sediment basin type selected	Type F/D Basin - wet basin. Capture, then treat and release within 3 to 5 days of event, but monitor and adapt to weather. Flocculation may be required to achieve discharge standards.
Design objectives adopted.	Capacity to contain all runoff expected from the 85th percentile, 5-day rainfall depth. Assumes external run-off diverted around contaminated works areas and best practice soil erosion measures undertaken during construction activities.
Settling pond storage volume (V_s)	Total sediment basin volume available = 52,500 m^3 (based on preliminary existing lake volume estimate of 3.5m depth x 1.5ha area). Settling volume available (max.) = 37,500 m^3 (top 2.5m) Required V_s = 9,700 (Parklands construction area only) up to 32,500 m^3 (worst case 100 ha). Using equation B7 (from IECA): $V_s = 10.R_{(Y\%,5\text{-day})}C_v.A$ Where: Y% = 85th (Table B4, IECA) R = 51.6 mm (Table B5, IECA) C_v = 0.63 (conservative - Group D soil, Table B7, IECA) A = 30 (Parklands area only) = 100 ha (assume worse case)
Length to width ratio	<3:1 – insufficient. Design to include pre-treatment basin prior to inflow into main settlement basin OR inlet chamber OR internal baffles. Final arrangement to be confirmed prior to construction.
Minimum depth of settling zone	Required = 0.6m Measured setting depth = 1.0 to 1.5 - ok
Sediment storage volume	Measured = 15,000 m^3 (below RL 17.4m) Required = 4,350 to 16,000 m^3 (@50% of V_s) - ok
Use of inlet chamber	TBC
Internal baffles	TBC
Outlet chamber	Perforated Riser
Control of inflow conditions	Overland flow drain cut to pre-treatment pond.
Pre-treatment pond	Required as L:W <3:1
Primary outlet	Perforated riser outlet set 2.5m below existing spillway outlet.
Emergency spillyway minimum design capacity	Spillway designed to convey ~1 in 100 year ARI event flows
Freeboard from max ponded water depth to top of embankment	~0.3m (emergency spillyway) (min 0.15m required in IECA)
Freeboard on spillway shoot	>300mm - ok
Embankment crest width	3m
Access ramp gradient	To be <1:6 depending on desilting methodology adopted.
Chemical flocculation	As required to satisfy water quality objectives. Nominally 32kg gypsum per 100 m^3 of stored water.

5.2 STORMWATER QUALITY

MUSIC modelling was conducted to quantitatively assess the stormwater quality treatment performance of the proposed stormwater strategy. MUSIC version 5.1 was used for the assessment and the parameters have been established in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2010). Details of the modelling assumptions, parameters and results are discussed below.

5.2.1 Model Structure

The structure of the MUSIC model is shown in Figure 13 with the general data upon which the model is based provided in Table 5.

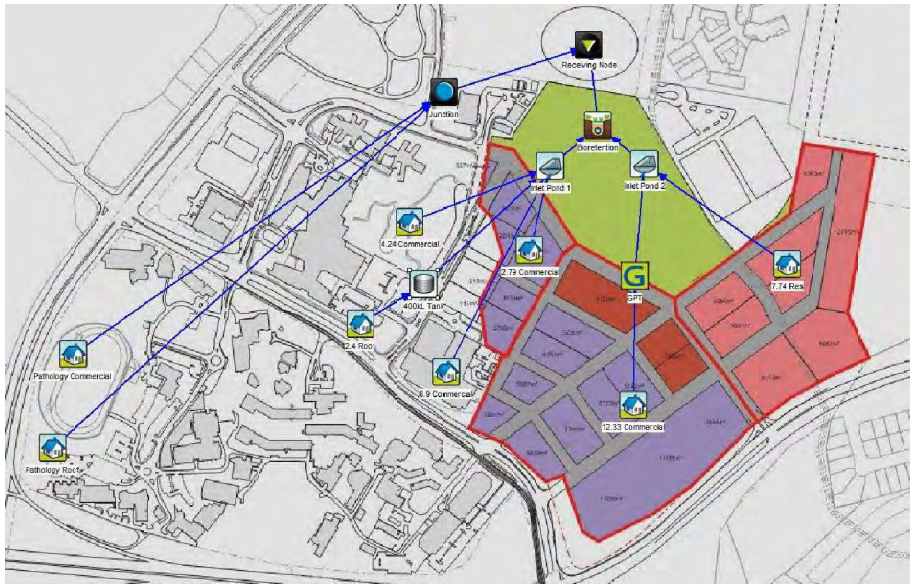


Figure 13: MUSIC catchment delineation and model layout

Table 5: MUSIC model data summary

Input	Data used in modelling
Rainfall station	40584 HINZE
Time step	6 minute
Modelling period	1976 to 1986
Mean annual rainfall	1370 mm
Evapotranspiration	Monthly Mean PET
Rainfall runoff parameters	Commercial & Urban Residential
Pollutant export parameters	Commercial & Urban Residential

All information above has been sourced from Water by Design, 2010

5.2.2 Catchment data

The development has been split into a number of sub-catchments draining to the bioretention systems, with additional catchments included representing the untreated hospital precinct catchments required to be treated as part of the Parklands site. The model adopts the lumped catchment approach because there are no tanks in the Parklands site. The only catchment split adopted was for the Hospital site to account for the roof draining to the rainwater tank. Each of the sub-catchments has been assigned areas and imperviousness based on measurements from the development plans. Summary catchment data is provided in Table 6.

Table 6: MUSIC catchment data

MUSIC Model ID	Catchment Area (ha)	Total impervious (%)	Treatment system
12.3 Commercial	12.3	85%	GPT + Sed Pond +Bio
7.7 Residential	7.7	60%	Sed Pond + Bio
2.8 Commercial	2.8	85%	Sed Pond + Bio
4.2 Commercial	4.2	85%	Sed Pond + Bio
2.4 Roof	2.4	100%	RW Tank + Sed Pond + Bio
6.9 Commercial	6.9	85%	Sed Pond + Bio
Pathology Commercial	0.8	85%	Untreated
Pathology Roof	0.3	100%	Untreated
TOTAL	37.4	81%	-

5.2.3 Rainwater Tank Demand (Hospital Site)

A 400kL rainwater tank has been installed on the Hospital site for open space irrigation and fit for purpose internal uses such as toilet flushing. The derivation of demand from rainwater tanks adopted the assumptions in Table 7 based on data provided in the *MUSIC Modelling Guidelines for South East Queensland (Water by Design, 2010)*.

Table 7: Rainwater tank demands.

Data	Value	Comment
Daily indoor demand	8.74 kL/d	Toilets assuming dual flush
Annual outdoor demand	1380 kL/yr	Irrigation applied to 75% of outdoor pervious area

5.2.4 Gross Pollutant Trap

A gross pollutant trap (GPT) has been modelled to treat runoff from the commercial areas prior to entering Inlet Pond 2. Coarse sediment and litter generation from these catchments is anticipated to be high and a GPT was deemed necessary.

The GPT was conservatively modelled with the following load reductions:

- Gross pollutants: 90%
- TSS: 40%
- TP: 10%
- TN: 0%

5.2.5 Inlet Ponds

Inlet ponds have been located upstream of each bioretention system to provide primary treatment of coarse sediments and flow control. Table 8 presents the parameter used to model the inlet ponds.

Table 8. Inlet pond parameters and modelled values.

Parameter	Inlet Pond 1	Inlet Pond 2
High flow bypass	100 m^3/s	100 m^3/s
Surface Area	350 m^2	450 m^2
Extended detention	0.3 m	0.3 m
Permanent pool volume	300 m^3	350 m^3
Equivalent pipe diameter	400 mm	400 mm
Notional weir width	2.0 m	2.0 m

5.2.6 Bioretention Systems

The bioretention basins were modelled in accordance with the *MUSIC Modelling Guidelines* (Water by Design, 2010). For the purpose of establishing the size of bioretention system it was modelled as a single bioretention but it will split into 3 bioretention cells

The proposed arrangement of the bioretention systems include inlet ponds and flow distribution drains to provide even flow splitting between each bioretention basin cell. As each cell receives equal flows the separate filter media cells have been modelled as single bioretention systems, referred to as Bioretention 1 and 2. Table 9 summarises the design parameters used for each bioretention system in the MUSIC modelling assessment.

Table 9. Bioretention Basin node

Parameter	Bioretention
Surface area (m^2)	2600
Has the filter area been calculated appropriately?	Yes
Extended Detention Depth (m)	0.3
Filter area (m^2)	2600
Saturated hydraulic conductivity (mm/hour).	200
Filter depth (m)	0.6
Filter Median Particle Diameter (mm)	0.45
Overflow weir width (m)	15
Seepage Loss (mm/hr)	0
Confirmation that K and C* remain default?	Y
High flow bypass (m^3/s)	2.8 (2 inlet ponds with bypass at 1.4m^3/s)

5.2.7 Results

The results of the stormwater quality (MUSIC) modelling for the Parklands development are shown in Table 10. The modelled pollutant loads reduction performance results are presented for the overall development, with and without the untreated hospital catchment (described in section 2.3). Sufficient additional treatment area has been provided within the bioretention basin to mitigate the pollutant loads from the hospital catchment. The modelling results show that the proposed stormwater strategy achieves the stormwater quality design objectives for Parklands site (including the additional hospital catchment).

Table 10: MUSIC model results – stormwater quality

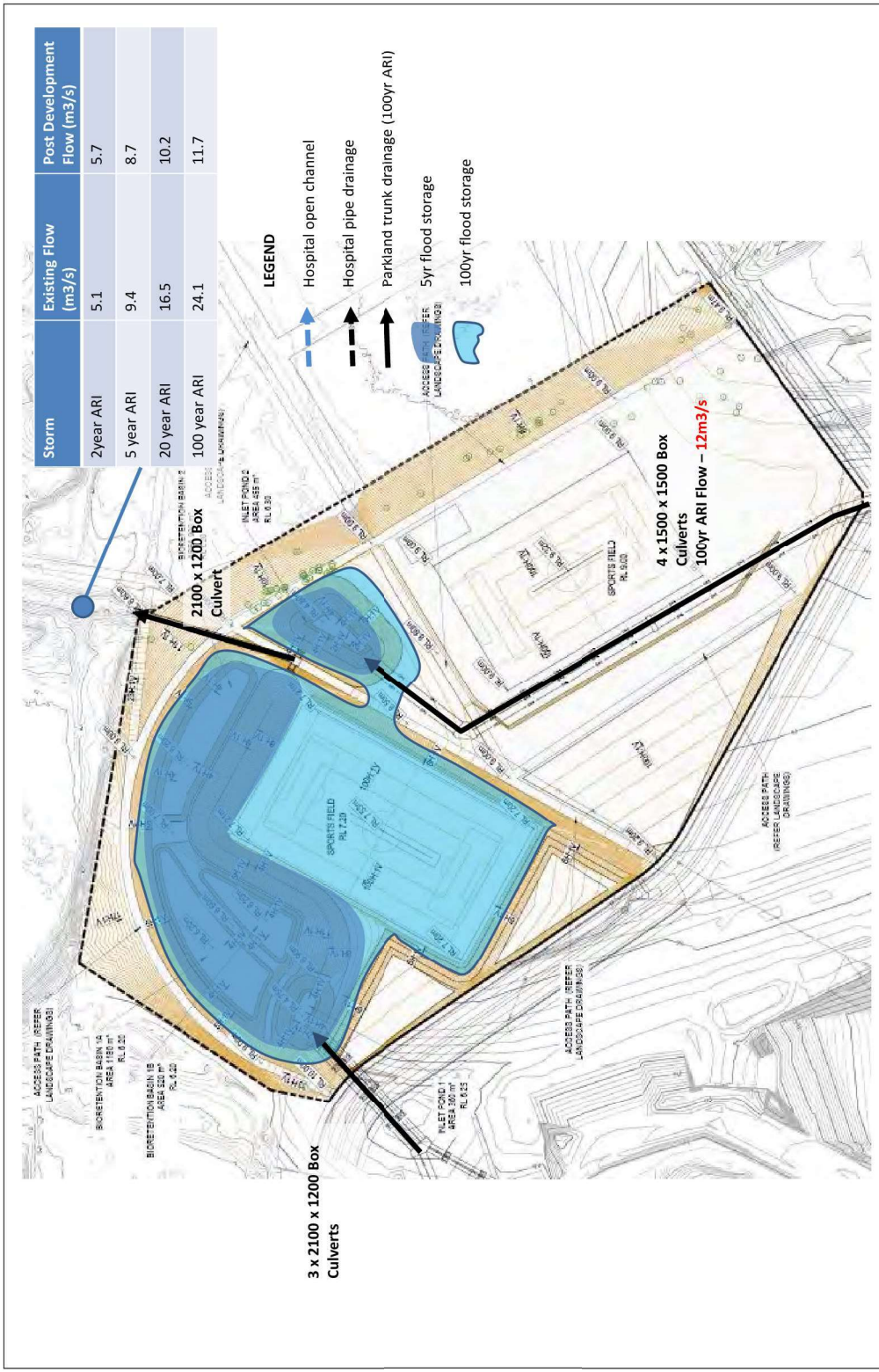
ID	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction (kg/yr)	Reduction achieved (%)	Water Quality Objective (%)
Parklands Treatment	TSS	82,200	14,500	67,700	82%	*Water Quality Objectives apply to combined site discharges*
	TP	206	74.4	131.6	64%	
	TN	1190	607	583	49%	
Pathology Building (Untreated Hospital Catchment)	TSS	2,020	2,020	0	0%	
	TP	5.49	5.49	0	0%	
	TN	36.5	36.5	0	0%	
Overall Parklands Total	**TSS**	84,200	16,600	67,600	80%	**80**
	TP	212	79.9	132	62%	**60**
	TN	1,230	644	586	48%	**45**

5.3 FLOODING AND WATERWAY STABILITY

Details of the flood modelling are provided in Appendix A *Gold Coast Parklands—Early Works & Trunk Infrastructure Flooding and Hydraulics Report* (Hyder, 2013). The flood modelling confirms that the flood objectives for the site are achieved:

- Flood flows along Sharks Lane are dramatically reduced from 24m³/s to 11m³/s. This means Sharks Lane access becomes essentially flood free which may well be very important for the Commonwealth Games.
- Flooding in Sharks Rugby League is reduced to the point where flooding regional is avoided. Local stormwater runoff will be the only source of flooding which can be managed through local drainage.
- The 100 yr ARI flood level within the Parkland is 8.45m AHD which is below the outer bund (9m AHD) and the southern portion of the parkland ensuring this area is flood free.
- The 5 yr ARI flood level within the Parkland is 7.2m AHD meaning the lower playing field is flood free.

Figure 14 presents the main findings from the flood modelling for easy interpretation. Note the flood outlet structure is being designed to minimise the risk of blockage and public safety. We are closely following preferred inlet designs provided by Council's Engineering Services department.



6 CONCLUSIONS AND RECOMMENDATIONS

The redevelopment of the Gold Coast Parklands Site is a prime opportunity to create a new urban and open space area in Southport that is sustainable, safe and exciting for visitors and residents. The central parkland will provide an important stormwater management function for the Parklands and Hospital site. DesignFlow have developed a concept that achieves the objectives of managing stormwater quality and flooding while providing opportunities to implement contemporary stormwater management as features that are carefully integrated into the open space landscapes.

The concept provides a stormwater quality and flood management strategy and landscape concept that:

- Is consistent with previous assessments and recommendations for the GCHKP
- Provides stormwater quality management for the site and also parts of the hospital site that did not meet stormwater quality objectives
- Provides a flood management strategy that optimises the use of public open space in accordance with Water by Design's *Framework for the Integration of Flood and Stormwater Management into Open Space* (April 2011) and also allows Shark Lane and Rugby League oval to be flood free.

The stormwater strategy consists of the following:

- Trunk drainage for flows up to the 100yr ARI to convey flows through the Parklands in a safe manner allowing maximum development of the land.
- Treating the Parklands and Hospital site stormwater through inlet ponds and bioretention basins integrated in the central parkland.
- Managing flood flows by diverting all Parklands and upstream flows into the central parkland where flood attenuation is provided in a manner that still allows active use of the parkland.
- Easy maintenance access to the stormwater management features.

APPENDIX A – Flood Modelling Report (Hyder)

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Attachment 5
Hyder Flooding and Hydraulics Report – Parkwood PDA



GOLD COAST PARKLANDS – EARLY WORKS & TRUNK INFRASTRUCTURE

FLOODING & HYDRAULICS REPORT

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Economic Development Queensland

Gold Coast Parklands

Flooding & Hydraulics Report

Early Works & Trunk Infrastructure

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Report No F0007-AA005621-AAR-03

Date 20th August 2013

This report has been prepared for Economic Development Queensland in accordance with the terms and conditions of appointment for Early Works & Trunk Infrastructure dated 2013. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 SUMMARY

The proposed Commonwealth Games Village and Legacy Development includes the complete re-development of the Gold Coast Parklands site. Currently, Sharks Lane, immediate downstream of the site's legal point of discharge is heavily impacted by flooding under rainfall events. Upon the re-development of the site, it is a necessary objective to reduce the impacts of flooding on Sharks Lane as well as safely convey and store flood water on site.

This Flooding and Hydraulics report has identified the extents and behaviour of flooding in the surrounding waterways in pre and post development scenarios. In doing so, it has been demonstrated that the proposed Gold Coast Parklands re-development can be undertaken without having any detrimental impacts on the surrounding waterways or adjacent properties.

To demonstrate these results, MIKE FLOOD software has been utilised. The Biggera Creek model utilised has been provided to Hyder by GCCC. To ensure accuracy in the comparison of pre and post development scenarios, Hyder have made some necessary adjustments to the model surrounding the subject site in order to improve the accuracy of the model, including the addition of current site survey data. A design case model has also been created to simulate the future Gold Coast Parklands re-development. The results and findings of the Flooding and Hydraulics report have been achieved via comparison of the water levels and flow rates within the surrounding properties and the on-site flood storage available within the two model scenarios.

Additionally, the model results have been utilised to assess the flood hazard within the proposed Gold Coast Parklands and adjacent downstream properties. Using the stipulations of the Gold Coast City Council planning policies, it is demonstrated that the upgrade will maintain acceptable safety and not exceed allowable levels of risk.

2 BACKGROUND

Hyder have been commissioned by Economic Development Queensland (EDQ) to provide a Flooding and Hydraulic Assessment Report as part of the early works package for the proposed Commonwealth Games Village located at the Gold Coast Parklands, Southport, Queensland. The flood management approach has been established with DesignFlow and this report will form part of a larger site based stormwater management plan. The assessment of the site considers the full development of the site due to the 2018 Commonwealth Games Village as well as the 'legacy' development, and the necessary infrastructure, flood storage and flood extent mitigation that will be required to service the site and adjacent properties once it has been fully developed. This report will demonstrate that the proposed stormwater infrastructure and on-site detention will be sufficient in mitigating flood hazards on-site and downstream of the site in accordance with Gold Coast City Council requirements.

The development is located on the corner of Smith Street and Parklands Drive and ultimately is proposed to consist of low rise residential accommodation, retail and commercial precincts and a 'Health and Knowledge Precinct' which features areas planned for medical research institutes, biopharmaceutical manufacturing facilities and health and medical commercial type uses.

Having identified a number of discrepancies between the existing GCCC flood model and the known site conditions and infrastructure around the Gold Coast Parklands, Hyder Consulting have constructed a corrected base case model that will be used to perform comparative assessment of works proposed as part of the Gold Coast Parklands re-development.

This report has been prepared to present details of the approach which has been used to create a corrected base case model, as well as the modelling of the proposed works involved in the Gold Coast Parklands upgrade.

3 SITE CHARACTERISTICS

3.1 Site Description

The subject site is located within Southport, on the Gold Coast, South-East Queensland, on the following parcel of land:

- Lot 40 on SP 222438 (1 Parklands Drive, Southport)

3.2 Land Usage

In its present state the site is occupied by the Gold Coast Parklands Race Track and Show Grounds. The site is primarily covered with pervious grass and land areas through the middle of the site, including a dirt racing track around a large retention basin in the centre of the site. Along the western boundary of the site are several buildings and a large carpark area. The southern half of the site contains several asphalt roadways that run from the western boundary buildings to the eastern side, where several other buildings are located along with a second carpark area.

The site grades inward from two high points on either side of the southern boundary, adjacent to Parklands Drive and Smith Street, with the entire site grading toward the northern boundary where it discharges to the adjacent channel. Figure 3.1 below shows the site locality:



Figure 3.1: Site Locality

3.3 Current Site Flooding

As shown in Figure 3.1, the site discharges to the north, where it is conveyed by a channel away from the site. Anecdotal evidence suggests that in the existing scenario, the Sharks Rugby League Club to the north east of the site are heavily impacted by flood waters in rainfall events. The channel that takes the discharge from the site also has flooding implications for the adjacent roadway running parallel down to the intersection of Musgrave Avenue, where flood waters also over top the roadway under the Q100 flood event. This is also evident in the current Gold Coast City Council Flood Model, as seen in figure 3.2.



Figure 3.2 – Current Gold Coast City Council Flood Extents

One of the primary objectives of this assessment and the subsequent recommended works is to alleviate the impacts from this flooding. As per requests from Economic Development Queensland and Gold Coast City Council, It is expected that these areas will become flood free after the Gold Coast Parklands site has been re-developed.

4 FLOOD OBJECTIVES

As part of Hyder's consultancy to Economic Development Queensland, it is expected that the optimal solution for the proposed flood model will not only maintain flood waters, but reduce the impacts to adjacent land properties. Two adjacent sporting grounds, as well as the small road adjacent to the discharge channel and Musgrave Avenue are all heavily affected by the current predictions of the flood levels under the Q100 storm event. The three specific objectives for this flood assessment include:

Objective 1:

- Safely convey flood waters through the subject site.

Objective 2:

- Ensure no adverse impacts to flood levels, velocity and duration of inundation on other properties external to the subject site.

Objective 3:

- Take active measures to alleviate the flooding constraints experienced by the adjoining properties by providing on-site detention of peak flood waters.

5 HYDROLOGY ASSESSMENT & HYDROGRAPH FORMATION

5.1 Review of Flood Model Hydrology

After analysing the hydrographs constructed from GCCC's hydrology, it was determined that a revised assessment of the contributing catchments was necessary to provide more accurate and calibrated hydrographs under the standard storm events. Previous calculations and assessment of the subject site by DesignFlow and the report "Parklands Redevelopment Business Case 2012 – Developed Flood Modelling Report" prepared by SKM dated 27th July 2012 resulted in a peak discharge of approximately 24 m^3/s in the Q100 storm event. Under the GCCC model, the peak discharge was approximately 18 m^3/s, which was significantly lower than the other studies.

After Hyder conducted an analysis of the site, calibrated overland flows resulted in discharges similar to the previous studies by SKM. These calculated flow rates were then used for the basis of the hydraulic assessment of the site. Ultimately, an updated hydrologic study was necessary to reflect any changes in the catchments and provide consistent on-site flooding events.

5.2 Contributing Catchments

There are two contributing catchments to the site, as detailed in table 5.1. GCCC defines the contributing catchments within the Biggera Creek catchment as catchments 15 and 16. A catchment plan can be seen in figure 5.1.

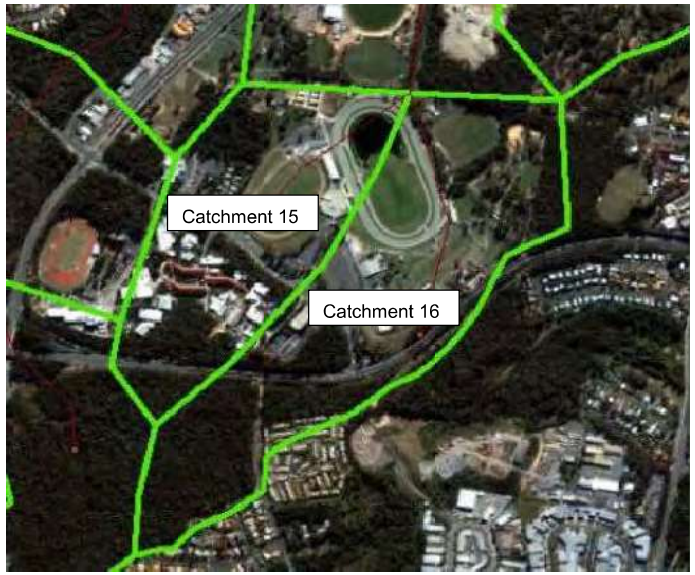


Figure 5.1 – Existing Catchment Plan

Table 5.1 below shows the properties of the catchments 15 and 16 for the site.

Table 5.1 – Existing Catchment Properties

Catchment Property	Catchment 15	Catchment 16
Catchment Area (ha)	39	57
Flow Path Slope (%)	1.85	1.29
Imperviousness (%)	45	30
Flow Path Manning's value	0.049	0.0849

After the Gold Coast Parklands site has been re-developed it is anticipated that the site will be fully developed including all roads and buildings. In addition, as a result of the proposed grading of the site, it is anticipated that there will be slight changes in the properties of the associated site catchments, as seen in table 5.2

Table 5.2 – Developed Catchment Properties

Catchment Property	Catchment 15	Catchment 16
Catchment Area (ha)	39	57
Flow Path Slope (%)	1.85	1.2
Imperviousness (%)	55	55
Flow Path Manning's value	0.049	0.0849

It can be seen that the significant change in the catchments is the increase in impervious percentage, which reflects the re-development of the Gold Coast Parklands site.

5.3 Hydrology Flow Rates

Hydrological analysis of the site determined that the local critical storm duration was to be the 90 minute storm. Table 5.3 below shows the discharge for the three critical events for the range of standard storm events in both the existing and developed case. All of the XPRAFTS hydrographs can be seen in Appendix A and B.

Table 5.3 – Catchment Discharge Flow Rates for Range of Storm Events

Storm Event	Discharge at Channel (m^3/s) (Hyder Existing 90 min)	Discharge at Channel (m^3/s) (GCCC Existing 90min)	Discharge at Channel (m^3/s) (Hyder Design 90 min)
Q2	5.093	5.01	6.412
Q5	9.429	8.1	11.815
Q10	12.282	11.37	15.690
Q20	16.494	12.98	21.270
Q50	19.979	15.76	25.521
Q100	24.085	17.64	30.468

Given that the hydrological assessment of the subject site returned a critical storm duration of 90 minutes, the majority of the hydraulic analysis will be performed with this local peak flooding condition. It is acknowledged that sites external to the Parklands site elsewhere in the Biggera Creek catchment are subject to different critical storm durations.

A range of different storm durations have therefore been checked using GCCC's original hydrology calculations to ensure no worsening of impacts downstream as part of this assessment. The major focus of this report and the results presented are limited to the critical storm duration of 90 minutes at the Gold Coast Parklands site and surrounding areas of interest. Table 5.4 below shows the peak discharge rates at the combined discharge channel under the Q100 storm event for a range of storm durations under the developed scenario.

Table 5.4 – Channel Discharge Flow Rates for Q100 Storm Event – Design Scenario

Q100 Storm Duration (minutes)	Combined Channel Discharge (m^3/s)
60	28.685
90	**30.468**
120	27.406
180	27.985
360	23.820

6 HYDRAULIC ASSESSMENT / FLOOD MODELLING

6.1 Acquisition of Flood Model

A complete MIKE FLOOD model was released by GCCC (Agreement 16/2013) for Hyder's exclusive use on the Gold Coast Parklands site. The MIKE FLOOD model includes the Biggera Creek Flood Model comprising 5m grid two-dimensional flood modelling (MIKE 21 throughout the flood plain with implicitly coupled one-dimensional flood modelling (MIKE 11) surrounding critical infrastructure within the flood plain such as bridges and culvert crossings.

The MIKE FLOOD model was provided in a format compatible only with Mike Zero Version 2011.

6.2 Project Site Area of Interest

The Gold Coast Parklands site is included in the MIKE 21 bathymetry component of the model. It is represented by a section of the mesh with 5m grids representing the topography and roughness of the existing surface.

6.3 Key Assumptions

The modelling presented in this report has used the assumption that all existing parameters programmed into the GCCC Biggera Creek flood model are correct and accepted by GCCC and not subject to assessment.

Exemptions to this assumption include the hydrology calculations used to produce the hydrographs for catchments 15 & 16 around the subject site as well as the network, cross sections and boundary conditions of the MIKE 11 partition of the flood model.

Following discussions with GCCC, Hyder were given the responsibility of providing a corrected base case MIKE 11 flood model to perform a more accurate assessment of the subject site by including all relevant stormwater infrastructure which has been previously ignored in the model.

6.4 Limitations of the Model

The MIKE FLOOD software and model utilised for this assessment is seen to have limited accuracy in terms of the position of the stormwater infrastructure and properly modelling the topography, predominantly due to the resolution of the 5m grids used in the bathymetry, roughness and initial water level.

In the MIKE 11 software, limitations were found in the modelling of the specific stormwater structure types found in the existing flooding scenario. The large stormwater retention basin in the centre of the site has two large outflow pits with an approximate 2 metre depth. No options exist within the current software to model the required setup, so additional loss factors were adopted to mimic the structure. By applying large head loss factors above standard values, the output of the basin was calibrated against a rating curve constructed by DesignFlow for the outflow infrastructure. These rating curves can be seen in Appendix C.

