APPENDIX

D

REFERENCE DRAWINGS

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

© Cardno Limited All Rights Reserved. This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

COVER SHEET

DATE PLOTTED: 11 October 2019 8:18 AM BY: - JACK JONES
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1000.dwg

Q184103-CI-1000
Drawing Number

A
Revision

DATE PLOTTED: 11 October 2019 8:21 AM BY: JACK JONES

SCHEDULE OF DRAWINGS

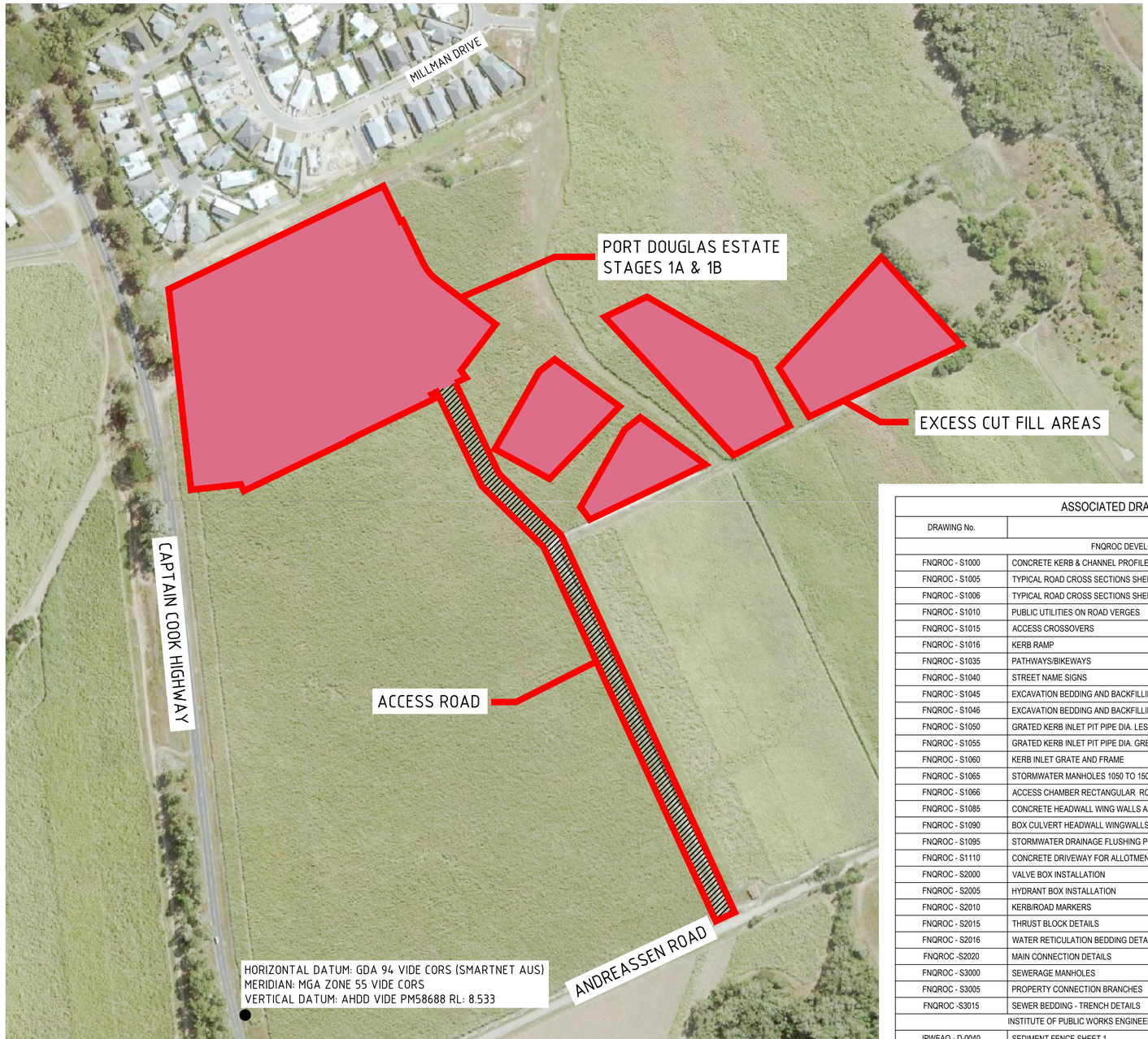
DRAWING No.	DESCRIPTION
Q184103-CI-1000	COVER SHEET
Q184103-CI-1001	DRAWING SCHEDULE AND LOCALITY PLAN
Q184103-CI-1002	NOTES
Q184103-CI-1003	OVERALL SITE PLAN - SHEET 1 OF 2
Q184103-CI-1004	OVERALL SITE PLAN - SHEET 2 OF 2
Q184103-CI-1005	SEDIMENT CONTROL DETAILS - SHEET 1 OF 2
Q184103-CI-1006	SEDIMENT CONTROL DETAILS - SHEET 2 OF 2
EARTHWORKS	
Q184103-CI-1100	BULK EARTHWORKS PLAN
Q184103-CI-1101	EXCESS CUT STOCKPILING PLAN
Q184103-CI-1102	SITE CROSS SECTIONS
ROADWORKS	
Q184103-CI-1200	ROADWORKS PLAN
Q184103-CI-1201	ROADWORKS - TYPICAL CROSS SECTIONS
Q184103-CI-1202	WABUL STREET LONGITUDINAL SECTION & CROSS SECTIONS
Q184103-CI-1203	WABUL STREET CROSS SECTIONS
Q184103-CI-1204	ROAD 2 LONGITUDINAL SECTION
Q184103-CI-1205	ROAD 2 CROSS SECTIONS SHEET 1 OF 2
Q184103-CI-1206	ROAD 2 CROSS SECTIONS SHEET 2 OF 2
Q184103-CI-1207	ROAD 3 LONGITUDINAL SECTION & CROSS SECTIONS
Q184103-CI-1208	ROAD 4 LONGITUDINAL SECTION & CROSS SECTIONS
Q184103-CI-1209	ROAD 5 LONGITUDINAL SECTION
Q184103-CI-1210	ROAD 5 CROSS SECTIONS
Q184103-CI-1211	INTERSECTION PLAN SHEET 1 OF 6
Q184103-CI-1212	INTERSECTION PLAN SHEET 2 OF 6
Q184103-CI-1213	INTERSECTION PLAN SHEET 3 OF 6
Q184103-CI-1214	INTERSECTION PLAN SHEET 4 OF 6
Q184103-CI-1215	INTERSECTION PLAN SHEET 5 OF 6
Q184103-CI-1216	INTERSECTION PLAN SHEET 6 OF 6
DRAINAGE	
Q184103-CI-1250	STORMWATER LAYOUT PLAN
Q184103-CI-1251	STORMWATER CATCHMENT PLAN
Q184103-CI-1252	STORMWATER LONGITUDINAL SECTIONS SHEET 1 OF 2
Q184103-CI-1253	STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 2
Q184103-CI-1260	STORMWATER CALCULATION TABLES SHEET 1 OF 2
Q184103-CI-1261	STORMWATER CALCULATION TABLES SHEET 2 OF 2
Q184103-CI-1262	CULVERT DETAILS PLAN SHEET 1 OF 2
Q184103-CI-1263	CULVERT DETAILS PLAN SHEET 2 OF 2
Q184103-CI-1264	DRAIN DESIGN - SHEET 1 OF 2
Q184103-CI-1265	DRAIN DESIGN - SHEET 2 OF 2
Q184103-CI-1266	SOUTHERN DIVERSION DRAIN
Q184103-CI-1267	EASTERN DIVERSION DRAIN
SEWERAGE	
Q184103-CI-1300	SEWER LAYOUT PLAN
Q184103-CI-1301	SEWER LONGITUDINAL SECTIONS SHEET 1 OF 2
Q184103-CI-1302	SEWER LONGITUDINAL SECTIONS SHEET 2 OF 2
WATER	
Q184103-CI-1350	WATER LAYOUT PLAN
MISCELLANEOUS	
Q184103-CI-1400	EROSION AND SEDIMENT CONTROL STRATEGY
Q184103-CI-1401	VEGETATION MANAGEMENT PLAN
Q184103-CI-1402	MISCELLANEOUS DETAILS PLAN
Q184103-CI-1403	COMBINED SERVICES PLAN
Q184103-CI-1404	RETAINING WALL DETAILS

LEGEND:

EXTENT OF WORKS

SITE ACCESS

NORTH



LOCALITY PLAN
SCALE 1:3000m

ASSOCIATED DRAWINGS SCHEDULE

DRAWING No.	DESCRIPTION
	FNQROC DEVELOPMENT MANUAL
FNQROC - S1000	CONCRETE KERB & CHANNEL PROFILES & DIMENSIONS
FNQROC - S1005	TYPICAL ROAD CROSS SECTIONS SHEET 1
FNQROC - S1006	TYPICAL ROAD CROSS SECTIONS SHEET 2
FNQROC - S1010	PUBLIC UTILITIES ON ROAD VERGES
FNQROC - S1015	ACCESS CROSSOVERS
FNQROC - S1016	KERB RAMP
FNQROC - S1035	PATHWAYS/BIKEWAYS
FNQROC - S1040	STREET NAME SIGNS
FNQROC - S1045	EXCAVATION BEDDING AND BACKFILLING OF PRECAST BOX CULVERTS
FNQROC - S1046	EXCAVATION BEDDING AND BACKFILLING OF CONCRETE PIPES
FNQROC - S1050	GRATED KERB INLET PIT PIPE DIA. LESS THAN 600mm
FNQROC - S1055	GRATED KERB INLET PIT PIPE DIA. GREATER THAN 600mm
FNQROC - S1060	KERB INLET GRATE AND FRAME
FNQROC - S1065	STORMWATER MANHOLES 1050 TO 1500
FNQROC - S1066	ACCESS CHAMBER RECTANGULAR ROOF SLAB
FNQROC - S1085	CONCRETE HEADWALL WING WALLS AND APRON
FNQROC - S1090	BOX CULVERT HEADWALL WINGWALLS AND APRON
FNQROC - S1095	STORMWATER DRAINAGE FLUSHING POINTS OUTLET
FNQROC - S1110	CONCRETE DRIVEWAY FOR ALLOTMENT ACCESS
FNQROC - S2000	VALVE BOX INSTALLATION
FNQROC - S2005	HYDRANT BOX INSTALLATION
FNQROC - S2010	KERB/ROAD MARKERS
FNQROC - S2015	THRUST BLOCK DETAILS
FNQROC - S2016	WATER RETICULATION BEDDING DETAILS
FNQROC -S2020	MAIN CONNECTION DETAILS
FNQROC - S3000	SEWERAGE MANHOLES
FNQROC - S3005	PROPERTY CONNECTION BRANCHES
FNQROC -S3015	SEWER BEDDING - TRENCH DETAILS
	INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND (IPWEAQ)
IPWEAQ - D-0040	SEDIMENT FENCE SHEET 1
IPWEAQ - D-0041	SEDIMENT CONTROL DEVICES SHEET 2
	MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)
	DEPARTMENT OF TRANSPORT AND MAIN ROADS
SD1250	RC BOX BULVERTS & SLAB LINK CULVERTS - CULVERT HEIGHTS > 600

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 50 100 200 300m
SCALE 1:3000 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno
Shaping the Future
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500 Fax: 07 4051 0133
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	JJ	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: DRAWING SCHEDULE AND LOCALITY PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1001
Revision: A

XREFs: GOOGLE EARTH
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1001.dwg

DATE PLOTTED: 11 October 2019 8:22 AM BY: JACK JONES

GENERAL

G1 IF IN DOUBT ASK.
G2 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATIONS INCLUDING FNQROC AND ALL INFORMATION ISSUED BY THE SUPERINTENDENT DURING THE COURSE OF THE CONTRACT AND INCLUDES THE DOUGLAS SHIRE COUNCIL DECISION NOTICE.
G3 ALL LEVELS ARE TO AHD.
G4 ALL CO-ORDINATES ARE TO MGA ZONE 55.
G5 ALL SET OUT SHALL BE RELATED TO ROAD CENTRE LINES.
G6 ALL DIMENSIONS AND RADII ARE EXPRESSED IN METRES (UNO).
G7 DRAWINGS SHALL NOT BE SCALED.
G8 EXISTING CONTOURS, LEVELS AND FEATURES SHOWN ON THE DRAWINGS ARE INDICATIVE ONLY AND ARE BASED ON SURVEY DRAWINGS AND DATA PROVIDED BY CARDNO (QLD) PTY LTD CONSULTING SURVEYORS.
G9 ALL DIMENSIONS RELEVANT TO SETTING OUT, SURFACE LEVELS AND INVERT LEVELS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES TO THE SUPERINTENDENT.
G10 THE CONTRACTOR SHALL ENSURE THAT ALL WORKS ARE MAINTAINED IN A SAFE AND STABLE CONDITION AND THAT ADEQUATE PROTECTION AGAINST EROSION AND SILTATION IS IN PLACE.
G11 WORKMANSHIP AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE RELEVANT STANDARDS AND THE REQUIREMENTS OF DOUGLAS SHIRE COUNCIL AND OTHER AUTHORITIES SHALL BE MAINTAINED.
G12 GRADE EVENLY BETWEEN LEVELS SHOWN EXCEPT WHERE LEVELS INDICATE VERTICAL CURVES.
G13 THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION PROTECTION AND SEDIMENT CONTROL FOR THE WORKS AS SPECIFIED AND TO THE SATISFACTION OF DOUGLAS SHIRE COUNCIL.
G14 REFER FNQROC DEVELOPMENT MANUAL

SITE CLEARANCE

C1 THE SITE SHALL BE CLEARED ONLY TO THE EXTENT NECESSARY TO PERMIT CONSTRUCTION OF THE PERMANENT WORKS U.N.O.
C2 AREAS TO BE USED FOR STOCKPILING EXCESS EXCAVATED MATERIALS SHALL BE CLEARED AND STRIPPED OF TOPSOIL AND OTHER UNSUITABLE MATERIAL.
C3 ALL ITEMS NOMINATED ON THE DRAWINGS TO BE REMOVED ARE TO BE DISPOSED OF OFF SITE. REMOVED VEGETATION IS TO HAVE ALL ROOTS GRUBBED OUT AND DISPOSED OF OFF SITE. ALL OFFSITE DISPOSAL IS AT CONTRACTORS EXPENSE.

EARTHWORKS

E1 DRY DENSITY RATIO AS REFERRED TO IN THESE NOTES IS THE RATIO DETERMINED IN ACCORDANCE WITH AS1289.5.4.1 OF COMPACTED DRY DENSITY IN ACCORDANCE WITH AS1289.5.3.1 OR AS1289.5.8.1 TO THE STANDARD MAXIMUM DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1259.5.1.11 (STANDARD COMPACTION).
E2 STRIP ALL VEGETAL MATTER, TOPSOIL AND OTHER UNSUITABLE MATERIAL FROM AREAS TO BE EXCAVATED OR FILLED. STOCKPILE SUITABLE TOPSOIL MATERIAL IN APPROVED LOCATIONS FOR SUBSEQUENT RE-USE.
E3 EXCAVATE AS REQUIRED AND DEPOSIT EXCAVATED MATERIAL AS NECESSARY. COMPACT SURFACES EXPOSED BY STRIPPING OR EXCAVATION TO 98% DRY DENSITY RATIO TO A DEPTH OF AT LEAST 250mm, SHOULD ANY SOFT OR UNSUITABLE MATERIAL BE IDENTIFIED SEEK THE ADVICE OF THE SUPERINTENDENT.
E4 COMPACT FILL TO 98% DRY DENSITY RATIO IN LAYERS OF THICKNESS APPROPRIATE TO THE COMPACTION PLANT EMPLOYED BUT NOT EXCEEDING 200mm.
E5 ALL MATERIALS WITHIN 300mm BELOW ROAD PAVEMENT/SUBGRADE INTERFACE SHALL BE COMPACTED TO 98% DRY DENSITY RATIO.
E6 IN PLACING FILL IN AND AROUND ROAD FOOTPATHS AND BATTERS ALLOW FOR TOPSOIL THICKNESS AS DETERMINED ON BASIS OF ACTUAL TOPSOIL MATERIALS BALANCE.
E7 ALL AREAS EXPOSED BY EARTHWORKS SHALL BE TOPSOILED AND GRASSED BY DRILL SEEDING EXCEPT THAT HYDROMULCHING IS REQUIRED ON BATTERS STEEPER THAN 1 VERTICAL TO 4 HORIZONTAL. ALL AREAS TO BE GRASSED WILL HAVE 80% ROOT MAT AT THE END OF DEFECTS LIABILITY PERIOD AND SHALL BE FREE OF ROCK AND LOOSE STONE WHEN WORKS ARE TAKEN "ON MAINTENANCE".

ROADWORKS

R1 PAVEMENT DESIGN IS BASED ON SUBGRADE RESULTS AS PER GEOTECHNICAL REPORT AND IS SUBJECT TO REVISION ON THE BASIS OF CONFIRMATORY CBR TESTS OF THE SUBGRADE AT TIME OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE 7 No. CONFIRMATORY SUBGRADE SOAKED CBR TESTING TO THE SUPERINTENDENT AS SOON AS POSSIBLE LOCATIONS TO BE AGREED WITH THE SUPERINTENDENT.
R2 EXCAVATE OR FILL AS NECESSARY TO PAVEMENT/SUBGRADE INTERFACE AS DESCRIBED IN THE SPECIFICATION AND EARTHWORKS NOTES.
R3 PRIOR TO PLACING ROAD PAVEMENT MATERIAL THE SUBGRADE SHALL BE TESTED AND PROOF ROLLED IN THE PRESENCE OF THE SUPERINTENDENT AND DOUGLAS SHIRE COUNCIL'S INSPECTING OFFICER.
R4 PAVEMENT DESIGN SHALL BE AS SHOWN ON DRAWINGS

DRAINAGE

D1 STORMWATER DRAINAGE PIPE SHALL BE RCP FJ CLASS 2 PIPE UNO. JOINTS TO HAVE MANUFACTURER APPROVED BANDS AT ALL JOINTS TO PREVENT MOVEMENT OF FINE MATERIAL THROUGH JOINT e.g. ROCLA SAND BANDS
D2 BEDDING SHALL BE TYPE HS2 AS SPECIFIED IN AS3725.
D3 PIPE LAYING SHALL COMMENCE AT THE DOWNSTREAM END OF THE WORKS AT ALL TIMES.
D4 STORMWATER HEADWALLS TO BE CONSTRUCTED AS DETAILED ON FNQROC STANDARD DRAWING S1080. SEEK SUPERINTENDENTS APPROVAL OF VARIATION PRIOR TO CONSTRUCTION. LIDS SHALL BE CAST AFTER COMPLETION OF ALL EARTHWORKS
D5 STORMWATER KERB INLET PITS TO BE CONSTRUCTED AS DETAILED ON FNQROC STANDARD DRAWINGS S1050, S1055 AND S1060 U.N.O.
D6 ALL "FINISHED SURFACE LEVELS" ON STORMWATER LONG SECTIONS ARE BASED ON A PROJECTION OF THE KERB INVERT AT THE SETOUT CO-ORDINATE
D7 SUBSOIL DRAIN MIN GRADE 0.5%. REFER FNQROC STD DWG S1095 FOR DETAILS
D8 ALL STORMWATER DRAINAGE LINES SHALL HAVE CCTV SURVEY COMPLETED IN ACCORDANCE WITH THE FNQROC DEVELOPMENT MANUAL.
D9 ALL TOP OF PIT, INLETS AND GPT UNITS TO BE CONFIRMED BY CONTRACTOR ON SITE PRIOR TO ORDERING. ANY VARIATION IN LEVELS FROM THE DESIGN PLANS TO BE REPORTED TO THE SUPERINTENDENT
D10 ALL TOP OF PIT, INLETS AND GPT UNITS TO BE CONFIRMED BY CONTRACTOR ON SITE PRIOR TO ORDERING. ANY VARIATION IN LEVELS FROM THE DESIGN PLANS TO BE REPORTED TO THE SUPERINTENDENT

WATER

W1 CONTRACTOR SHALL ADVISE DOUGLAS SHIRE COUNCIL PRIOR TO UNDERTAKING ANY SEWERAGE AND WATER RELATED WORK.
W2 COMPLY WITH FNQROC - STANDARD DRAWINGS S2000 TO S2020
W3 POTABLE WATER MAINS TO BE INSTALLED 2.80m FROM PROPERTY BOUNDARY U.N.O. GENERALLY IN ACCORDANCE WITH FNQROC STD. DWG S1010.
W4 CONNECTION TO EXISTING MAINS TO BE CARRIED OUT BY DOUGLAS SHIRE COUNCIL AT THE CONTRACTOR'S EXPENSE.
W5 ALL PVC WATER MAINS SHALL BE CLASS 16 PVC-M RUBBER RING JOINTED U.N.O. ALL DICL WATER MAINS SHALL BE PN35 DICL RUBBER RING JOINTED U.N.O. ALL 63Ø POLY PIPES SHALL BE MDPE CLASS 16.
W6 WATER MAINS 225Ø OR GREATER SHALL HAVE 900mm MINIMUM COVER.
W7 BEDDING AND SURROUND TO PIPES AND FITTINGS SHALL BE IN IN ACCORDANCE WITH FNQROC STANDARD DRAWING S2016
W8 HYDRANTS AND VALVES ARE TO BE NYLON POWDER COATED OR EQUIVALENT AND HYDRANTS ARE TO BE OF THE MAXI-FLOW TYPE.
W9 HYDRANTS TO BE IDENTIFIED BY KERB MARKER PLATE AND BLUE RETRO-REFLECTIVE MARKER IN ACCORDANCE WITH FNQROC STANDARD DRAWING S2010 & S2005
W10 VALVES TO BE IDENTIFIED BY KERB MARKER PLATE AND YELLOW RETRO-REFLECTIVE MARKER IN ACCORDANCE WITH FNQROC STANDARD DRAWING S2010
W11 WATER MAINS CROSSING ROADS SHALL BE PN35 DICL FOR THE FULL ROAD CROSSING WIDTH, FINISHING 100mm BEHIND THE BACK OF KERB AND CHANNEL AT A MINIMUM AND AS SHOWN ON THE DRAWINGS.
W12 MINIMUM TEST PRESSURE OF WATER MAINS SHALL BE 1200kPa. IN ACCORDANCE WITH DOUGLAS SHIRE COUNCIL AND FNQROC SPECIFICATIONS.
W13 EXISTING HYDRANTS OR VALVES SHALL BE PROVIDED WITH NEW COVER BOXES AND SURROUNDS AS PER FNQROC STD. DWGS. S2000 AND S2005.
W14 WHERE VALVE SURROUNDS ARE TO BE SET IN CONCRETE, A COMPRESSIBLE LAYER IS TO BE PROVIDED TO ALLOW FOR MAINTENANCE
W15 LOWER WATER MAIN UNDER ROADS AS NECESSARY TO AVOID SUBGRADE IMPROVEMENT LAYER IF APPLICABLE