6.5 Project Scenarios & Model Set-up

6.5.1 Correction to GCCC Existing Base Case

Upon receiving the MIKE FLOOD model for the Biggera Creek catchment from GCCC, several adjustments were necessary within the site extents to provide a more accurate description of the flood events. The first amendment was to the initial water surface level, where it was decided that the storm events should be modelled when the on-site stormwater retention basin was full up to the level of the lower of the two elevated outflow pits. Initially, GCCC used the base topography of the retention basin, assuming that it had full storage capacity available.

In the corrected existing scenario, the initial water level in the retention basin is set to R.L 7.34m AHD. This caused a dramatic reduction in the storage capacity of the detention basin, which was holding more water during the storm event under the existing model. The second amendment was to the surrounding stormwater infrastructure. A number of surrounding structures were not included in the MIKE11 model that would have a dramatic impact on the flow paths and flood levels. A summary of the structures surrounding the Gold Coast Parklands that were added to the existing model and subject to assessment are presented in Table 6.1 and Figure 6.1.

Table 6.1 – GCCC Standard MIKE 11 Structures Surrounding Gold Coast Parklands

Structure Name	Structure Type
Trotting Pipe 1	Culvert (2 x 1050mm dia RCP)
Trotting Pipe 2	Culvert (2 x 1200mm dia RCP)
Trotting Pipe 3	Culvert (3 x 1050mm dia RCP)
Trotting Bypass	Culvert (2 x 1050mm dia RCP)
ParklandMajor	Culvert (2.4m x 1.2m RCBC)
HospitalPipe	Culvert (2 x 1200mm dia RCP)
Hopsital1	Culvert (3 x 900mm dia RCP)
Hospital2	Culvert (4 x 1200mm dia RCP)
Hospital3	Culvert (3 x 2.7m x 0.6m RCBC)
Hospital4	Culvert (3 x 2.1m x 1.2m RCBC)
HospitalBypass	Culvert (2 x 1200mm dia RCP)

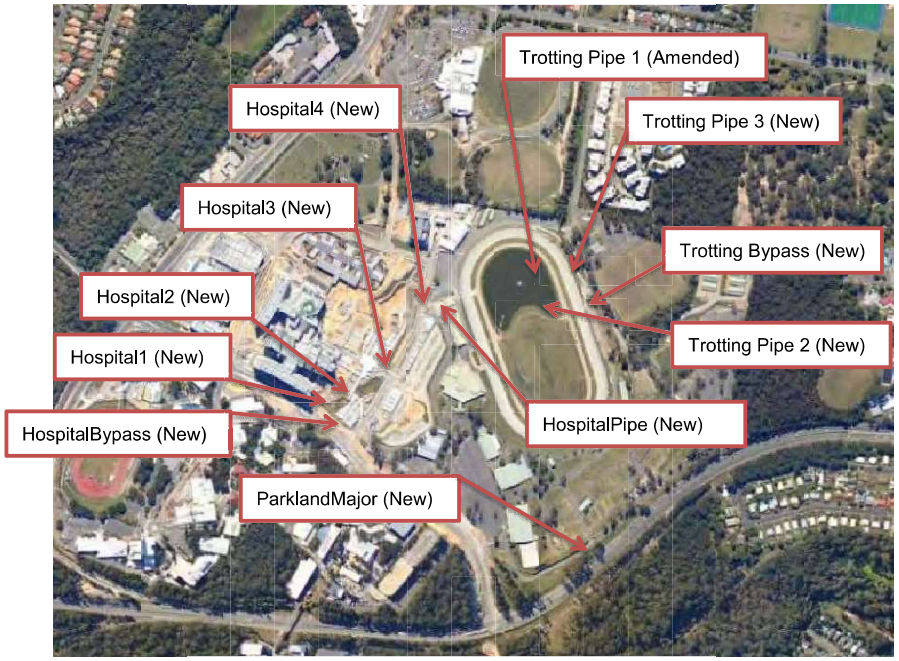


Figure 6.1 – Description of GCCC Standard MIKE 11 Structures Surrounding Gold Coast Parklands

As shown indicatively in Figure 6.2, the GCCC model released to Hyder introduces only 1 of the 11 one-dimensional large stormwater infrastructure lines found within the extents of the site flooding to the model, being the trotting pipe 1. The revised base case model has been prepared by Hyder to describe the actual existing case scenario using more accurate site survey data.

The exclusion of the additional one-dimensional links in the model provides an unrealistic representation of flows and increases the overland flow over the site and the adjacent properties. In addition, the original GCCC model used a single 900mm diameter RCP pipe for the outlet, whereas the corrected model has 2x1050mm diameter and 2x1200mm diameter RCP pipes. The result of the previous GCCC model was a slower discharge into and out of the retention basin.



Figure 6.2 – Original GCCC MIKE 11 One-Dimensional Infrastructure Network

The subsequently revised model that has been created by Hyder incorporates detailed site survey data compiled from a combination of as-constructed surveys and additional detailed surveys commissioned specifically for this flood modelling exercise. To produce a more accurate description of the flood events on the subject site, the remaining infrastructure was inserted into the MIKE 11 model and coupled with the respective MIKE 21 files. Figure 6.3 shows the corrected existing GCCC base network.

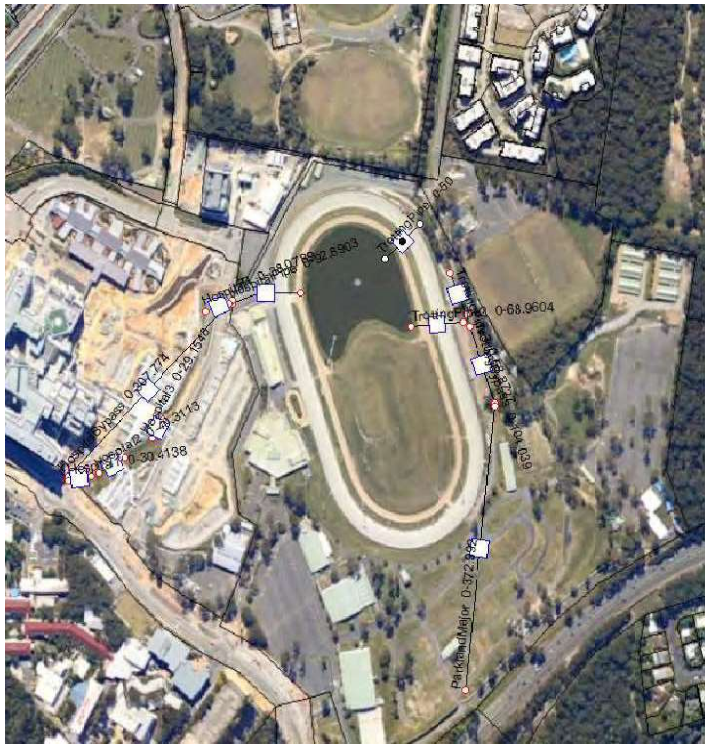


Figure 6.3 – Corrected GCCC MIKE 11 One-Dimensional Infrastructure Network

The corrections made to the GCCC model MIKE 11 inputs and initial water surface have had significant impact on the model results within the surrounding flooding extents.

To investigate these impacts Hyder have prepared an assessment of the Q100 peak water surface levels from the GCCC model compared to the Q100 peak water surface levels that were calculated using the corrected model.

Figure 6.4 below shows the difference between flood water depths in this comparison. The blue and purple areas represent the reduction in flood water depth after the original GCCC model has been updated. The yellow and green areas represent the increase in water depth after the model has been altered. This corrected model includes the appropriate initial water level and considers all relevant stormwater infrastructure.

It can be seen from figure 6.4 that due to the missing stormwater infrastructure, there is a significant increase in the overland flow component in the original GCCC model which has been corrected. This causes a slight decrease in the flooding surrounding the site, as more water enters the basin for retention and discharges straight into the channel rather than bypassing via overland flow, which can be seen by the increase in depth in the channel. The corrections made to the GCCC model are therefore considered to provide a more accurate description of the actual flooding extents under the Q100 storm event. The corrected model will be used as the basis for the assessment of the proposed Gold Coast Parklands development.

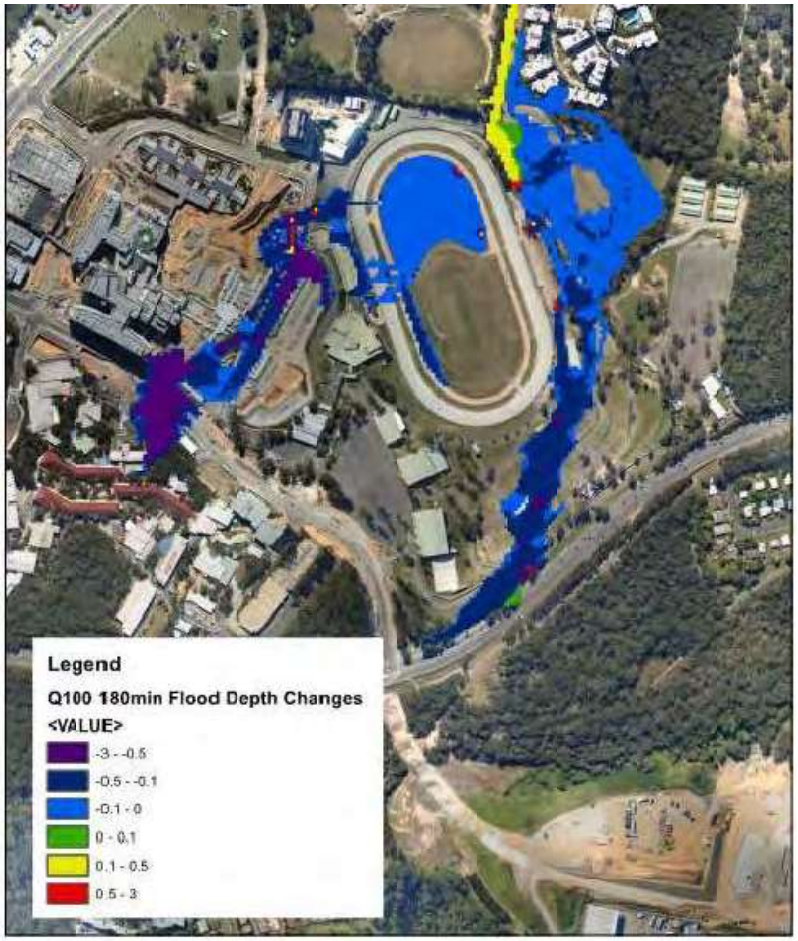


Figure 6.4 – Water Surface Results for GCCC Model & Corrected Model

6.5.2 Proposed Gold Coast Parklands Design

The proposed Gold Coast Parklands design model scenario incorporates the design outcomes of the proposed upgrade works, including the construction of roads, buildings and park areas. The existing retention system will be completely removed, replaced by a park area containing several detention basins and a lowered sporting field surrounded by a raised bund for flood storage before being discharged off-site.

The topography for this model scenario has been generated using the base model with the Hyder Consulting design contours appended over the site extents. Hyder have utilised 12d model software to generate the design surface of this model based on the proposed architectural design layout and levels. Figures 6.5 and 6.6 show the MIKE 21 topography for existing and design cases respectively.

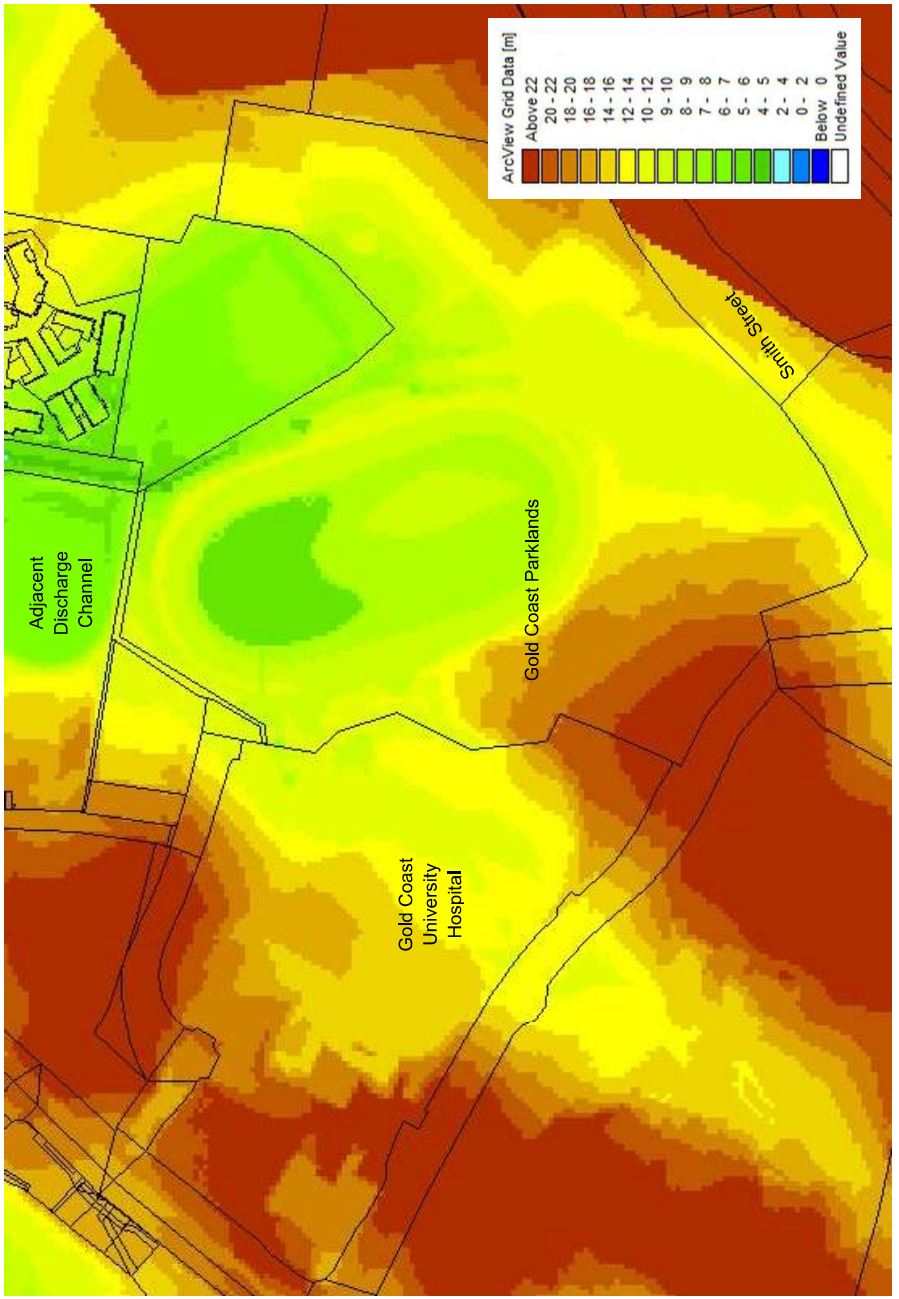


Figure 6.5 – GCCC Standard MIKE 21 Bathymetry

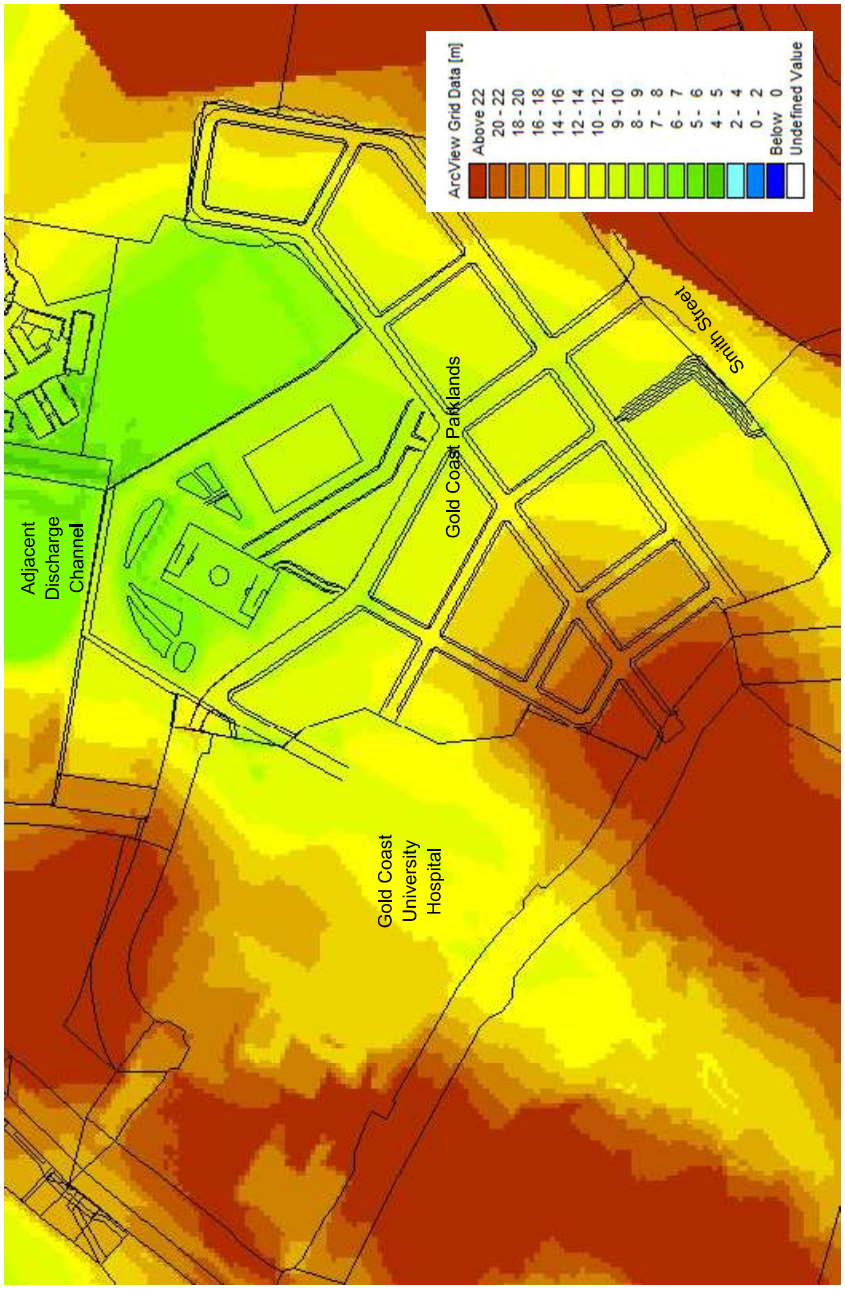


Figure 6.6 – Hyder Design MIKE 21 Bathymetry

The proposed design incorporates the construction of several new major stormwater infrastructure lines, which were constructed as one-dimensional links in the upgraded MIKE 11 model. Table 6.2 shows the new major structures modelled in the MIKE 11 portion of the flood model within the site extents.

Table 6.2 – Parklands Design MIKE 11 Structures

Structure Name	Structure Type
HospitalCulvert	Culvert (3 x 2.1m x 1.2m RCBC)
ParklandMajor_Design	Culvert (4 x 1.5m x 1.5m RCBC)
NWBio	Culvert (2.4m x 1.2m RCBC)
SEBio	Culvert (2.4m x 1.2m RCBC)
BioPipe	Culvert (2.1m x 1.2m RCBC)

The hospital culvert and the Parkland Major Design culverts collect water external to the site boundary as well as collecting on-site stormwater runoff to discharge within the detention basin areas within the lower park region. This can be seen in figure 6.7, where the design MIKE 11 network is displayed with the above structures labelled.

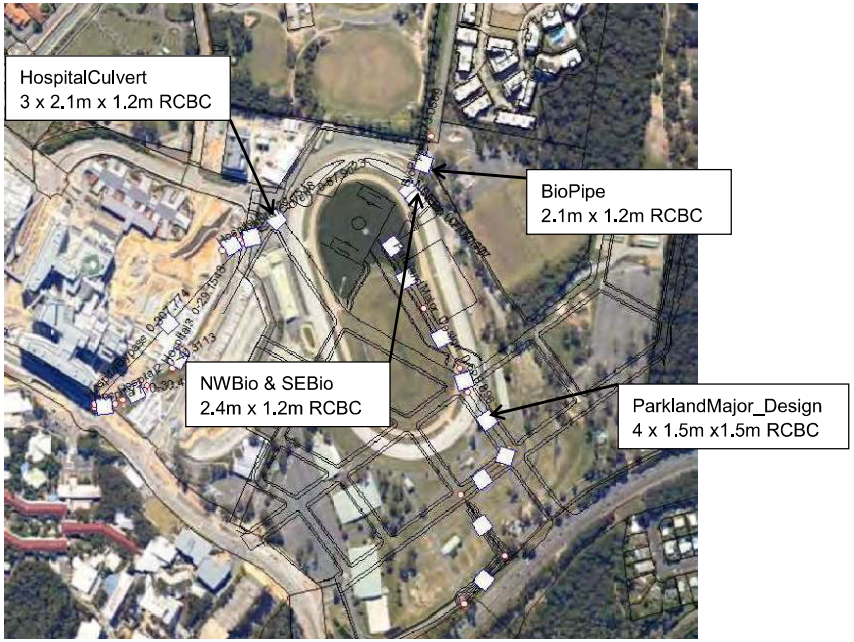


Figure 6.7 – Gold Coast Parklands Design MIKE 11 Network

6.5.3 Model Data Provisions to GCCC for Assessment

A copy of all data files used to create the above described model scenarios shall be provided to GCCC for inspection and approval. This data will be provided in the following formats:

Table 6.3 Model Data Types and Formats Provided to GCCC

Data Type	Format
Updated Existing MIKE 11 model inputs: - Boundary file - Network file - Cross Section file - HD Parameters file	 .bnd11 .nwk11 .xns11 .hd11
Design MIKE 11 model inputs: - Boundary file - Network file - Cross Section file - HD Parameters file	 .bnd11 .nwk11 .xns11 .hd11
Updated Existing MIKE 21 model inputs: - Bathymetry - Initial Water Surface Elevation - Roughness - Hydrographs – updated 90 minute storm	 .dsf2 .dsf2 .dsf2 .dsf0
Design MIKE 21 model inputs: - Bathymetry - Initial Water Surface Elevation - Roughness - Hydrographs – updated 90 minute storm	 .dsf2 .dsf2 .dsf2 .dsf0

7 MIKE FLOOD MODELLING RESULTS

7.1 Gold Coast Parkland Existing Flood Extents

Figure 7.1 below provides an extract of the 1 in 100 year 90 minute flood extents results generated using the existing Gold Coast Parklands model. Further details are provided in Appendix D. Appendix E also shows the velocity maps of the standard ARI storm events.

The results of the MIKE FLOOD modelling exercise indicate that the surrounding properties will be subject to inundation during the 1 in 100 ARI flood event for the local critical storm duration of 90 minutes. Figure 7.1 shows that the adjacent sports field becomes almost completely flooded, and the roadway adjacent to the discharge channel becomes partially inundated.

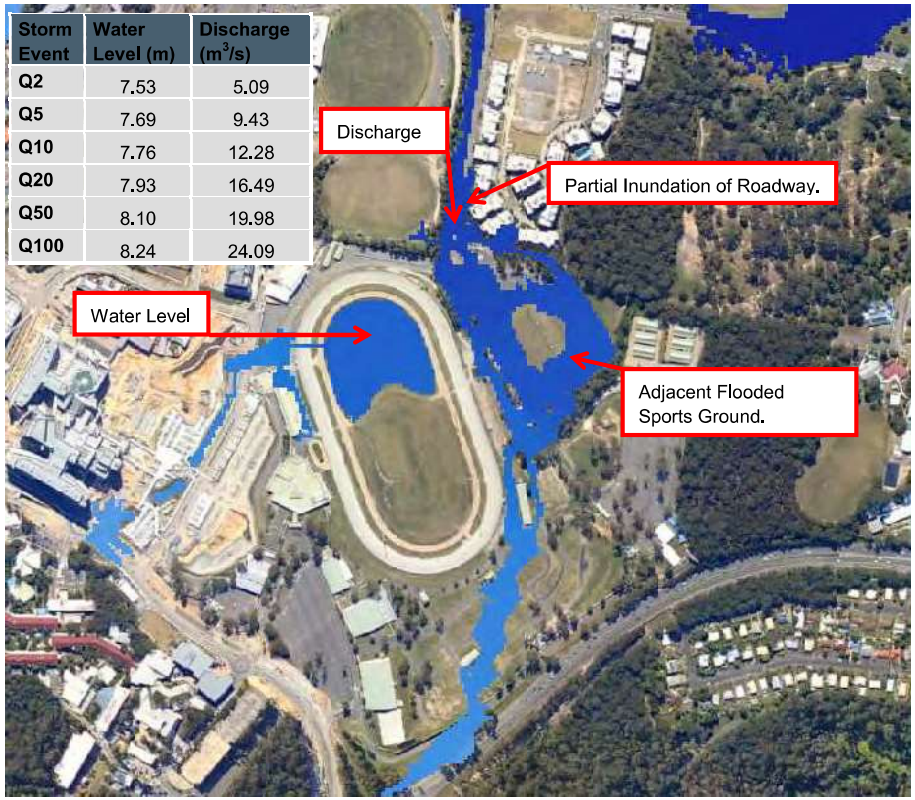
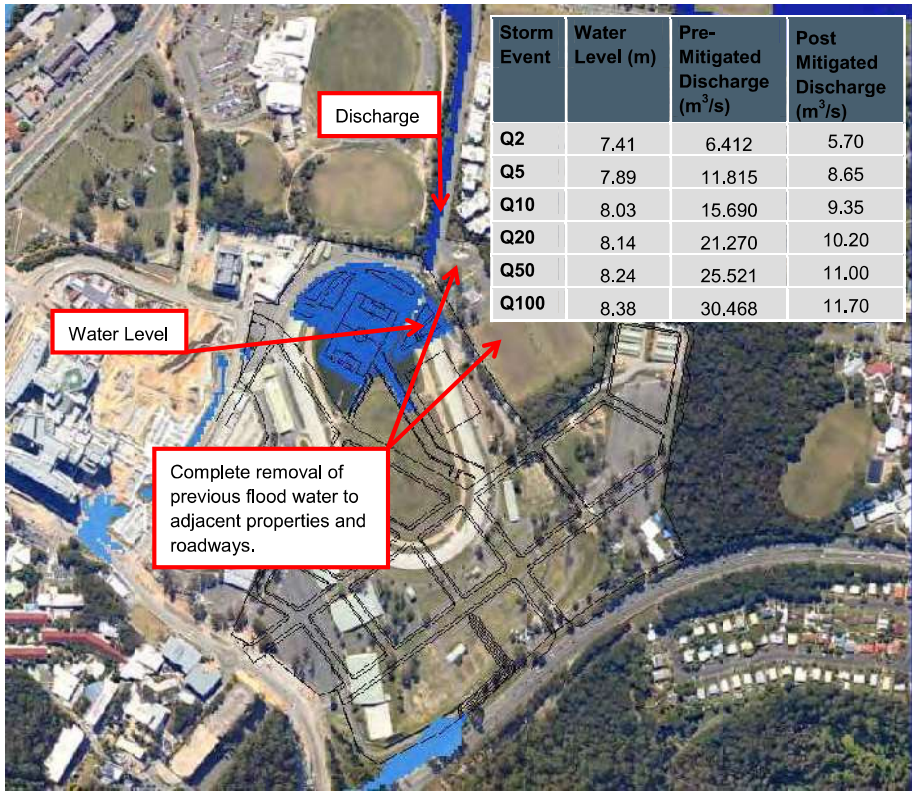


Figure 7.1 – Gold Coast Parklands Existing 90 minute Q100 Flood Extents

7.2 Gold Coast Parkland Developed Flood Extents

Figure 7.2 below provides an extract of the 1 in 100 year 90 minute flood extents results generated using the design Gold Coast Parklands model, incorporating the design bathymetry and roughness values assuming the entire site has been developed. Further details and greater extents of other standard storm events (Q2, Q5, Q10, Q20 & Q50) are provided in Appendix F. Appendix G also shows the velocity maps of the standard ARI storm events.

The results of the MIKE FLOOD modelling exercise indicate that the surrounding properties will no longer be subject to inundation during the 1 in 100 ARI flood event for the local critical storm duration of 90 minutes. Figure 7.2 shows that the adjacent sports field and roadway become completely flood immune under the on-site detention system which has been designed for the Gold Coast Parklands development. There can also be seen a significant reduction in the discharge to Sharks Lane.



Storm Event	Water Level (m)	Pre-Mitigated Discharge (m^3/s)	Post Mitigated Discharge (m^3/s)
Q2	7.41	6.412	5.70
Q5	7.89	11.815	8.65
Q10	8.03	15.690	9.35
Q20	8.14	21.270	10.20
Q50	8.24	25.521	11.00
Q100	8.38	30.468	11.70

Figure 7.2 – Gold Coast Parklands Developed 90 minute Q100 Flood Extents

7.3 Assessment of Flood impacts

7.3.1 Impacts on Floodplain Levels

The primary assessment of impacts on floodplain levels will be the comparison of the water surface elevation for the Gold Coast Parklands Developed model against the corrected base case model.