SEWER NOTES

1. PROPERTY CONNECTION BRANCHES SHALL BE 100 DIA. AND TERMINATE AT THE INLET END OF THE INSPECTION PIPE. THE END SHALL BE SEALED WITH PLUG AND CLIP AND THE INVERT LEVEL OF THE BEND SHALL BE AS DIRECTED BY THE SUPERINTENDENT.
2. ALL SEWER MAINS SHALL BE 150 DIA. UPVC CLASS DWV SN10 R.R.J. UNLESS NOTED OTHERWISE.
3. MANHOLE LIDS TO BE CONSTRUCTED 50mm ABOVE GROUND LEVEL. OR FLUSH WITH PATHWAYS, ROADWAYS AND PAVED SURFACES
4. ENSURE MANHOLES ARE 1.5m CLEAR ON 3 SIDES FROM BATTERS. STEEPEN BATTERS LOCALLY IF REQUIRED. MEASUREMENT TAKEN AS A RADIUS AROUND THE CENTRE OF LID.
5. ENSURE MANHOLES ARE MIN 0.1m CLEAR FROM PROPERTY BOUNDARIES
6. ENSURE HCBs ARE MIN 0.5m CLEAR FROM PROPERTY BOUNDARIES
7. WHERE SEWER IS IN VERGE, E2 HCB's SHALL EXTEND PAST TOP OF BATTER MIN 1.0m

GEOTECHNICAL

GT1 DOUGLAS PARTNERS HAVE PREPARED A GEOTECHNICAL INVESTIGATION REPORT DATED JULY 2019. THE CONTRACTOR IS TO COMPLY WITH THE REPORT OR NOTIFY THE ENGINEER.
GT2 ALL EARTHWORKS SHALL BE SUPERVISED IN ACCORDANCE WITH L1 OF AS3798. THE CONTRACTOR SHALL EMPLOY AN RPEQ GEOTECHNICAL CONSULTANT WHO SHALL PROVIDE A CERTIFICATE THAT THE WORKS HAVE BEEN COMPLETED SATISFACTORY IN ACCORDANCE WITH THE SPECIFICATION AND TO LEVEL 1 OF AS 3798.
GT3 ALL BATTERS STEEPER THAN 1 IN 2 AND HIGHER THAN 1.5m ARE TO BE CHECKED BY A GEOTECHNICAL ENGINEER AND CERTIFIED AS TO THEIR STABILITY TO SATISFY DOUGLAS SHIRE COUNCIL.
GT4 ALL STRUCTURE DESIGN CRITERIA SHALL BE CONFIRMED ONCE A GEOTECHNICAL INVESTIGATION HAS BEEN COMPLETED. THIS INCLUDES PAVEMENT DESIGN
GT5 ALL BATTERS TO BE CONFIRMED BY GEOTECHNICAL INVESTIGATION RECOMMENDATIONS

EARTHWORKS NOTES

1. CONTROL TESTING OF BULK EARTHWORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH A.S.3798 - 2007.
2. ALL EARTHWORKS ARE TO BE CONTROLLED BY LEVEL 1 INSPECTION AND TESTING BY A QUALIFIED GEOTECHNICAL, TESTING AND INSPECTION AUTHORITY.
3. COMPACTION TEST FREQUENCY FOR EARTHWORKS ARE TO BE IN ACCORDANCE WITH TABLE 8.1 OF AS3798-2007.
4. MINIMUM RELATIVE COMPACTION STANDARDS FOR EARTHWORKS ARE TO BE IN ACCORDANCE WITH TABLE 5.1 OF AS3798-2007.
5. FOR SETTING OUT DETAILS OF ROADS AND KERB REFER TO TYPICAL CROSS SECTIONS, ROAD SETTING OUT DETAILS AND INTERSECTION DETAILS.
6. LOTS ARE TO BE GRADED EVENLY BETWEEN FINISHED SURFACE LEVELS SHOWN UNLESS OTHERWISE NOTED.
7. EXCESS MATERIAL FROM EXCAVATION IS TO BE MOVED TO FUTURE STAGE.
8. REFER VEGETATION MANAGEMENT PLAN FOR CLEARING DETAILS
9. ALL EXISTING SERVICES SHALL BE CHECKED FOR CLEARANCE PRIOR TO CONSTRUCTION.
10. FINISHED SURFACE LEVELS SHOWN ON ALLOTMENTS (EXCLUDING VERGES) ARE AT COMPLETION OF EARTHWORKS AND TOPSOILING.
11. ALL AREAS EXPOSED BY EARTHWORKS SHALL BE TOPSOILED AND GRASSED BY DRILL SEEDING EXCEPT THAT HYDROMULCHING IS REQUIRED ON BATTERS STEEPER THAN 1 VERTICAL TO 4 HORIZONTAL. ALL AREAS TO BE GRASSED WILL HAVE 80% ROOT MAT AT THE END OF DEFECTS LIABILITY PERIOD AND SHALL BE FREE OF ROCK AND LOOSE STONE WHEN WORKS ARE TAKEN "ON MAINTENANCE".
12. WHERE BATTERS FRONT A ROAD, ENSURE THERE IS AN EXTENSION OF VERGE GRADE INTO LOT WITH GRADE TO MATCH. REFER FNQROC STD. DWG. S1005 FOR DETAILS

SAFETY IN CONSTRUCTION

CONSTRUCTION ACTIVITY CAN BE HAZARDOUS. POTENTIAL SAFETY HAZARDS CONSIDERED BY THE DESIGNERS TO HAVE A HIGHER RISK THAN NORMAL CONSTRUCTION ACTIVITY ARE IDENTIFIED WITH APPROPRIATE NOTES ON THESE DRAWINGS. IT SHOULD BE NOTED THAT DESIGNERS HAVE A LOWER UNDERSTANDING OF THE RISKS INVOLVED IN CONSTRUCTION COMPARED WITH THAT OF A COMPETENT CONTRACTOR. IT IS THEREFORE ESSENTIAL THAT AN ADEQUATE SAFETY PLAN FOR THE WORKS IS PREPARED BY THE CONTRACTOR. SAFETY PLANS ARE TO BE PREPARED IN COMPLIANCE WITH THE STATUTORY REQUIREMENTS. THE DESIGNERS MAY NOT BE AWARE OF ALL SAFETY RISKS AND HAZARDS INVOLVED IN THIS PROJECT AND THE ABSENCE OF COMMENT DOES NOT IMPLY THAT THERE ARE ONLY LOW LEVEL RISKS OF HAZARDS INVOLVED IN THE PROJECT. APPROPRIATE WORK METHOD STATEMENTS ARE TO BE PREPARED FOR ANY HIGH RISK ACTIVITY BY THE CONTRACTOR. THE DESIGNERS ARE AVAILABLE TO BE CONSULTED WHEN REQUIRED CONCERNING THEIR AREA OF CONTROL WITH REGARD TO SAFETY PLANS.

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

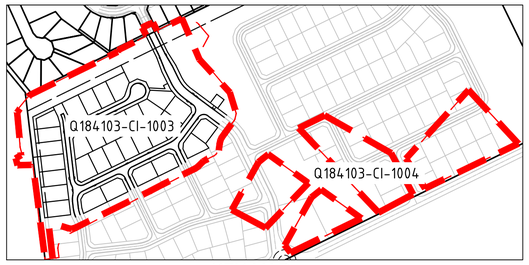
		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: NOTES

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum: AHD | Scale: AS SHOWN | Size: A1
Drawing Number: Q184103-CI-1002 | Revision: A

XREF's:
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1002.dwg

DATE PLOTTED: 11 October 2019 1:55 PM BY : MAURICE SHEEHAN



KEY MAP
SCALE 1:4000m

LEGEND:

- STAGE BOUNDARY
- LIMIT OF WORKS
- DRAINAGE RESERVE
- NATURAL SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- 1.8m HIGH TIMBER PACING FENCE
- 1.8m HIGH NOISE MOUND FENCE

NORTH

RETAIN EXISTING CHANNEL AND ROCK PROTECTION

REFER Q184103-CI-1262 & 1263 FOR ROCK PROTECTION DETAILS

REFER Q184103-CI-1264 & 1265 FOR ROCK PROTECTION DETAILS

5 EXISTING 1.54x1.1m CULVERTS

DRAIN 1

PARK

EASEMENT

ROAD 5 — STAGE 1B

STAGE 1A

ROAD 2

ROAD 3

ROAD 4

CAPTAIN COOK HIGHWAY

WABUL STREET

SEWER PUMP STATION

Lot	Area
1	700m²
2	702m²
3	601m²
4	600m²
5	600m²
6	600m²
7	600m²
8	700m²
9	600m²
10	600m²
11	600m²
12	600m²
13	600m²
14	600m²
15	607m²
16	700m²
17	600m²
18	600m²
19	700m²
20	702m²
21	612m²
22	612m²
23	681m²
24	681m²
25	681m²
26	681m²
27	700m²
28	658m²
29	641m²
30	641m²
31	625m²
32	614m²
17 SP192596	
18 SP192596	
19 SP192596	
20 SP192596	
21 SP192596	
33 SP276051	
34 SP276051	
35 SP276051	
37 SP276051	
38 SP276051	

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: OVERALL SITE PLAN
SHEET 1 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

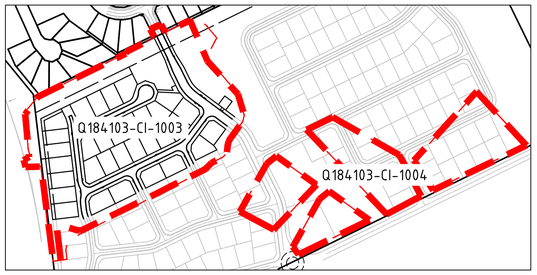
Drawing Number: Q184103-CI-1003
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1003-1004.dwg

DATE PLOTTED: 11 October 2019 9:07 AM BY: JACK JONES

LEGEND:

- SITE BOUNDARY
- LIMIT OF WORKS
- 3.50 NATURAL SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)



KEY MAP
SCALE 1:4000m

NORTH

FUTURE STAGE

FILL AREA 4

FILL AREA 2

FUTURE STAGE

FILL AREA 1

FILL AREA 3

FUTURE STAGE

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: OVERALL SITE PLAN
SHEET 2 OF 2

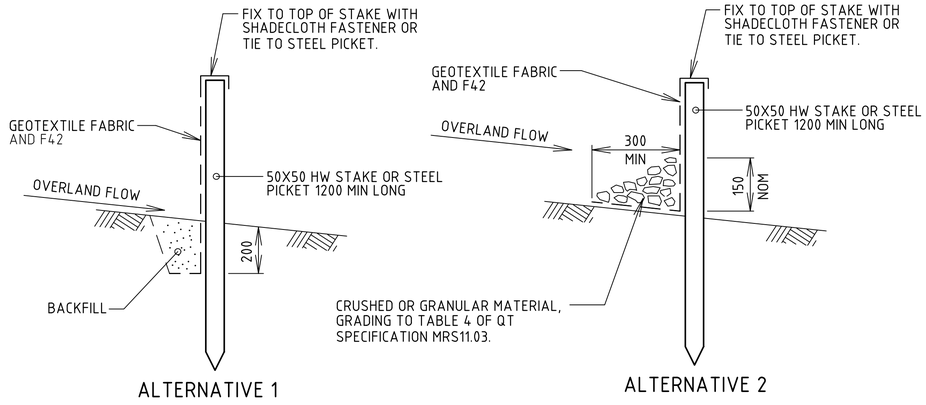
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1004
Revision: A

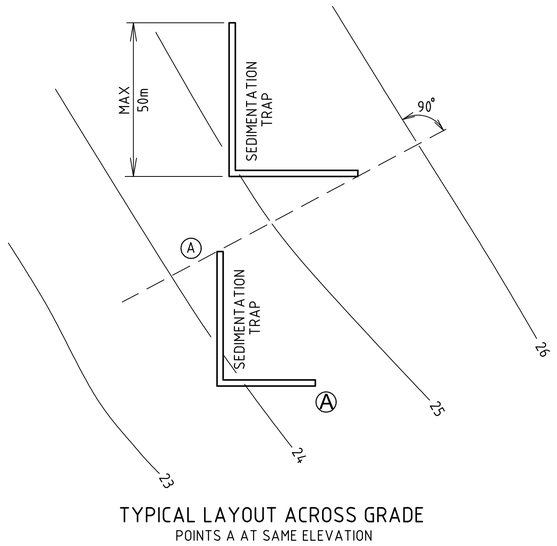
XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-EXST-CNTRS
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1003-1004.dwg

DATE PLOTTED: 11 October 2019 10:12 AM BY: -JACK JONES

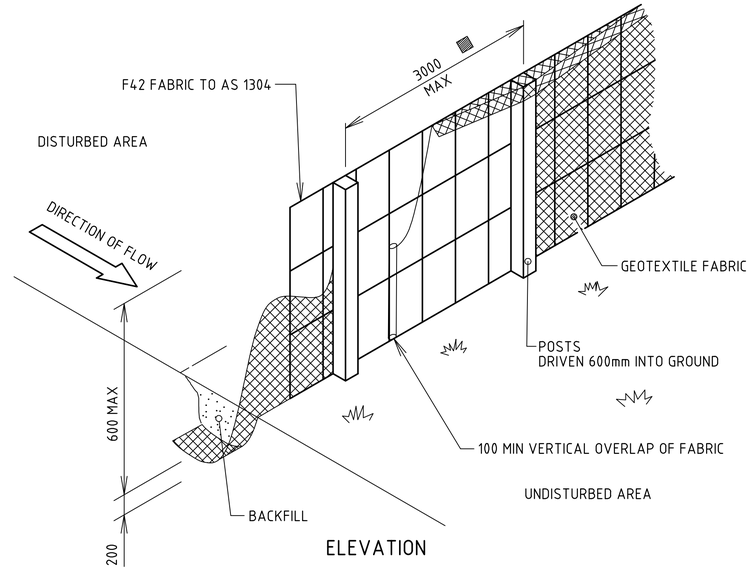


ALTERNATIVE 1

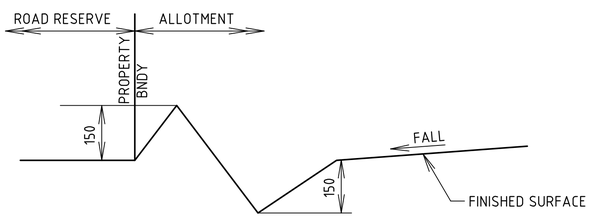
ALTERNATIVE 2



TYPICAL LAYOUT ACROSS GRADE
POINTS A AT SAME ELEVATION

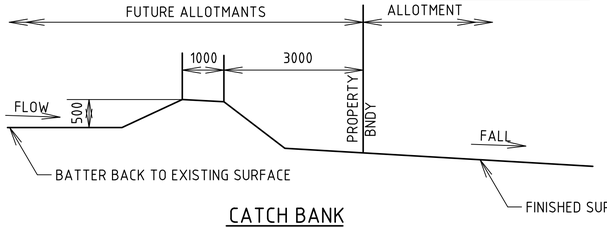


ELEVATION

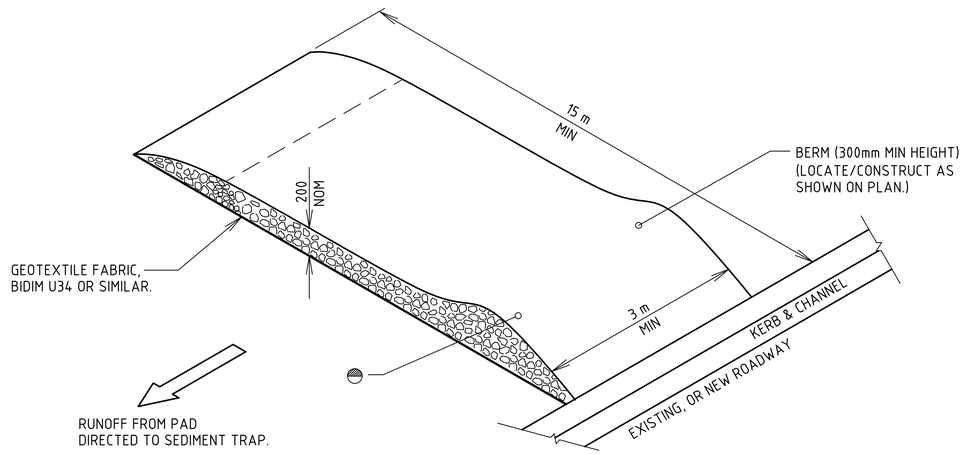


SILT TRAP TRENCH

SEDIMENT FENCE



CATCH BANK



TEMPORARY CONSTRUCTION ENTRY / EXIT
SEDIMENT TRAP

LEGEND

- UNBOUND PAVEMENT MATERIAL (GRAVEL) TO GRADING B, TABLE 9 OF TMR SPECIFICATION MRS11.05, EXCLUDE MATERIAL FINER THAN AS SIEVE 2.36mm.
- WITHOUT F42 FABRIC, 2000 MAX C\C

NOTES

1. GENERAL
   - (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) ALL CONTROL MEASURES TO BE INSPECTED AT LEAST WEEKLY AND AFTER SIGNIFICANT RUNOFF PRODUCING STORMS.
   - (D) CONTROL MEASURES MAY BE REMOVED WHEN ON-SITE EROSION IS CONTROLLED AND 70% PERMANENT SOIL COVERAGE IS OBTAINED OVER ALL UPSTREAM DISTURBED LAND.
   - (E) 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.
2. SEDIMENT FENCE
   - (A) NORMALLY LOCATED ALONG THE CONTOUR WITH A MAXIMUM CATCHMENT AREA 0.6 ha PER 100m LENGTH OF FENCE.
   - (B) WOVEN FABRICS ARE PREFERRED, I.E. OPERATIONAL PERIOD LESS THAN 6 MONTHS OR ON SITES WHERE SIGNIFICANT SEDIMENT RUNOFF IS NOT EXPECTED.
   - (C) WHERE FENCES NEED TO BE LOCATED ACROSS THE CONTOUR THE LAYOUT SHALL CONFORM TO 'TYPICAL LAYOUT ACROSS GRADE'.
   - (D) FENCES ARE REQUIRED 2m MIN FROM TOE OF CUT OR FILL BATTERS, WHERE NOT PRACTICAL ONE FENCE CAN BE AT THE TOE WITH A SECOND FENCE 1m MIN AWAY. FENCE SHOULD NOT BE LOCATED PARALLEL WITH TOE IF CONCENTRATION OF FLOW WILL OCCUR BEHIND THE FENCE.
3. TEMP CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP.
   - (A) ADJACENT STORMWATER RUNOFF TO BE DIVERTED AWAY FROM ENTRY/EXIT.
   - (B) WHEEL - WASH OR SPRAY UNIT MAY BE REQUIRED DURING WET WEATHER.
4. SAFETY ISSUES MUST BE CONSIDERED AT ALL TIMES, INCORPORATE TRAFFIC CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS INDICATED OTHERWISE.

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	JJ	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	MB	RPEQ No. 10801 Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SEDIMENT CONTROL DETAILS
SHEET 1 OF 2

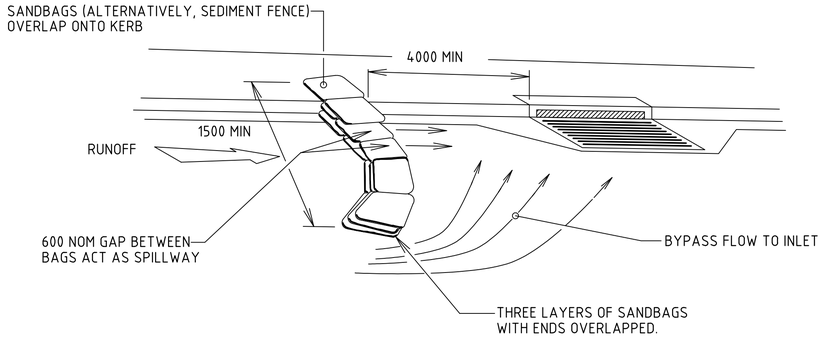
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

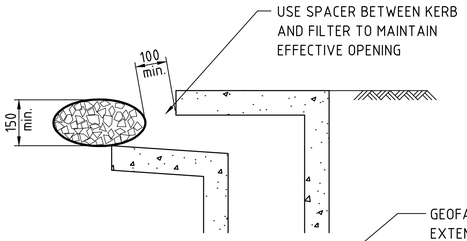
Drawing Number: Q184103-CI-1005
Revision: A

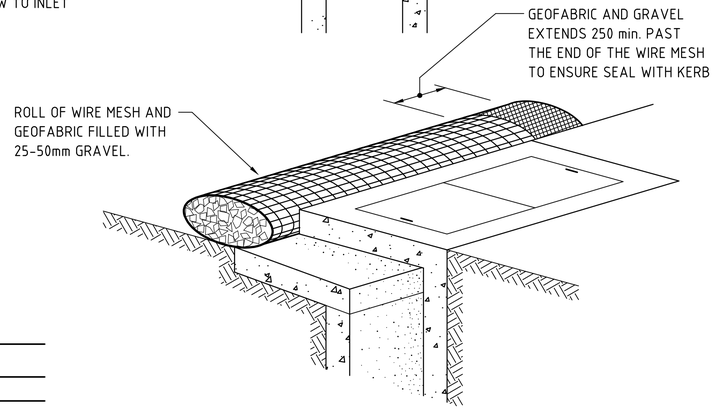
XREF's:
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1005-1006.dwg

DATE PLOTTED: 11 October 2019 10:12 AM BY: JACK JONES



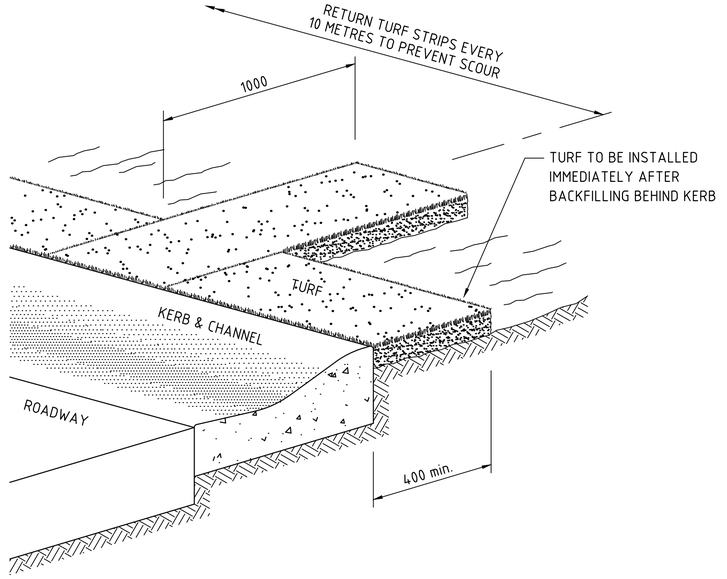
ON GRADE KERB INLET SEDIMENT TRAP





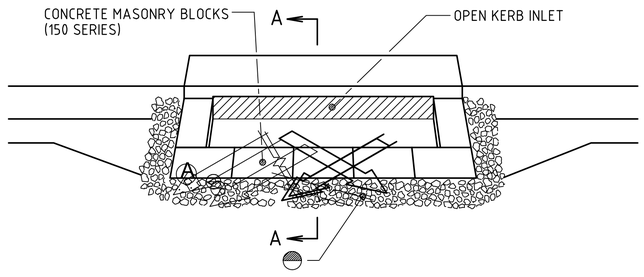
FILTER TO SIDE INLET GULLY PIT

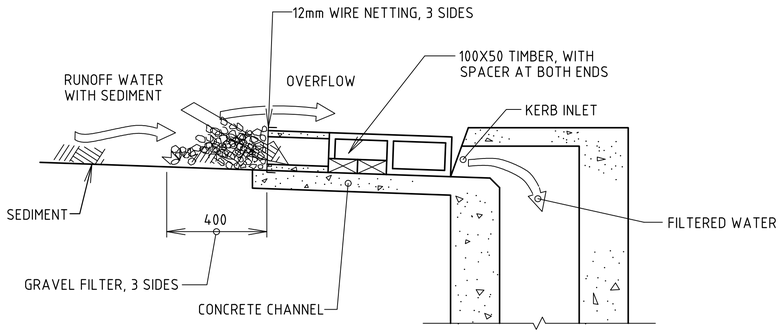
NOT TO SCALE



TURF STRIPS TO KERBLINE

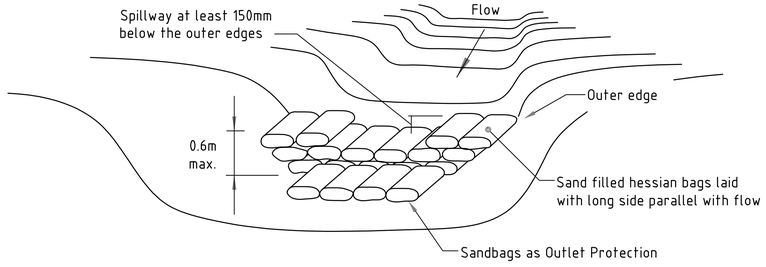
NOT TO SCALE





SECTION A-A
SAG INLET SEDIMENT TRAP, ST-1

A STABILISED BYPASS 'OVERLAND FLOW PATH' SHOULD EXIST ADJACENT TO INLET IN GENUINE SAGS.



SAND BAG CHECK DAM SECTION DETAIL

NOT TO SCALE

LEGEND

GRAVEL FILTER, REFER GRADING B, TABLE 9 OF QT SPECIFICATION MRS11.05, EXCLUDE MATERIAL FINER THEN AS SIEVE 2.36mm.

NOTES

1. FIELD INLET
   - A) A STABILISED BYPASS OVERLAND FLOW PATH SHOULD EXIST ADJACENT TO THE FIELD INLET.
   - B) WATER LEVEL CONTROL PERIMETER BANKS MAY BE REQUIRED.
   - C) BLOCKS TO BE RESTRAINED BY A HORIZONTAL TIMBER RAIL AT BLOCK JOINT HEIGHT FIXED TO TIMBER STAKES AT CORNERS.
2. CHECK DAMS
   - A) CATCHMENT AREA LIMITED TO 4 ha
   - B) USE IN MINOR OPEN DRAINS ONLY, (VELOCITY CONTROL), SEDIMENT COLLECTION IS A SECONDARY PURPOSE.
3. STRAW BALE BANKS
   - A) BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR,IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
   - B) EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 100mm ON THE DOWNSTREAM SIDE AND PLACED SO THE BINDINGS ARE HORIZONTAL.
   - C) BALES SHALL BE SECURELY ANCHORED IN PLACE WITH EITHER TWO STAKES OR STEEL PICKETS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER.
   - D) INSPECTIONS SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED. REPLACE AT LEAST 3 monthly.
4. SAFETY ISSUES MUST BE CONSIDERED AT ALL TIMES, INCORPORATE TRAFFIC CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS INDICATED OTHERWISE.

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SEDIMENT CONTROL DETAILS
SHEET 2 OF 2

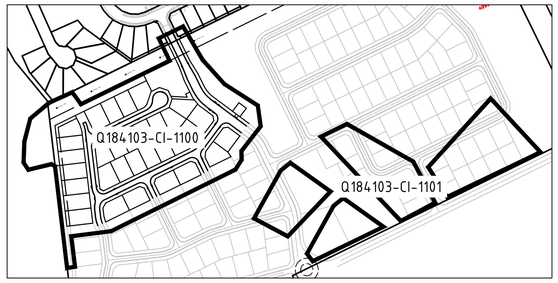
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1006
Revision: A

XREFs:
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1005-1006.dwg

DATE PLOTTED: 11 October 2019 1:57 PM BY : MAURICE SHEEHAN



KEY MAP
SCALE 1:4000m

GENERAL NOTES

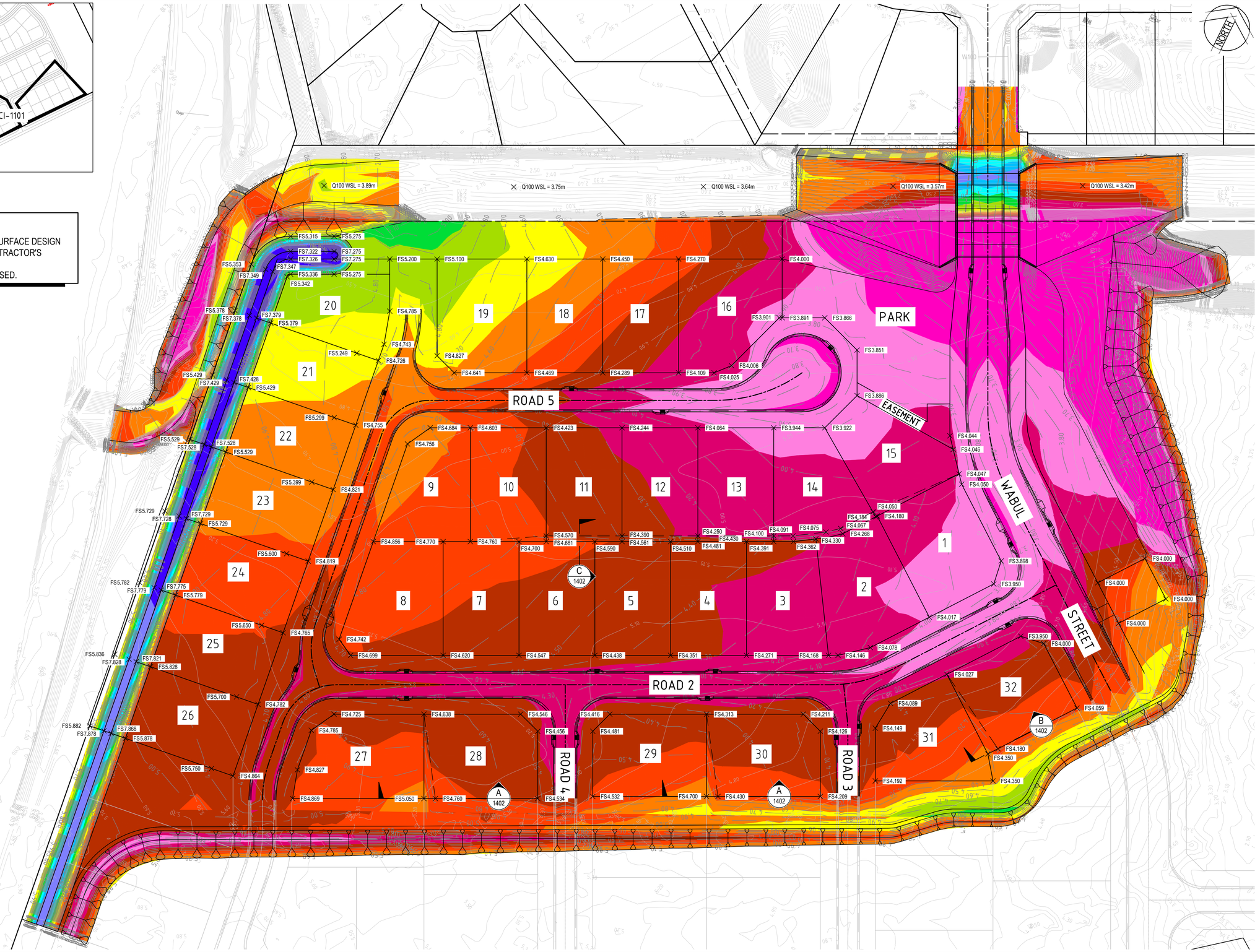
1. DESIGN CONTOURS SHOWN ON ROADS ARE FINISHED SURFACE DESIGN LEVELS. BOXING CONTOURS CAN BE PROVIDED AT CONTRACTOR'S REQUEST
2. ALL RUBBISH IS TO BE REMOVED FROM SITE AND DISPOSED.

CUT AND FILL LEGEND

CUT > 1.5m	FILL 0m - 0.25m
CUT 1.5m - 1.25m	FILL 0.25m - 0.5m
CUT 1.25m - 1.0m	FILL 0.5m - 0.75m
CUT 1.0m - 0.75m	FILL 0.75m - 1.0m
CUT 0.75m - 0.5m	FILL 1.0m - 1.25m
CUT 0.5m - 0.25m	FILL 1.25m - 1.5m
CUT 0.25m - 0m	FILL > 1.5m

LEGEND

- 3.50 — NATURAL SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- 3.50 — FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- TOP OF BATTER
- × FS0.000 — FINISHED SURFACE LEVEL



XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-SURV; XR-Q184103-CI-EWERKS; XR-Q184103-CI-GRADE STRINGS; XR-Q184103-CI-Q100 BNDY; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1100.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 5 10 15 20 25m
SCALE 1:250 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: BULK EARTHWORKS PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

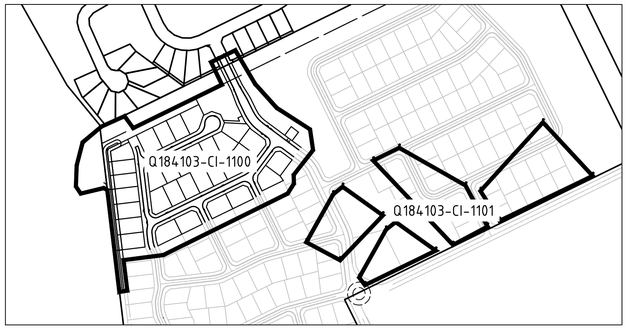
Drawing Number: Q184103-CI-1100
Revision: A

DATE PLOTTED: 11 October 2019 9:06 AM BY: JACK JONES

XREF's: XR-Q184103-CI-BASE; XR-Q184103-CI-EWRKS FILL; XR-Q184103-EXST-CNTRS
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1101.dwg

SETOUT POINTS

PT No.	EASTING	NORTHING	RL.
1	337150.899	8170403.543	4.500
2	337195.000	8170380.000	4.424
3	337250.899	8170438.543	4.300
4	337198.399	8170476.043	4.000
5	337185.899	8170466.043	4.000
6	337220.000	8170357.500	4.470
7	337227.500	8170347.500	4.500
8	337320.000	8170392.500	4.339
9	337267.500	8170430.000	4.302
10	337255.000	8170420.000	4.300
11	337238.280	8170510.232	3.800
12	337342.500	8170400.000	4.000
13	337387.500	8170423.929	4.000
14	337359.014	8170477.500	3.881
15	337272.161	8170526.807	4.000
16	337378.376	8170470.477	4.000
17	337403.121	8170431.435	4.000
18	337525.000	8170490.000	3.500
19	337460.000	8170560.000	3.500



KEY MAP
SCALE 1:4000m

CUT AND FILL LEGEND

- CUT > 1.5m
- CUT 1.5m – 1.25m
- CUT 1.25m – 1.0m
- CUT 1.0m – 0.75m
- CUT 0.75m – 0.5m
- CUT 0.5m – 0.25m
- CUT 0.25m – 0m
- FILL 0m – 0.25m
- FILL 0.25m – 0.5m
- FILL 0.5m – 0.75m
- FILL 0.75m – 1.0m
- FILL 1.0m – 1.25m
- FILL 1.25m – 1.5m
- FILL > 1.5m

NORTH

FUTURE STAGE

FILL AREA 4
FILL = 1124m³

FILL AREA 2
FILL = 4110m³

FUTURE STAGE

FUTURE STAGE

FILL AREA 3
FILL = 1348m³

FILL AREA 1
FILL = 8049m³

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

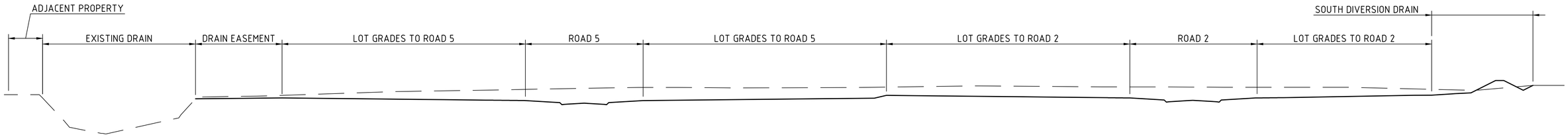
		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: EXCESS CUT STOCKPILING PLAN

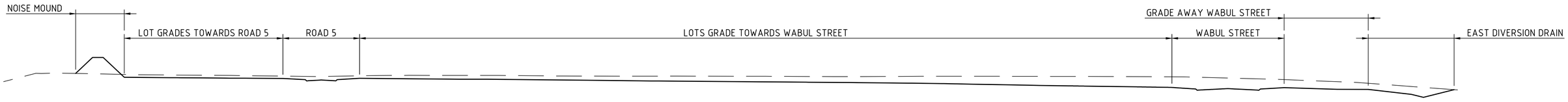
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1101
Revision: A



SECTION 1 / 1102
SCALE 1:250m



SECTION 2 / 1102
SCALE 1:400m



LOCALITY PLAN
SCALE 1:2000m

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 5 10 15 20 25m
SCALE 1:250 @A1

0 10 20 30 40m
SCALE 1:400 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SITE CROSS SECTIONS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1102
Revision: A

DATE PLOTTED: 11 October 2019 9:11 AM BY: JACK JONES
XREFs: XR-Q184103-CI-BASE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1102.dwg

DATE PLOTTED: 11 October 2019 2:02 PM BY : MAURICE SHEEHAN

WABUL STREET

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	337027.151	8170672.714	3.801	153°54'44.48"			
TC	112.977	337076.833	8170571.247	3.846	153°54'44.48"			
IP 2	123.680	337081.630	8170561.449	3.910		R = -45.000	21.405	27°15'14.83"
CT	134.383	337090.381	8170554.936	3.874	126°39'29.65"			
IP 3	194.179	337183.373	8170519.218	4.014	126°39'29.65"			

ROAD 2

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	337113.187	8170537.963	3.895	216°39'29.65"			
TC	49.020	337083.920	8170498.639	3.925	216°39'29.65"			
IP 2	57.344	337078.854	8170491.832	3.966		R = 35.000	16.648	27°15'11.83"
CT	65.668	337071.234	8170488.101	4.020	243°54'41.48"			
TC	195.817	336954.346	8170430.867	4.576	243°54'41.48"			
IP 3	205.074	336944.786	8170426.187	4.610		R = -15.000	18.514	70°43'00.00"
CT	214.330	336946.048	8170415.618	4.645	173°11'41.48"			
TC	225.459	336947.366	8170404.568	4.684	173°11'41.48"			
IP 4	230.507	336947.970	8170399.507	4.702		R = -30.000	10.097	19°17'00.00"
CT	235.555	336950.211	8170394.930	4.719	153°54'41.48"			

ROAD 3

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	337074.354	8170489.831		148°04'11.98"			
TC	9.427	337079.340	8170481.830	3.973	148°04'11.98"			
IP 2	10.957	337080.149	8170480.531	3.969		R = 30.000	3.059	5°50'29.50"
CT	12.486	337080.822	8170479.156	3.965	153°54'41.48"			
IP 3	29.682	337088.385	8170463.712	4.050	153°54'41.48"			

ROAD 4

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING
IP 1	0.000	337008.526	8170457.396	4.335	153°54'41.48"
IP 2	30.012	337021.724	8170430.442	4.375	153°54'41.48"

ROAD 5

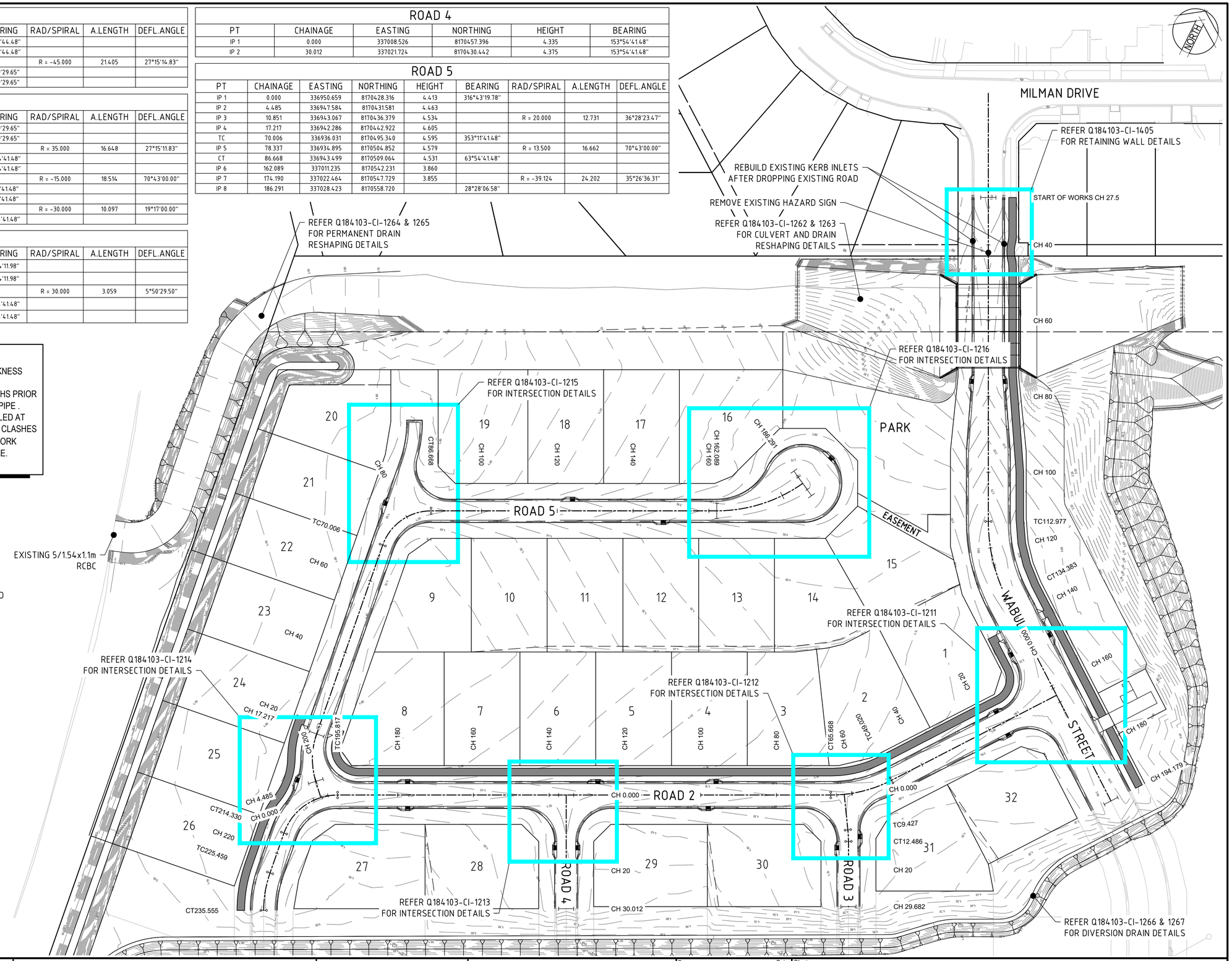
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	336950.659	8170428.316	4.413	316°43'19.78"			
IP 2	4.485	336947.584	8170431.581	4.463				
IP 3	10.851	336943.067	8170436.379	4.534		R = 20.000	12.731	36°28'23.47"
IP 4	17.217	336942.286	8170442.922	4.605				
TC	70.006	336936.031	8170495.340	4.595	353°11'41.48"			
IP 5	78.337	336934.895	8170504.852	4.579		R = 13.500	16.662	70°43'00.00"
CT	86.668	336943.499	8170509.064	4.531	63°54'41.48"			
IP 6	162.089	337011.235	8170542.231	3.860				
IP 7	174.190	337022.464	8170547.729	3.855		R = -39.124	24.202	35°26'36.31"
IP 8	186.291	337028.423	8170558.720		28°28'06.58"			

NOTES

1. AT INTERSECTIONS, CUL-DE-SACS AND ROUNDABOUTS, THE THICKNESS OF AC SURFACE SHALL INCREASE TO 50mm
2. DN100 PVC PIPES ARE TO BE PLACED UNDERNEATH THE FOOTPATHS PRIOR TO POUR OF THE FOOTPATHS TO SERVICE FUTURE HOUSE DOWNPIPE . DISCHARGES TO KERB. TWO (2) PIPES PER LOT ARE TO BE INSTALLED AT SUITABLE LOCATIONS FOR THE BUILDERS AND TO AVOID SERVICE CLASHES
3. SAWCUT AC SEAL & STRIP BACK TO BASE COURSE ALONG ROADWORK INTERFACE WITH EXISTING INCLUDING CROWN WHERE APPLICABLE. TIE IN NEATLY AND EVENLY TO EXISTING.