The water level difference between the two models was calculated by subtracting the existing water depths for the flood extents from the developed flood extent water depths. The results of this assessment can be seen in figure 7.3. It can be seen that all of the blue flooding has been completely removed in the design case model, with an increase in water surface elevation in the park area where the water storage is located. The blue areas show a reduced water level between 50mm and 100mm through the channel after discharging from the site.

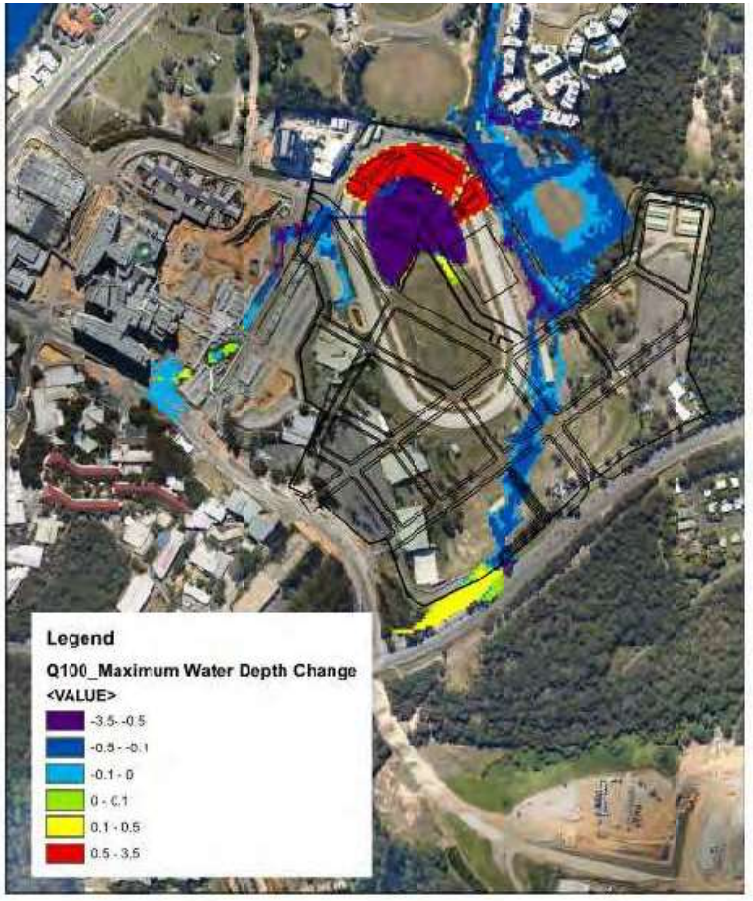


Figure 7.3 – Q100 flood level changes due to Parklands development

The velocity of the flood water travelling over the site was also assessed, with a velocity change map constructed using a similar process. Figure 7.4 shows the change in flood water velocity between the existing and developed cases. It can be seen that all the green area present a reduction in velocity, whereas yellow and red areas are an increase. As expected, there is an increase within the proposed detention areas and a significant decrease in the downstream properties.

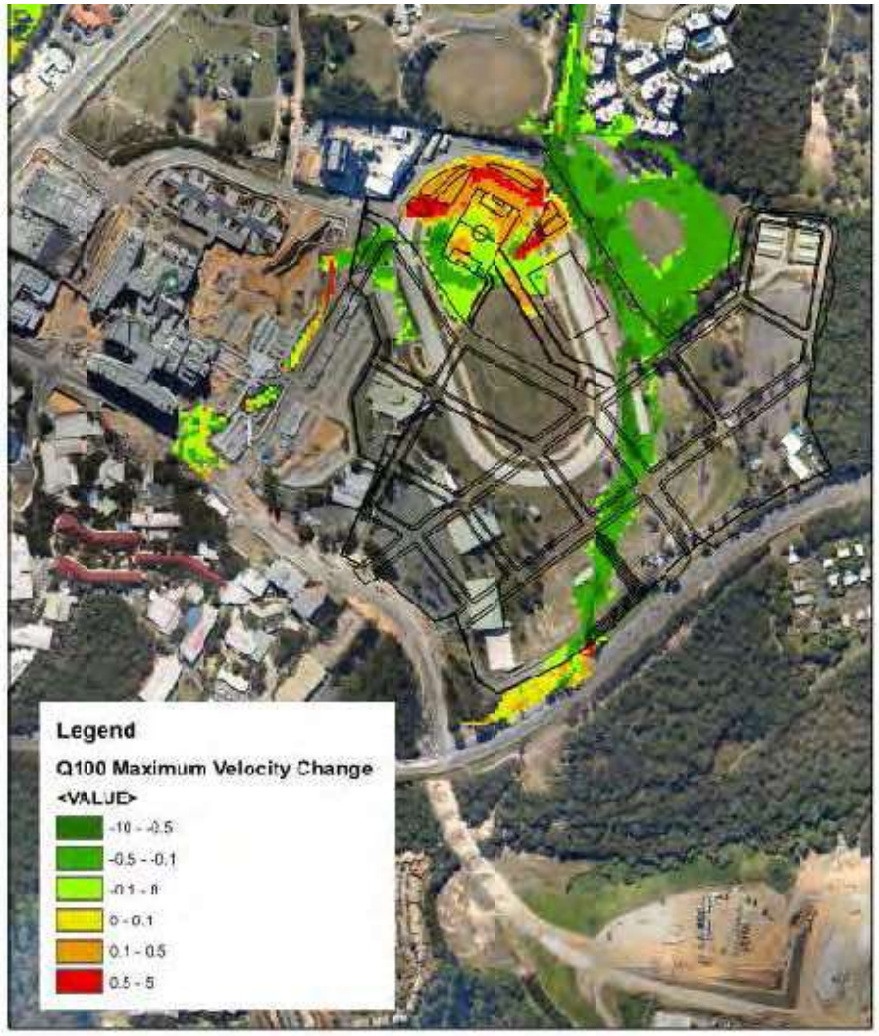


Figure 7.4 – Q100 maximum velocity changes due to Parklands development

During the MIKE FLOOD modelling, the maximum water surface elevation was recorded for both the existing and design cases within the water retention area as well as within the start of the channel. Table 7.1 below shows the recorded values for the existing and design cases under the critical 90 minute storm events. It can be seen that there is a reduction in the channel water level in the design case, indicating that the on-site detention is effective in reducing the downstream effects of flooding, even after the site has been fully developed. As expected, the water surface elevation on-site in the flood storage area increases to accommodate the reduced effects downstream.

Table 7.1 – Maximum Water Surface Elevation

Location	Storm Event	Existing Case	Developed Case
Flood Storage Area	Q2	R.L 7.53m	R.L 7.41m
	Q5	R.L 7.69m	R.L 7.89m
	Q10	R.L 7.76m	R.L 8.03m
	Q20	R.L 7.93m	R.L 8.14m
	Q50	R.L 8.10m	R.L 8.24m
	Q100	R.L 8.24m	R.L 8.38m
Sharks Lane Southern Entrance	Q2	R.L 5.66m	R.L 5.39m
	Q5	R.L 5.86m	R.L 5.43m
	Q10	R.L 5.92m	R.L 5.52m
	Q20	R.L 6.00m	R.L 5.63m
	Q50	R.L 6.12m	R.L 5.72m
	Q100	R.L 6.18m	R.L 5.75m

Another necessary comparison is the discharge of water through the adjacent channel in both the pre and post development scenarios. Table 7.2 presents the expected discharge at the beginning of the channel for a variety of storm events after only discharge from the subject site is taken into account.

Table 7.2 – Maximum Water Discharge Flow Rates

Storm Event	Existing Case	Developed Case
Q2	5.09m^3/s	5.70m^3/s
Q5	9.43m^3/s	8.65m^3/s
Q10	12.28m^3/s	9.45m^3/s
Q20	16.49m^3/s	10.55m^3/s
Q50	19.98m^3/s	11.75m^3/s
Q100	24.09m^3/s	11.95m^3/s

It can be seen that by removing the overland flow path bypassing the basin that is apparent in the existing case, there is a significant reduction in the discharge rate through the channel. By significantly reducing this discharge, the adjacent roadway, sporting fields and Sharks Lane entrance are effectively flood free under the Q100 event and below. This reduced discharge does however raise water levels on-site, which has been accommodated by an increase in flood storage volume with the use of the park area in the developed Gold Coast Parklands scenario.

The final comparison will investigate the regional peak flooding event, which is the 180 minute storm event. Using GCCC hydrology for the rainfall event hydrographs, the comparison results between the pre and post developed site flood extents can be seen in figure 7.5, where the orange extents represent the design 180 minute storm event and the blue extents represent the existing 180 minute storm event. In alignment with the 90 minute study using Hyder's revised hydrology, this assessment also demonstrates significant reduction to impacts, flood levels and flow rates generally comparable to tables 7.1 and 7.2.

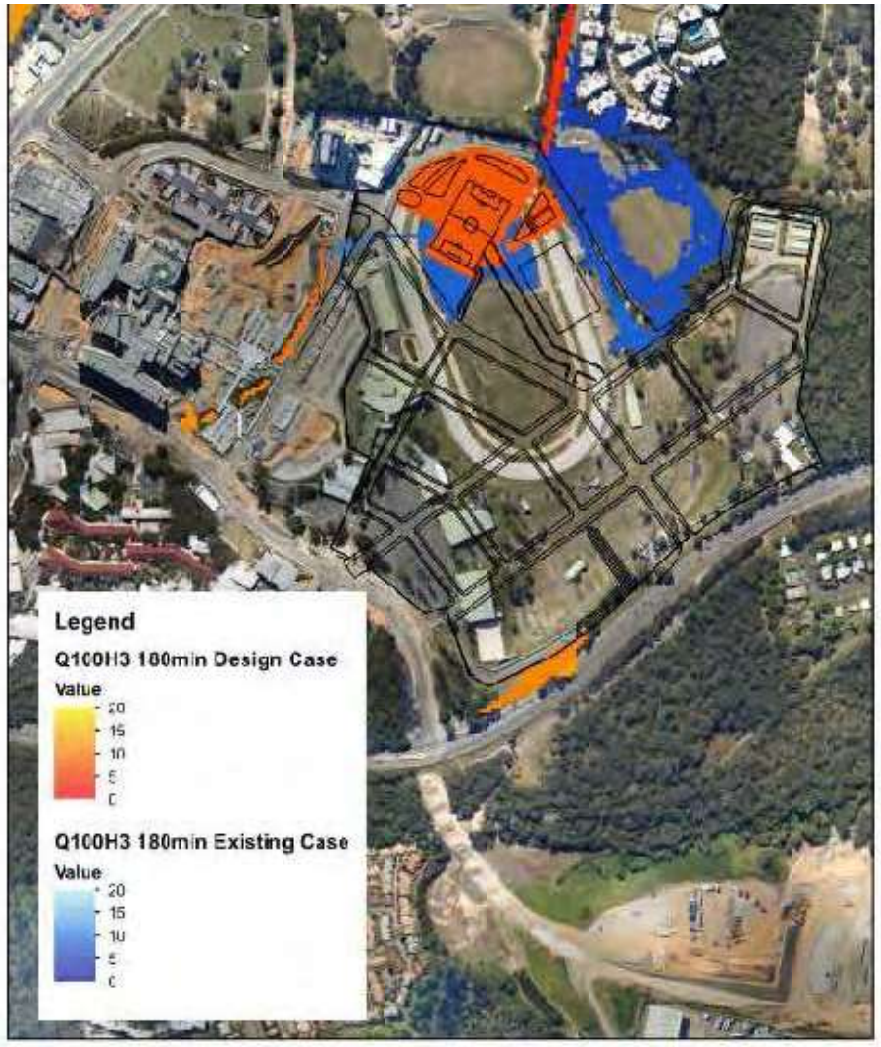


Figure 7.5 – 180 minute Q100 flood extent changes due to Parklands development

8 FLOOD STORAGE VOLUMES

12d Model software was used to calculate the flood storage volumes within the Gold Coast Parklands developed park area.

The volume taken as the flood storage includes that above the ground surface within the lower park, detention basin areas and upper park areas. A summary of the calculations based on the depth of water is as follows:

Table 8.1 – Flood Storage Volumes

Water Depth (R.L m)	Volume above model surface level
5.5m	0 m^3
6.0	82 m^3
6.5m	1,615 m^3
7.0m	5,374 m^3
7.5m	12,062 m^3
8.0m	22,489 m^3
8.45m	33,132 m^3

Table 8.1 indicates that the Gold Coast Parklands design includes provision of flood storage volumes in excess of the currently existing detention, which is calculated to be approximately 6,500 m^3 under the corrected Q100, 90 minute storm duration flood model. This indicates that at the current flood water levels on-site, there is an increase in water detention, reducing downstream flood levels and flows significantly as expected.

9 FLOOD HAZARD

The proposed Gold Coast Parklands developed site has been designed in such a way to reduce flood hazards. The adjacent sporting fields and roadway parallel to the channel are completely flood free up to the Q100 storm event under the specified design proposal. On-site, all roadways and building lots are also flood free to avoid any hazards and to ensure safe evacuation can be undertaken if necessary. The flooding on-site only occurs within the lower park region and extending up a portion of the overland flow paths within the park area.

Although there is an increase in water surface elevation on-site, this is necessary to provide sufficient flood storage space to reduce the downstream impacts of flooding events. By increasing the on-site flood storage in the lower park and detention basin regions, the downstream properties are immune to the effects of flooding. It should be noted the increase in the flood level on-site causes the water surface to sit above the invert of the culverts entering the site from the adjacent Gold Coast University Hospital. Given that the culverts are not fully submerged, i.e. the obvert is above the flood level, this is expected to cause no problems upstream of the site.

10 CONCLUSION

This report has presented the methodology and results of a detailed flood modelling assessment which has included the proposed Gold Coast Parklands re-development.

This assessment has followed discussions with Gold Coast City Council regarding the proposed development and has used software, model data and corrections to previous modelling exercises as agreed upon with Council engineers.

The resulting hydraulic assessment has shown that:

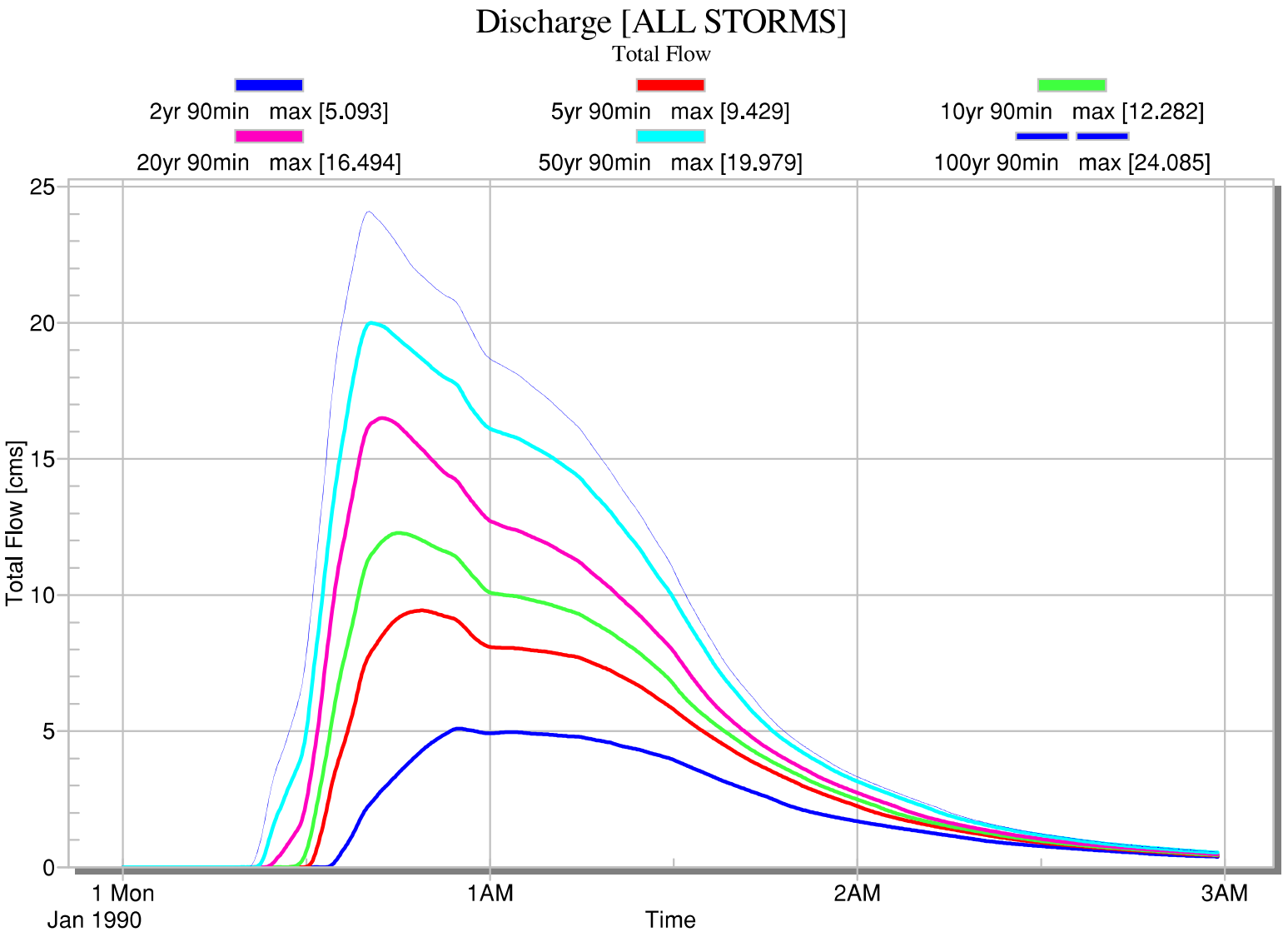
- No detrimental flooding aspects occur due to the full development of the site.
- Flooding on-site is reduced to only the lower park and detention basin areas.
- Flood storage is increased within the site.
- Flood levels and extents are reduced on downstream and adjacent properties.

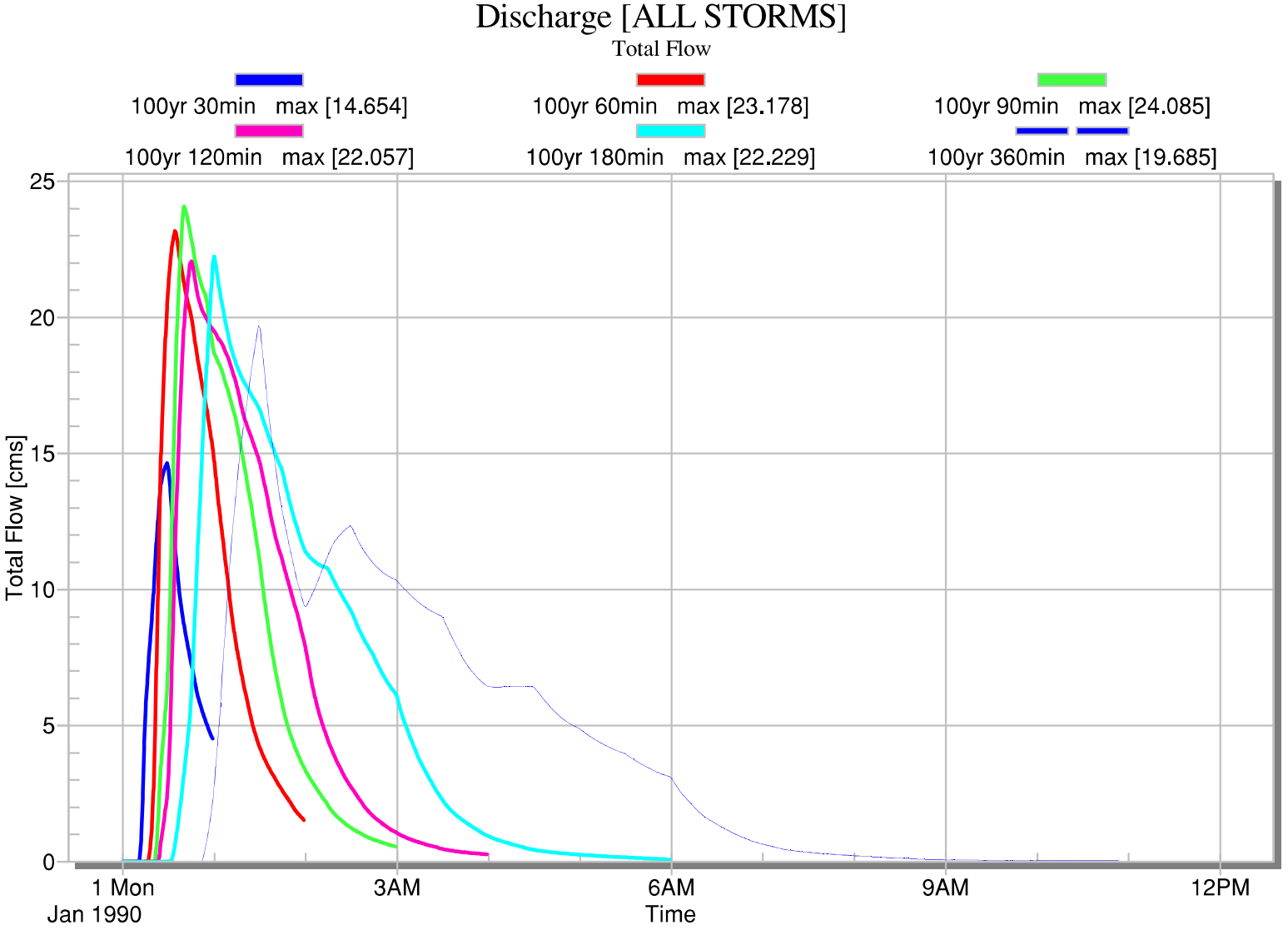
Therefore the results of this assessment have indicated that the proposed Gold Coast Parklands design upgrades can be undertaken as planned without having any considerable adverse impacts on the regional flooding regime of the Biggera Creek, and dramatically reducing the flooding effects on the downstream and adjacent properties.

The impacts of the proposed Gold Coast Parklands development have been assessed against the Gold Coast City Councils corrected base case version of the model which incorporates accurate, recently obtained site survey data. It has been shown that the flood level increases are isolated and contained within the subject site, and no adverse impacts are experienced to either upstream or downstream properties or structures.

Appendix A

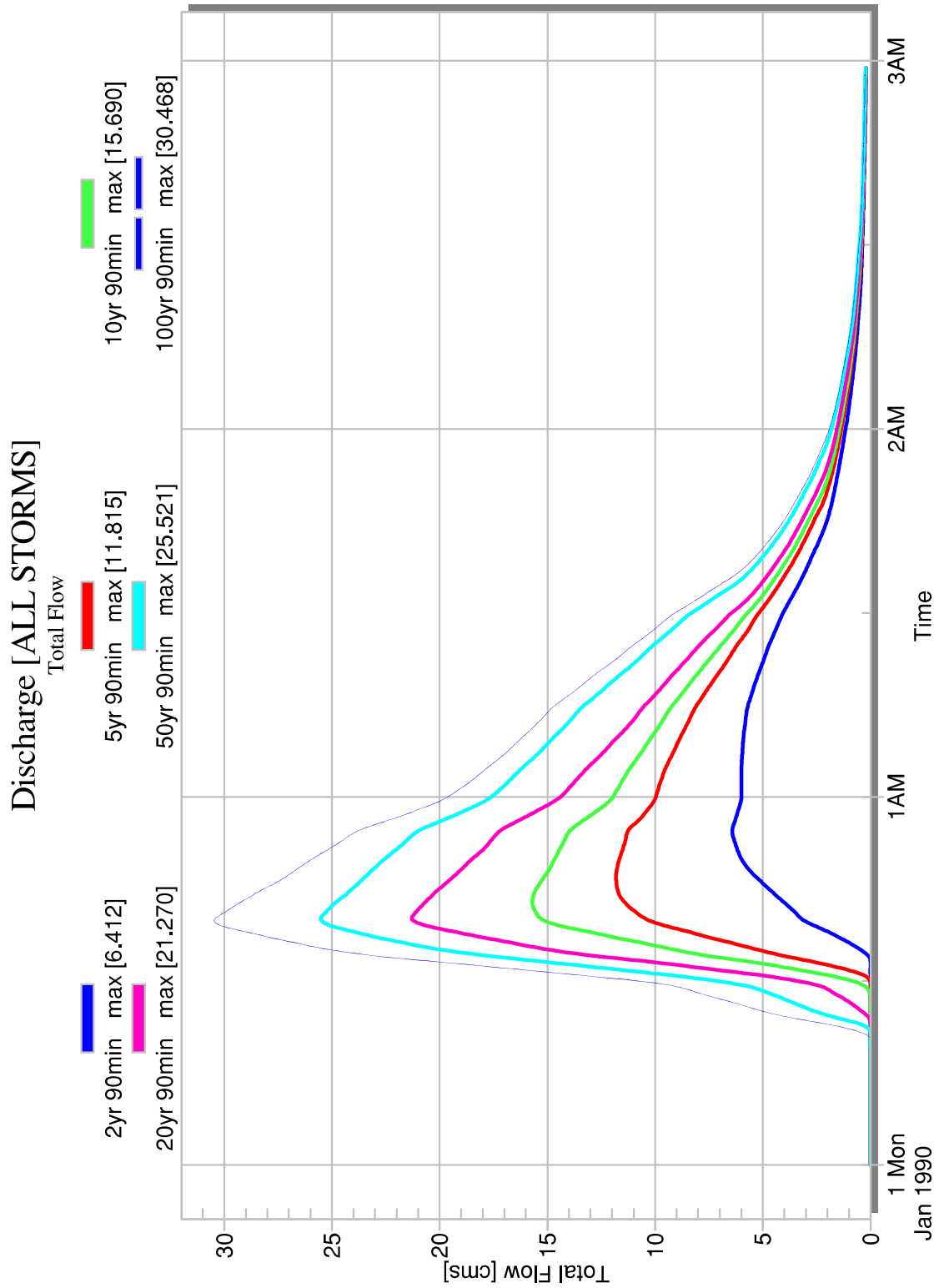
Gold Coast Parklands Existing Hydrographs

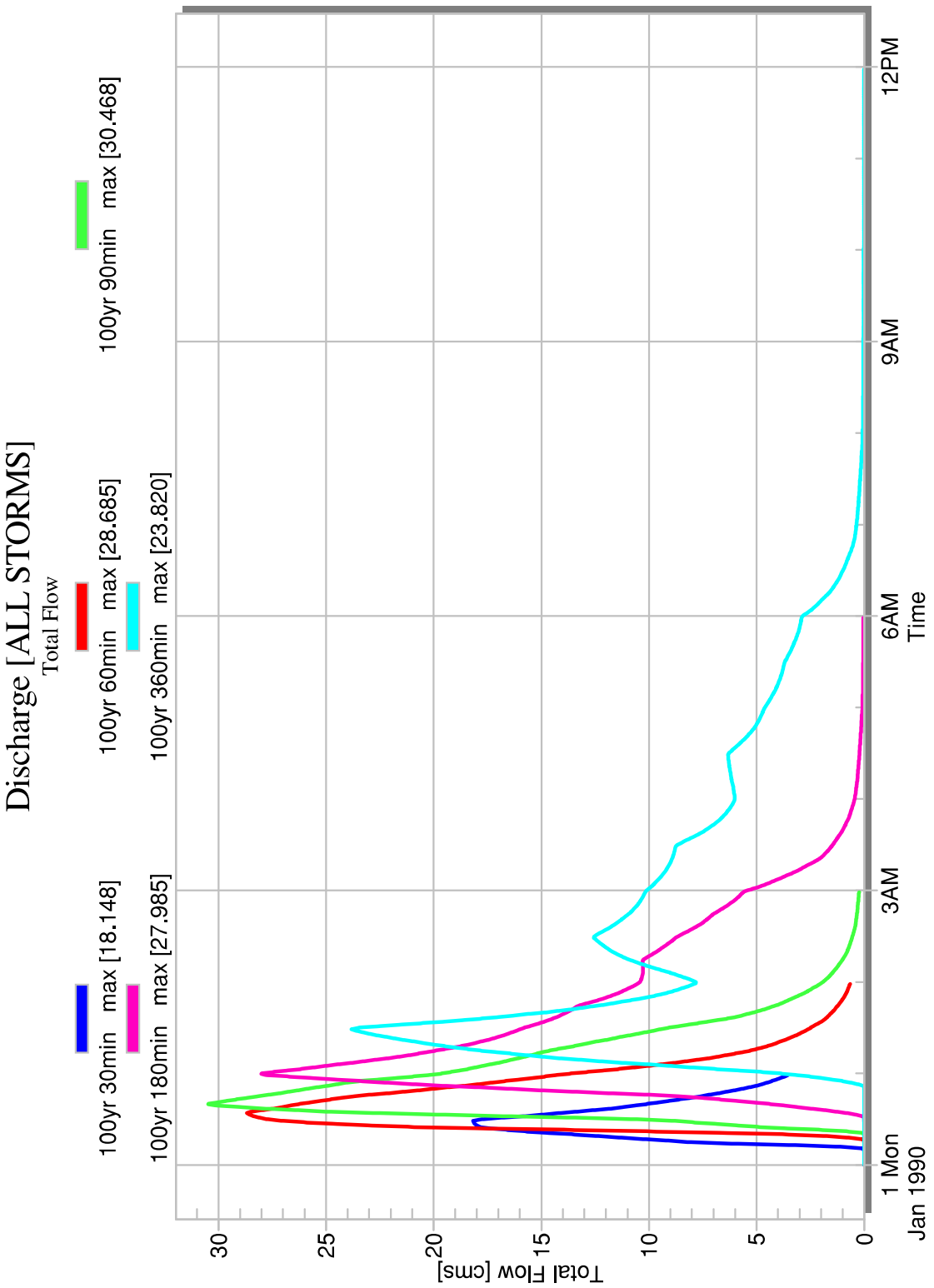

Discharge [ALL STORMS]
Total Flow
2yr 90min max [5.093]
5yr 90min max [9.429]
10yr 90min max [12.282]
20yr 90min max [16.494]
50yr 90min max [19.979]
100yr 90min max [24.085]
Total Flow [cms]
25
20
15
10
5
0
1 Mon
Jan 1990
1AM
2AM
3AM
Time