LEGEND

- 3.50 — FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- TOP OF BATTER
- LAYBACK KERB (REFER FNQROC STD DWD 1000 FOR DETAILS)
- 2.0m WIDE FOOTPATH (REFER FNQROC STD DWG S1035 FOR DETAILS)



0 10 20 30 40 50m

SCALE 1:500 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: ROADWORKS PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

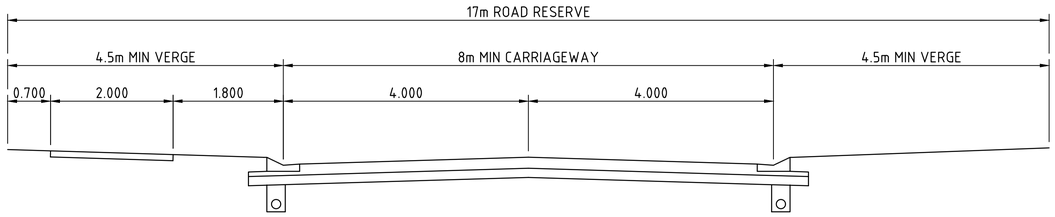
Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1200

Revision: A

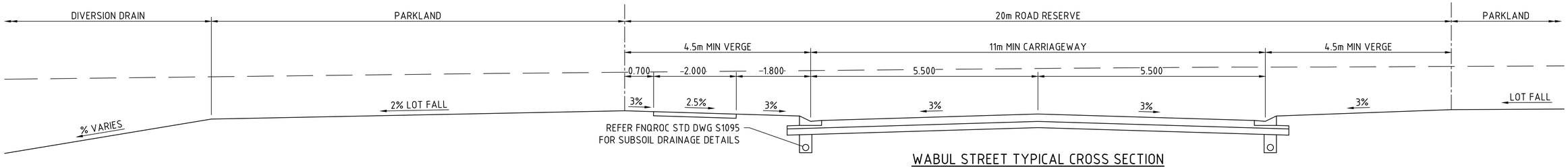
XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-CL; XR-Q184103-CI-TABLE; XR-Q184103-CI-GRADE STRINGS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1200.dwg

DATE PLOTTED: 11 October 2019 9:33 AM BY: JACK JONES



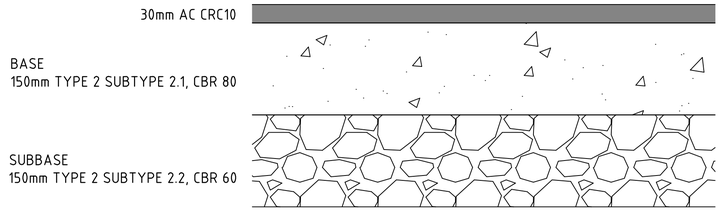
WABUL STREET TYPICAL CROSS SECTION

CH 27.5 - CH 74.426
TRANSITION IN CARRIAGEWAY WIDTH FROM CH 74.426 - CH 86.95 (8m WIDTH TO 11m WIDTH)
SCALE 1:50m



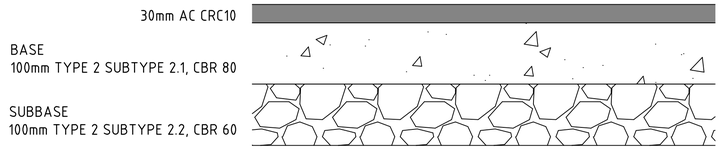
WABUL STREET TYPICAL CROSS SECTION

CH 86.95 - CH 194.5
SCALE 1:50m



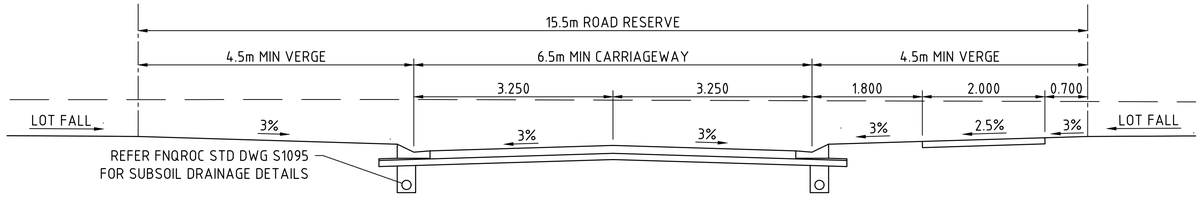
WABUL STREET PAVEMENT DESIGN

BASED ON CBR = 8



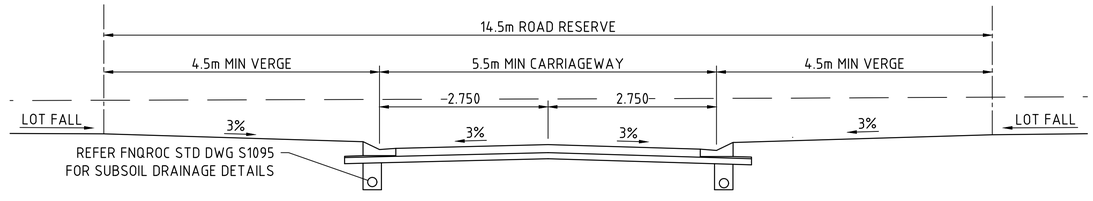
ROAD 2, 3, 4 & 5 PAVEMENT DESIGN

BASED ON CBR = 8



ROAD 2 TYPICAL CROSS SECTION

CH 14.5 - CH 235.555
SCALE 1:50m



ROAD 3 TYPICAL CROSS SECTION

CH 12.486 - CH 29.682

ROAD 4 TYPICAL CROSS SECTION

CH 12.25 - CH 30.012

ROAD 5 TYPICAL CROSS SECTION

CH 17.217 - CH 162.089

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 3 4 5m
SCALE 1:50 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

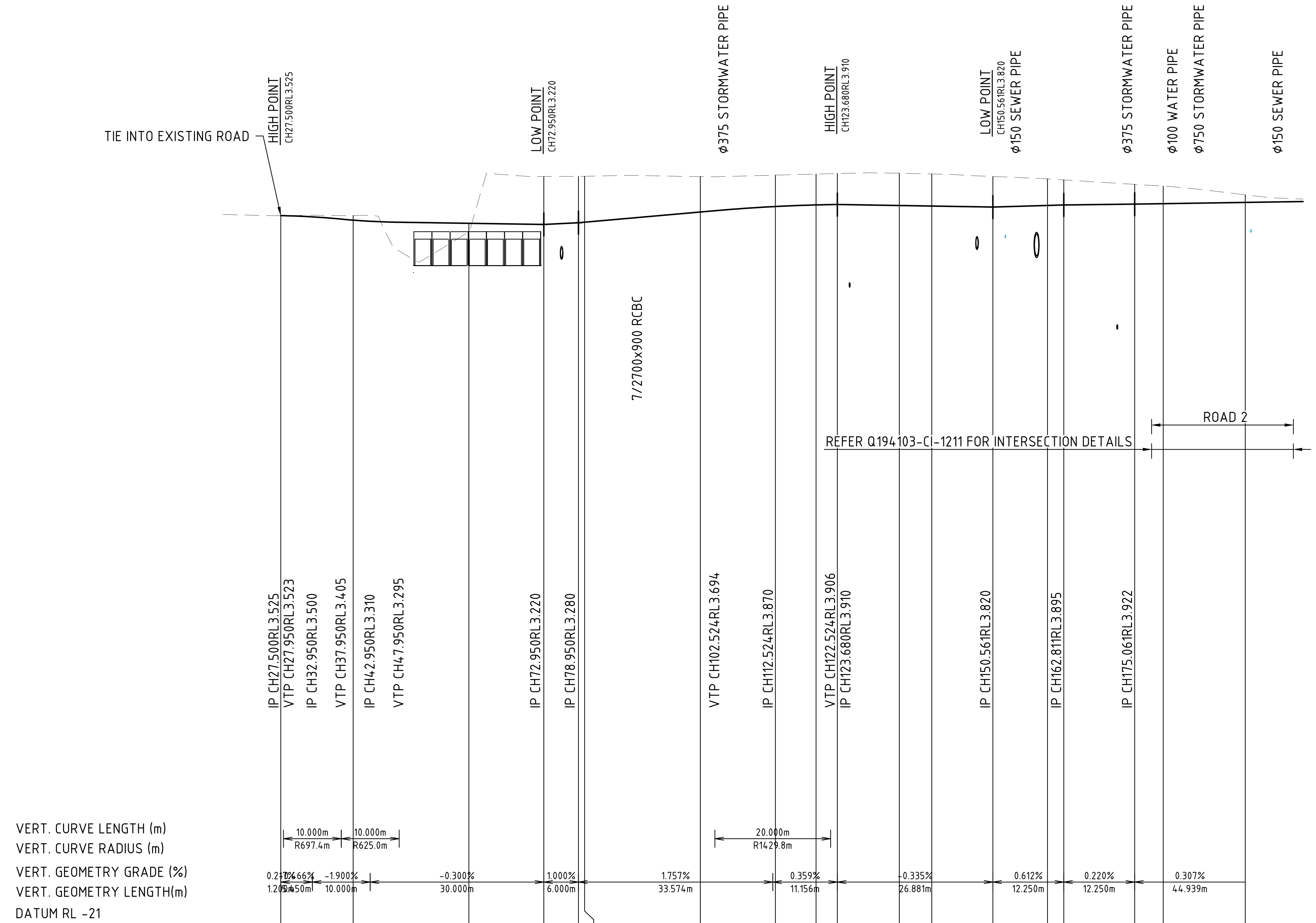
Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: ROADWORKS - TYPICAL CROSS SECTIONS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1201
Revision: A

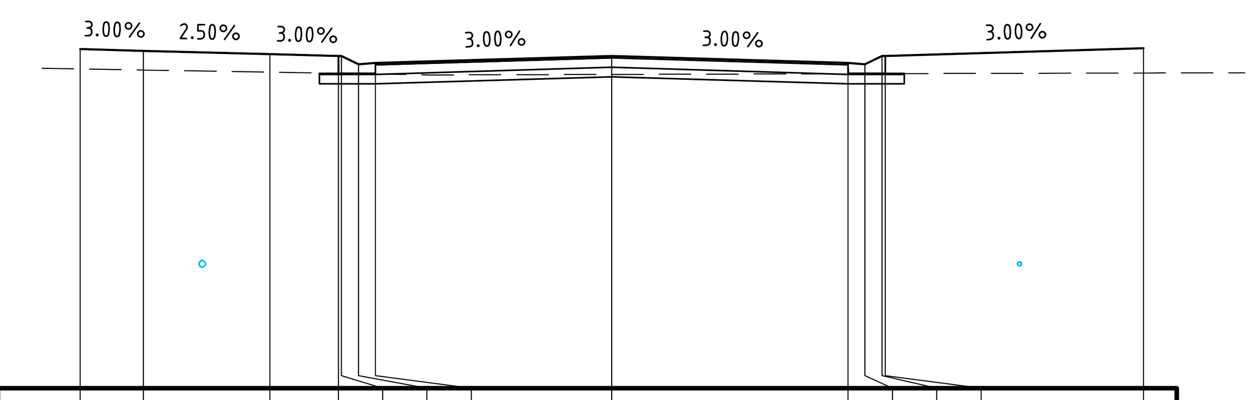
XREF's:
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1201.dwg



HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)								21.405m R-45.000m										
EXISTING SURFACE LEVELS ROAD CENTRELINE	3.525	3.529	2.966	4.876	4.882	4.883	4.873	4.925	4.960	4.979	4.988	4.965	4.877	4.792	4.759	4.604	4.546	4.244
CUT/FILL DEPTH TO EXISTING SURFACE	0.000	-0.160	0.293	-1.656	-1.602	-1.585	-1.224	-1.085	-1.065	-1.069	-1.114	-1.109	-1.057	-0.914	-0.864	-0.682	-0.609	-0.264
DESIGN LEVELS ROAD CENTRELINE	3.525	3.369	3.259	3.220	3.280	3.298	3.650	3.840	3.895	3.910	3.874	3.855	3.820	3.878	3.895	3.922	3.937	3.981
CONTROL LINE CHAINAGE ROAD CENTRELINE	27.500	40.000	60.000	72.950	78.950	80.000	100.000	112.977	120.000	123.680	134.383	140.000	150.561	160.000	162.811	175.061	180.000	194.179

WABUL STREET
SCALE: H 1:500
V 1:100

WABUL STREET
X = 337053.536
Y = 8170618.827

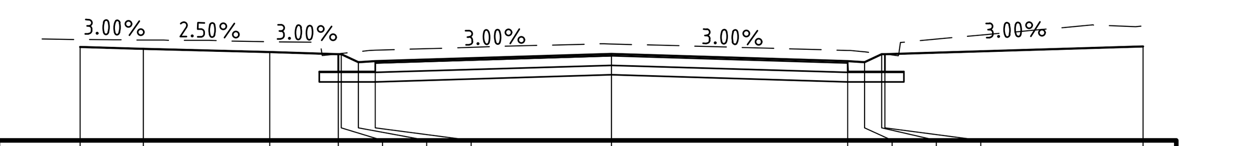


Datum -2.00

DESIGN HEIGHT	3.369	3.339	3.289	3.257	3.257	3.127	3.147	3.259	3.147	3.127	3.257	3.257	3.379
EXISTING SURFACE	3.051	3.034	3.000	2.982	2.981	2.976	2.972	2.966	2.976	2.977	2.978	2.978	2.989
OFFSETS	-8.400	-7.400	-5.400	-4.320	-4.270	-4.000	-3.735	0.000	3.735	4.000	4.270	4.320	8.400

CHAINAGE 60.000

WABUL STREET
X = 337044.741
Y = 8170636.790

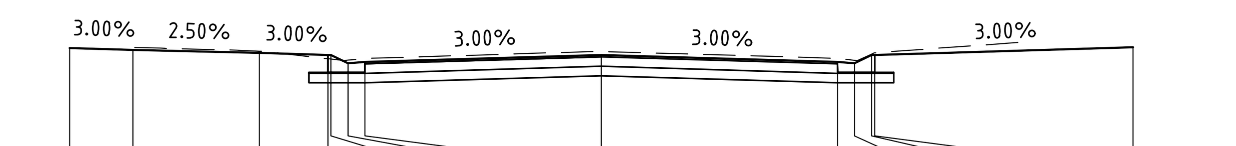


Datum 2.00

DESIGN HEIGHT	3.480	3.450	3.400	3.367	3.367	3.237	3.257	3.369	3.257	3.237	3.367	3.367	3.490
EXISTING SURFACE	3.599	3.591	3.561	3.373	3.378	3.407	3.429	3.529	3.426	3.404	3.375	3.369	
OFFSETS	-8.400	-7.400	-5.400	-4.320	-4.270	-4.000	-3.735	0.000	3.735	4.000	4.270	4.320	8.400

CHAINAGE 40.000

WABUL STREET
X = 337041.641
Y = 8170643.121



Datum 2.00

DESIGN HEIGHT	3.594	3.564	3.514	3.482	3.482	3.352	3.372	3.484	3.372	3.352	3.482	3.482	3.604
EXISTING SURFACE			3.542	3.423	3.417	3.400	3.427	3.537	3.430	3.398	3.495	3.516	
OFFSETS	-8.400	-7.400	-5.400	-4.320	-4.270	-4.000	-3.735	0.000	3.735	4.000	4.270	4.320	8.400

CHAINAGE 32.950

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

SCALE 1:100 @A1 (0 1 2 4 6 8 10m)
SCALE 1:200 @A1 (0 5 10 15 20m)
SCALE 1:500 @A1 (0 10 20 30 40 50m)

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn JJ Date 10.10.2019
Checked MS Date 10.10.2019
Designed MC Date 10.10.2019
Verified MS Date 10.10.2019
Approved RPEQ No. 10801 MB Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B SUBDIVISION OF LOT 2 ON SR431 CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: WABUL STREET LONGITUDINAL SECTION & CROSS SECTIONS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum: AHD
Scale: AS SHOWN
Size: A1
Drawing Number: Q184103-CI-1202
Revision: A

DATE PLOTTED: 11 October 2019 9:33 AM BY : JACK JONES
XREFs: XR-Q184103-CI-LS-WABUL1; XR-Q184103-CI-XS-WABUL01; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS021; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg

DATE PLOTTED: 11 October 2019 9:42 AM BY: JACK JONES
XREFs: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-R5041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_colfab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg

WABUL STREET
X = 337110.932
Y = 8170539.641

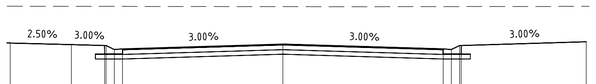


Datum 2.00

DESIGN HEIGHT	3.812	3.812	3.682	3.702	3.878
EXISTING SURFACE	4.719	4.720	4.723	4.726	4.792
OFFSETS	-5.820	-5.770	-5.500	-5.235	0.000

CHAINAGE 160.000

WABUL STREET
X = 337071.126
Y = 8170582.902

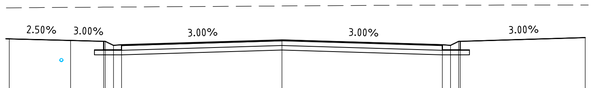


Datum -2.00

DESIGN HEIGHT	3.685	3.635	3.603	3.603	3.473	3.493	3.650	3.493	3.473	3.603	3.603	3.725
EXISTING SURFACE	4.885	4.883	4.881	4.881	4.881	4.880	4.873	4.875	4.875	4.876	4.876	4.882
OFFSETS	-8.900	-6.900	-5.820	-5.770	-5.500	-5.235	0.000	5.235	5.500	5.770	5.820	9.900

CHAINAGE 100.000

WABUL STREET
X = 337094.888
Y = 8170551.582

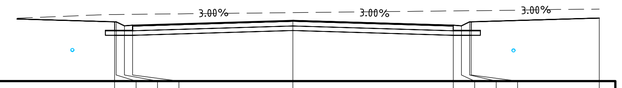


Datum -2.00

DESIGN HEIGHT	3.891	3.841	3.808	3.808	3.678	3.698	3.855	3.698	3.678	3.808	3.808	3.931
EXISTING SURFACE	4.903	4.918	4.925	4.926	4.928	4.929	4.965	4.991	4.991	4.991	4.991	4.996
OFFSETS	-8.900	-6.900	-5.820	-5.770	-5.500	-5.235	0.000	5.235	5.500	5.770	5.820	9.900

CHAINAGE 140.000

WABUL STREET
X = 337138.608
Y = 8170519.044

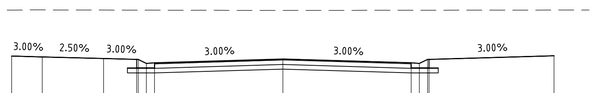


Datum 2.00

DESIGN HEIGHT	3.935	3.935	3.805	3.825	3.982	3.825	3.805	3.935	3.935	4.060	
EXISTING SURFACE	4.174	4.175	4.177	4.180	4.236	4.293	4.296	4.298	4.299	4.350	
OFFSETS	-5.820	-5.770	-5.500	-5.235	0.000	5.235	5.500	5.770	5.820	10.000	

CHAINAGE 194.500

WABUL STREET
X = 337062.331
Y = 8170600.865

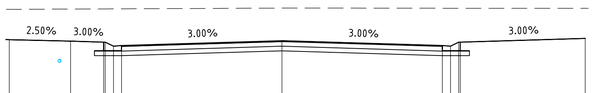


Datum -2.00

DESIGN HEIGHT	3.395	3.365	3.315	3.283	3.283	3.153	3.173	3.298	3.173	3.153	3.283	3.283	3.405
EXISTING SURFACE	4.894	4.900	4.896	4.893	4.893	4.893	4.892	4.883	4.889	4.890	4.890	4.890	4.896
OFFSETS	-8.854	-7.854	-5.854	-4.774	-4.724	-4.454	-4.189	0.000	4.189	4.454	4.724	4.774	8.854

CHAINAGE 80.000

WABUL STREET
X = 337080.400
Y = 8170565.206

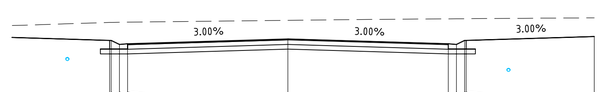


Datum -2.00

DESIGN HEIGHT	3.930	3.880	3.848	3.848	3.718	3.738	3.895	3.738	3.718	3.848	3.848	3.970
EXISTING SURFACE	4.919	4.928	4.933	4.933	4.934	4.936	4.960	4.955	4.954	4.954	4.954	4.951
OFFSETS	-8.900	-6.900	-5.820	-5.770	-5.500	-5.235	0.000	5.235	5.500	5.770	5.820	9.900