Discharge [ALL STORMS]
Total Flow
100yr 30min max [14.654]
100yr 60min max [23.178]
100yr 90min max [24.085]
100yr 120min max [22.057]
100yr 180min max [22.229]
100yr 360min max [19.685]
Total Flow [cms]
25
20
15
10
5
0
1 Mon
Jan 1990
3AM
6AM
9AM
12PM
Time

Appendix B

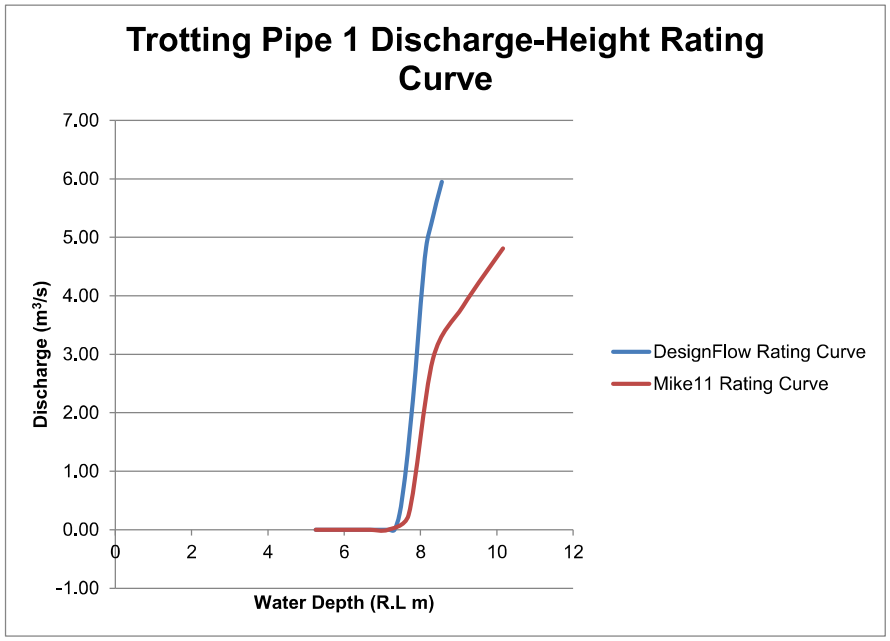
Gold Coast Parklands Design Hydrographs

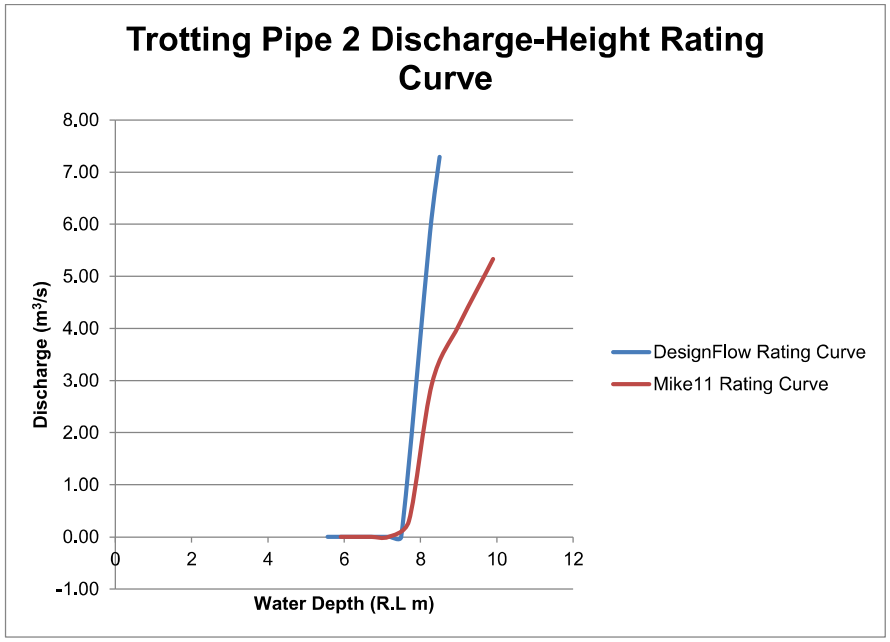




Appendix C

DesignFlow Rating Curves for Existing Basin Outflow

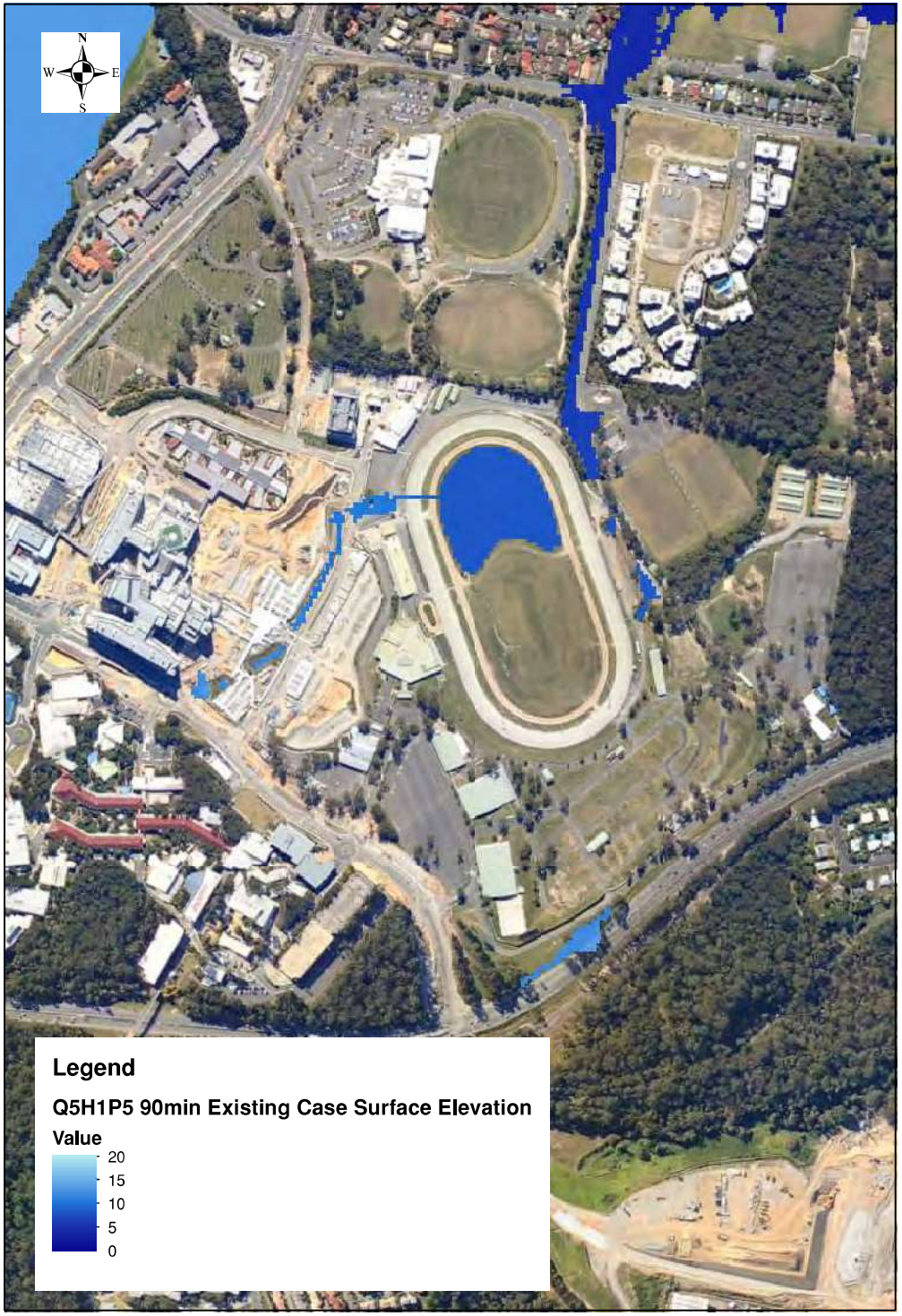


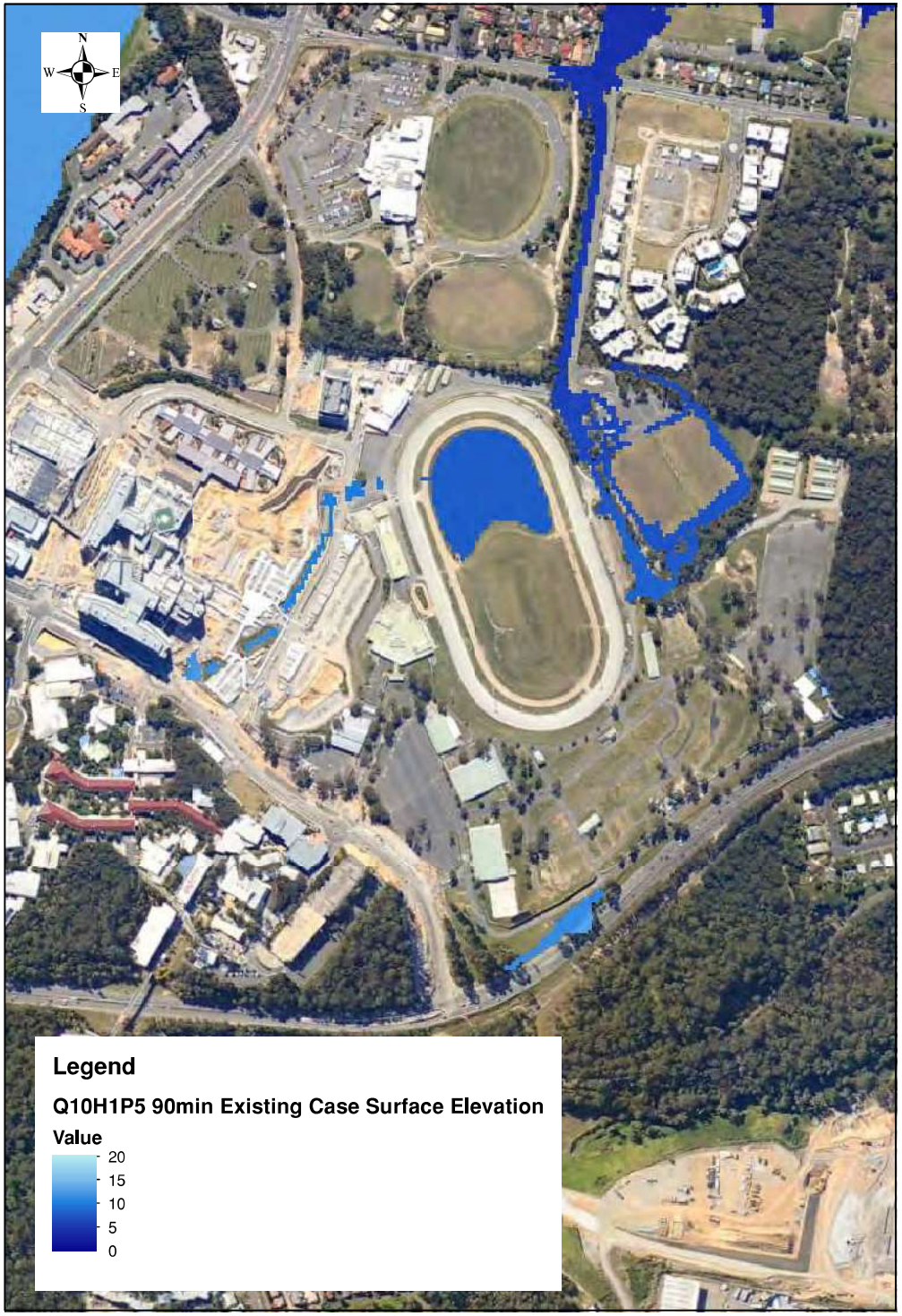


Appendix D

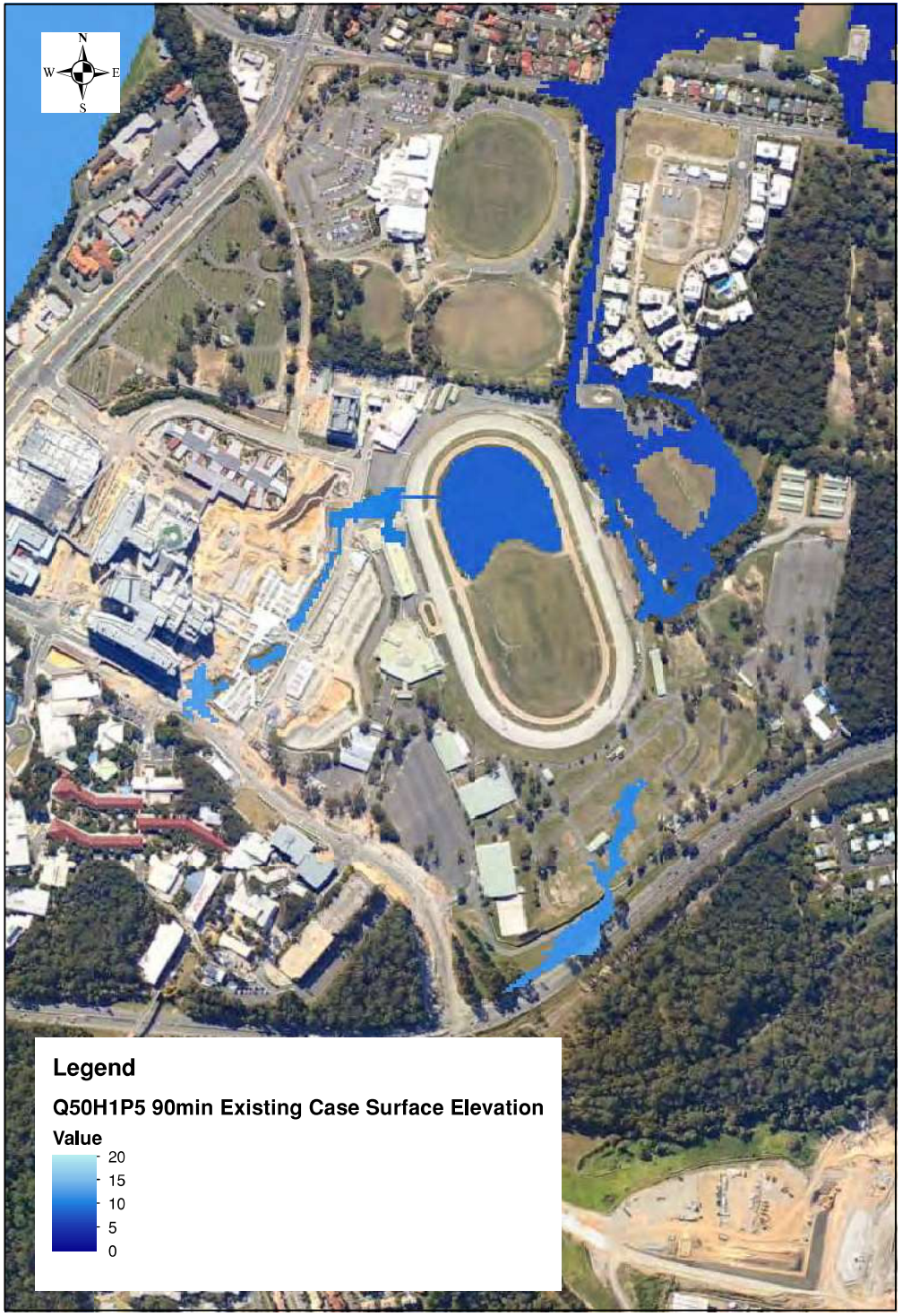
Gold Coast Parklands Existing Flood Extents

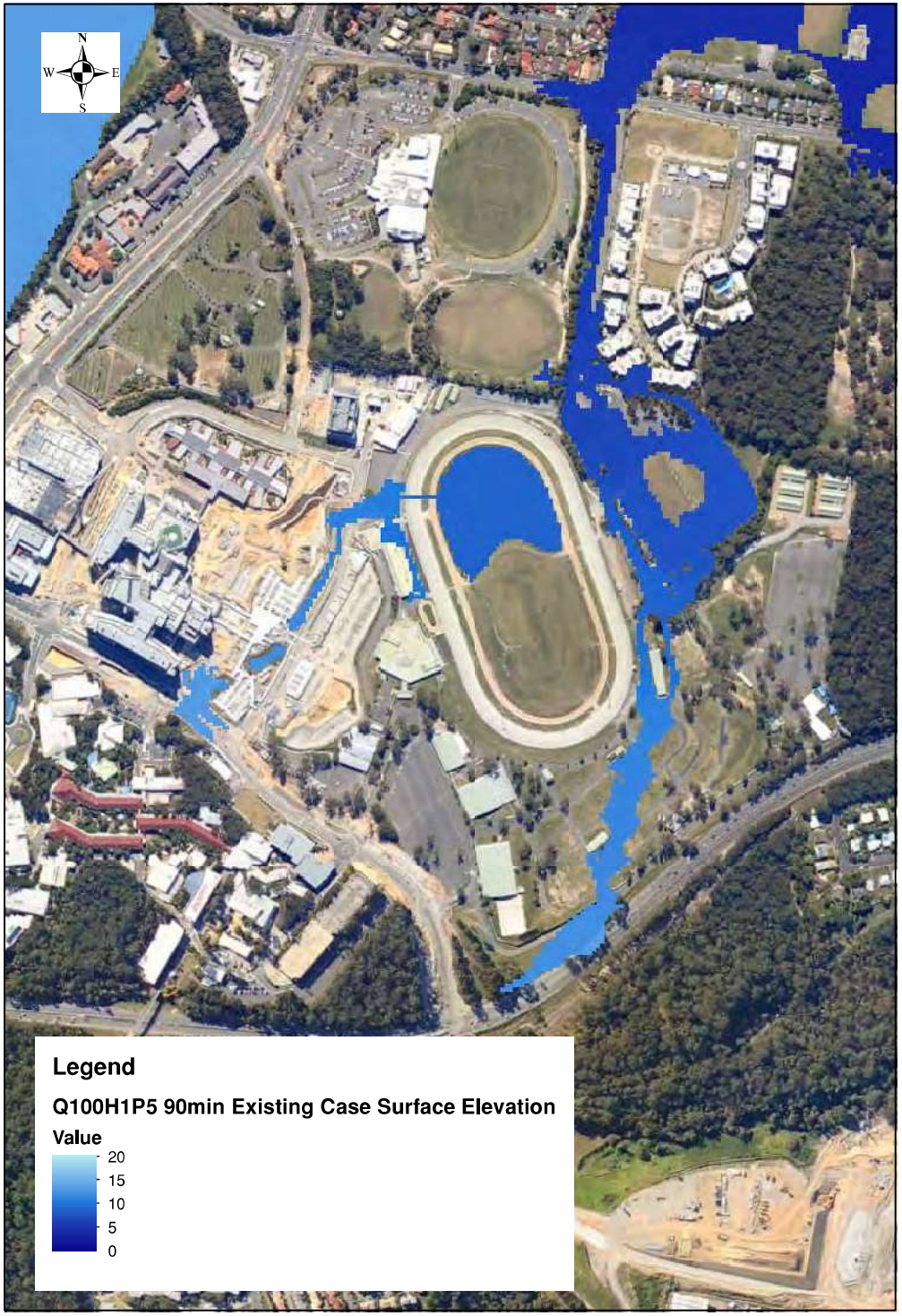

N
W
E
S
Legend
Q2H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0


N
W
E
S
Legend
Q5H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0


N
W
E
S
Legend
Q10H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0


N
W
E
S
Legend
Q20H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0


N
W
E
S
Legend
Q50H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0


N
W
E
S
Legend
Q100H1P5 90min Existing Case Surface Elevation
Value
20
15
10
5
0

Appendix E

Gold Coast Parklands Existing Velocity Maps




N
W
E
S
Legend
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1.000000001 - 1.5
1.500000001 - 2
2.000000001 - 5


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S
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2.000000001 - 5

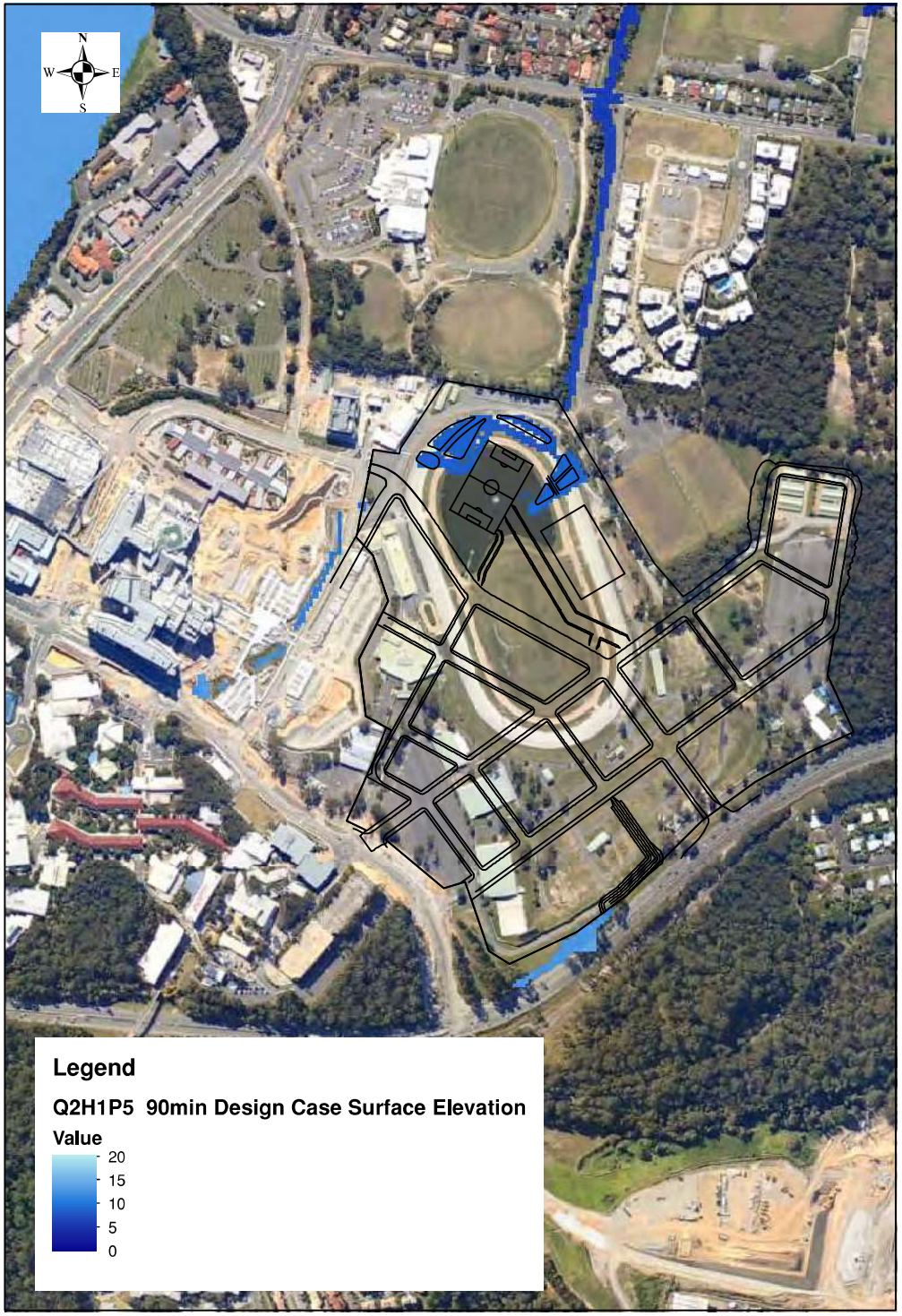

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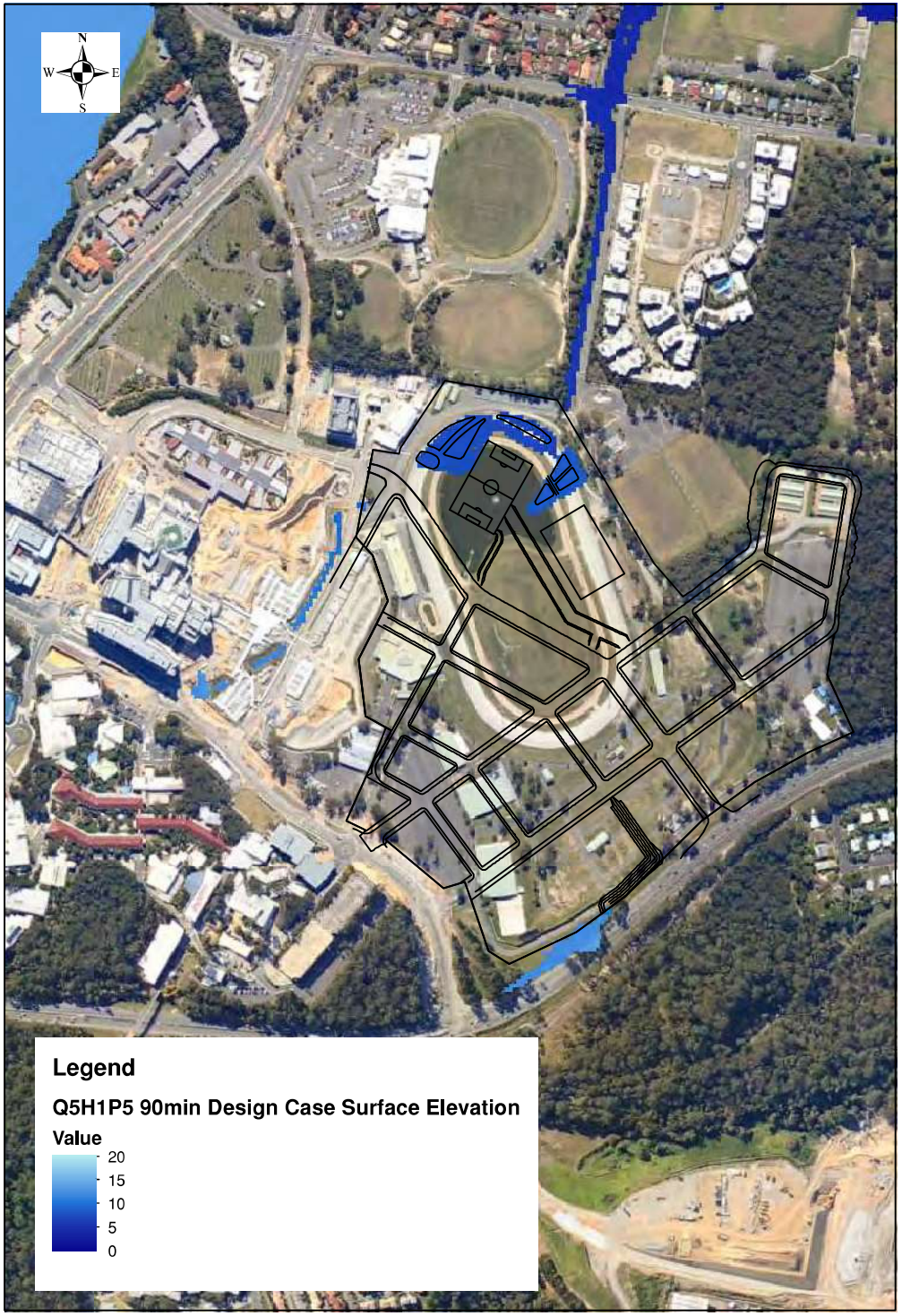

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1.500000001 - 2
2.000000001 - 10

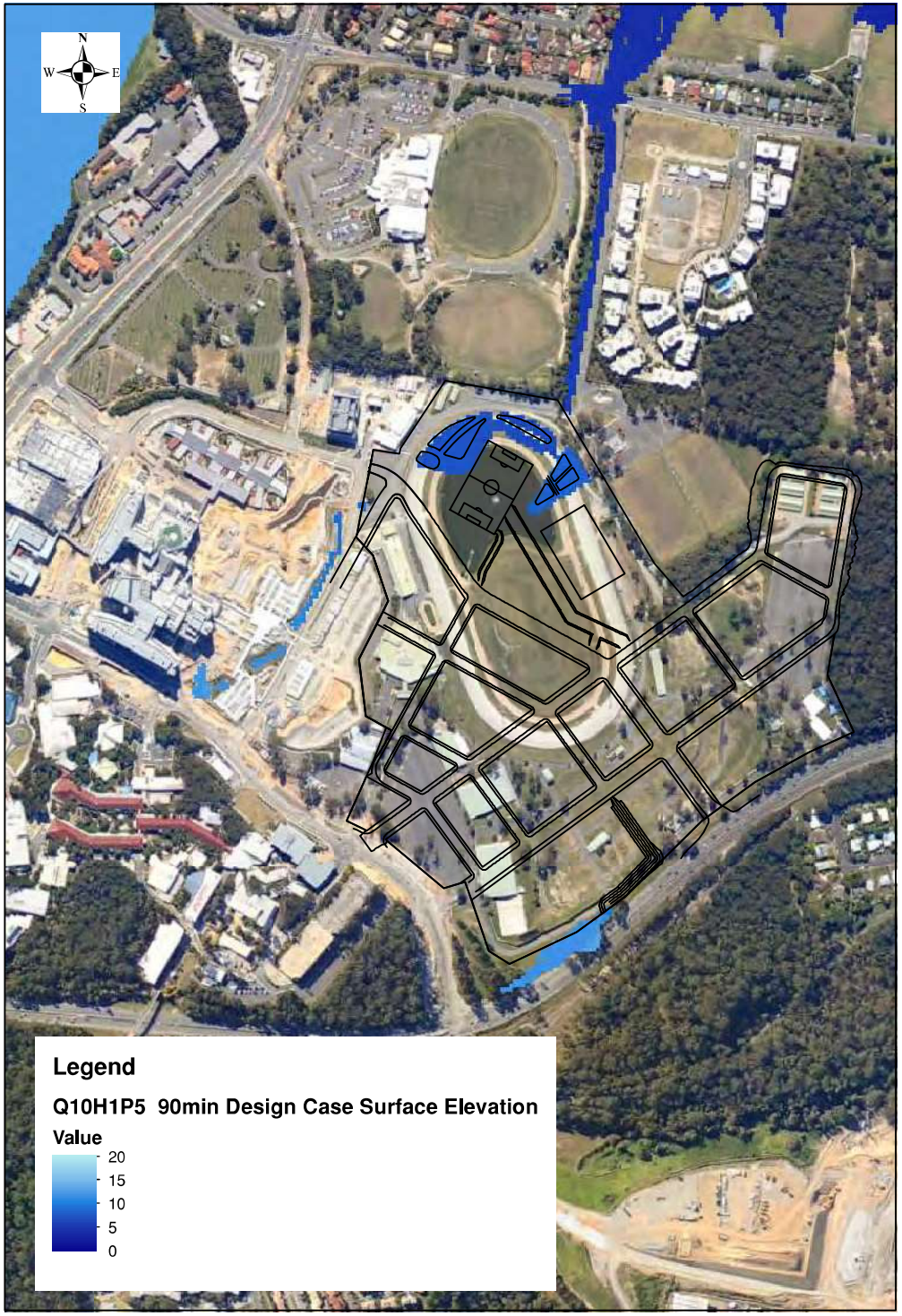


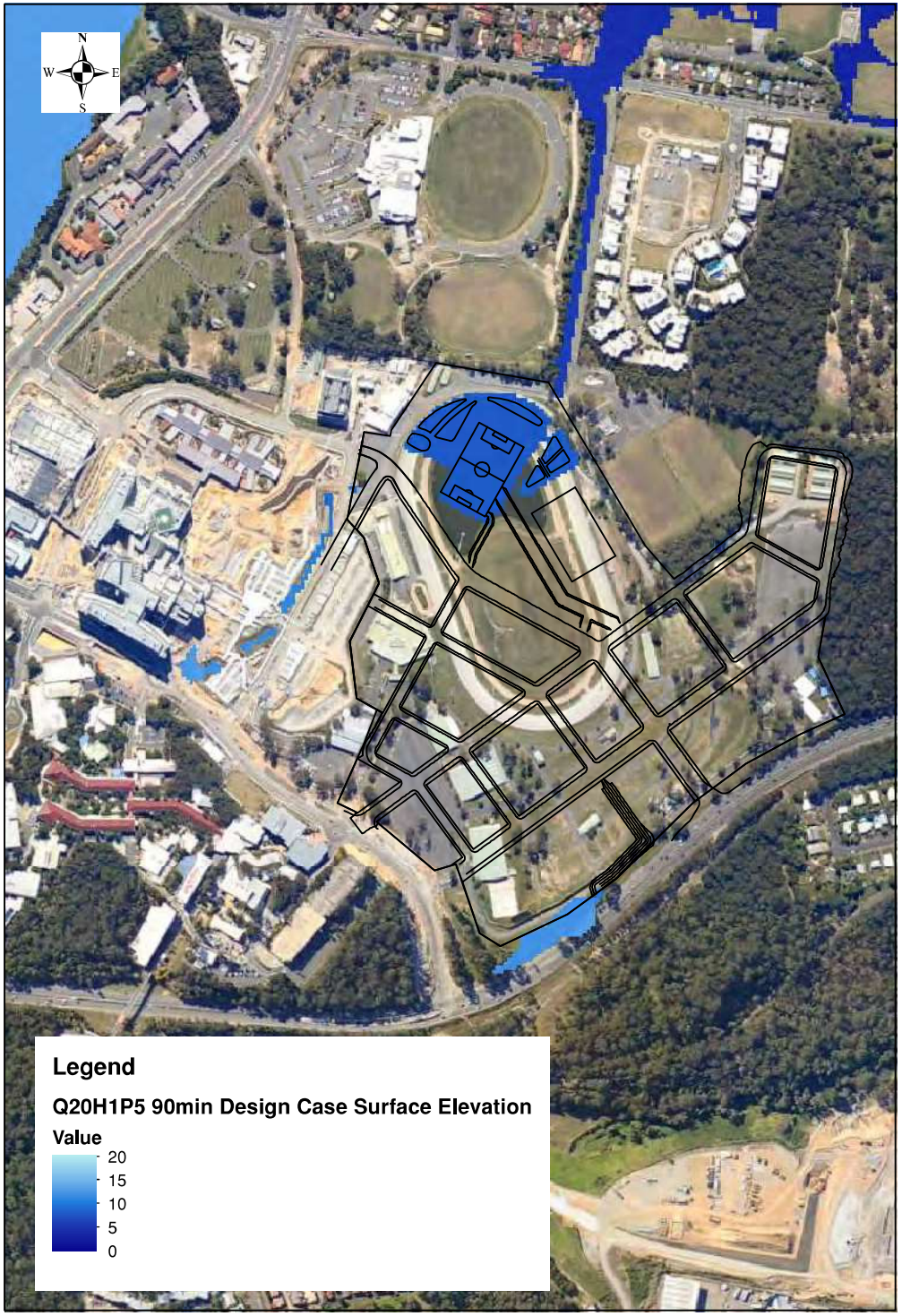
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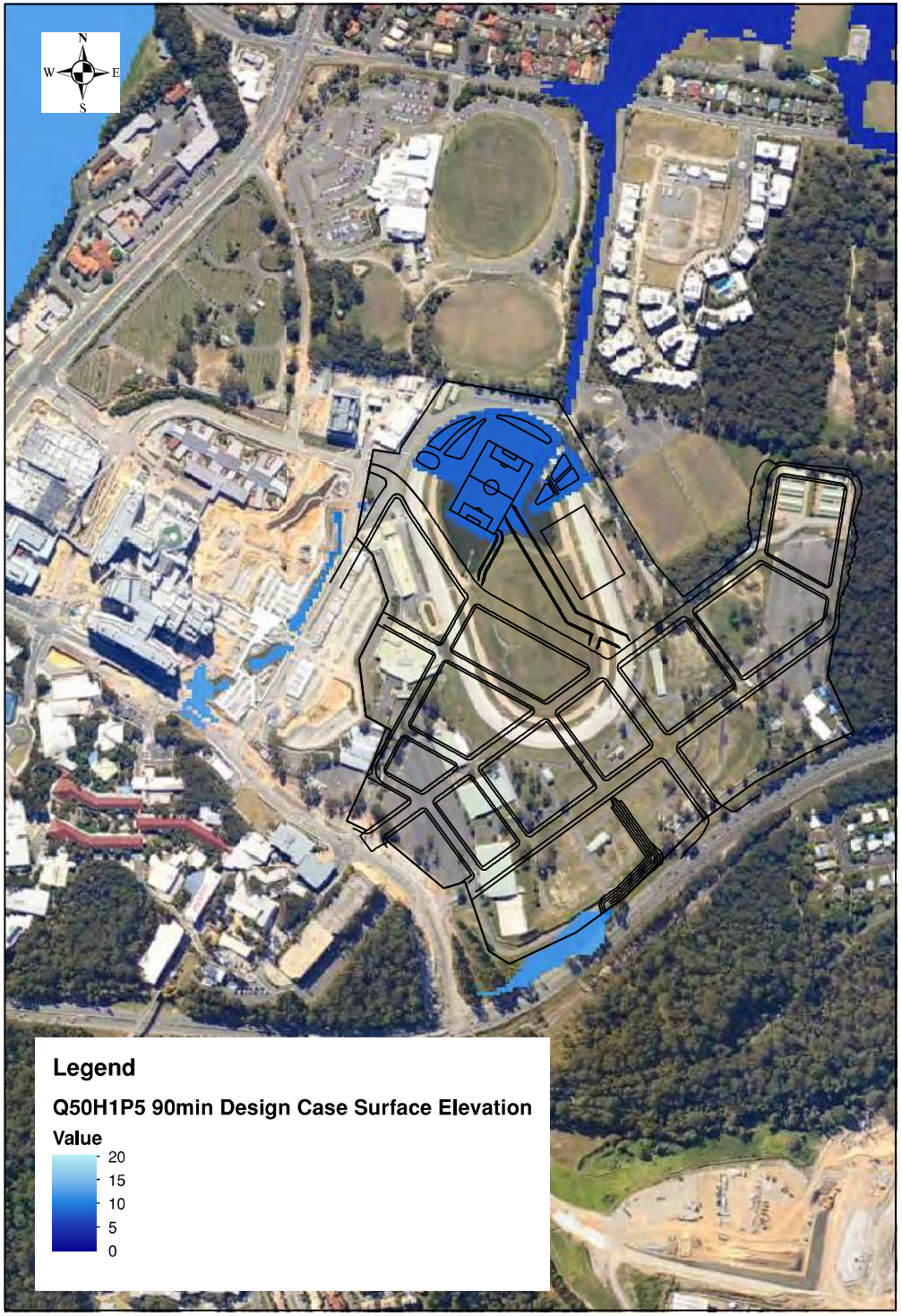
Gold Coast Parklands Developed Flood Extents

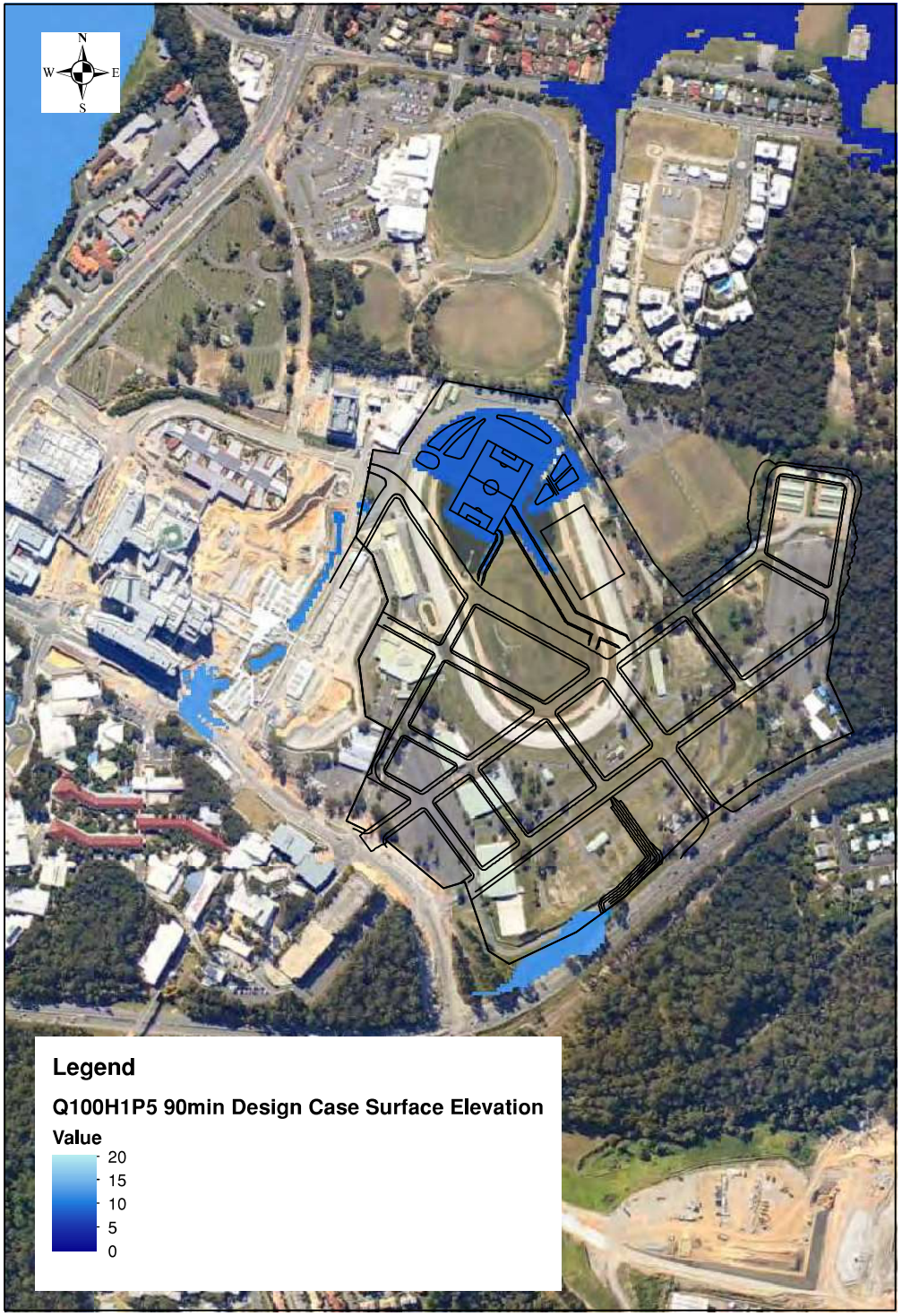

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Legend
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Value
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N
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E
S
Legend
Q10H1P5 90min Design Case Surface Elevation
Value
20
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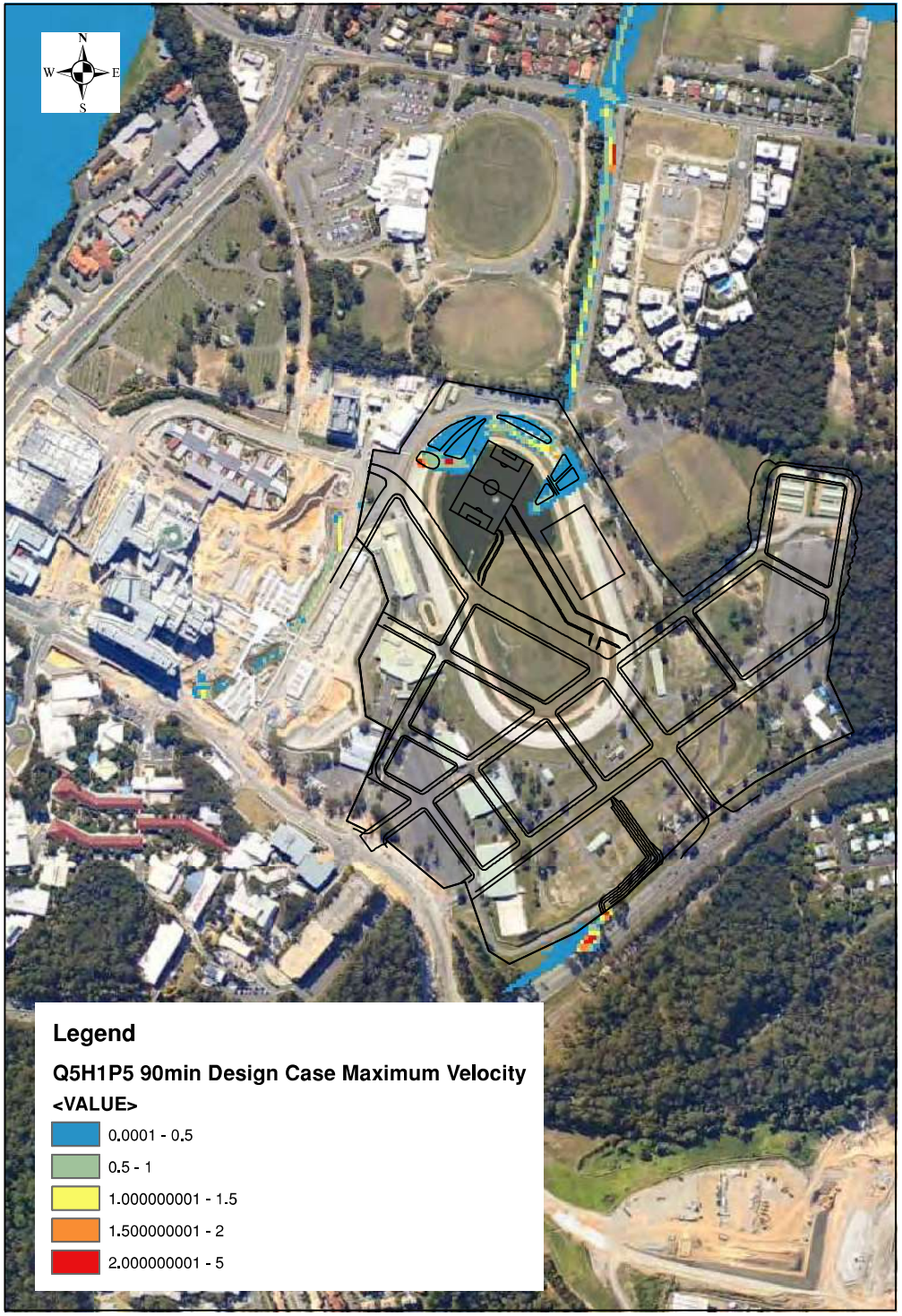

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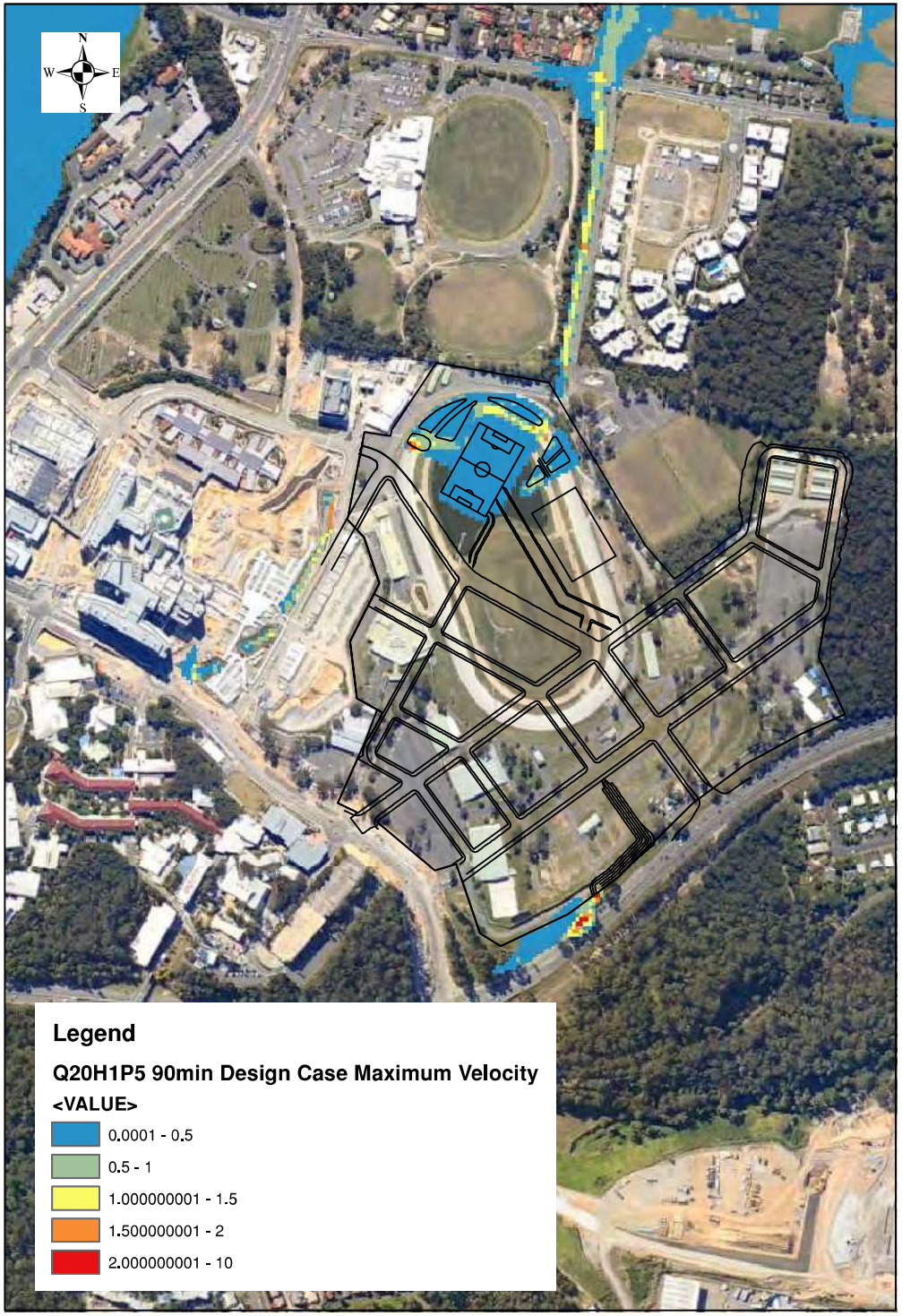
Appendix G

Gold Coast Parklands Developed Velocity Maps

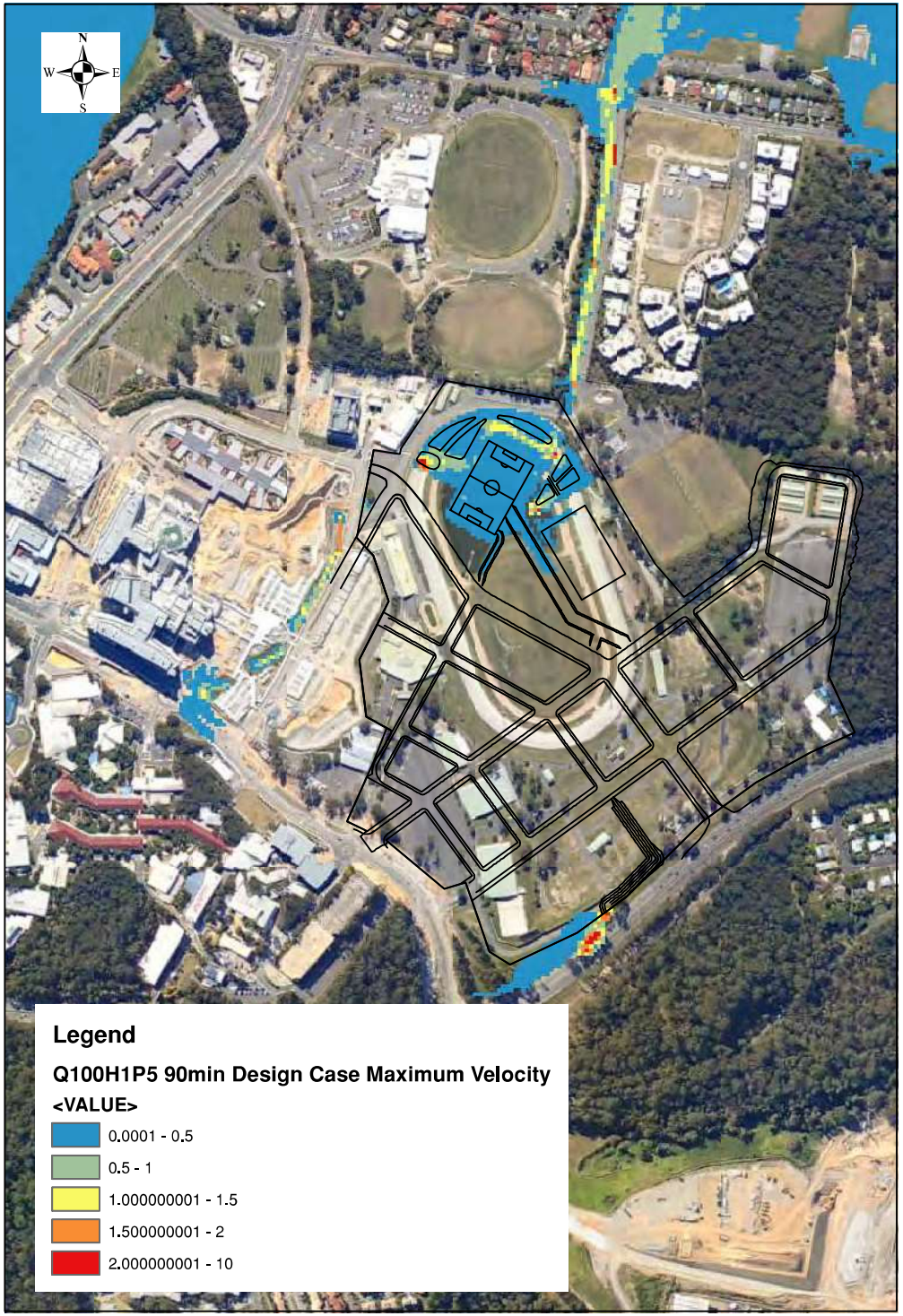



N
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Legend
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1.500000001 - 2
2.000000001 - 5


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1.500000001 - 2
2.000000001 - 10

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1300 657 402

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Attachment 6
ADG Engineering Drawings

PROPOSED DEVELOPMENT

48 VILLAGE BOULEVARD, SOUTPORT, QLD 4215

CIVIL WORKS

NOTE:

THE FOLLOWING INSPECTIONS MUST BE COMPLETED BY ADG ENGINEERS BEFORE ENGINEERING CERTIFICATION WILL BE ISSUED. THE CONTRACTOR IS TO PROVIDE A MINIMUM OF 72 HOURS NOTICE TO ADG FOR REQUIRED INSPECTIONS. SHOULD THE CONTRACTOR FAIL TO REQUEST AN INSPECTION, THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS TO ALLOW FOR THE WORKS TO BE INSPECTED TO THE SATISFACTION OF ADG. ANY INSPECTIONS THAT FAIL ARE TO BE RE-INSPECTED WITH ALL REINSPECTION COSTS TO BE PAID BY THE CONTRACTOR.

a) PRESTART
b) EARTHWORKS - FINAL STRIPPING OF TOPSOIL, INSTALLATION OF SEDIMENT AND EROSION CONTROL MEASURES
c) UNSUITABLE GROUND
d) STORMWATER PIPE LAID ON BEDDING PRIOR TO BACKFILL
e) STORMWATER TRENCH BACKFILLED PRIOR TO PAVEMENT PLACEMENT
f) STORMWATER STRUCTURE BASE SLABS
g) PRACTICAL COMPLETION
h) ON MAINTENANCE
i) OFF MAINTENANCE
j) ANY OTHER INSPECTION AS SPECIFIED BY THE RELEVANT AUTHORITY (REFER DEVELOPMENT APPROVAL)

GENERAL NOTES:

G1. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE SHOWN.

G2. ALL SETOUT ON SITE IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR TO ALLOW FOR ALL MEANS NECESSARY TO ACCURATELY SETOUT THE WORKS.

G3. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH PROJECT SPECIFICATIONS AND WHERE FURTHER DETAILS ARE REQUIRED THE CONTRACTOR SHALL REFER TO GOLD COAST CITY COUNCIL (GCCC) DEVELOPMENT GUIDELINES, LOCAL WATER AUTHORITY GUIDELINES, ASSOCIATED STANDARD DRAWINGS AND SPECIFICATIONS U.N.O.

G4. SHOULD ANY OF THE CONSTRUCTED WORKS BE CONSTRUCTED OUTSIDE OF THE TOLERANCES SPECIFIED WITHIN THE PROJECT SPECIFICATION AND LOCAL AUTHORITY REQUIREMENTS, THE CONTRACTOR WILL RECTIFY AT THEIR COST INCLUSIVE OF ANY ADDITIONAL COSTS INCURRED BY ADG.

G5. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. NO RESPONSIBILITY IS TAKEN BY ADG OR THE PRINCIPAL FOR THE ACCURACY AND COMPLETENESS OF THIS INFORMATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ACCURATELY ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CONTRACTOR TO LOCATE AND PROTECT SERVICES AS REQUIRED DURING PROPOSED WORKS.