CHAINAGE 120.000

WABUL STREET
X = 337126.976
Y = 8170527.701



Datum 2.00

DESIGN HEIGHT	3.890	3.890	3.760	3.780	3.937	3.780	3.760	3.890	3.890	4.016	
EXISTING SURFACE	4.477	4.479	4.482	4.485	4.546	4.594	4.596	4.598	4.598	4.627	
OFFSETS	-5.820	-5.770	-5.500	-5.235	0.000	5.235	5.500	5.770	5.820	10.000	

CHAINAGE 180.000

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: WABUL STREET CROSS SECTIONS

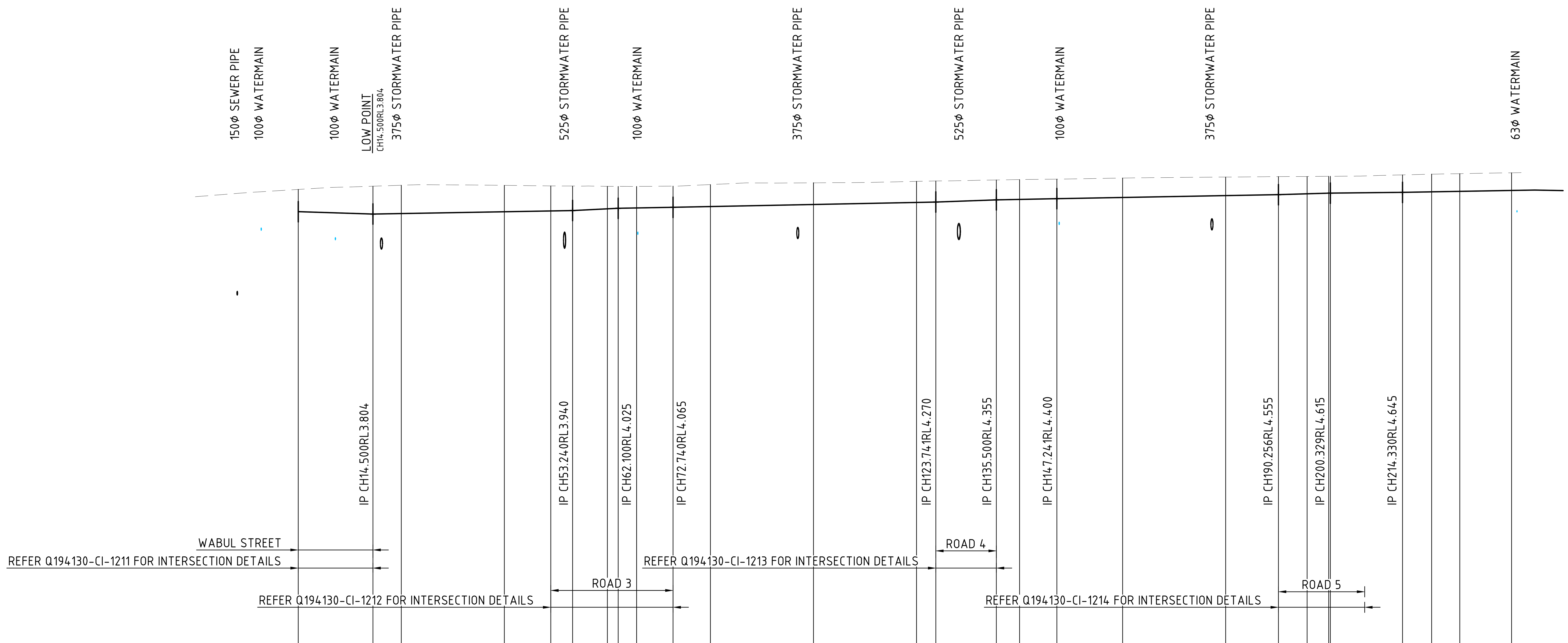
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1203
Revision: A

DATE PLOTTED: 11 October 2019 9:43 AM BY : JACK JONES

XREFs: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS021; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg



VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%)
VERT. GEOMETRY LENGTH(m)
DATUM RL -20

VERT. GEOMETRY GRADE (%)	-0.628%	0.351%	0.959%	0.376%	0.402%	0.723%	0.383%	0.360%	0.596%	0.214%	0.351%
VERT. GEOMETRY LENGTH(m)	14.500m	38.740m	8.860m	10.640m	51.001m	11.759m	11.741m	43.015m	10.073m	14.001m	25.670m

HORZ. CURVE LENGTH (m)	16.648m	18.514m	10.097m
HORZ. CURVE RADIUS (m)	R35.000m	R-15.000m	R-30.000m

CONTROL LINE CHAINAGE ROAD CENTRELINE	EXISTING SURFACE LEVELS ROAD CENTRELINE	CUT/FILL DEPTH TO EXISTING SURFACE	DESIGN LEVELS ROAD CENTRELINE
0.000	4.759	-0.864	3.895
14.500	4.884	-1.080	3.804
20.000	4.920	-1.097	3.823
40.000	4.918	-1.024	3.894
49.020	4.895	-0.970	3.925
53.240	4.888	-0.948	3.940
60.000	4.878	-0.873	4.005
62.100	4.875	-0.850	4.025
65.668	4.875	-0.837	4.038
72.740	4.886	-0.821	4.065
80.000	4.947	-0.853	4.094
100.000	5.016	-0.841	4.175
120.000	5.071	-0.816	4.255
123.741	5.087	-0.817	4.270
135.500	5.125	-0.770	4.355
140.000	5.142	-0.770	4.372
147.241	5.159	-0.759	4.400
160.000	5.201	-0.755	4.446
180.000	5.238	-0.720	4.518
190.256	5.255	-0.700	4.555
195.817	5.261	-0.672	4.588
200.000	5.266	-0.653	4.613
200.329	5.266	-0.651	4.615
214.330	5.323	-0.678	4.645
220.000	5.350	-0.685	4.665
225.459	5.371	-0.687	4.684
235.500	5.404	-0.685	4.719

ROAD 2

SCALE: H 1:500
V 1:100

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

SCALE 1:100 @A1 (0 1 2 4 6 8 10m)
SCALE 1:500 @A1 (0 10 20 30 40 50m)

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	MB	RPEQ No. 10801 — 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

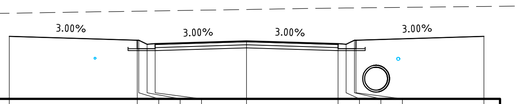
Title: ROAD 2 LONGITUDINAL SECTION

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: Q184103-CI-1204 | Revision: A

ROAD 2
X = 337089.305
Y = 8170505.875

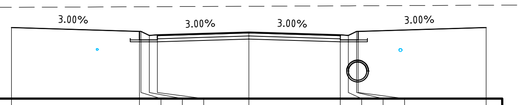


Datum 2.00

DESIGN HEIGHT	4.039		3.914	3.914	3.784	3.804		3.894		3.804	3.784	3.914	3.914		4.039
EXISTING SURFACE	4.796		4.862	4.862	4.867	4.871		4.918		4.964	4.967	4.970	4.970		5.015
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 40.000

ROAD 2
X = 337040.400
Y = 8170473.003

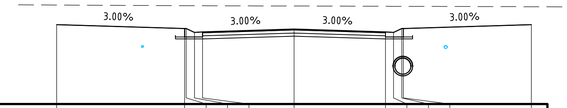


Datum 2.00

DESIGN HEIGHT	4.320		4.195	4.195	4.065	4.085		4.175		4.085	4.065	4.195	4.195		4.320
EXISTING SURFACE	4.982		4.999	5.000	5.001	5.002		5.016		5.029	5.030	5.031	5.032		5.050
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 100.000

ROAD 2
X = 336986.513
Y = 8170446.618

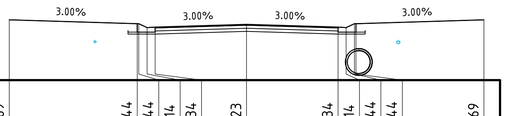


Datum 2.00

DESIGN HEIGHT	4.592		4.466	4.466	4.336	4.356		4.446		4.356	4.336	4.466	4.466		4.592
EXISTING SURFACE	5.232		5.210	5.209	5.209	5.208		5.201		5.191	5.191	5.190	5.190		5.177
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 160.000

ROAD 2
X = 337101.246
Y = 8170521.919

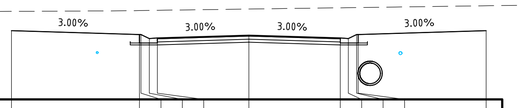


Datum 2.00

DESIGN HEIGHT	3.969		3.844	3.844	3.714	3.734		3.823		3.734	3.714	3.844	3.844		3.969
EXISTING SURFACE	4.814		4.865	4.866	4.870	4.874		4.920		4.966	4.971	4.975	4.975		5.040
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 20.000

ROAD 2
X = 337058.362
Y = 8170481.799

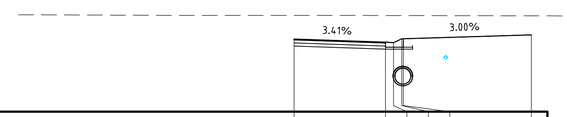


Datum 2.00

DESIGN HEIGHT	4.240		4.115	4.115	3.985	4.005		4.094		4.005	3.985	4.115	4.115		4.240
EXISTING SURFACE	4.870		4.898	4.898	4.902	4.906		4.947		4.988	4.992	4.995	4.996		5.054
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 80.000

ROAD 2
X = 337004.475
Y = 8170455.413

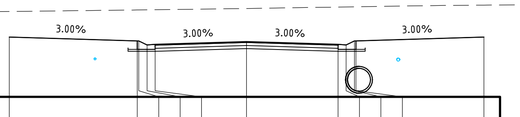


Datum 2.00

DESIGN HEIGHT			4.372			4.270		4.250		4.380					4.506
EXISTING SURFACE			5.142			5.138		5.137		5.137					5.128
OFFSETS			0.000			2.985		3.250		3.520		3.570			7.750

CHAINAGE 140.000

ROAD 2
X = 337104.530
Y = 8170526.331

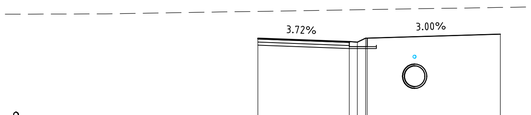


Datum 2.00

DESIGN HEIGHT	3.950		3.824	3.824	3.694	3.714		3.804		3.714	3.694	3.824	3.824		3.950
EXISTING SURFACE	4.785		4.835	4.836	4.839	4.842		4.884		4.930	4.934	4.938	4.939		4.994
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 14.500

ROAD 2
X = 337076.101
Y = 8170490.994

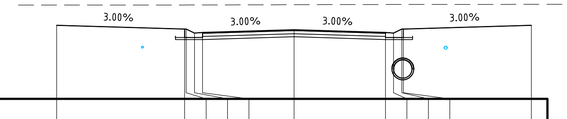


Datum 0.00

DESIGN HEIGHT						4.005		3.894	3.874	4.004	4.004	4.134			
EXISTING SURFACE						4.878		4.926	4.931	4.935	4.936	5.007			
OFFSETS						0.000		2.985	3.250	3.520	3.570	7.917			

CHAINAGE 60.000

ROAD 2
X = 337022.438
Y = 8170464.208



Datum 2.00

DESIGN HEIGHT	4.401		4.275	4.275	4.145	4.165		4.255		4.165	4.145	4.275	4.275		4.401
EXISTING SURFACE	5.060		5.062	5.062	5.063	5.063		5.071		5.079	5.080	5.081	5.081		5.083
OFFSETS	-7.750		-3.570	-3.520	-3.250	-2.985		0.000		2.985	3.250	3.520	3.570		7.750

CHAINAGE 120.000

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: ROAD 2 CROSS SECTIONS
SHEET 1 OF 2

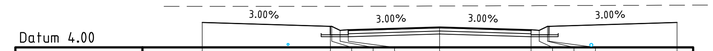
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1205
Revision: A

XREFs: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS941; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS0201; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS021
CAD File: \\cardno.corp\apac_colla\Regional QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg
DATE PLOTTED: 11 October 2019 9:43 AM BY: JACK JONES

ROAD 2
X = 336946.719
Y = 8170409.988

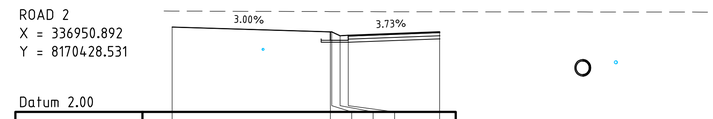


Datum 4.00

DESIGN HEIGHT	4.811	4.685	4.685	4.555	4.575	4.665	4.575	4.555	4.685	4.685	4.811
EXISTING SURFACE	5.336	5.337	5.337	5.337	5.338	5.350	5.360	5.361	5.362	5.362	5.376
OFFSETS	-7.750	-3.570	-3.520	-3.250	-2.985	0.000	2.985	3.250	3.520	3.570	7.750

CHAINAGE 220.000

ROAD 2
X = 336950.892
Y = 8170428.531

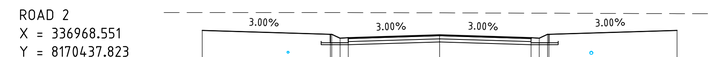


Datum 2.00

DESIGN HEIGHT	4.767	4.612	4.612	4.482	4.502	4.613
EXISTING SURFACE	5.289	5.272	5.272	5.271	5.270	5.266
OFFSETS	-8.732	-3.570	-3.520	-3.250	-2.985	0.000

CHAINAGE 200.000

ROAD 2
X = 336968.551
Y = 8170437.823



Datum 2.00

DESIGN HEIGHT	4.664	4.538	4.538	4.408	4.428	4.518	4.428	4.408	4.538	4.538	4.664
EXISTING SURFACE	5.246	5.248	5.248	5.248	5.247	5.238	5.228	5.227	5.226	5.226	5.212
OFFSETS	-7.750	-3.570	-3.520	-3.250	-2.985	0.000	2.985	3.250	3.520	3.570	7.750

CHAINAGE 180.000

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: ROAD 2 CROSS SECTIONS
SHEET 2 OF 2

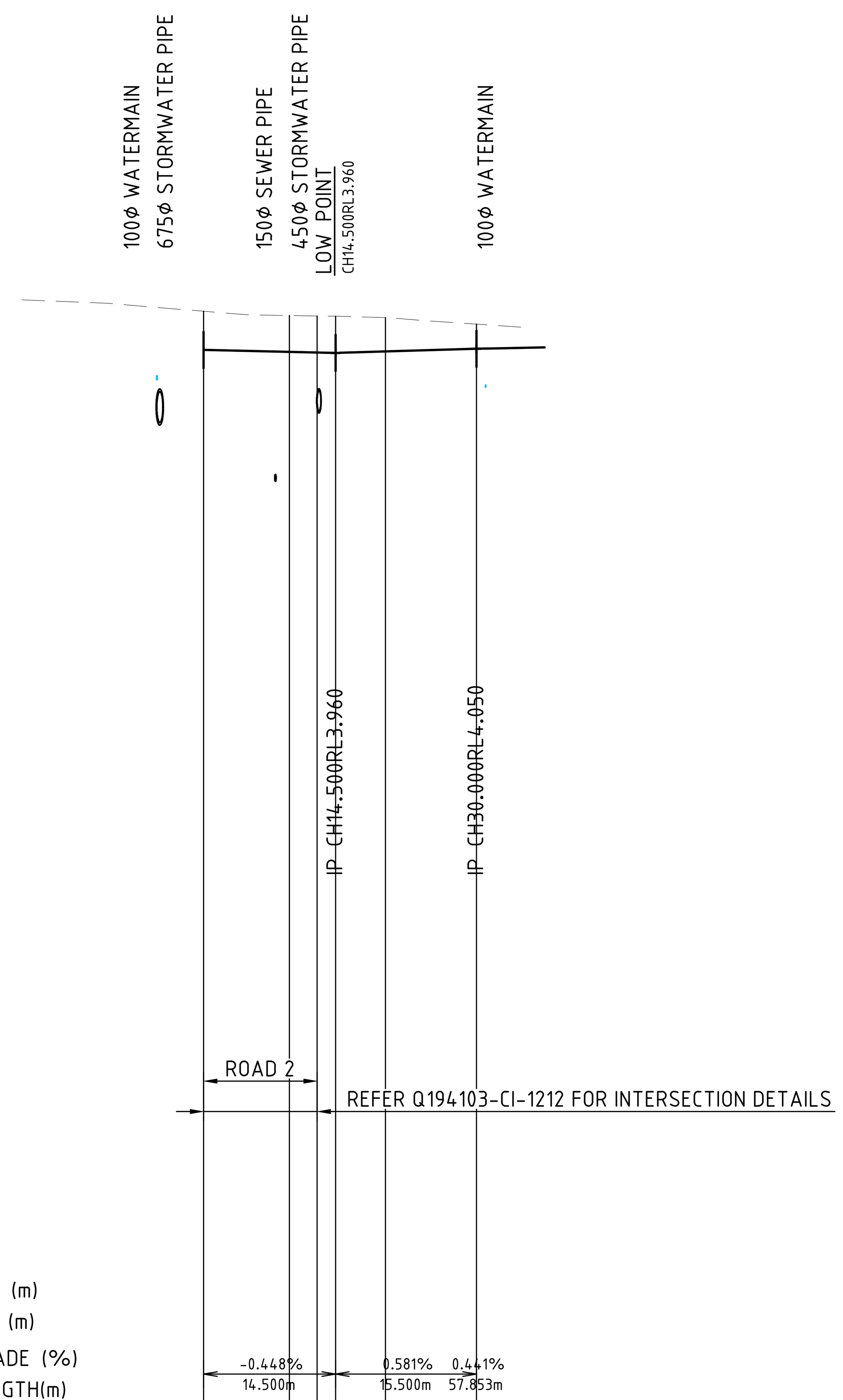
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1206
Revision: A

XREF's: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS021; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg
DATE PLOTTED: 11 October 2019 9:43 AM BY: JACK JONES

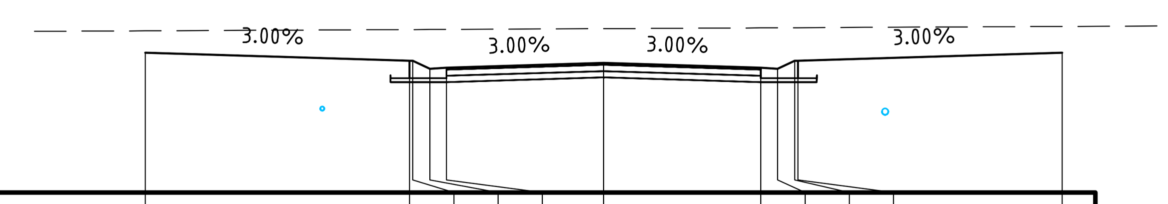
DATE PLOTTED: 11 October 2019 9:44 AM BY : JACK JONES



VERT. CURVE LENGTH (m)							
VERT. CURVE RADIUS (m)							
VERT. GEOMETRY GRADE (%)		-0.448%			0.581%	0.441%
VERT. GEOMETRY LENGTH(m)		14.500m			15.500m	57.853m
DATUM RL -20							
HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)			3.059m R30.000m				
EXISTING SURFACE LEVELS ROAD CENTRELINE	4.875	4.783	4.772	4.765	4.737	4.592
CUT/FILL DEPTH TO EXISTING SURFACE	-0.850	-0.800	-0.803	-0.805	-0.745	-0.542
DESIGN LEVELS ROAD CENTRELINE	4.025	3.983	3.969	3.960	3.992	4.050
CONTROL LINE CHAINAGE ROAD CENTRELINE	0.000	9.427	12.486	14.500	20.000	30.000

ROAD 3
SCALE: H 1:500
V 1:100

ROAD 3
X = 337088.524
Y = 8170463.427

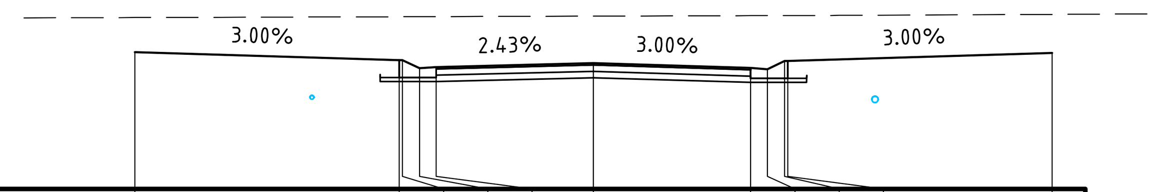


Datum 2.00

DESIGN HEIGHT	4.211	4.085	4.085	3.955	3.975	4.050	3.975	3.955	4.085	4.085	4.211
EXISTING SURFACE	4.556	4.577	4.577	4.578	4.580	4.592	4.604	4.605	4.606	4.607	4.627
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 30.000

ROAD 3
X = 337084.127
Y = 8170472.408

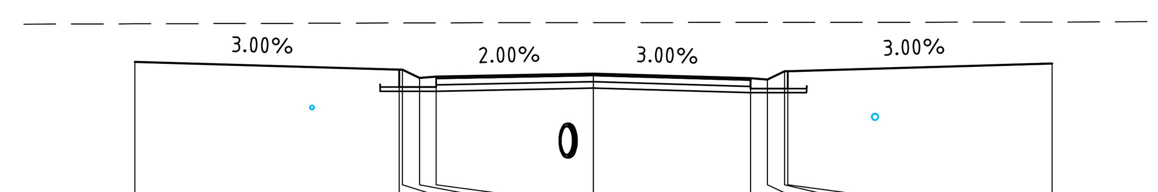


Datum 2.00

DESIGN HEIGHT	4.167	4.042	4.042	3.912	3.932	3.992	3.917	3.897	4.027	4.027	4.153
EXISTING SURFACE	4.715	4.728	4.728	4.729	4.730	4.737	4.745	4.746	4.746	4.747	4.766
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 20.000

ROAD 3
X = 337080.822
Y = 8170479.156



Datum 2.00

DESIGN HEIGHT	4.151	4.025	4.025	3.895	3.915	3.965	3.891	3.871	4.001	4.001	4.126
EXISTING SURFACE	4.753	4.766	4.766	4.767	4.768	4.772	4.775	4.775	4.775	4.775	4.780
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 12.486

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	MB	RPEQ No. 10801 Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

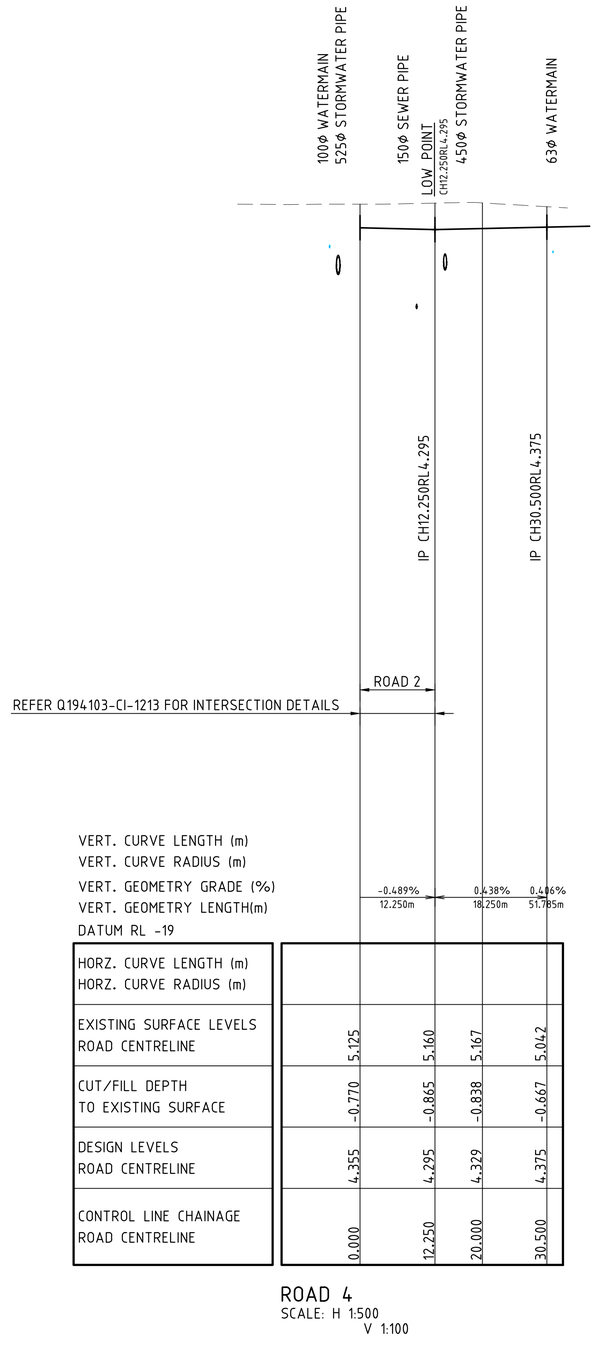
Title: ROAD 3 LONGITUDINAL SECTION & CROSS SECTIONS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number	Revision
Q184103-CI-1207	A

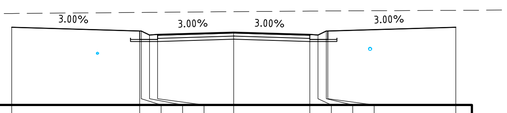
XREFs: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS021; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg



VERT. CURVE LENGTH (m)				
VERT. CURVE RADIUS (m)				
VERT. GEOMETRY GRADE (%)				
VERT. GEOMETRY LENGTH(m)				
DATUM RL -19				
HORZ. CURVE LENGTH (m)				
HORZ. CURVE RADIUS (m)				
EXISTING SURFACE LEVELS ROAD CENTRELINE	5.125	5.160	5.167	5.042
CUT/FILL DEPTH TO EXISTING SURFACE	-0.770	-0.865	-0.838	-0.667
DESIGN LEVELS ROAD CENTRELINE	4.355	4.295	4.329	4.375
CONTROL LINE CHAINAGE ROAD CENTRELINE	0.000	12.250	20.000	30.500

ROAD 4
SCALE: H 1:500
V 1:100

ROAD 4
X = 337021.938
Y = 8170430.004

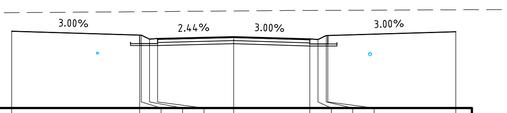


Datum 2.00

DESIGN HEIGHT	4.536	4.410	4.410	4.280	4.300	4.375	4.300	4.280	4.410	4.410	4.536
EXISTING SURFACE	4.984	5.018	5.018	5.020	5.022	5.042	5.063	5.065	5.067	5.067	5.086
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 30.500

ROAD 4
X = 337017.321
Y = 8170439.434

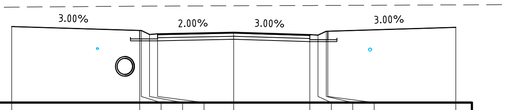


Datum 2.00

DESIGN HEIGHT	4.504	4.378	4.378	4.248	4.268	4.329	4.254	4.234	4.364	4.364	4.490
EXISTING SURFACE	5.111	5.143	5.144	5.146	5.148	5.167	5.184	5.185	5.186	5.187	5.205
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 20.000

ROAD 4
X = 337013.913
Y = 8170446.394



Datum 2.00

DESIGN HEIGHT	4.481	4.355	4.355	4.225	4.245	4.295	4.220	4.200	4.330	4.330	4.456
EXISTING SURFACE	5.115	5.148	5.148	5.149	5.150	5.160	5.169	5.170	5.171	5.171	5.189
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 12.250

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: ROAD 4 LONGITUDINAL SECTION & CROSS SECTIONS

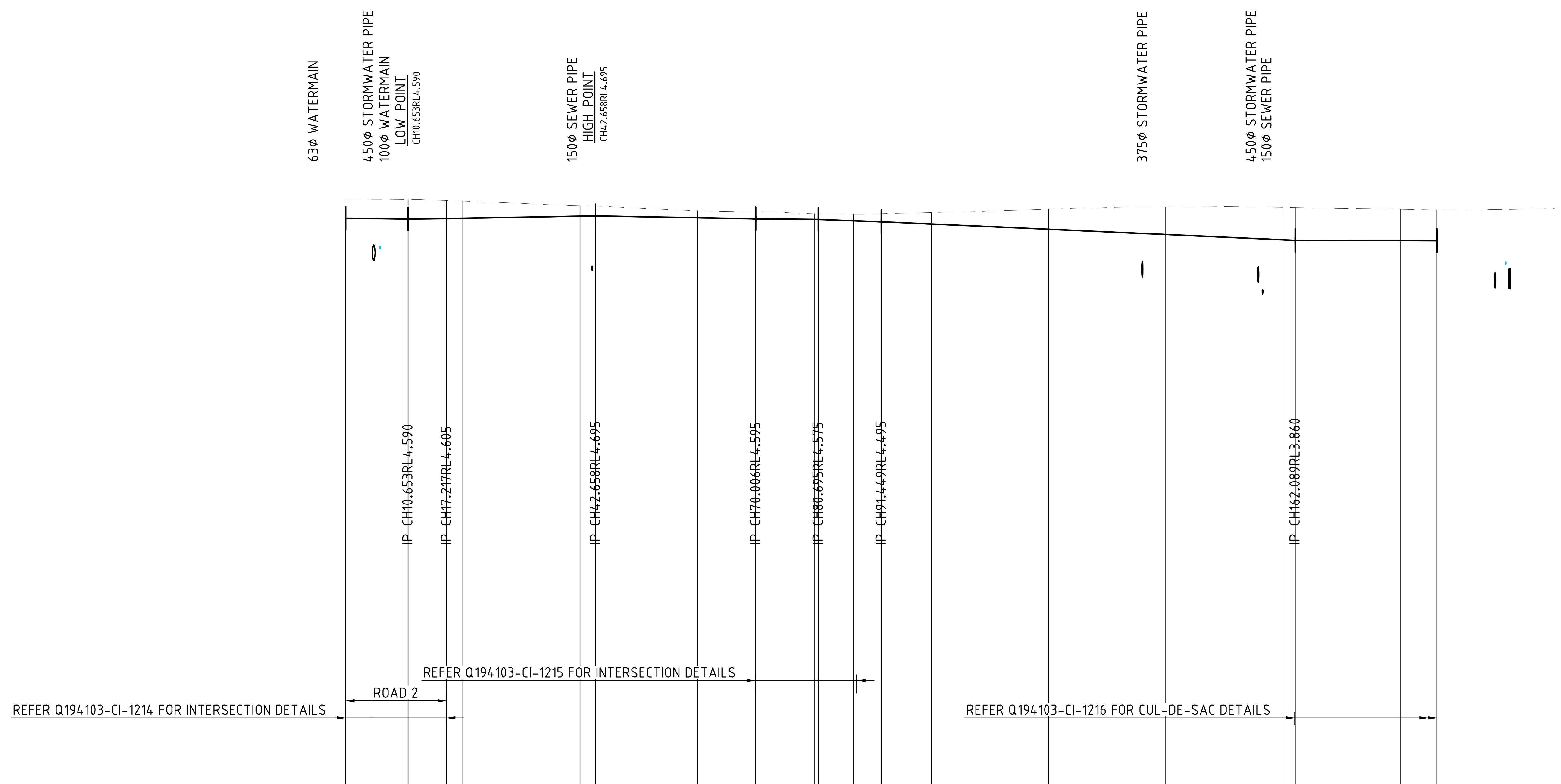
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1208
Revision: A

XREF's: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg
DATE PLOTTED: 11 October 2019 9:44 AM BY: JACK JONES

DATE PLOTTED: 11 October 2019 9:45 AM BY : JACK JONES



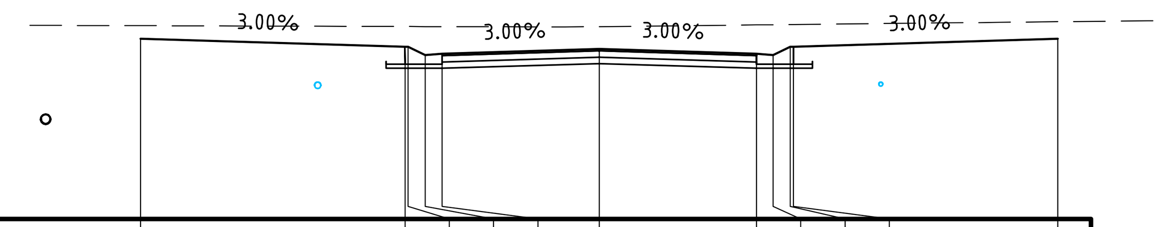
VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%): -0.238% | 0.234% | 0.354% | -0.366% | -0.187% | -0.744% | -0.899% | -0.041%
VERT. GEOMETRY LENGTH(m): 10.653m | 6.564m | 25.441m | 27.348m | 10.689m | 10.754m | 70.640m | 24.202m
DATUM RL -19

HORZ. CURVE LENGTH (m): 12.731m | 16.662m | 24.202m
HORZ. CURVE RADIUS (m): R20.000m | R13.500m | R-39.124m

CONTROL LINE CHAINAGE ROAD CENTRELINE	DESIGN LEVELS ROAD CENTRELINE	CUT/FILL DEPTH TO EXISTING SURFACE	EXISTING SURFACE LEVELS ROAD CENTRELINE
-0.000	4.615		
4.485	4.604	-0.657	5.261
10.653	4.590	-0.663	5.253
17.217	4.605	-0.615	5.220
20.000	4.615	-0.584	5.199
40.000	4.686	-0.354	5.040
42.658	4.695	-0.332	5.027
60.000	4.632	-0.238	4.870
70.006	4.595	-0.236	4.831
80.000	4.576	-0.193	4.770
80.695	4.575	-0.191	4.766
86.668	4.531	-0.225	4.755
91.449	4.495	-0.276	4.771
100.000	4.418	-0.392	4.810
120.000	4.238	-0.685	4.924
140.000	4.059	-0.940	4.999
160.000	3.879	-1.111	4.989
162.089	3.860	-1.122	4.982
180.000	3.853	-1.068	4.921
186.291	3.850	-1.047	4.897

ROAD 5
SCALE: H 1:500
V 1:100

ROAD 5
X = 336939.586
Y = 8170465.545

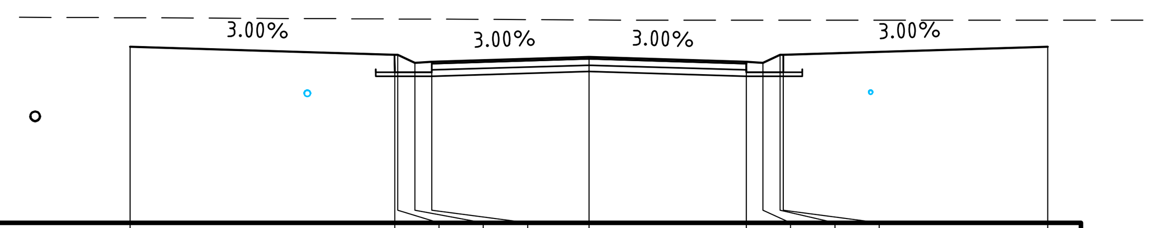


Datum 2.00

DESIGN HEIGHT	4.846	4.721	4.721	4.591	4.611	4.686	4.611	4.591	4.721	4.721	4.846
EXISTING SURFACE	5.054	5.042	5.041	5.041	5.040	5.040	5.066	5.069	5.072	5.072	5.117
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 40.000

ROAD 5
X = 336941.956
Y = 8170445.686

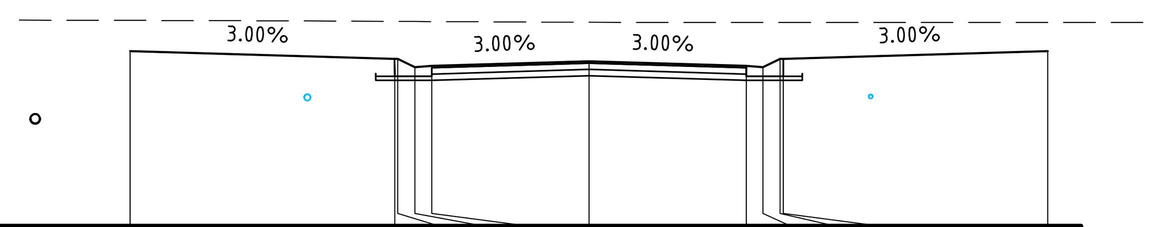


Datum 2.00

DESIGN HEIGHT	4.776	4.650	4.650	4.520	4.540	4.615	4.540	4.520	4.650	4.650	4.776
EXISTING SURFACE	5.234	5.214	5.214	5.212	5.211	5.199	5.193	5.193	5.193	5.193	5.194
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 20.000

ROAD 5
X = 336942.286
Y = 8170442.922



Datum 2.00

DESIGN HEIGHT	4.766	4.640	4.640	4.510	4.530	4.605	4.530	4.510	4.640	4.640	4.766
EXISTING SURFACE	5.249	5.234	5.234	5.233	5.232	5.220	5.216	5.216	5.216	5.216	5.216
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 17.217

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

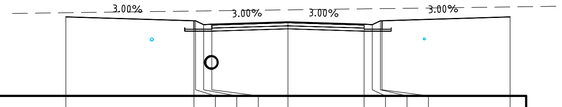
Drawn JJ Date 10.10.2019
Checked MS Date 10.10.2019
Designed MC Date 10.10.2019
Verified MS Date 10.10.2019
Approved MB RPEQ No. 10801 Date 10.10.2019

Client PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title ROAD 5 LONGITUDINAL SECTION

Status FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum AHD | Scale AS SHOWN | Size A1
Drawing Number Q184103-CI-1209 | Revision A

XREFs: XR-Q184103-CI-LS-WABUL1; XR-Q184103-CI-XS-WABUL01; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS021; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS031
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg

ROAD 5
X = 336955.472
Y = 8170514.927

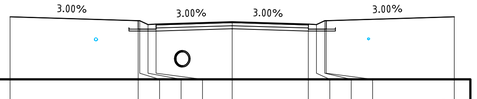


Datum 2.00

DESIGN HEIGHT	4.579	4.454	4.454	4.324	4.344	4.418	4.344	4.324	4.454	4.579
EXISTING SURFACE	4.715	4.770	4.771	4.774	4.778	4.810	4.842	4.846	4.849	4.850	4.904
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 100.000

ROAD 5
X = 337009.359
Y = 8170541.312

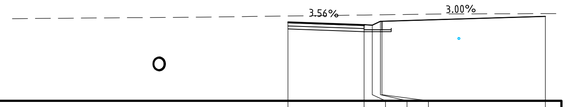


Datum 2.00

DESIGN HEIGHT	4.040	3.914	3.914	3.784	3.804	3.879	3.804	3.784	3.914	3.914	4.040
EXISTING SURFACE	4.958	4.977	4.977	4.978	4.980	4.989	4.999	5.000	5.001	5.001	5.015
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 160.000

ROAD 5
X = 336938.460
Y = 8170504.800

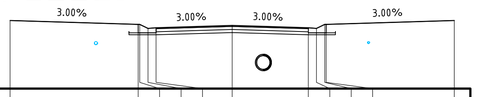


Datum 2.00

DESIGN HEIGHT	4.576	4.488	4.468	4.598	4.598	4.758
EXISTING SURFACE	4.770	4.802	4.806	4.809	4.810	4.847
OFFSETS	0.000	2.485	2.750	3.020	3.070	8.402

CHAINAGE 80.000

ROAD 5
X = 336991.397
Y = 8170532.517

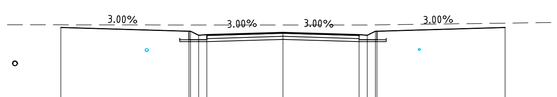


Datum 2.00

DESIGN HEIGHT	4.219	4.094	4.094	3.964	3.984	4.059	3.984	3.964	4.094	4.094	4.219
EXISTING SURFACE	4.939	4.973	4.974	4.976	4.978	4.999	5.019	5.021	5.023	5.024	5.053
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 140.000

ROAD 5
X = 336937.216
Y = 8170485.404

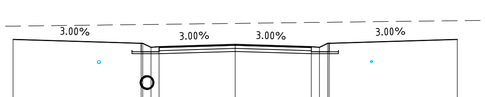


Datum 2.00

DESIGN HEIGHT	4.792	4.667	4.667	4.537	4.557	4.632	4.557	4.537	4.667	4.667	4.792
EXISTING SURFACE	4.877	4.871	4.871	4.871	4.870	4.870	4.870	4.872	4.876	4.877	4.932
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 60.000

ROAD 5
X = 336973.434
Y = 8170523.722



Datum 2.00

DESIGN HEIGHT	4.399	4.274	4.274	4.144	4.164	4.238	4.164	4.144	4.274	4.274	4.399
EXISTING SURFACE	4.835	4.886	4.886	4.890	4.893	4.924	4.954	4.957	4.961	4.961	5.011
OFFSETS	-7.250	-3.070	-3.020	-2.750	-2.485	0.000	2.485	2.750	3.020	3.070	7.250

CHAINAGE 120.000

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: ROAD 5 CROSS SECTIONS

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1210
Revision: A

XREFs: XR-Q184103-CI-LS-WABUL01; XR-Q184103-CI-XS-WABUL1; XR-Q184103-CI-LS-ROAD 201; XR-Q184103-CI-XS-ROAD 21; XR-Q184103-CI-LS-RA0401; XR-Q184103-CI-XS-RS041; XR-Q184103-CI-LS-RS0201; XR-Q184103-CI-XS-RS0201; XR-Q184103-CI-LS-RS0301; XR-Q184103-CI-XS-RS021
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1202-1210.dwg
DATE PLOTTED: 11 October 2019 9:45 AM BY: JACK JONES

XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-KR-TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg
DATE PLOTTED: 11 October 2019 9:46 AM BY: JACK JONES

LEGEND

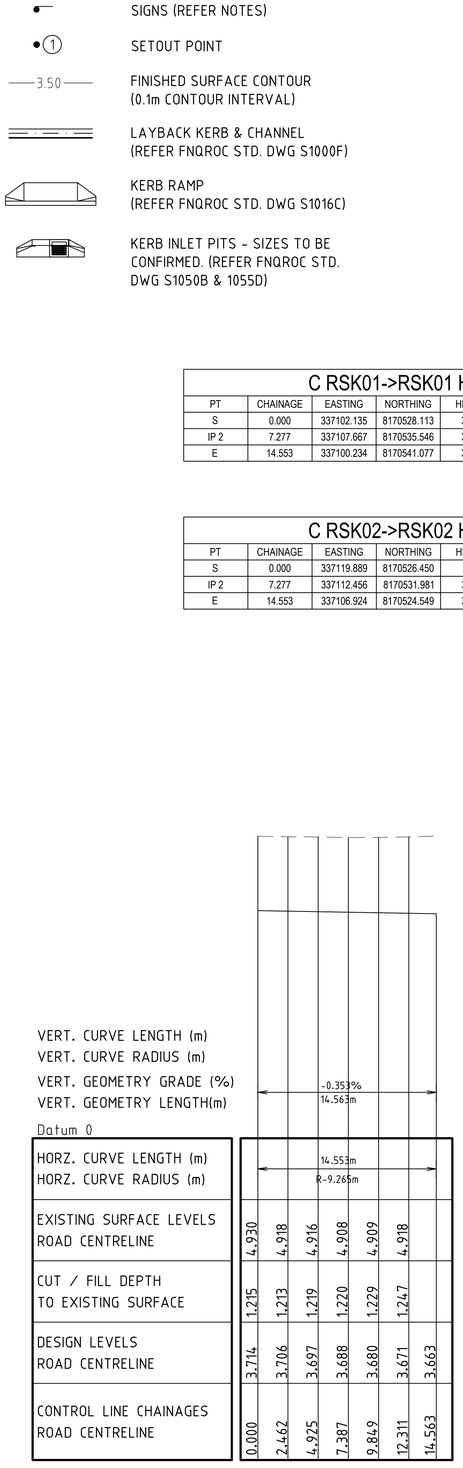
- SIGNS (REFER NOTES)
- ① SETOUT POINT
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS – SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK01->RSK01 HORIZONTAL POINTS