G6. THE CONTRACTOR IS TO CHECK THROUGH LOCATING, POTHOLING AND SURVEY ALL CRITICAL CONNECTION POINTS FOR ALL CIVIL WORKS SHOWN ON THE DRAWINGS INCLUDING ANY POTENTIAL EXISTING SERVICES CLASHES PRIOR TO COMMENCEMENT OF CIVIL WORKS. CONTRACTOR TO IMMEDIATELY REPORT ANY DISCREPANCIES TO ADG AND AWAIT FORMAL DIRECTION PRIOR TO COMMENCING CIVIL WORKS.

G7. ON COMPLETION OF SERVICES INSTALLATION, ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL LEVEL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.

G8. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY DAMAGE TO AUTHORITY/COUNCIL'S INFRASTRUCTURE. SUCH REPAIR OR REINSTATEMENT TO BE CARRIED OUT IMMEDIATELY TO THE SATISFACTION OF INFRASTRUCTURE OWNER/MANAGER / AUTHORITY/COUNCIL.

G9. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH ALL WORKPLACE HEALTH AND SAFETY REQUIREMENTS.

G10. WHERE ANY EXCAVATION OR CONSTRUCTION WORKS ARE TO BE IN CLOSE PROXIMITY TO NEIGHBOURING LOT BOUNDARIES OR INFRASTRUCTURE, CONTRACTOR TO ALLOW IN SCOPE OF WORKS TO PROVIDE ALL MEASURES NECESSARY TO ENSURE THE INTEGRITY OF EXISTING BOUNDARIES AND INFRASTRUCTURE. THIS MAY INCLUDE THE USE OF LOW VIBRATION EQUIPMENT, TRENCH SHORING ETC AS REQUIRED.

G11. PRIOR TO THE CONTRACTOR COMMENCING ANY WORKS DETAILED ON THESE DRAWINGS, THE CONTRACTOR IS TO NOTIFY ADG ENGINEERS (AUST.) Pty. Ltd. AND RECEIVE WRITTEN CONFIRMATION THAT WORKS CAN COMMENCE

G12. CONTRACTOR TO PROVIDE AS CONSTRUCTED DRAWINGS FOR ALL CONSTRUCTED WORKS IN ACCORDANCE WITH LOCAL GOVERNMENT REQUIREMENTS. UNLESS OTHERWISE ADVISED BY ADG ENGINEERS (AUST.) Pty. Ltd. CONTRACTOR TO NOTE COUNCILS ADAC REQUIREMENTS.

G13. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH RELEVANT APPROVALS.

G14. CONTRACTOR TO ALLOW TO LIAISE/CO-ORDINATE WITH ELECTRICAL, LANDSCAPE AND OTHER SERVICE CONTRACTORS THROUGHOUT CIVIL CONSTRUCTION.

G15. CONTRACTOR TO ORGANISE ALL DEMOLITION PERMITS PRIOR TO ANY DEMOLITION WORKS COMMENCING ON SITE.

G16. CONTRACTOR TO ALLOW TO DEMOLISH ALL EXISTING STRUCTURES, ROADS AND SERVICES WITHIN LIMIT OF WORKS AND REMOVE FROM SITE U.N.O.

G17. CONTRACTOR TO UNDERTAKE DILAPIDATION REPORT FOR ADJOINING PROPERTIES AND COUNCIL ROADS AND VERGES PRIOR TO COMMENCEMENT OF ANY WORKS ON SITE.

G18. CONTRACTOR TO UNDERTAKE POST CONSTRUCTION DILAPIDATION REPORT AND COUNCIL ROADS AND VERGES AT PRACTICAL COMPLETION.

G19. CONTRACTOR TO CLEAR AND GRUB ALL VEGETATION ON SITE AS IDENTIFIED IN THE APPROVED VEGETATION MANAGEMENT PLAN. CONTRACTOR TO ENSURE ALL TREE ROOTS AND STUMPS ARE COMPLETELY REMOVED AND BACKFILLED TO LEVEL 1 SUPERVISION. CONTRACTOR TO ALLOW TO MULCH ALL CLEARED VEGETATION AND STOCKPILE ON SITE OR REMOVE FROM SITE AS DIRECTED.

G20. DRAWINGS TO BE READ IN CONJUNCTION WITH THE FOLLOWING CONSULTANTS/CONTRACTORS DRAWINGS:

SURVEYOR - FOCUS SURVEYING

ARCHITECT - GJG ARCHITECTS

G21. CONTRACTOR TO PREPARE AND HAVE APPROVED BY RELEVANT AUTHORITY: ROAD OPENING PERMIT AND TRAFFIC MANAGEMENT PLAN FOR ALL WORKS WITHIN COUNCIL ROAD RESERVES. CONTRACTOR TO ALLOW FOR ALL COSTS ASSOCIATED WITH IMPLEMENTATION OF THE TMP.

G22. ALL WORKS TO BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING LOCAL AUTHORITY APPROVALS: T.B.A

G23. CONTRACTOR TO UNDERTAKE ALL WORKS IN ACCORDANCE WITH OPW APPROVALS BY COUNCIL.

G24. NO WORKS ARE TO BE UNDERTAKEN ON LAND OUTSIDE OF THE SITE BOUNDARY WITHOUT FORMAL APPROVAL BY THE OWNER/CUSTODIAN OF THAT LAND INCLUDING BUT NOT LIMITED TO PRIVATE PROPERTY, ROAD RESERVE, PARKS/OPEN SPACE, EASEMENTS.

G25. THE CONTRACTOR SHALL HAVE AN APPROVED SET OF CONSTRUCTION DRAWINGS AND APPROVALS ON SITE AT ALL TIMES.

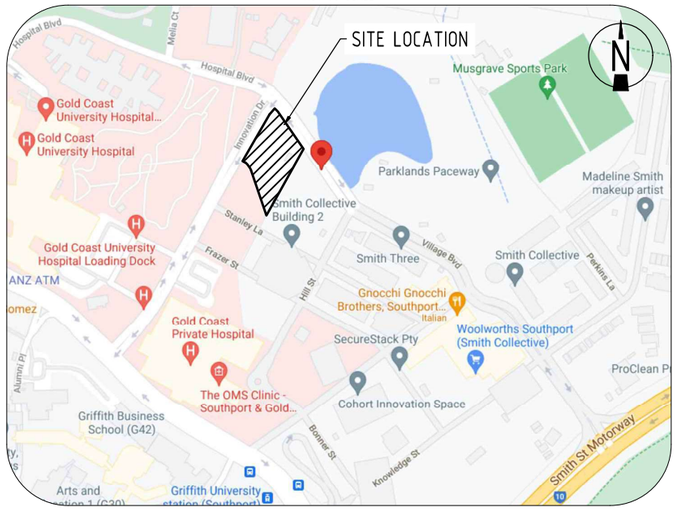
G26. ALL WATER AND SEWER RETICULATION WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT SEQ WATER SUPPLY AND SEWERAGE DESIGN AND CONSTRUCTION CODE.

G27. CONTRACTOR TO INSTALL INFORMATION SIGNAGE IN ACCORDANCE WITH LOCAL AUTHORITY STANDARDS PRIOR TO COMMENCEMENT OF WORKS.

G28. CONTRACTOR TO PREPARE CONSTRUCTION MANAGEMENT PLAN IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS AND HAVE APPROVED BY LOCAL AUTHORITY WHERE REQUIRED.

LOCALITY PLAN

NOT TO SCALE



PROPERTY DESCRIPTION

LOT: 16 ON SP275512

LOT: 18 ON SP275512

DRAWING SCHEDULE

DRAWING No.	DRAWING TITLE
C01	DRAWING SCHEDULE NOTES AND LOCALITY PLAN
C02	EXISTING FEATURES LAYOUT PLAN
C10	EROSION AND SEDIMENT CONTROL LAYOUT PLAN
C11	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
C20	EARTHWORKS LAYOUT PLAN
C21	EARTHWORKS SITE SECTIONS
C30	ROADWORK AND DRAINAGE LAYOUT PLAN

ADG CIVIL SERVICES

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
02	08.09.21	ISSUED FOR APPROVAL	LDV	DS
01	05.05.21	ISSUED FOR APPROVAL	MD	DS

PLOT DATE: 9/8/2021 8:02 AM FILENAME: J:\24000\24792\CIVIL\DWG\24792_C01_DRAWING SCHEDULE NOTES AND LOCALITY PLAN.DWG

RPEQ CERTIFICATION

PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 08.09.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

Gold Coast Office
Suite 201, Level 1, 1 Short Street,
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BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: INFINITE AGED CARE (DEVELOPMENTS) PTY LTD

Project Name: 48 VILLAGE BOULEVARD SOUTHPORT QLD 4215

Discipline: CIVIL | Status: APPROVAL

Designed By: LDV | Checked By: DS | Approved By: ML

Project No.: 24792 | Drawn By: MD | Scale at A1: NTS

Title: DRAWING SCHEDULE NOTES AND LOCALITY PLAN

Drawing No.: C01 | Revision: 02

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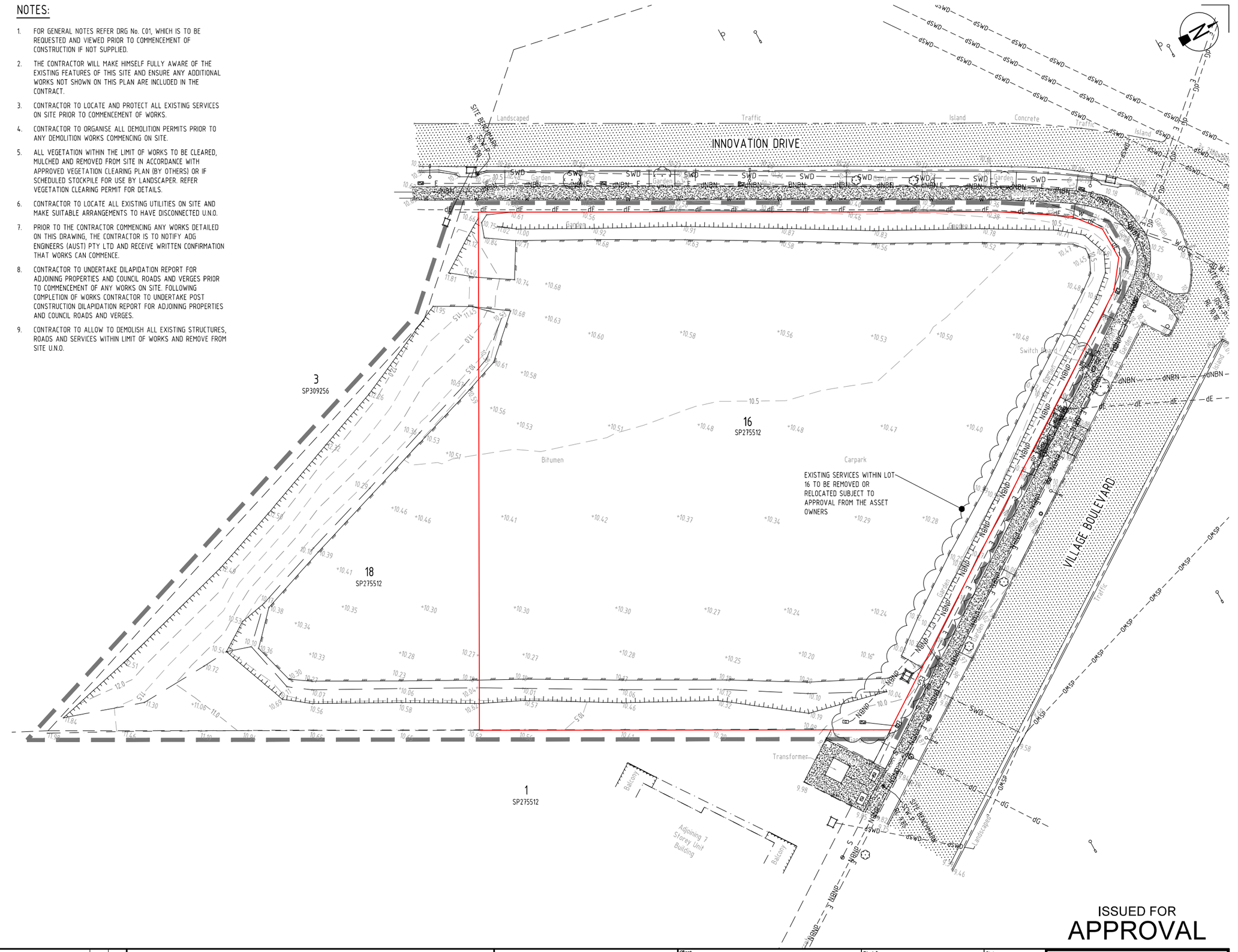
FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- EXISTING SURFACE CONTOURS
- LIMIT OF WORKS
- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING NOMINAL KERB LINE / EDGE OF ROAD
- EXISTING EDGE OF BITUMEN
- EXISTING ROAD CENTERLINE
- EXISTING EDGE OF BUILDING
- EXISTING EDGE OF BUILDING EAVE
- EXISTING STORMWATER DRAINAGE
- EXISTING STORMWATER DRAINAGE (RECORDS)
- EXISTING SEWER
- EXISTING SEWER (RECORDS)
- EXISTING WATER
- EXISTING WATER (RECORDS)
- EXISTING UNDERGROUND ELECTRICITY
- EXISTING UNDERGROUND ELECTRICITY (RECORDS)
- EXISTING OVERHEAD ELECTRICITY
- EXISTING GAS
- EXISTING GAS (RECORDS)
- EXISTING NBN
- EXISTING NBN (RECORDS)
- EXISTING TELECOMMUNICATIONS
- EXISTING TELECOMMUNICATIONS (RECORDS)
- EXISTING COMMUNICATIONS
- EXISTING BATTER
- EXISTING FENCE
- EXISTING TREE TO BE PROTECTED AND RETAINED
- EXISTING TREE TO BE REMOVED
- EXISTING ROAD
- EXISTING FOOTPATH

NOTES:

1. FOR GENERAL NOTES REFER DRG No. C01, WHICH IS TO BE REQUESTED AND VIEWED PRIOR TO COMMENCEMENT OF CONSTRUCTION IF NOT SUPPLIED.
2. THE CONTRACTOR WILL MAKE HIMSELF FULLY AWARE OF THE EXISTING FEATURES OF THIS SITE AND ENSURE ANY ADDITIONAL WORKS NOT SHOWN ON THIS PLAN ARE INCLUDED IN THE CONTRACT.
3. CONTRACTOR TO LOCATE AND PROTECT ALL EXISTING SERVICES ON SITE PRIOR TO COMMENCEMENT OF WORKS.
4. CONTRACTOR TO ORGANISE ALL DEMOLITION PERMITS PRIOR TO ANY DEMOLITION WORKS COMMENCING ON SITE.
5. ALL VEGETATION WITHIN THE LIMIT OF WORKS TO BE CLEARED, MULCHED AND REMOVED FROM SITE IN ACCORDANCE WITH APPROVED VEGETATION CLEARING PLAN (BY OTHERS) OR IF SCHEDULED STOCKPILE FOR USE BY LANDSCAPER. REFER VEGETATION CLEARING PERMIT FOR DETAILS.
6. CONTRACTOR TO LOCATE ALL EXISTING UTILITIES ON SITE AND MAKE SUITABLE ARRANGEMENTS TO HAVE DISCONNECTED U.N.O.
7. PRIOR TO THE CONTRACTOR COMMENCING ANY WORKS DETAILED ON THIS DRAWING, THE CONTRACTOR IS TO NOTIFY ADG ENGINEERS (AUST) PTY LTD AND RECEIVE WRITTEN CONFIRMATION THAT WORKS CAN COMMENCE.
8. CONTRACTOR TO UNDERTAKE DILAPIDATION REPORT FOR ADJOINING PROPERTIES AND COUNCIL ROADS AND VERGES PRIOR TO COMMENCEMENT OF ANY WORKS ON SITE. FOLLOWING COMPLETION OF WORKS CONTRACTOR TO UNDERTAKE POST CONSTRUCTION DILAPIDATION REPORT FOR ADJOINING PROPERTIES AND COUNCIL ROADS AND VERGES.
9. CONTRACTOR TO ALLOW TO DEMOLISH ALL EXISTING STRUCTURES, ROADS AND SERVICES WITHIN LIMIT OF WORKS AND REMOVE FROM SITE U.N.O.



NOTE

EXCEPT WHERE NOTED ON PLAN AND ASSOCIATED DESIGN DRAWINGS, ALL IN-GROUND SERVICES WITHIN THE PROPERTY BOUNDARY INCLUDING BUT NOT LIMITED TO: STORMWATER DRAINAGE, SEWERAGE, WATER, GAS, ELECTRICAL AND COMMUNICATIONS TO BE SAFELY DISCONNECTED, REMOVED FROM SITE AND CAPPED OFF AT SITE BOUNDARY. CONTRACTOR TO ARRANGE ALL NECESSARY APPLICATIONS AND PERMITS WITH THE RELEVANT AUTHORITIES. SERVICES TO BE CAPPED IN ACCORDANCE WITH RELEVANT SERVICE PROVIDER SPECIFICATIONS AND STANDARD DETAILS U.N.O.

CAUTION

THE LOCATION AND DEPTH OF EXISTING SERVICES AS SHOWN IS BASED ON INFORMATION OBTAINED FROM FOCUS SURVEYS DATED 01/03/21 AND COUNCIL RECORDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM THE ACTUAL LOCATION AND DEPTH OF EXISTING SERVICES PRIOR TO CARRYING OUT ANY EXCAVATION, TRENCHING OR TUNNELING WORKS.

WARNING ⚠

EXISTING FIBRE OPTIC, ELECTRICAL AND TELECOM CABLES MAY EXIST IN THE VICINITY OF REQUIRED WORKS. FOR ALL WORK WITHIN 2.5m OF MAJOR OPTIC CABLES, THE CONTRACTOR IS REQUIRED TO HAND DIG (POTHOLE) AND EXPOSE THE CABLE/CONDUIT. BEFORE WORK CAN COMMENCE, ON SITE LOCATION SHOULD BE SOUGHT FROM AN ACCREDITED PLANT LOCATOR.

DIAL BEFORE YOU DIG www.1100.com.au
The Essential First Step

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
01	05,05,21	ISSUED FOR APPROVAL	MD	DS

RPEQ CERTIFICATION

PROJECT NUMBER:	24792
PROJECT NAME:	48 VILLAGE BOULEVARD
DATE:	05.05.21
CERTIFIED BY:	MICHAEL LEPELAAR
RPEQ NUMBER:	11171
SIGNATURE:	

0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

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BRISBANE / DARWIN / GOLD COAST / MELBOURNE / PERTH / SUNSHINE COAST / SYDNEY / TOOWOOMBA

Client: INFINITE AGED CARE (DEVELOPMENTS) PTY LTD	Discipline: CIVIL	Status: APPROVAL
Project Name: 48 VILLAGE BOULEVARD SOUTHPORT QLD 4215	Designed By: LDV / Checked By: DS / Approved By: ML	
	Project No.: 24792 / Drawn By: MD / Scale at A1: 1:200	

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Title: EXISTING FEATURES LAYOUT PLAN
Drawing No.: C02
Revision: 01

PLOT DATE: 5/5/2021 5:13 PM FILENAME: J:\24000\24792\CVL\DWG\24792_C02_EXISTING FEATURES LAYOUT PLAN.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING SURFACE CONTOURS
- FINISHED SURFACE CONTOURS
- EXISTING NOMINAL KERB LINE
- EXISTING STORMWATER DRAINAGE
- EXISTING STORMWATER DRAINAGE DBYD
- PROPOSED NOMINAL KERB LINE
- PROPOSED BATTER
- PROPOSED STORMWATER DRAINAGE
- PROPOSED DRAIN
- FIELD INLET SEDIMENT BARRIER
- GULLY PIT SEDIMENT BARRIER
- PROPOSED SUMP PIT
- PROPOSED FIELD INLET
- FLOW DIRECTION
- SEDIMENT FENCE (INDICATIVE LOCATION)
- CHECK DAM
- PROPOSED SWALE (TURFED)
- LIMIT OF WORKS
- CONSTRUCTION ENTRY/EXIT SHAKEDOWN AREA
- EXISTING ROAD
- EXISTING FOOTPATH

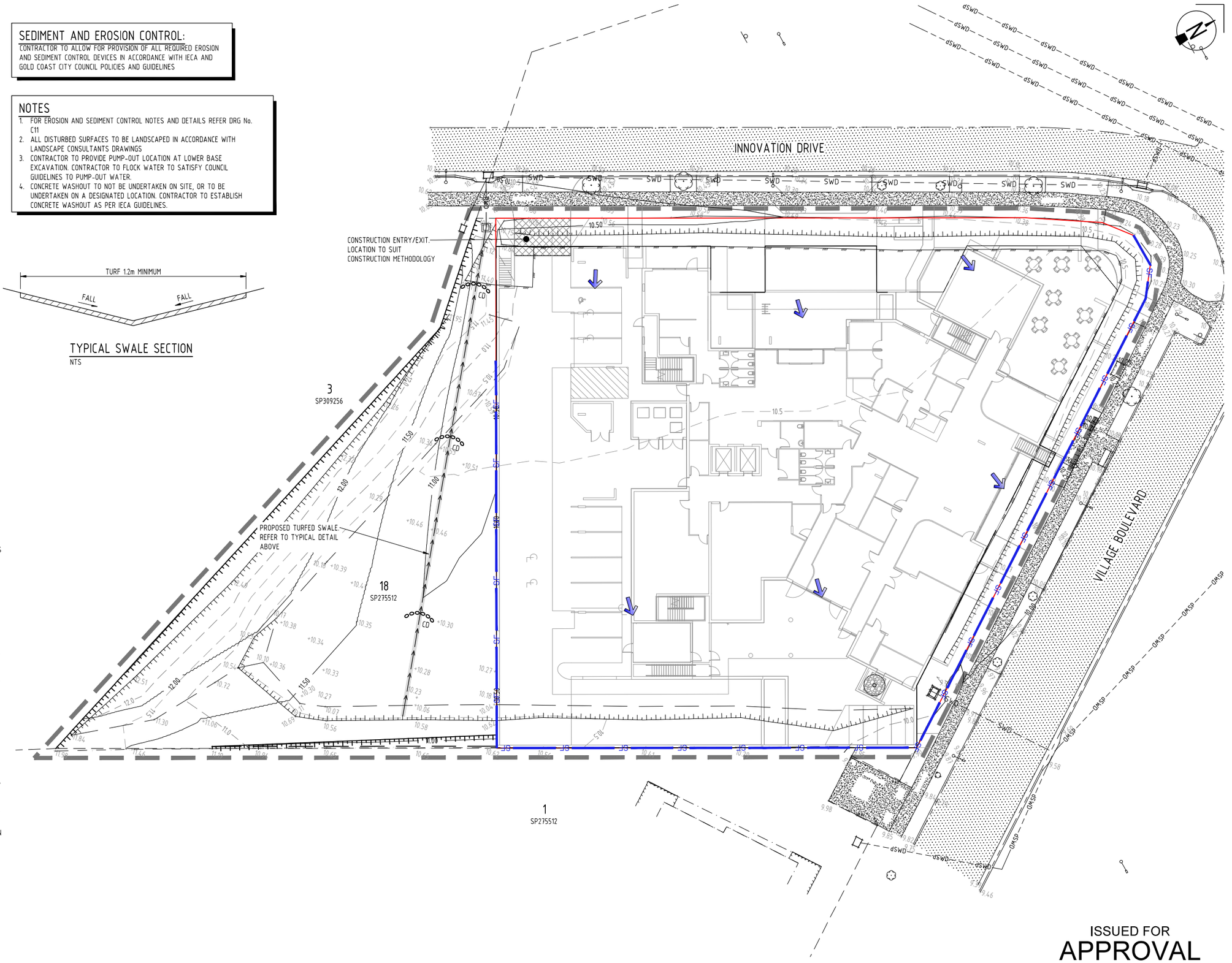
SEDIMENT AND EROSION CONTROL:

CONTRACTOR TO ALLOW FOR PROVISION OF ALL REQUIRED EROSION AND SEDIMENT CONTROL DEVICES IN ACCORDANCE WITH IECA AND GOLD COAST CITY COUNCIL POLICIES AND GUIDELINES

NOTES

1. FOR EROSION AND SEDIMENT CONTROL NOTES AND DETAILS REFER DRG No. C11
2. ALL DISTURBED SURFACES TO BE LANDSCAPED IN ACCORDANCE WITH LANDSCAPE CONSULTANTS DRAWINGS
3. CONTRACTOR TO PROVIDE PUMP-OUT LOCATION AT LOWER BASE EXCAVATION. CONTRACTOR TO FLOCK WATER TO SATISFY COUNCIL GUIDELINES TO PUMP-OUT WATER.
4. CONCRETE WASHOUT TO NOT BE UNDERTAKEN ON SITE, OR TO BE UNDERTAKEN ON A DESIGNATED LOCATION. CONTRACTOR TO ESTABLISH CONCRETE WASHOUT AS PER IECA GUIDELINES.

TYPICAL SWALE SECTION
NTS



GENERAL NOTE:

1. FOR GENERAL NOTES REFER DRG No. C01, WHICH IS TO BE REQUESTED AND VIEWED PRIOR TO COMMENCEMENT OF CONSTRUCTION IF NOT SUPPLIED.

SEDIMENT RELEASE GUIDELINES:

1. ALL RELEASES OF STORMWATER CAPTURED ONSITE, UNLESS OTHERWISE NOTED IN THIS STANDARD, MUST NOT EXCEED THE FOLLOWING LIMITS:
   a. 50mg/L OF TOTAL SUSPENDED SOLIDS (TSS) AS A MAXIMUM CONCENTRATION;
   b. TURBIDITY (NTU) VALUE LESS THAN 10% ABOVE BACKGROUND;
   c. pH VALUE MUST BE IN THE RANGE 6.5 TO 8.5 EXCEPT WHERE, AND TO THE EXTENT THAT, THE NATURAL RECEIVING WATERS LIE OUTSIDE THIS RANGE.

2. THE CONCENTRATION OF TSS RELEASED BY DEWATERING MAY ONLY EXCEED 50mg/L WHERE IT CAN BE DEMONSTRATED AND SUPPORTED THROUGH DOCUMENTATION THAT:
   a. FURTHER SIGNIFICANT RAINFALL IS FORECAST TO OCCUR BEFORE THE TSS CONCENTRATION IS LIKELY TO BE REDUCED TO 50mg/L;
   b. RELEASING A HIGHER CONCENTRATION OF TOTAL SUSPENDED SOLIDS WILL RESULT IN A BETTER ENVIRONMENTAL OUTCOME BY PROVIDING STORAGE FOR THE CAPTURE AND TREATMENT OF RUN-OFF FROM THE IMMINENT RAINFALL AND RUN-OFF.
   c. ALL REASONABLE AND PRACTICABLE STEPS HAVE BEEN TAKEN TO TREAT THE WATER WITHIN BEST-PRACTICE TIME FRAMES;
   d. FLOCCULENT HAS BEEN APPROPRIATELY APPLIED AND THE CONCENTRATION OF TSS IN THE CAPTURED WATER HAS ALREADY SIGNIFICANTLY DECREASED.

3. FOR ALL OTHER STORMWATER RELEASES, FLOWS AND DISCHARGES FROM THE SITE, THE RELEASE LIMIT PRESCRIBED IN (1a) ABOVE MUST NOT BE EXCEEDED UNLESS THE DEVELOPMENT IS IN FULL COMPLIANCE WITH THIS STANDARD.

NOTE: IT IS RECOMMENDED THAT A SITE-SPECIFIC RELATIONSHIP BETWEEN TURBIDITY AND SUSPENDED SOLIDS IS DETERMINED FOR EACH SEDIMENT BASIN. ONCE A CORRELATION BETWEEN SUSPENDED SOLIDS AND TURBIDITY HAS BEEN ESTABLISHED FOR A SEDIMENT BASIN, TESTING STORMWATER FOR COMPLIANCE WITH RELEASE LIMITS, PRIOR TO RELEASE, CAN BE DONE ON SITE WITH A TURBIDITY TUBE OR CALIBRATED TURBIDITY METER. THIS HAS THE ADVANTAGE OF PROVIDING IMMEDIATE ASSESSMENT TO JUSTIFY A RELEASE RATHER THAN WAITING FOR LABORATORY RESULTS TO CONFIRM CONCENTRATION LEVELS AND COMPLIANCE. NOTE THAT POST-RELEASE TSS VALIDATION IS APPROPRIATE TO DEMONSTRATE THAT THE NTU/TSS CORRELATION IS BEING MAINTAINED.

NOTE: BACKGROUND REFERS TO RECEIVING WATER QUALITY IMMEDIATELY UPSTREAM OF THE SITE LOCATION RELEASE POINT AT THE TIME OF RELEASE. WHERE THERE IS NO IMMEDIATE UPSTREAM RECEIVING WATER AT THE LOCATION AND TIME OF RELEASE, THEN THE TURBIDITY RELEASE LIMIT (NTU) WILL BE EQUAL TO THE RELEASE LIMIT FOR 50mg/L TOTAL SUSPENDED SOLIDS (TSS) BASED UPON THE ONSITE CORRELATION BETWEEN TSS AND NTU.