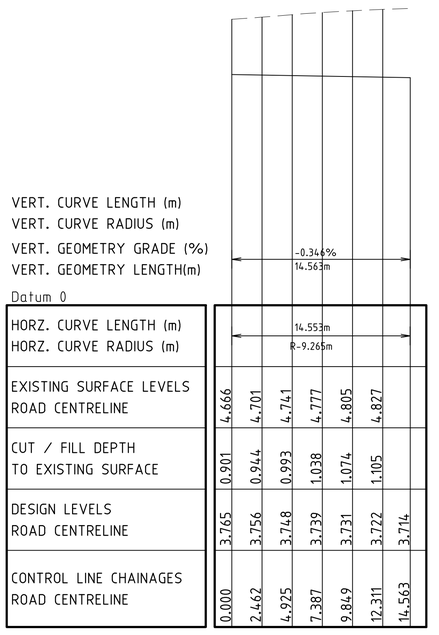
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337102.135	8170528.113	3.714	36°39'29.65"			
IP 2	7.277	337107.667	8170535.546	3.689		R = -9.265	14.553	90°00'00.00"
E	14.553	337100.234	8170541.077	3.663	306°39'29.65"			

C RSK02->RSK02 HORIZONTAL POINTS

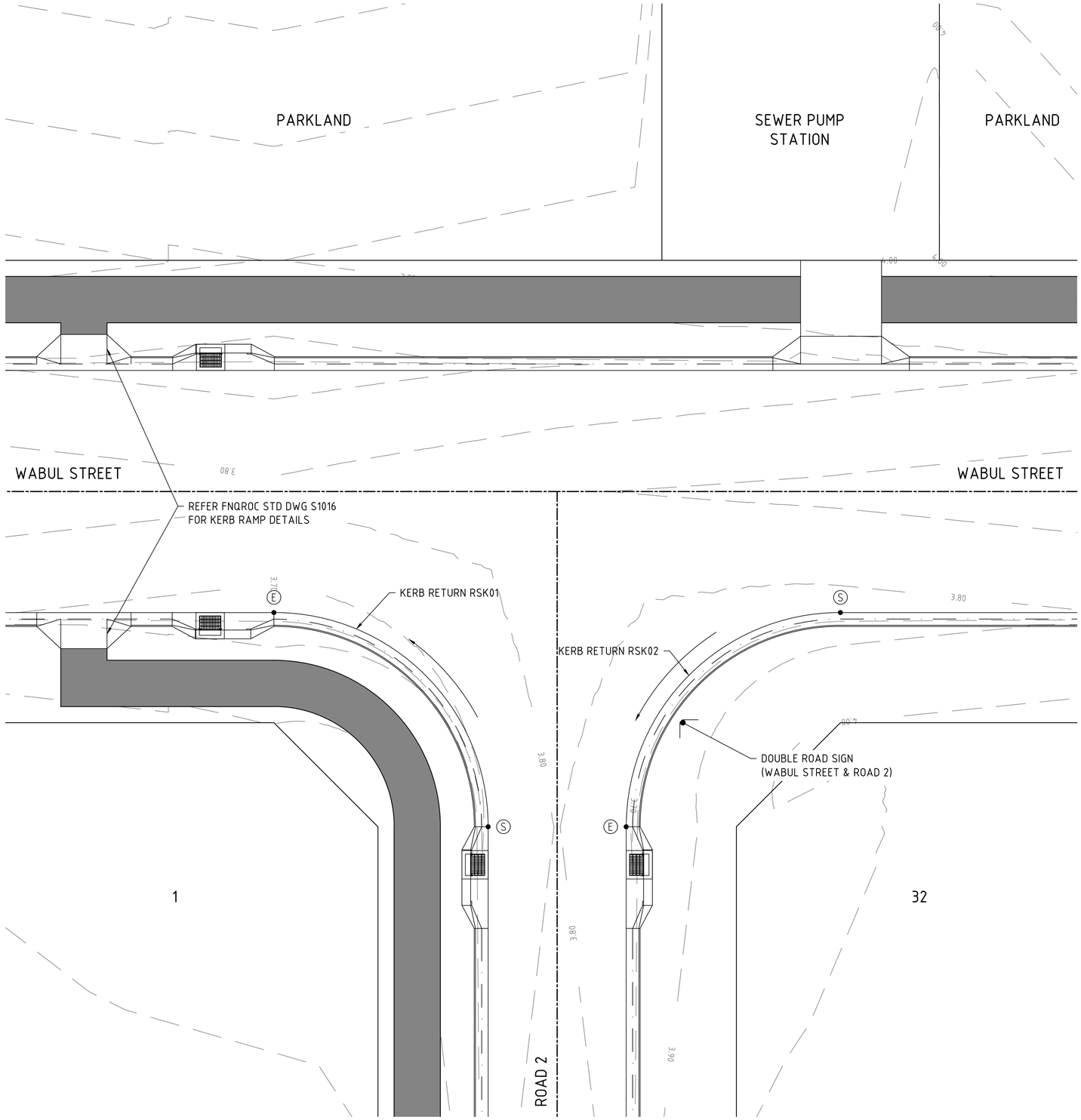
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337119.889	8170526.450		306°39'29.65"			
IP 2	7.277	337112.456	8170531.981	3.740		R = -9.265	14.553	90°00'00.00"
E	14.553	337106.924	8170524.549	3.715	216°39'29.65"			



KERB RETURN RSK01



KERB RETURN RSK02



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 PLAN @A1

H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: INTERSECTION PLAN
SHEET 1 OF 6

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1211
Revision: A

XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-KR-TABLE
DATE PLOTTED: 11 October 2019 9:47 AM BY: JACK JONES
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg

LEGEND

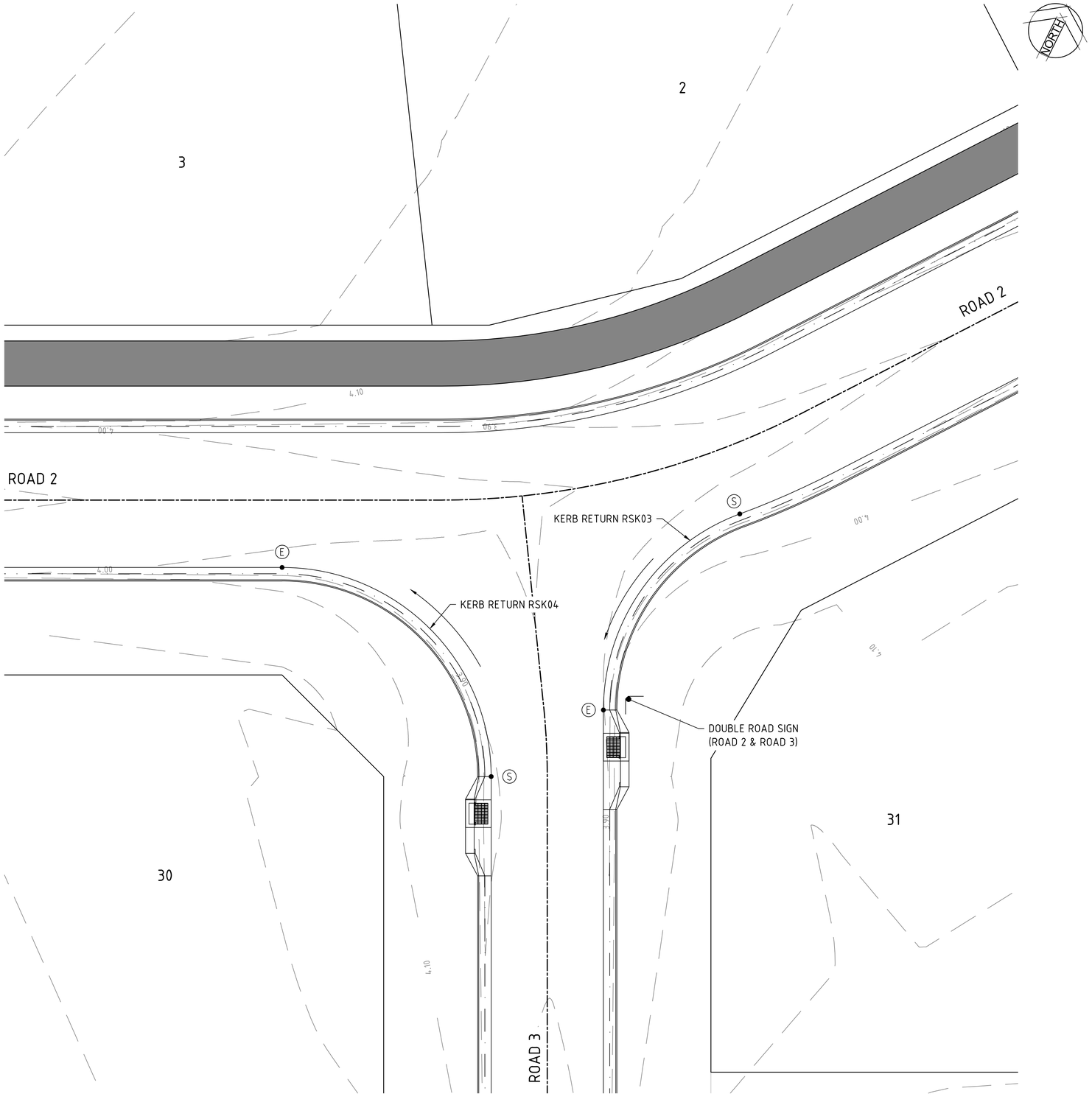
- SIGNS (REFER NOTES)
- ① SETOUT POINT
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS – SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK03->RSK03 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337083.366	8170493.356	3.850	223°33'59.10"			
IP 2	5.632	337078.923	8170488.686	3.877		R = -9.265	11.264	69°39'17.62"
CT	11.264	337081.758	8170482.896	3.903	153°54'41.48"			
E	14.211	337083.054	8170480.249	3.917	153°54'41.48"			

C RSK04->RSK04 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337078.590	8170478.063	3.891	333°54'41.48"			
IP 2	7.277	337074.516	8170486.385	3.929		R = -9.265	14.553	90°00'00.00"
E	14.553	337066.195	8170482.310	3.975	243°54'41.48"			



VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%)
VERT. GEOMETRY LENGTH(m)

0.468%
14.221m

Datum 0

HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)								
								11.264m / R-9.265m
EXISTING SURFACE LEVELS ROAD CENTRELINE			4.835	4.811	4.792	4.784	4.776	
CUT / FILL DEPTH TO EXISTING SURFACE		0.973	0.937	0.907	0.888	0.868		
DESIGN LEVELS ROAD CENTRELINE	3.850	3.862	3.874	3.885	3.897	3.908	3.917	
CONTROL LINE CHAINAGES ROAD CENTRELINE	-0.000	2.462	4.925	7.387	9.849	12.311	14.221	

KERB RETURN RSK03

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%)
VERT. GEOMETRY LENGTH(m)

0.530% 0.646%
8.023m 6.566m

IP CH7.997RL3.933

HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)								
								14.553m / R-9.265m
EXISTING SURFACE LEVELS ROAD CENTRELINE			4.775	4.783	4.792	4.800	4.802	4.810	4.826	
CUT / FILL DEPTH TO EXISTING SURFACE		0.884	0.880	0.875	0.870	0.869	0.865	0.866	
DESIGN LEVELS ROAD CENTRELINE	3.890	3.891	3.904	3.917	3.930	3.933	3.945	3.961	3.975	
CONTROL LINE CHAINAGES ROAD CENTRELINE	-0.026	0.000	2.462	4.925	7.387	7.997	9.849	12.311	14.563	

KERB RETURN RSK04

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 PLAN @A1

H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: INTERSECTION PLAN
SHEET 2 OF 6

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1212
Revision: A

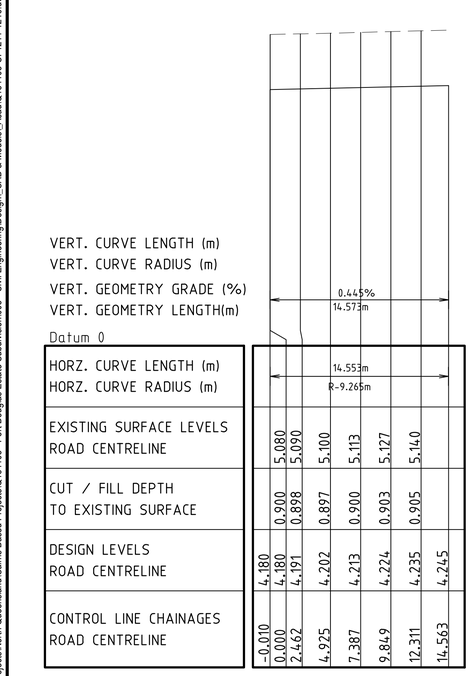
XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-KR-TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg
DATE PLOTTED: 11 October 2019 9:47 AM BY: JACK JONES

LEGEND

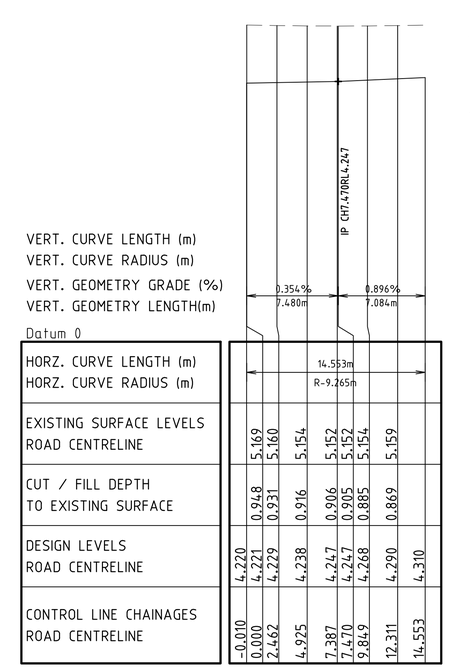
- SIGNS (REFER NOTES)
- ① SETOUT POINT
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS - SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK05->RSK05 HORIZONTAL POINTS								
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337020.391	8170459.882	4.180	243°54'41.48"			
IP 2	7.277	337012.070	8170455.808	4.213		R = -9.265	14.553	90°00'00.00"
E	14.553	337016.144	8170447.487	4.245	153°54'41.48"			

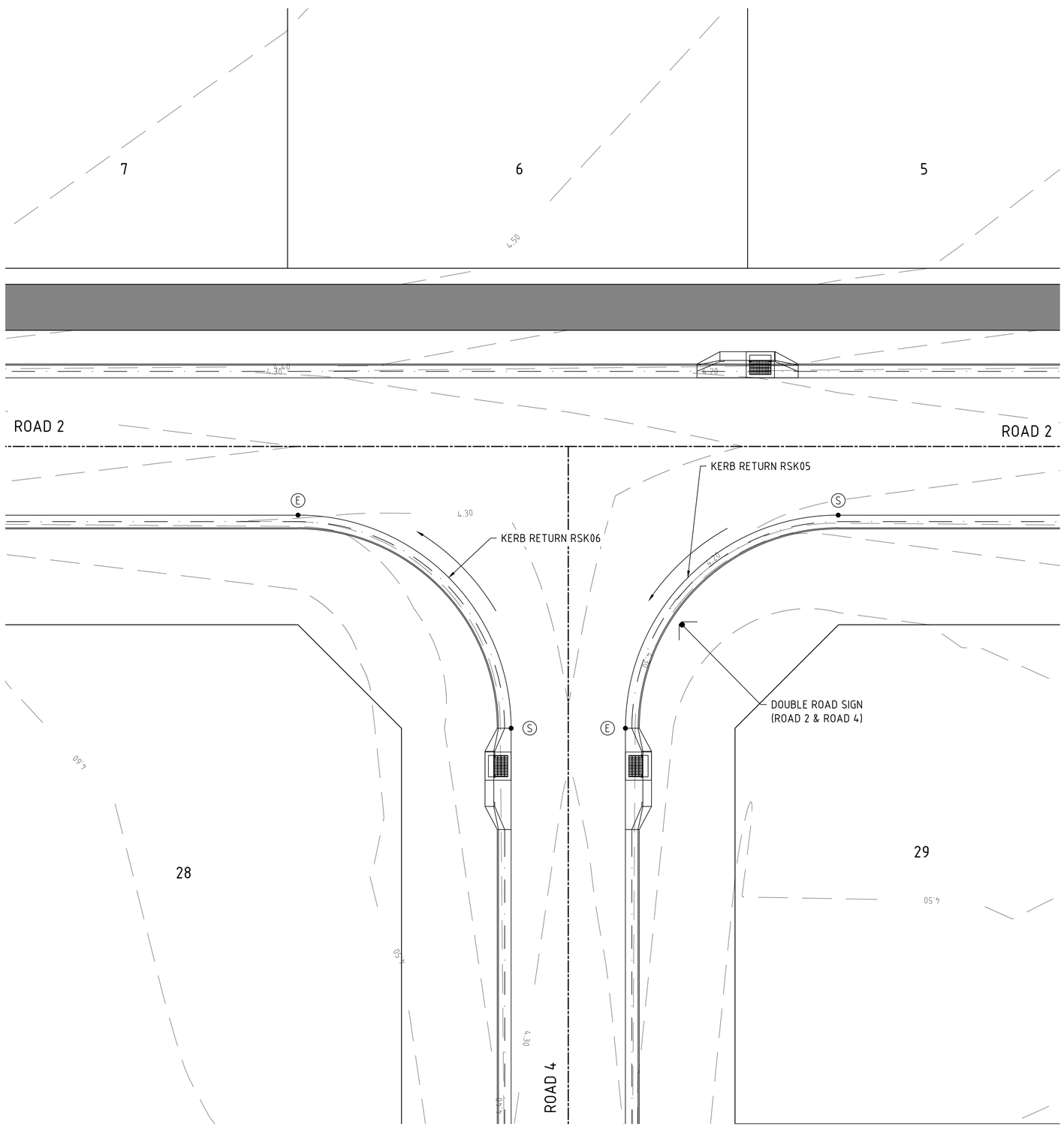
C RSK06->RSK06 HORIZONTAL POINTS								
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337011.681	8170445.301	4.221	333°54'41.48"			
IP 2	7.277	337007.606	8170453.623	4.246		R = -9.265	14.553	90°00'00.00"
E	14.553	336999.285	8170449.548	4.310	243°54'41.48"			



KERB RETURN RSK05



KERB RETURN RSK06



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 PLAN @A1
H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: INTERSECTION PLAN
SHEET 3 OF 6

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1213
Revision: A

LEGEND

- SIGNS (REFER NOTES)
- (1) SETOUT POINT
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS - SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK07->RSK07 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	336944.753	8170443.217		173°11'41.48"			
IP 2	8.836	336946.300	8170430.252	4.498		R = -9.265	17.672	109°17'00.00"
E	17.672	336958.027	8170435.994	4.465	63°54'41.48"			

C RSK08->RSK08 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	336943.084	8170415.264		353°11'41.48"			
IP 2	3.689	336942.643	8170418.961	4.532		R = 22.485	7.379	18°48'10.07"
CC	7.379	336943.416	8170422.603	4.509	11°59'51.54"			
IP 3	14.029	336944.851	8170429.352	4.481		R = -20.265	13.301	37°36'20.13"
CC	20.680	336941.868	8170435.574	4.504	334°23'31.41"			
IP 4	24.369	336940.259	8170438.931	4.517		R = 22.485	7.379	18°48'10.07"
E	28.059	336939.818	8170442.628	4.530	353°11'41.48"			

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%) -0.368%
VERT. GEOMETRY LENGTH(m) 17.679m

Datum 0

HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)																		
							17.672m R-9.265m											
EXISTING SURFACE LEVELS ROAD CENTRELINE		5.216	5.235	5.247	5.251	5.253	5.253	5.253	5.251									
CUT / FILL DEPTH TO EXISTING SURFACE		0.685	0.714	0.734	0.748	0.759	0.768	0.776	0.784									
DESIGN LEVELS ROAD CENTRELINE		4.530	4.521	4.512	4.503	4.494	4.485	4.476	4.467	4.465								
CONTROL LINE CHAINAGES ROAD CENTRELINE	0.000	2.462	4.925	7.387	9.849	12.311	14.774	17.236	17.679									

KERB RETURN RSK07

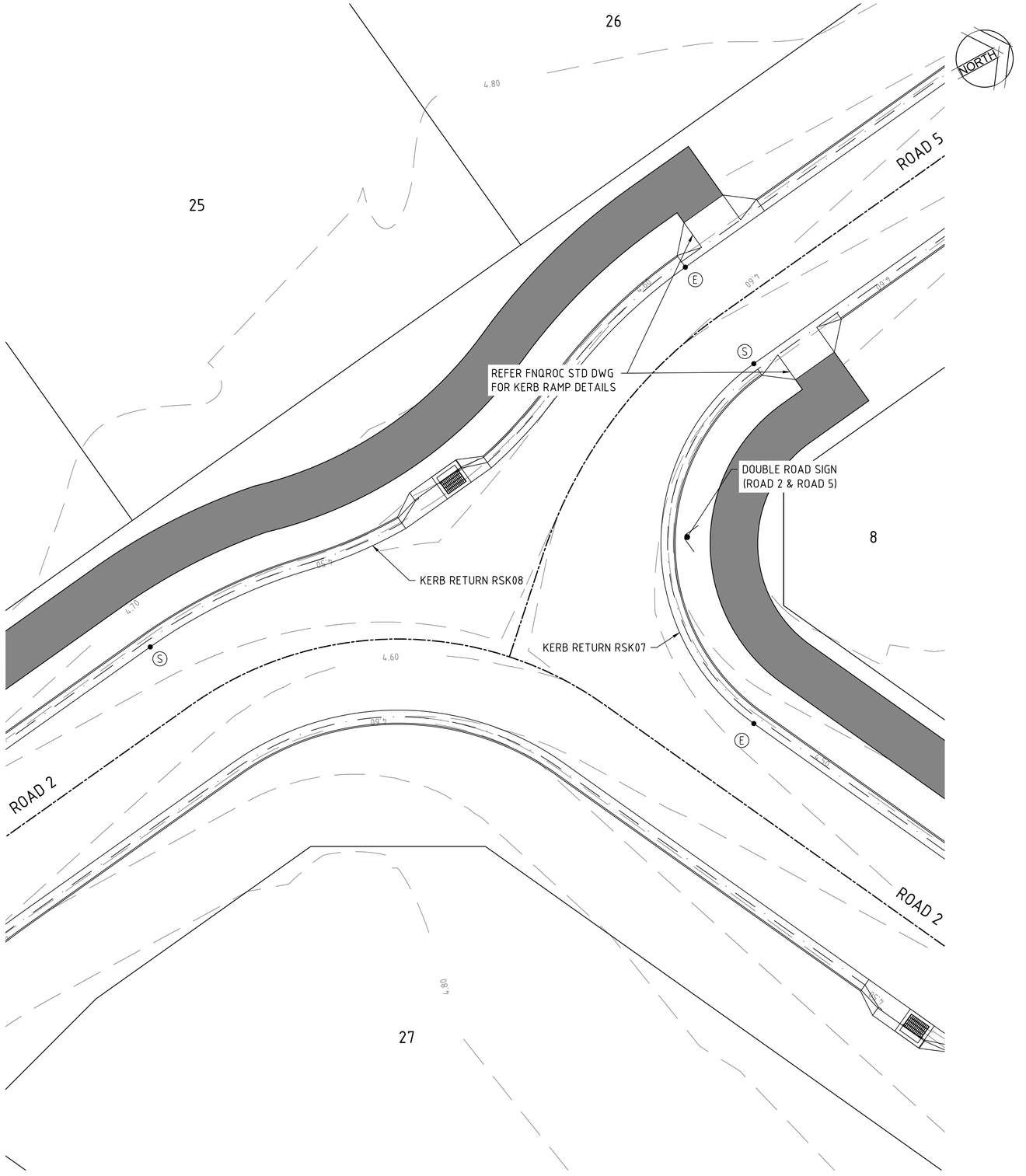
LOW POINT CH12.745RL4.476
IP CH12.745RL4.476