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
01	05,05,21	ISSUED FOR APPROVAL	MD	DS

RPEQ CERTIFICATION
PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 05.05.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

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Client: INFINITE AGED CARE (DEVELOPMENTS) PTY LTD	Discipline: CIVIL		Status: APPROVAL
Project Name: 48 VILLAGE BOULEVARD SOUTHPORT QLD 4215	Designed By: LDV	Checked By: DS	Approved By: ML
	Project No.: 24792	Drawn By: MD	Scale at A1: 1:200

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Title: EROSION AND SEDIMENT CONTROL LAYOUT PLAN
Drawing No.: C10
Revision: 01

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

PLOT DATE: 5/5/2021 5:13 PM FILENAME: J:\24000\24792\CVL\DWG\24792_C10_EROSION AND SEDIMENT CONTROL LAYOUT PLAN.DWG

NOTES:

SEDIMENT CONTROL

1. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE IN ACCORDANCE WITH INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA) AUSTRALIA GUIDELINES AND THE SPECIFICATIONS.
2. EROSION AND SEDIMENT CONTROL DETAILS SHOWN ARE MINIMUM REQUIREMENTS. IT IS THE CONTRACTORS RESPONSIBILITY TO INSTALL ADDITIONAL CONTROL MEASURES AS DEEMED NECESSARY THROUGHOUT CONSTRUCTION.
3. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL SEDIMENT CONTROL DEVICES IN A FUNCTIONAL ORDER AND REPLACE ALL BLOCKED SEDIMENT DEVICES AS REQUIRED UNTIL SUCCESSFUL OFF MAINTENANCE OF WORKS.
4. CONSTRUCTION OF ALL SEDIMENT MANAGEMENT DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT. SHALL BE COMPLETED AND EFFECTIVE PRIOR TO:
   a. STRIPPING OF TOPSOIL AND GRASS.
   b. BULK EARTHWORKS TO THE SITE.
   c. SERVICES INSTALLATION.
   d. PAVEMENT CONSTRUCTION.
5. ALL SEDIMENT MANAGEMENT MEASURES ARE TO REMAIN IN PLACE UNTIL INSTRUCTION IS RECEIVED IN WRITING FROM THE SUPERINTENDENT TO REMOVE ALL OR PART OF THE SILT CONTROL APPLICATIONS.
6. THE BULK EARTHWORKS AND SEDIMENT CONTROL LAYOUT PLAN SHALL BE READ IN CONJUNCTION WITH THE APPROVED DRAWINGS.
7. PRIOR TO COMMENCEMENT OF CONSTRUCTION APPROVAL IS TO BE OBTAINED FROM THE SUPERINTENDENT FOR THE LOCATION OF THE SITE ACCESS POINT AND WASH DOWN AREA WHICH ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
8. IF EROSION AND SEDIMENT CONTROL DEVICES HAVE BEEN FOUND TO BE DIFFERENT OR FAILED IN SERVICE, CORRECTIVE ACTION IS TO BE UNDERTAKEN IMMEDIATELY WHICH MAY INCLUDE AMENDMENTS' ADDITIONS TO THE ORIGINAL APPROVED EROSION CONTROL PLANS. SUCH AMENDMENTS ARE TO BE APPROVED BY SUPERINTENDENT, IF DEEMED NECESSARY AND RELEVANT.

OVERALL

9.
   a. TEMPORARY DRAINAGE CONTROL FLOW SHOULD BE DIVERTED AROUND THE WORK SITE WHERE POSSIBLE.
   b. ALL DRAINAGE, EROSION AND SEDIMENT CONTROLS TO BE INSTALLED AND BE OPERATIONAL BEFORE COMMENCING UP-SLOPE EARTHWORKS.
   c. IN AREAS WHERE RUNOFF TURBIDITY IS TO BE CONTROLLED, EXPOSED SURFACES TO BE EITHER MULCHED, COVERED WITH EROSION CONTROL BLANKETS OR TURFED IF EARTHWORKS ARE EXPECTED TO BE DELAYED FOR MORE THAN 14 DAYS.

SEDIMENT FENCE

10. FOR SEDIMENT FENCE STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWINGS SF-01 AND SF-02 SEDIMENT FENCE.

TEMPORARY CONSTRUCTION ENTRY/EXIT

11. FOR CONSTRUCTION ENTRY / EXIT STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWINGS EXIT-01 AND EXIT-02 CONSTRUCTION EXIT - ROCK PAD (CONSTRUCTION SITES ONLY), EXIT-03 - ROCK PADS FOR BUILDING SITES AND EXIT-04 AND EXIT-05 CONSTRUCTION EXIT - VIBRATION GRID.

KERB INLET

12. FOR KERB INLET STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING ESC-03 KERB INLET SEDIMENT TRAPS.

CHECK DAMS

13. FOR CHECK DAM STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING RCD-01 CHECK DAMS.

REVEGETATION

14. FOR REVEGETATION STANDARD SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING R-01 REVEGETATION GENERAL.

FIELD INLET

15. FOR FIELD INLET STANDARD DETAIL AND SPECIFICATION REFER TO INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWING ESC-02 GRATED STORMWATER (FIELD) INLET SEDIMENT TRAP.

OPERATION AND MAINTENANCE

16. IN ACCORDANCE WITH GCCC ESC GUIDELINES, ALL ESC MEASURES SHALL BE INSPECTED:
   - AT LEAST DAILY (WHEN WORK IS OCCURRING ON SITE) OR WEEKLY (WHEN WORK IS NOT OCCURRING ON SITE)
   - WITHIN 24 HOURS OF EXPECTED RAIN; AND
   - WITHIN 18 HOURS OF A RAINFALL EVENT (I.E. AN EVENT OF SUFFICIENT INTENSITY AND DURATION TO MOBILISE SEDIMENT ON SITE).
17. IN ACCORDANCE WITH GCCC ESC GUIDELINES, MAINTENANCE OF ESC MEASURES SHALL OCCUR IN ACCORDANCE WITH THE FOLLOWING TABLE:

MAINTENANCE SCHEDULE

ESC MEASURE	MAINTENANCE TRIGGER	TIMEFRAME FOR COMPLETION OF MAINTENANCE
SEDIMENT BASINS	WHEN SETTLED SEDIMENT EXCEEDS THE VOLUME OF THE SEDIMENT STORAGE ZONE (SEE COUNCIL'S SEDIMENT BASIN DESIGN GUIDELINES)	WITHIN 7 DAYS OF THE INSPECTION
OTHER ESC MEASURES	THE CAPACITY OF ESC MEASURES FALLS BELOW 75%	BY THE END OF THE DAY

GENERAL

18. CIVIL CONTRACTOR IS TO PROVIDE AN UPDATED PROGRAM OF ESC MAINTENANCE AND CONTROL OF ALL STAGES OF WORK FOR APPROVAL BY THE SUPERINTENDENT.

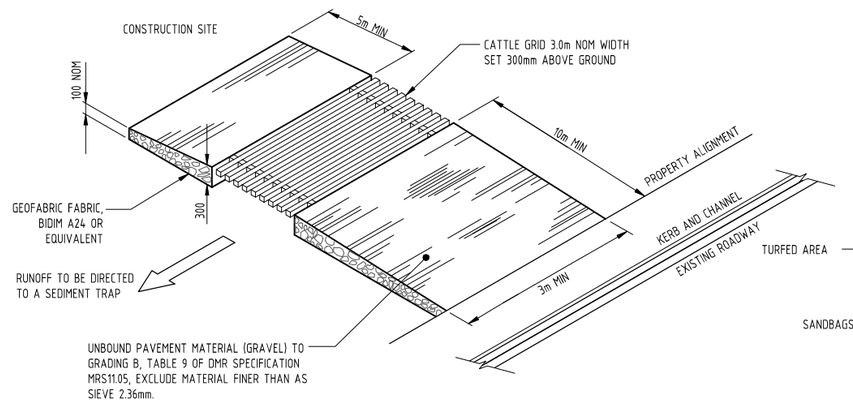
PUMP-OUT NOTES:
COLLECTED STORMWATER IS TREATED WITH AN APPROPRIATE FLOCCULATING AGENT PRIOR TO PUMP OUT BY LICENSED CONTRACTOR AFTER EVERY RAIN EVENT. SEDIMENT TO BE CLEANED OUT ON REGULAR BASIS.

IECA STANDARD DRAWINGS REGISTER

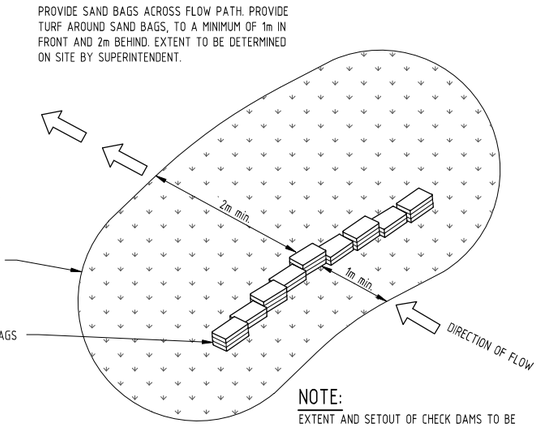
DRAWING NUMBER	DRAWING DESCRIPTION
EXIT-01	CONSTRUCTION EXIT - ROCK PAD
EXIT-02	CONSTRUCTION EXIT - ROCK PAD
EXIT-03	ROCK PADS FOR BUILDING SITES
CD-01	CATCH DRAINS
CD-02	CATCH DRAINS (EARTH LINED)
RCD-01	CHECK DAMS
FF-01	FILTER FENCE
SF-01	SEDIMENT FENCE
SF-02	SEDIMENT FENCE
ESC-02	GRATED STORMWATER (FIELD) INLET SEDIMENT TRAP
ESC-03	KERB INLET SEDIMENT TRAPS
R-01	REVEGETATION - GENERAL
SP-01	SUMP PITS
LOG-01	GEO LOGS (COIR LOGS)

*DRAWINGS TO BE READ IN CONJUNCTION WITH INTERNATIONAL EROSION CONTROL ASSOCIATION AUSTRALASIA (IECA) BEST PRACTICES STANDARD DRAWINGS AND SPECIFICATIONS.

NOTE
1. FOR EROSION AND SEDIMENT CONTROL LAYOUT PLAN REFER DRG No. C10
2. CONTRACTOR TO PROVIDE FINAL ESC DESIGN TO SUIT PROPOSED CONSTRUCTION METHODOLOGY

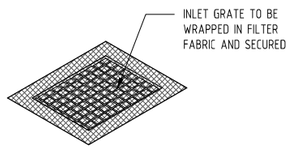


TEMPORARY CONSTRUCTION ENTRY/EXIT
NTS

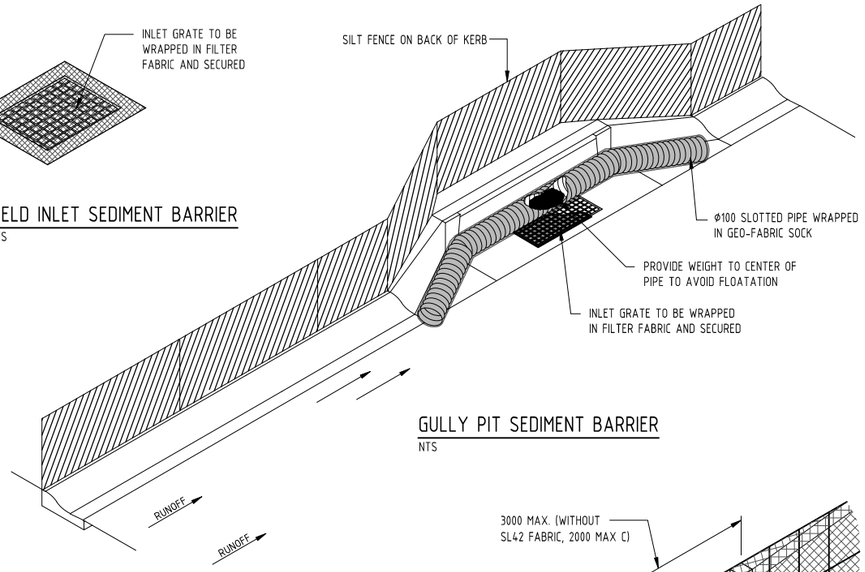


NOTE:
EXTENT AND SETOUT OF CHECK DAMS TO BE PROPOSED ON SITE BY CONTRACTOR TO THE SATISFACTION OF THE SUPERINTENDENT

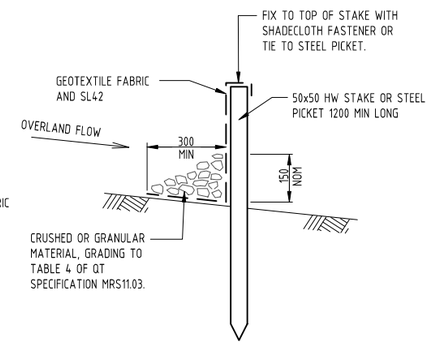
SAND BAG CHECK DAM
NTS



FIELD INLET SEDIMENT BARRIER
NTS

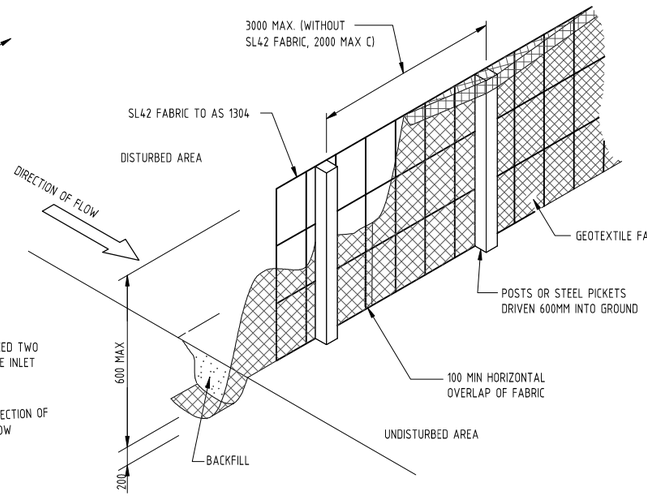


GULLY PIT SEDIMENT BARRIER
NTS

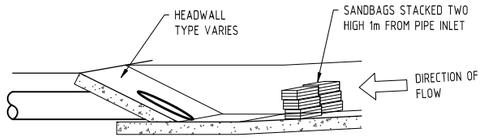


SEDIMENT FENCE - ALTERNATIVE 1
NTS

SEDIMENT FENCE - ALTERNATIVE 2
NTS



SEDIMENT FENCE DETAIL
NTS



HEADWALL INLET SEDIMENT PROTECTION
NTS

ISSUED FOR APPROVAL

Rev	Date	Description	By	Chk
01	05.05.21	ISSUED FOR APPROVAL	MD	DS

RPEQ CERTIFICATION
PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 05.05.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

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Client	INFINITE AGED CARE (DEVELOPMENTS) PTY LTD
Project Name	48 VILLAGE BOULEVARD SOUTHPORT QLD 4215
Discipline	CIVIL
Designed By	LDV
Checked By	DS
Approved By	ML
Project No.	24792
Drawn By	MD
Scale at A1	
Status	APPROVAL
Title	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
Drawing No.	C11
Revision	01

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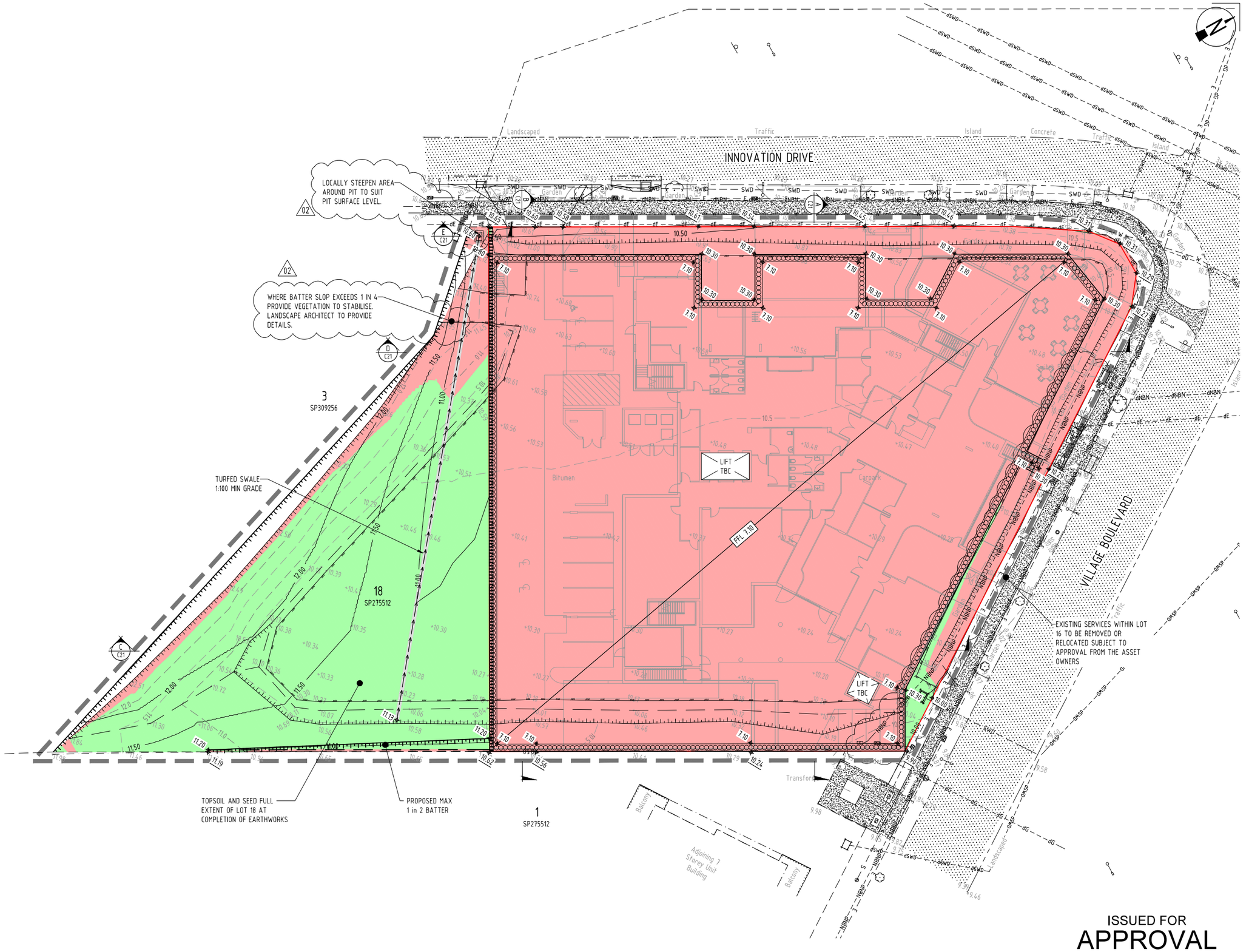
Do not scale drawings. If in doubt, ask!

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

PLOT DATE: 5/5/2021 5:13 PM FILENAME: J:\24000\24792\CVL\DWG\24792_C11_EROSION AND SEDIMENT CONTROL NOTES AND DETAILS.DWG

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING SURFACE CONTOURS (10.50)
- EARTHWORKS CONTOURS (10.30)
- EXISTING SURFACE LEVEL (10.42)
- FINISHED SURFACE LEVEL (7.10)
- EXISTING NOMINAL KERB LINE
- EXISTING EDGE OF BITUMEN LINE
- EXISTING ROAD CENTERLINE
- EXISTING EDGE OF BUILDING
- EXISTING EDGE OF BUILDING EAVE
- GRADE CHANGE
- EXISTING STORMWATER DRAINAGE (SWD)
- EXISTING STORMWATER DRAINAGE (RECORDS) (dSWD)
- EXISTING SEWER (S)
- EXISTING SEWER (RECORDS) (dS)
- EXISTING WATER (W)
- EXISTING WATER (RECORDS) (dW)
- EXISTING UNDERGROUND ELECTRICITY (E)
- EXISTING UNDERGROUND ELECTRICITY (RECORDS) (dE)
- EXISTING OVERHEAD ELECTRICITY (OE)
- EXISTING GAS (G)
- EXISTING GAS (RECORDS) (dG)
- EXISTING NBN (NBN)
- EXISTING NBN (RECORDS) (dNBN)
- EXISTING TELECOMMUNICATIONS (T)
- EXISTING TELECOMMUNICATIONS (RECORDS) (dT)
- EXISTING FIBER OPTIC (RECORDS) (dOF)
- EXISTING COMMUNICATIONS (C)
- EXISTING BATTER
- EXISTING FENCE
- PROPOSED SHORING SYSTEM REFER TO SPECIALISTS DRAWINGS FOR DETAILS
- PROPOSED RETAINING WALL
- PROPOSED BATTER
- LIMIT OF WORKS
- BUILDING OUTLINE
- PROPOSED SWALE (TURFED)
- PROPOSED EARTHWORKS PAD
- EXISTING ROAD
- PROPOSED EARTHWORKS CUT
- PROPOSED EARTHWORKS FILL



NOTE

FOR NOTES AND SITE SECTIONS REFER DRG No. C21

BASEMENT EXCAVATION

CUT TO SPOIL: NO STOCKPILE OF SOILS IS ALLOWED FOR. ALL EXCAVATION IS TO BE TAKEN OFF SITE AND DISPOSED IMMEDIATELY U.N.O.

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
02	08.09.21	ISSUED FOR APPROVAL	LDV	DS
01	05.05.21	ISSUED FOR APPROVAL	MD	DS

RPEQ CERTIFICATION
PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 08.09.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

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Client: INFINITE AGED CARE (DEVELOPMENTS) PTY LTD
Project Name: 48 VILLAGE BOULEVARD SOUTHPORT QLD 4215
Discipline: CIVIL
Status: APPROVAL
Designed By: LDV
Checked By: DS
Approved By: ML
Project No.: 24792
Drawn By: MD
Scale at A1: 1:200

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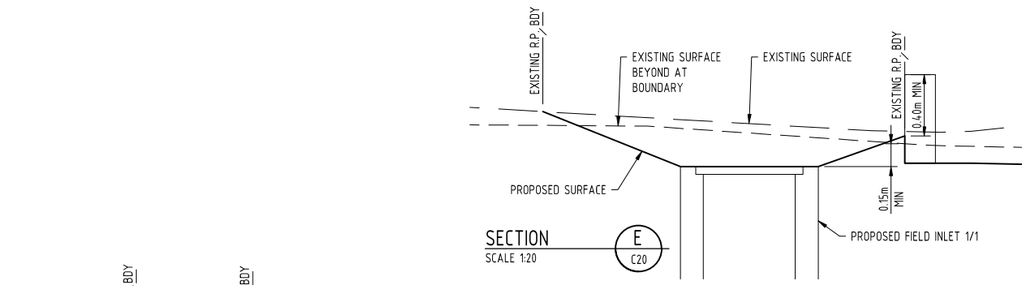
Title: EARTHWORKS LAYOUT PLAN
Drawing No.: C20
Revision: 02

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

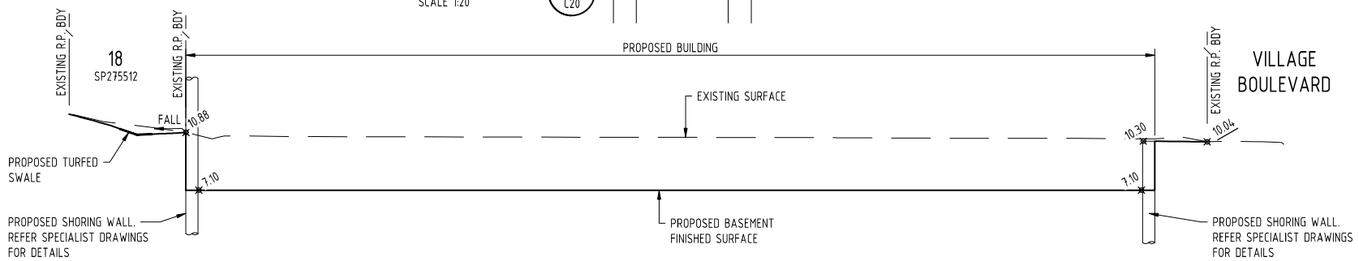
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EARTHWORKS NOTES

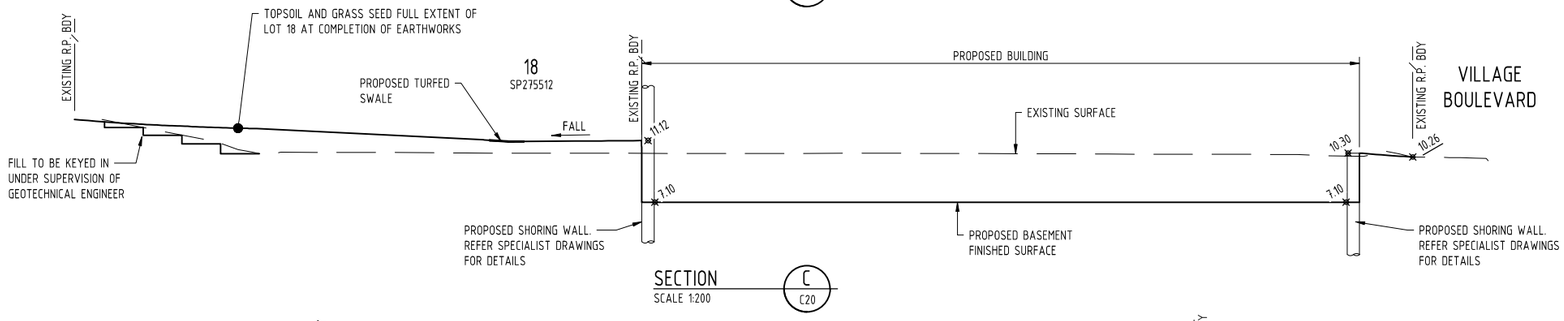
1. FOR GENERAL NOTES REFER DRG No. C01, WHICH IS TO BE REQUESTED AND VIEWED PRIOR TO COMMENCEMENT OF CONSTRUCTION IF NOT SUPPLIED.
2. GRASS AND TOPSOIL SHALL BE STRIPPED TO A MINIMUM DEPTH OF 100MM OVER THE EXTENT OF THE WORKS UNLESS DIRECTED OTHERWISE AND STOCKPILED FOR FUTURE USE AS NON-STRUCTURAL FILL IF REQUIRED, OR REMOVE FROM SITE.
3. CONTRACTOR TO ALLOW FOR ALL COSTS ASSOCIATED WITH ROCK EXCAVATION WITHIN CONTRACT RATES.
4. COMPACT THE EXPOSED SUBGRADE OR LOOSE TOP LEVEL MATERIAL TO A MINIMUM 98% STANDARD MAXIMUM DRY DENSITY TO AS1289 5.1.1. ANY 'SOFT SPOTS' IDENTIFIED BY THE PROOF ROLLING SHALL BE REMOVED AND REPLACED WITH A COMPACTED IMPORTED GENERAL FILL MATERIAL TO THE ABOVE COMPACTION REQUIREMENTS.
5. IMPORTED GENERAL FILL MATERIAL SHALL BE SUPPLIED AND COMPACTED WHERE NECESSARY TO OBTAIN SUBGRADE/PLATFORM LEVEL. IMPORTED GENERAL FILL MATERIAL SHALL BE CLEAN GRADED MATERIAL FREE OF ORGANIC MATTER AND STONES GREATER THAN 150mm AND CAPABLE OF BEING COMPACTED INTO COHERENT FILLING TO THE SPECIFIED STANDARD. THE MATERIAL SHALL HAVE A LINEAR SHRINKAGE NOT GREATER THAN 1.5% AND A MINIMUM C.B.R. OF 10%.
6. ANY PROPOSED RETAINING WALL WORKS MUST BE WHOLLY WITHIN THE PROPERTY BOUNDARY OF THE SUBJECT SITE, INCLUDING REAR OF RETAINING WALL DRAINAGE INFRASTRUCTURE FOR RETAINING WALLS IN CUT.
7. REFER ARCHITECT/LANDSCAPE ARCHITECT DRAWINGS FOR CONFIRMATION OF RETAINING WALL COLOUR AND FINISH.
8. ALL RETAINING WALL STRUCTURAL DESIGN AND CONSTRUCTION CERTIFICATION BY MANUFACTURER / INSTALLER.
9. ALL EARTHWORKS OPERATIONS SHALL BE CARRIED OUT WITH 'LEVEL 1' SOIL ENGINEERING SUPERVISION IN ACCORDANCE WITH APPENDIX B OF AS 3798. THE NOMINATED GEOTECHNICAL TESTING AUTHORITY SHALL PROVIDE CERTIFICATION THAT ALL GENERAL EARTHWORKS OPERATIONS HAVE BEEN CARRIED OUT IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS AND THE CONTROLLED FILL IS SUITABLE FOR PURPOSE WITH A MINIMUM 150KPA BEARING CAPACITY UNDER THE PLATFORM/STRUCTURES.
10. ALL EARTHWORKS FILL AND EXCAVATED AREAS SHALL BE COMPACTED TO 98% STANDARD MAXIMUM DRY DENSITY (AS 1289 5.1.1) IN LAYERS NOT EXCEEDING 150MM COMPACTED THICKNESS.
11. THE NOMINATED GEOTECHNICAL TESTING AUTHORITY SHALL PROVIDE CERTIFICATION THAT ALL GENERAL EARTHWORKS OPERATIONS HAVE BEEN CARRIED OUT IN ACCORDANCE WITH THE DRAWINGS.
12. CONTRACTOR TO UNDERTAKE ALL EARTHWORKS TESTING TO COMPLY WITH THE PROJECT SPECIFICATION AND LOCAL AUTHORITY REQUIREMENTS.
13. FINISHED SURFACES TO ALL DISTURBED AREAS ARE TO BE TREATED IN ACCORDANCE WITH LANDSCAPE DRAWINGS.
14. FINISHED EARTHWORKS SURFACES TO BE STABILISED.
15. ALL EARTHWORKS TO BE CARRIED OUT AT +/- 2% OPTIMUM MOISTURE CONTENT.
16. ALL NEW WORKS TO MATCH NEATLY INTO EXISTING
17. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH APPROVED MANAGEMENT PLANS.
18. CONTRACTOR TO ENSURE SUITABLE EROSION CONTROL MEASURES ARE INSTALLED INCLUDING BUT NOT LIMITED TO SHAKE DOWNS, SILT FENCE ETC.
19. ADEQUATE SAFETY FENCING/BARRIERS TO BE APPLIED TO ALL BATTERS OR RETAINING WALLS (TEMPORARY OR PERMANENT) AS PER RELEVANT AUSTRALIAN STANDARDS AND LEGISLATION.
20. DUST CONTROL MEASURES ARE TO INCLUDE SPRAYING WATER ON UNPAVED ROADS, ACCESS TRACKS AND STOCKPILES AT A SUFFICIENT LEVEL TO SUPPRESS DUST GENERATION. ADDITIONALLY CONTRACTORS ARE TO COVER OR ENCLOSE STOCKPILES WHERE REASONABLY PRACTICAL TO RESTRICT DUST MOVEMENT.
21. PRIOR TO THE CONTRACTOR COMMENCING ANY WORKS DETAILED ON THIS DRAWING, THE CONTRACTOR IS TO NOTIFY ADG ENGINEERS (AUST) PTY LTD AND RECEIVE WRITTEN CONFIRMATION THAT WORKS CAN COMMENCE
22. ALL BATTERS TO BE KEYED/STEPPED INTO EXISTING MATERIAL AS DIRECTED BY GEOTECHNICAL ENGINEER. CONTRACTOR TO ALLOW FOR ALL KEYING/STEPPING AS REQUIRED.
23. ALL TEMPORARY AND FINAL BATTER SLOPES ARE TO BE INSPECTED AND APPROVED BY GEOTECHNICAL ENGINEER. CERTIFICATION OF LONG TERM STABILITY TO BE PROVIDED BY GEOTECHNICAL ENGINEER PRIOR TO PRACTICAL COMPLETION.
24. CONTRACTOR'S RPEQ GEOTECHNICAL ENGINEER IS TO CONFIRM THAT ALL CONSTRUCTED CUT/FILL BATTERS AND RETAINING STRUCTURES ON THE SITE HAVE ACHIEVED ADEQUATE STABILITY WITH A LONG-TERM FACTOR OF SAFETY GREATER THAN OR EQUAL TO 1.5 AGAINST GEOTECHNICAL FAILURES.
25. EARTHWORKS LEVELS SHOWN ARE FINISHED SURFACE LEVELS INCLUSIVE OF TOPSOIL LAYER, CARPARK LEVELS ETC. REFER STRUCTURAL ENGINEERING DRAWINGS FOR BUILDING SLAB THICKNESSES AND HYDRAULIC DRAWINGS FOR SUB-FLOOR DRAINAGE FOR DETERMINATION OF REQUIRED BULK EARTHWORKS SURFACE.
26. EARTHWORKS LEVELS SHOWN ARE FINISHED SURFACE LEVELS INCLUSIVE OF 100mm TOPSOIL LAYER.
27. REFER ARCHITECTURAL DRAWINGS FOR BUILDING SETOUT.



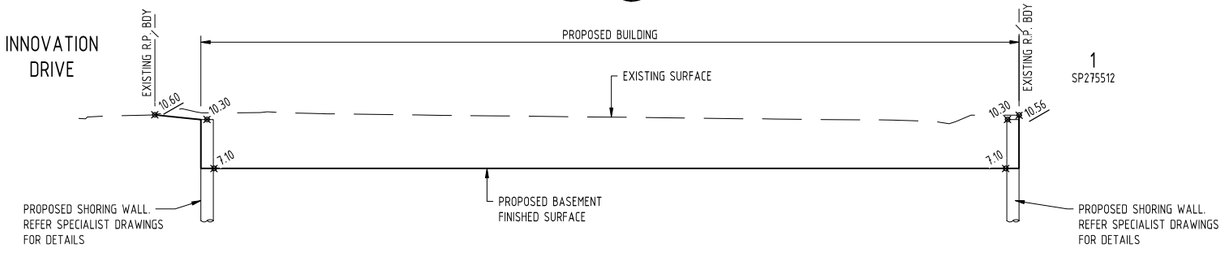
SECTION E
SCALE 1:20
C20



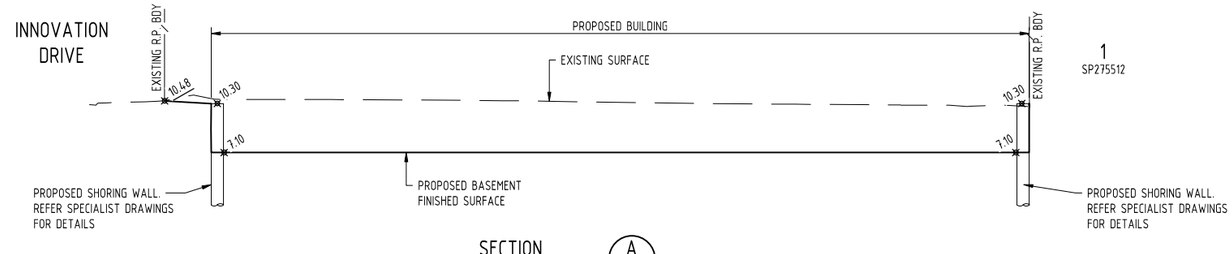
SECTION D
SCALE 1:200
C20



SECTION C
SCALE 1:200
C20



SECTION B
SCALE 1:200
C20



SECTION A
SCALE 1:200
C20

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
02	08.09.21	ISSUED FOR APPROVAL	LDV	DS
01	05.05.21	ISSUED FOR APPROVAL	MD	DS

RPEQ CERTIFICATION
PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 08.09.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

0 0.5 1m
SCALE 1:20
AT ORIGINAL SIZE (A1)

0 2 4 6 8 10m
SCALE 1:200
AT ORIGINAL SIZE (A1)

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Client	INFINITE AGED CARE (DEVELOPMENTS) PTY LTD
Project Name	48 VILLAGE BOULEVARD SOUTHPORT QLD 4215
Discipline	CIVIL
Status	APPROVAL
Designed By	LDV
Checked By	DS
Approved By	ML
Project No.	24792
Drawn By	MD
Scale at A1	1:200

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Title: EARTHWORKS NOTES AND SITE SECTIONS
Drawing No.: C21
Revision: 02

PLOT DATE: 9/8/2021 5:40 PM FILENAME: J:\24000\24792\CVL\DWG\24792_C21_EARTHWORKS NOTES AND SITE SECTIONS.DWG

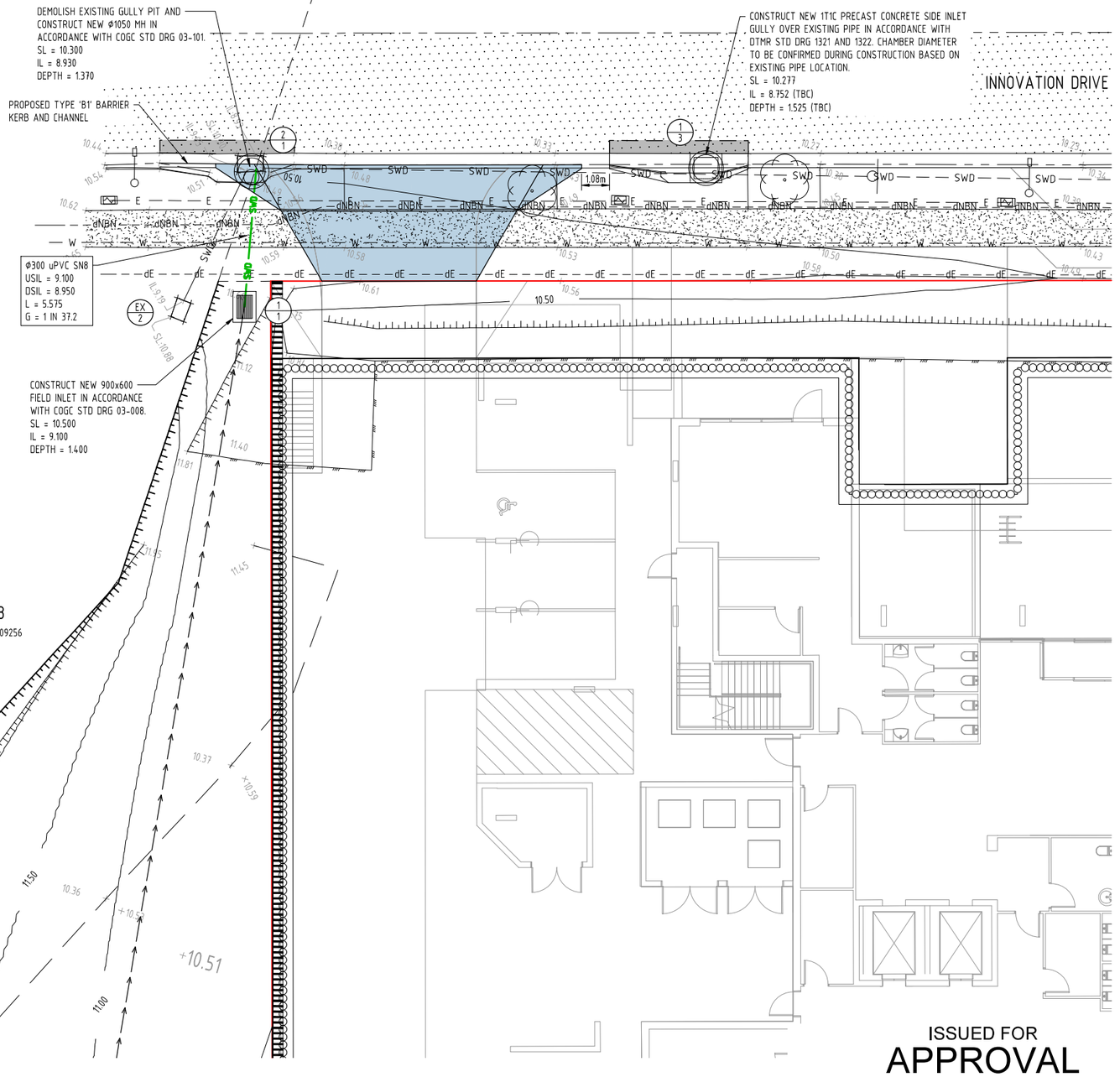
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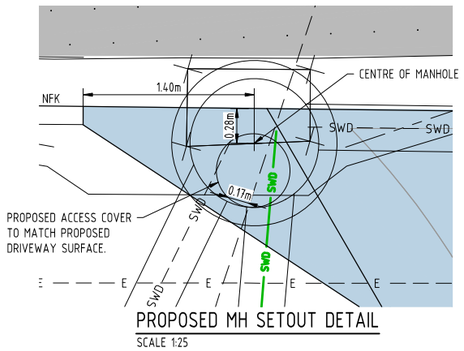
LEGEND

- 12.0 — FINISHED SURFACE CONTOURS
- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING EASEMENT BOUNDARY
- EXISTING NOMINAL KERB LINE
- EXISTING EDGE OF BITUMEN LINE
- EXISTING ROAD CENTERLINE
- EXISTING EDGE OF BUILDING
- EXISTING EDGE OF BUILDING EAVE
- GRADE CHANGE
- SWD — EXISTING STORMWATER DRAINAGE
- dSWD — EXISTING STORMWATER DRAINAGE (RECORDS)
- S — EXISTING SEWER
- dS — EXISTING SEWER (RECORDS)
- W — EXISTING WATER
- dW — EXISTING WATER (RECORDS)
- E — EXISTING UNDERGROUND ELECTRICITY
- dE — EXISTING UNDERGROUND ELECTRICITY (RECORDS)
- OE — EXISTING OVERHEAD ELECTRICITY
- G — EXISTING GAS
- dG — EXISTING GAS (RECORDS)
- NBN — EXISTING NBN
- dNBN — EXISTING NBN (RECORDS)
- T — EXISTING TELECOMMUNICATIONS
- dT — EXISTING TELECOMMUNICATIONS (RECORDS)
- dOF — EXISTING FIBER OPTIC (RECORDS)
- C — EXISTING COMMUNICATIONS
- EXISTING BATTER
- EXISTING FENCE
- PROPOSED SHORING SYSTEM REFER TO SPECIALISTS DRAWINGS FOR DETAILS
- PROPOSED RETAINING WALL
- LIMIT OF WORKS
- PROPOSED TURF SWALE TYPE AND SIZE VARIES
- SWD — PROPOSED STORMWATER DRAINAGE
- S — PROPOSED SEWER
- W — PROPOSED WATER MAIN
- B1 — PROPOSED 'TYPE B1' KERB AND CHANNEL IN ACCORDANCE WITH IPWEAQ STD DRG RS-080
- 1/1 — DRAINAGE STRUCTURE LABEL
- EXISTING ROAD
- PROPOSED ROAD PAVEMENT REINSTATEMENT IN ACCORDANCE WITH IPWEAQ STD DRG RS-170.
- PROPOSED TYPE 'GENERAL WIDE FLARED' DRIVEWAY CROSSOVER IN ACCORDANCE WITH IPWEAQ STD DRG. RS-051.

ROADWORKS AND DRAINAGE NOTES

1. FOR GENERAL NOTES REFER DRG No. C01, WHICH IS TO BE REQUESTED AND VIEWED PRIOR TO COMMENCEMENT OF CONSTRUCTION IF NOT SUPPLIED.
2. REFER HYDRAULIC DRAWINGS FOR BASEMENT, ROOF AND UPPER LEVEL TERRACES DRAINAGE.
3. ALL ROADWORKS AND DRAINAGE (EXTERNAL TO SITE BOUNDARIES AND/OR COUNCIL OWNED DRAINAGE PIPES INTERNAL TO THE SITE BOUNDARIES) CONSTRUCTION AND TESTING TO BE IN ACCORDANCE WITH CITY OF GOLD COAST COUNCIL DEVELOPMENT GUIDELINES, DRAWINGS AND SPECIFICATIONS.
4. ALL DRAINAGE CONSTRUCTION (PRIVATELY OWNED DRAINAGE LINES INTERNAL TO THE SITE BOUNDARIES) CONSTRUCTED AND TESTED TO BE IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARDS.
5. ALL STORMWATER PIPES ARE TO BE MANUFACTURED TO RELEVANT AUSTRALIAN STANDARDS INCLUDING BUT NOT LIMITED TO AS4058 AND AS1992.
6. STORMWATER DRAINAGE AND STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ONLY. CONTRACTOR TO CONSIDER CONSTRUCTION LOADINGS AND ENSURE NO EXCESSIVE LOADS ARE PLACED ON STORMWATER DRAINAGE OR STRUCTURES.
7. CONTRACTOR TO CONFIRM LOCATION AND LEVEL OF EXISTING STORMWATER DRAINAGE WHERE CONNECTING ON TO EXISTING.
8. CONTRACTOR TO NOTIFY THE SUPERINTENDENT OF ANY UNSUITABLE FOUNDING MATERIAL WITHIN DRAINAGE TRENCH OR STORMWATER STRUCTURES AND AWAIT DIRECTION PRIOR TO LAYING OF PIPES.
9. TRENCH BACKFILL UNDER PAVEMENT TO BE COMPACTED TO 100% STANDARD DRY DENSITY (AS1289 5.1.1) IN LAYERS NOT EXCEEDING 150mm OF CBR 15 MATERIAL OR APPROVED EQUIVALENT. TRENCH BACKFILL IN ROADS TO BE MINIMUM CBR15 MATERIAL UP TO ROAD SUBGRADE LEVEL.
10. ALL STORMWATER GRATES/LIDS WITHIN TRAFFICABLE AREAS TO BE CLASS "D" IN ACCORDANCE WITH AS3996.
11. ALL GRATES AND LIDS SHALL SIT FLAT WITH ITS SURROUND AND NOT BE LOOSE OR MOVE UNDER WHEEL LOADS.
12. ALL STORMWATER STRUCTURES TO BE CONSTRUCTED IN ACCORDANCE WITH PROJECT SPECIFICATION, AND LOCAL AUTHORITY GUIDELINES AND SPECIFICATIONS. WHERE STRUCTURES EXCEED MAXIMUM DEPTH AS IDENTIFIED WITHIN STANDARD DRAWINGS THE CONTRACTOR WILL ENSURE AN ADEQUATE STRUCTURAL DESIGN IS UNDERTAKEN FOR THE SUBJECT STRUCTURE TO BE CONSTRUCTED TO.
13. CONTRACTOR TO ENSURE ALL MANHOLE STRUCTURES COMPLY WITH THE MAXIMUM DEPTH SPECIFIED IN THE PROJECT SPECIFICATION OR LOCAL AUTHORITY FROM FINISHED SURFACE LEVEL TO UNDERSIDE OF ROOF SLAB. ANY NON CONFORMANCE IS TO BE RECTIFIED AT THE CONTRACTORS EXPENSE.
14. ALL FOOTPATHS TO BE CONSTRUCTED IN ACCORDANCE WITH ARCHITECTURAL/LANDSCAPING DRAWINGS AND RELEVANT AUTHORITY STANDARD DRAWINGS AND SPECIFICATIONS. FOOTPATHS TO BE CONSTRUCTED WITH MAXIMUM 2% CROSSFALL. SHOULD CONSTRUCTED FOOTPATHS EXCEED 2.5% CROSSFALL, THE CONTRACTOR WILL BE REQUIRED TO RECTIFY BY REMOVING AND REPLACING AT THEIR COST.
15. THE CONTRACTOR IS TO CONFIRM THE LOCATION OF SERVICE CONDUITS WITH THE SUPERINTENDENT PRIOR TO LAYING STORMWATER DRAINAGE. ALL TRENCH EXCAVATION AND CONSTRUCTION SHALL COMPLY WITH THE REQUIREMENTS OF THE QUEENSLAND WORKPLACE HEALTH AND SAFETY ACT 2011.
16. REMOVE ANY REDUNDANT DRAINAGE OUTLETS FROM THE KERB AND CHANNEL INCLUDING ANY ASSOCIATED PIPEWORK ACROSS THE FOOTWAY AND REINSTATE THE KERB AND CHANNEL AND THE FOOTWAY AREA IN ACCORDANCE WITH COUNCIL GUIDELINES.
17. ALL STORMWATER PITS TO BE LINEMARKED "FLOWS TO CREEK".
18. CONTRACTOR TO UNDERTAKE ROADWORKS TESTING IN ACCORDANCE WITH COGC GUIDELINES, DRAWINGS AND SPECIFICATIONS.
19. CONTRACTOR TO UNDERTAKE AND PROVIDE CCTV OF ALL STORMWATER LINES AT ON MAINTENANCE AND OFF MAINTENANCE. SHOULD THE CCTV IDENTIFY DAMAGE OR CRACKING WITHIN THE STORMWATER PIPES, THE CONTRACTOR WILL RECTIFY THE DAMAGE WITHIN THE PIPES BY MEANS DIRECTED BY THE SUPERINTENDENT WHICH MAY INCLUDE BUT NOT BE LIMITED TO PIPE RELINING OR PIPE REPLACEMENT.





PROPOSED MH SETOUT DETAIL
SCALE 1:25

ISSUED FOR
APPROVAL

Rev	Date	Description	By	Chk
01	08.09.21	ISSUED FOR APPROVAL	LDV	DS

RPEQ CERTIFICATION
PROJECT NUMBER: 24792
PROJECT NAME: 48 VILLAGE BOULEVARD
DATE: 08.09.21
CERTIFIED BY: MICHAEL LEPELAAR
RPEQ NUMBER: 11171
SIGNATURE:

0 1 2 3 4 5m
SCALE 1:100
AT ORIGINAL SIZE (A1)

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Client: INFINITE AGED CARE (DEVELOPMENTS) PTY LTD	Discipline: CIVIL		Status: APPROVAL
Project Name: LUMINA SOUTHPORT 48 VILLAGE BOULEVARD SOUTHPORT, QLD 4215	Designed By: LDV	Checked By: DS	Approved By: ML
	Project No.: 24792	Drawn By: LDV	Scale at A1: 1:100

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Title: ROADWORK AND DRAINAGE LAYOUT PLAN

Drawing No.: C30 Revision: 01

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

PLOT DATE: 9/8/2021 8:02 AM FILENAME: J:\24000\24792\CVL\DWG\24792_C30_ROADWORK AND DRAINAGE LAYOUT PLAN.DWG

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Attachment 7
ADG Hydrology checks for Lot 18 catchment

CIVIL DESIGN SPREADSHEETS

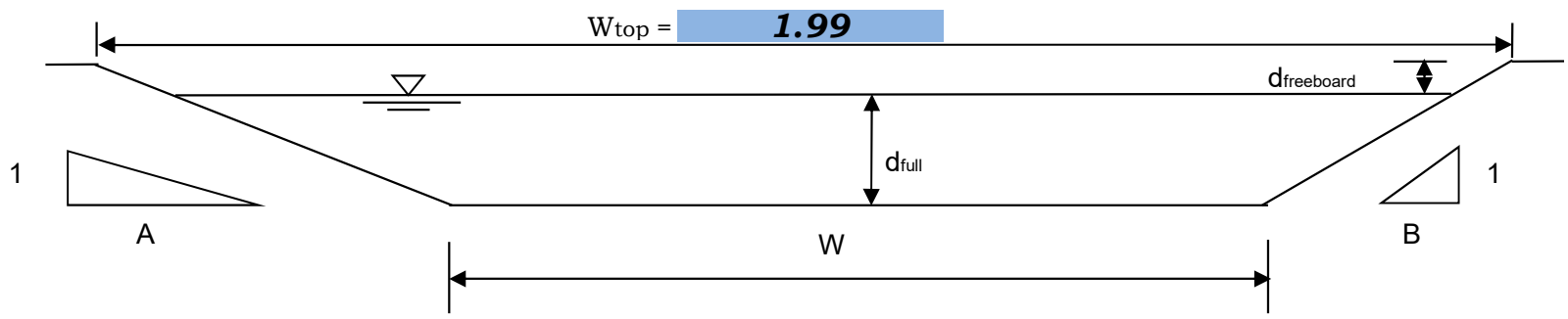
Project	Job #			Rev
Lumina, Southport	24792			0
	Made by / date			
	LDV	07	Sep-21	
Subject	Checked / date			
Lot 18 Post-Development Catchment Runoff	DS	07	Sep-21	

RATIONAL METHOD CALCULATIONS (POST-DEVELOPMENT)

POST-DEV CATCH-MENT ID	AREA (ha)	Fi	Impervious Area (ha)	Pervious Area (ha)	C10	C1	C100	CA100	Sheet Flow Length (m)	Slope (%)	Mannings "n"	Sheet Flow Time (mins)	Channel Flow Time (mins)	Time of Conc. "tc" (mins)	Q_1 Rainfall Intensity (mm/hr)	Q_{100} Rainfall Intensity (mm/hr)	Q1 Peak Flow (m3/s)	Q10 Peak Flow (m3/s)	Q100 Peak Flow (m3/s)
1	0.123	8.37	1.029	-0.906	0.90	0.72	1	0.123	25	3.39	0.035	9	1	9.6	99.1	262.5	0.024	0.055	0.090

Notes:
1) *Rational method calculations are in accordance with QUDM (2013) Volume 1 Chapter 4.0 where Q = CIA/360*
2) *Fraction Impervious and Mannings 'n' value estimated from site aerial imagery and topographical information*
3) *Intesity Frequency Duration Rainfall Data extracted from online Bureau of Meteorology 'Rainfall IFD Data System'*
4) *Time of concentration is sum of overland sheet flow time (Friend's eq.) plus channel time (Argue method)*
5) *C10 value for Fi values less than 0.10 assumes "medium" soil permeability and "poor" grass coverage*

	Project	Job #	Rev
	Lumina, Southport	**24792**	**01**
			Made by / date
			LDV / 07.09.21
	Subject		Checked / date
	CHANNEL 1 - Turfed - Q10 Flow 0.055m3/s		**DS / 07.09.21**



PARAMETERS TABLE

W	**0.00**	Channel width in metres
A	**6**	Grade of left hand channel bank. (1 in ___)
B	**10**	Grade of right hand channel bank. (1 in ___)
S	**1**	Slope of channel bed in percent.
n	**0.035**	Manning's "n" which is the channel roughness.
dfull	**0.124**	Full Flow Depth in metres
dfreeboard	**0.00**	Desired Freeboard Depth in metres
Qdesign	**0.055**	Calculated Runoff to be conveyed in Channel (m3/s)

OPEN CHANNEL FULL DEPTH FLOW CALCULATIONS

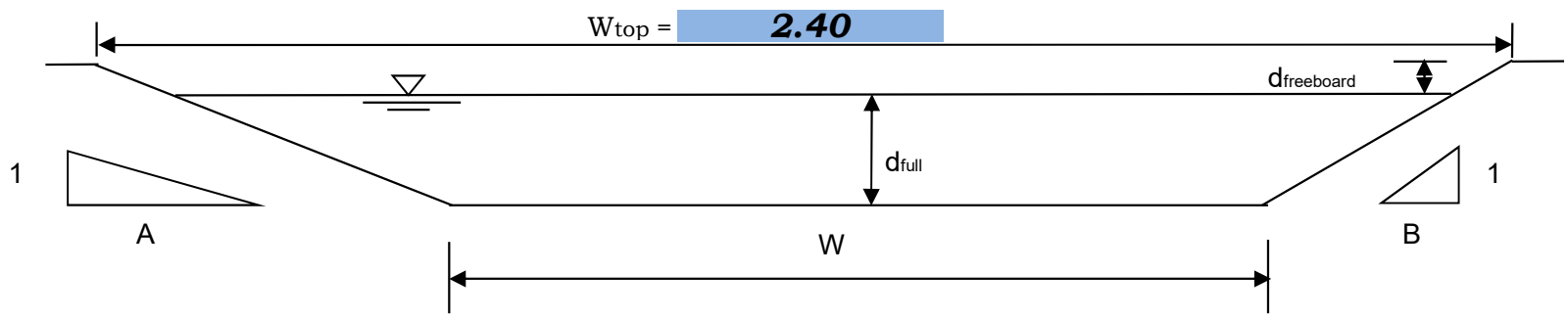
FLOW AREA (m2)	*WETTED PERIM. (m)*	*HYDRAULIC RADIUS (m)*	*FLOW CAPACITY (m3/s)*	*VELOCITY (m/s)*	*D-V PRODUCT*	*FACTOR OF SAFETY*
0.12	*2.01*	*0.06*	*0.055*	*0.45*	*0.06*	*1.00*

OKAY

Notes

1 This spreadsheet calculates flow in an open channel using Manning's equation from QUDM 9.03.5.

	Project	Job #	Rev
	Lumina, Southport	**24792**	**01**
			Made by / date
			LDV / 07.09.21
	Subject		Checked / date
	CHANNEL 1 - Turfed - Q100 Flow 0.090m3/s		**DS / 07.09.21**



PARAMETERS TABLE

W	**0.00**	Channel width in metres
A	**6**	Grade of left hand channel bank. (1 in ___)
B	**10**	Grade of right hand channel bank. (1 in ___)
S	**1**	Slope of channel bed in percent.
n	**0.035**	Manning's "n" which is the channel roughness.
d_{full}	**0.15**	Full Flow Depth in metres
$d_{freeboard}$	**0.00**	Desired Freeboard Depth in metres
Q_{design}	**0.09**	Calculated Runoff to be conveyed in Channel (m3/s)

OPEN CHANNEL FULL DEPTH FLOW CALCULATIONS

FLOW AREA (m2)	*WETTED PERIM. (m)*	*HYDRAULIC RADIUS (m)*	*FLOW CAPACITY (m3/s)*	*VELOCITY (m/s)*	*D-V PRODUCT*	*FACTOR OF SAFETY*
0.18	*2.42*	*0.07*	*0.091*	*0.50*	*0.08*	*1.01*

OKAY

Notes

1 This spreadsheet calculates flow in an open channel using Manning's equation from QUDM 9.03.5.