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%) -0.623% 0.356%
VERT. GEOMETRY LENGTH(m) 12.745m 15.324m

Datum 0

HORZ. CURVE LENGTH (m) / HORZ. CURVE RADIUS (m)																		
							7.379m R22.485m					13.301m R-20.265m					7.379m R22.485m	
EXISTING SURFACE LEVELS ROAD CENTRELINE		5.335	5.322	5.309	5.295	5.284	5.277	5.276	5.271	5.266	5.263	5.260	5.252	5.239				
CUT / FILL DEPTH TO EXISTING SURFACE		0.779	0.782	0.784	0.786	0.789	0.798	0.800	0.788	0.774	0.762	0.750	0.734	0.712				
DESIGN LEVELS ROAD CENTRELINE		4.555	4.540	4.525	4.509	4.494	4.479	4.476	4.483	4.492	4.501	4.509	4.518	4.527	4.530			
CONTROL LINE CHAINAGES ROAD CENTRELINE	0.000	2.462	4.925	7.387	9.849	12.311	12.745	14.774	17.236	19.698	22.161	24.623	27.085	28.069				

KERB RETURN RSK08



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

SCALE 1:100 PLAN @A1
0 1 2 4 6 8 10m
H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: INTERSECTION PLAN
SHEET 4 OF 6
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum: AHD | Scale: AS SHOWN | Size: A1
Drawing Number: Q184103-CI-1214 | Revision: A

XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-KR-TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg
DATE PLOTTED: 11 October 2019 9:47 AM BY: JACK JONES

XREFs: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-KR-TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg
DATE PLOTTED: 11 October 2019 9:48 AM BY : JACK JONES

LEGEND

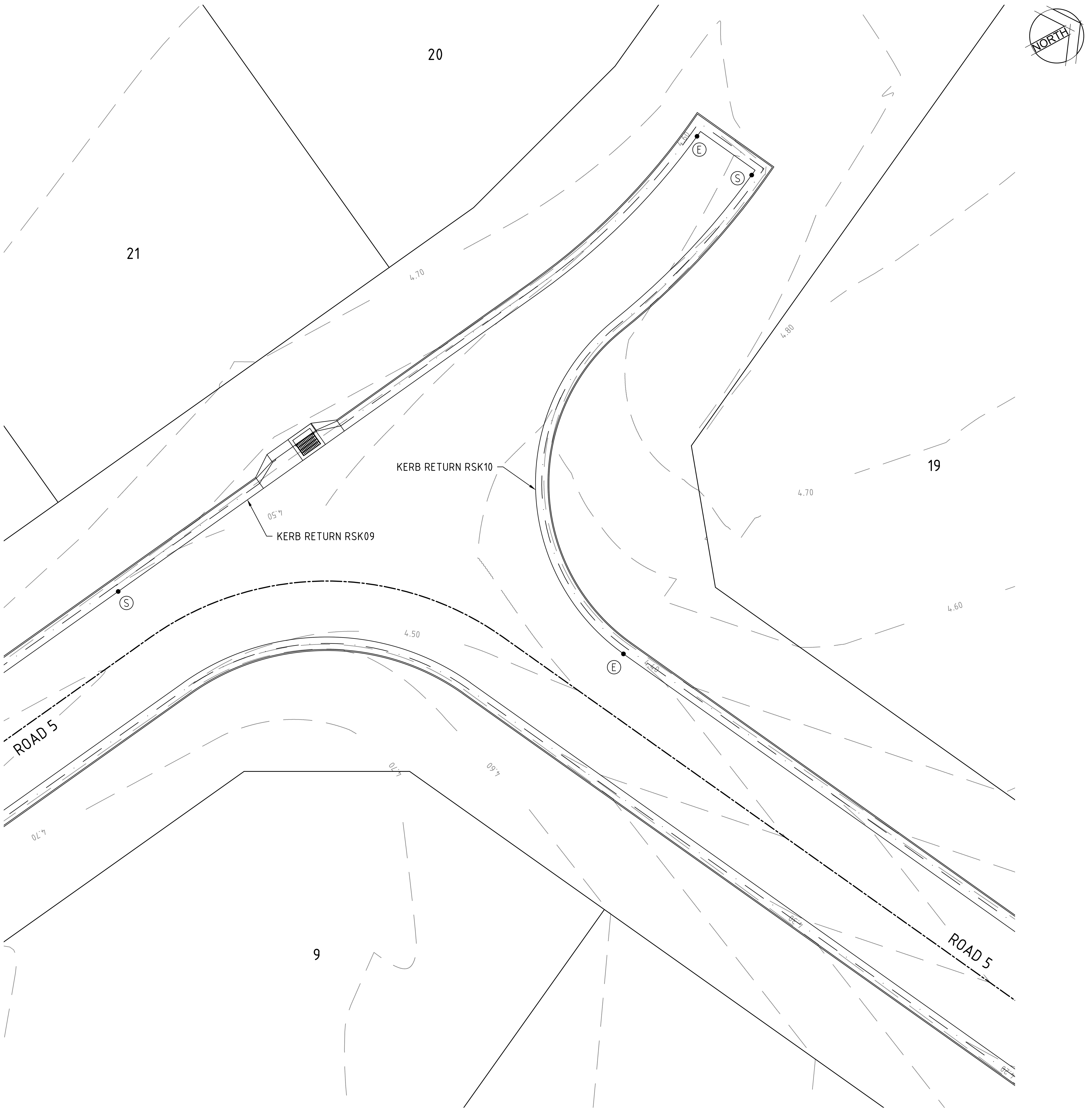
- SIGNS (REFER NOTES)
- SETOUT POINT
- FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL) — 3.50
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS - SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK09->RSK09 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	336933.563	8170495.046		353°11'41.48"			
TC	22.863	336930.854	8170517.747	4.508	353°11'41.48"			
IP 2	27.956	336930.245	8170522.853	4.527		R = -30.265	10.186	19°17'00.00"
E	33.049	336927.984	8170527.470	4.545	333°54'41.48"			

C RSK10->RSK10 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	336930.651	8170528.777	4.635	153°54'41.48"			
IP 2	4.595	336932.685	8170524.623	4.608		R = 33.235	9.191	15°50'40.83"
CC	9.191	336933.507	8170520.072	4.580	169°45'22.31"			
IP 3	17.749	336935.688	8170508.007	4.465		R = -9.265	17.116	105°50'40.83"
E	26.306	336946.699	8170513.398		63°54'41.48"			



LOW POINT CH9.605RL4.460
IP CH9.605RL4.460

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%): -0.629% | 0.363%
VERT. GEOMETRY LENGTH(m): 9.605m | 23.443m
Datum 0

HORZ. CURVE LENGTH (m): 10.186m
HORZ. CURVE RADIUS (m): R-30.265m

EXISTING SURFACE LEVELS ROAD CENTRELINE	4.833	4.795	4.745	4.741	4.686	4.634	4.590	4.545	
CUT / FILL DEPTH TO EXISTING SURFACE	0.312	0.306	0.285	0.279	0.206	0.137	0.074	0.011	
DESIGN LEVELS ROAD CENTRELINE	4.520	4.489	4.460	4.461	4.480	4.498	4.516	4.534	4.545
CONTROL LINE CHAINAGES ROAD CENTRELINE	0.000	5.000	9.605	10.000	15.000	20.000	25.000	30.000	33.049

KERB RETURN RSK09

IP CH9.191RL4.580
IP CH16.926RL4.470
IP CH20.003RL4.450

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%): -0.598% | -1.422% | -0.650% | -0.469%
VERT. GEOMETRY LENGTH(m): 9.191m | 7.735m | 3.077m | 6.304m
Datum 0

HORZ. CURVE LENGTH (m): 9.191m | 17.116m
HORZ. CURVE RADIUS (m): R33.235m | R-9.265m

EXISTING SURFACE LEVELS ROAD CENTRELINE	4.510	4.554	4.591	4.598	4.640	4.656	4.690	4.690	4.731	4.738
CUT / FILL DEPTH TO EXISTING SURFACE	-0.125	-0.051	0.011	0.030	0.143	0.186	0.240	0.240	0.305	0.318
DESIGN LEVELS ROAD CENTRELINE	4.635	4.605	4.580	4.568	4.497	4.470	4.450	4.450	4.427	4.420
CONTROL LINE CHAINAGES ROAD CENTRELINE	0.000	5.000	9.191	10.000	15.000	16.926	20.000	20.003	25.000	26.306

KERB RETURN RSK10

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 PLAN @A1

H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	MB	RPEQ No. 10801 Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: INTERSECTION PLAN
SHEET 5 OF 6

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: Q184103-CI-1215 | Revision: A

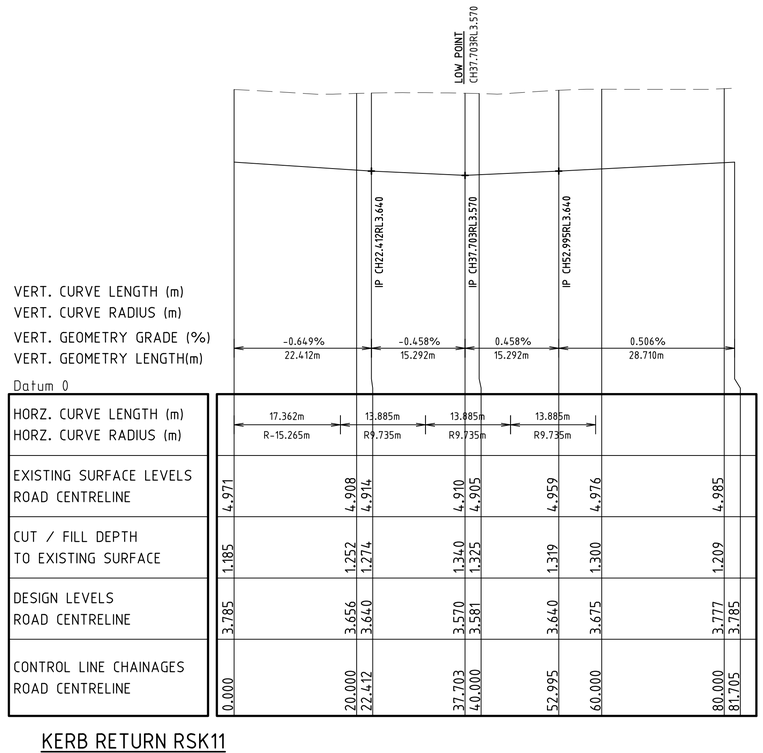
XREF's: XR-Q184103-CI-BASE; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-RSK01; XR-Q184103-CI-LS-RSK02; XR-Q184103-CI-LS-RSK03; XR-Q184103-CI-LS-RSK04; XR-Q184103-CI-LS-RSK05; XR-Q184103-CI-LS-RSK06; XR-Q184103-CI-LS-RSK07; XR-Q184103-CI-LS-RSK08; XR-Q184103-CI-LS-RSK09; XR-Q184103-CI-LS-RSK10; XR-Q184103-CI-LS-RSK11; XR-Q184103-CI-KR-TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1211-1216.dwg
DATE PLOTTED: 11 October 2019 9:48 AM BY: JACK JONES

LEGEND

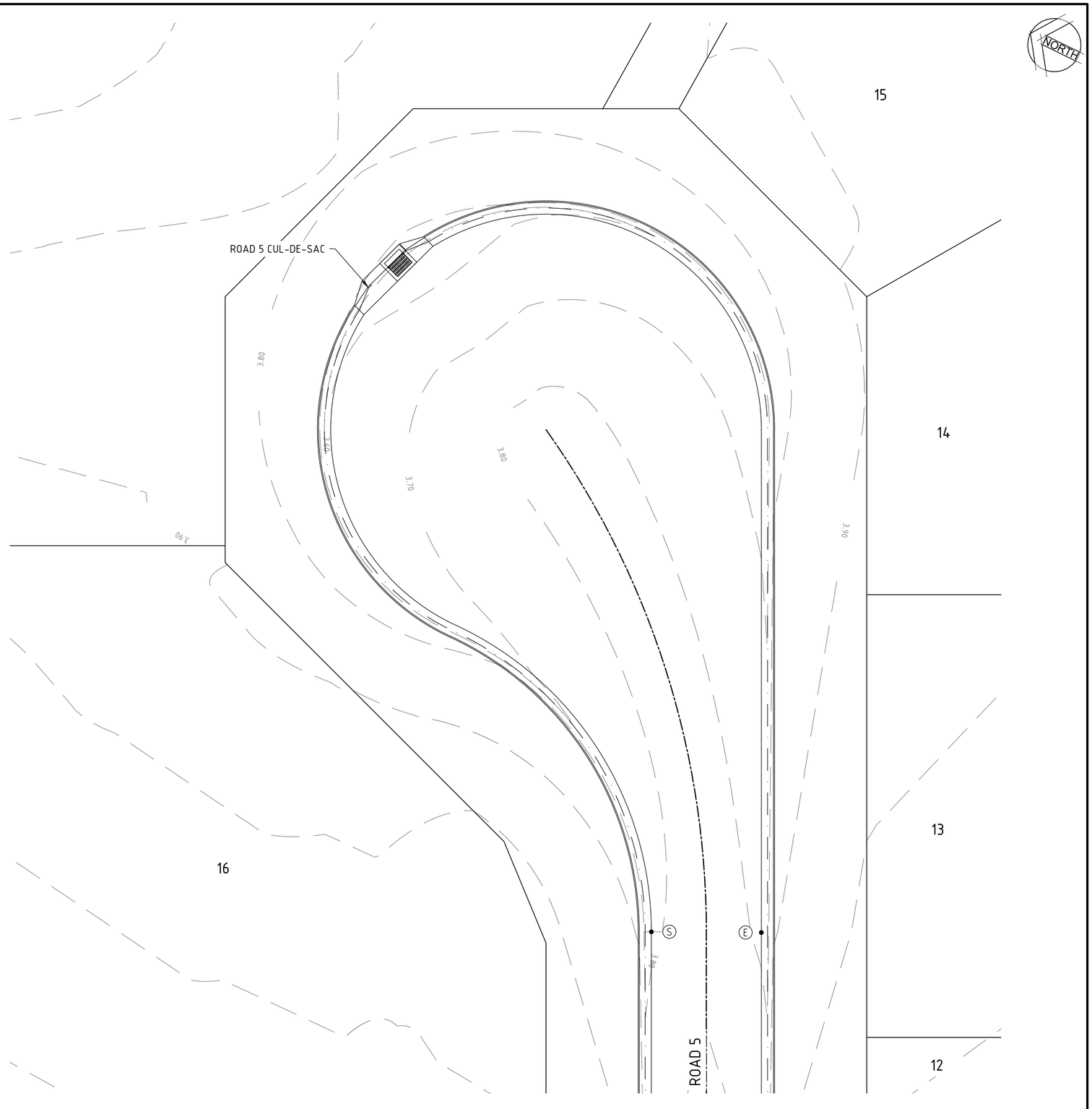
- SIGNS (REFER NOTES)
- ① SETOUT POINT
- 3.50 FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS - SIZES TO BE CONFIRMED. (REFER FNQROC STD. DWG S1050B & 1055D)

C RSK11->RSK11 HORIZONTAL POINTS

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
S	0.000	337010.142	8170544.463	3.785	63°54'41.48"			
IP 2	8.681	337018.904	8170548.753	3.729		R = -15.265	17.362	65°09'55.49"
CC	17.362	337018.691	8170558.507	3.673	358°44'45.99"			
IP 3	24.304	337018.506	8170566.926	3.631		R = 9.735	13.885	81°43'18.50"
CC	31.247	337026.811	8170568.320	3.600	80°28'04.49"			
IP 4	38.189	337035.116	8170569.715	3.572		R = 9.735	13.885	81°43'18.50"
CC	45.132	337037.692	8170561.697	3.604	162°11'22.98"			
IP 5	52.075	337040.268	8170553.680	3.636		R = 9.735	13.885	81°43'18.50"
CT	59.017	337032.704	8170549.977	3.670	243°54'41.48"			
E	81.705	337012.328	8170539.999	3.785	243°54'41.48"			



KERB RETURN RSK11



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

SCALE 1:100 PLAN @A1
0 1 2 4 6 8 10m
H: 0 5 10 15 20 25m
V: 0 1 2 3 4 5m
SCALE: H:1:250 V:1:50

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: INTERSECTION PLAN
SHEET 6 OF 6

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

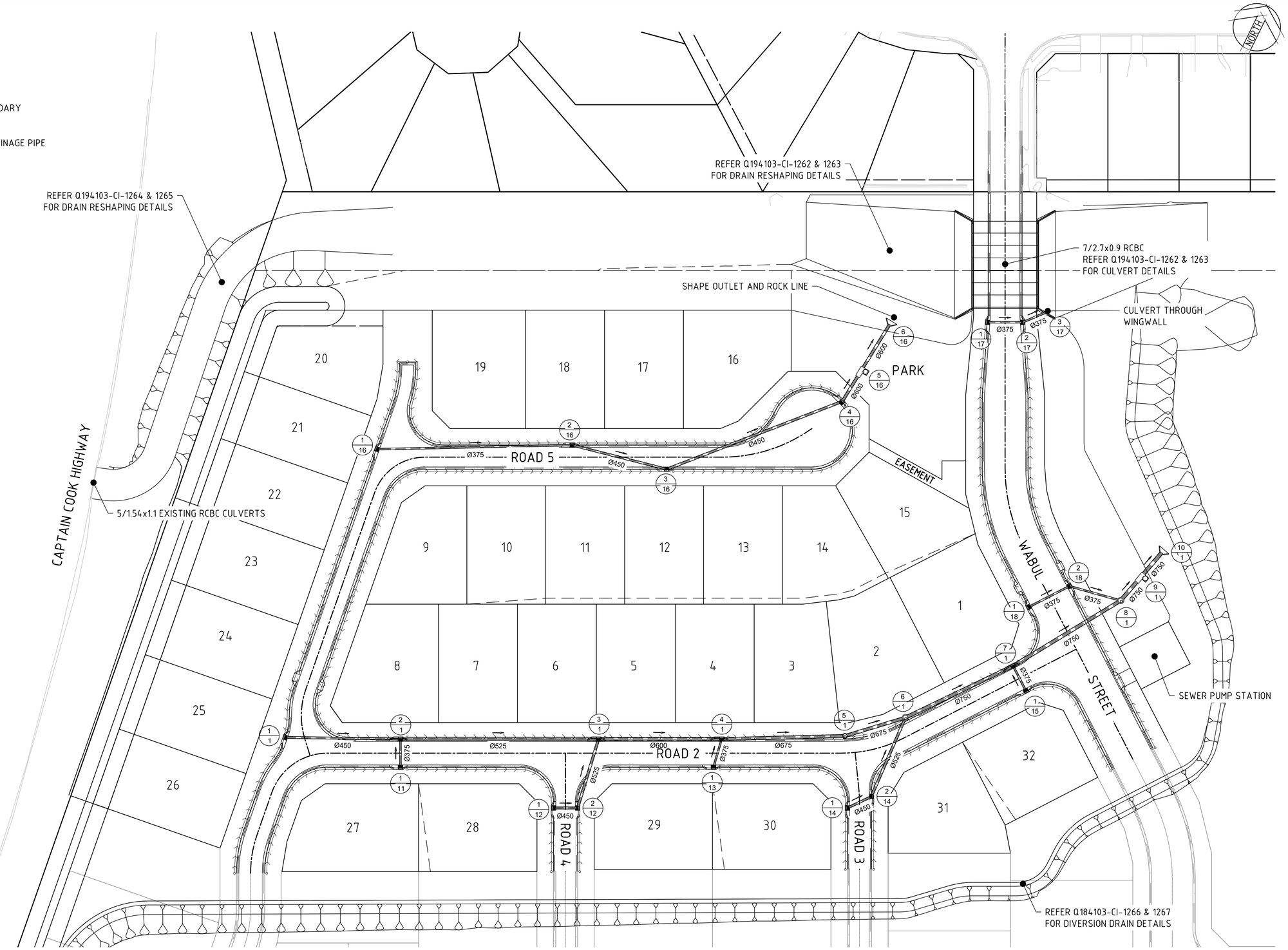
Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1216
Revision: A

DATE PLOTTED: 11 October 2019 2:02 PM BY : MAURICE SHEEHAN

LEGEND

- LOT BOUNDARY
- FUTURE LOT BOUNDARY
- STORMWATER DRAINAGE PIPE



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: STORMWATER LAYOUT PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

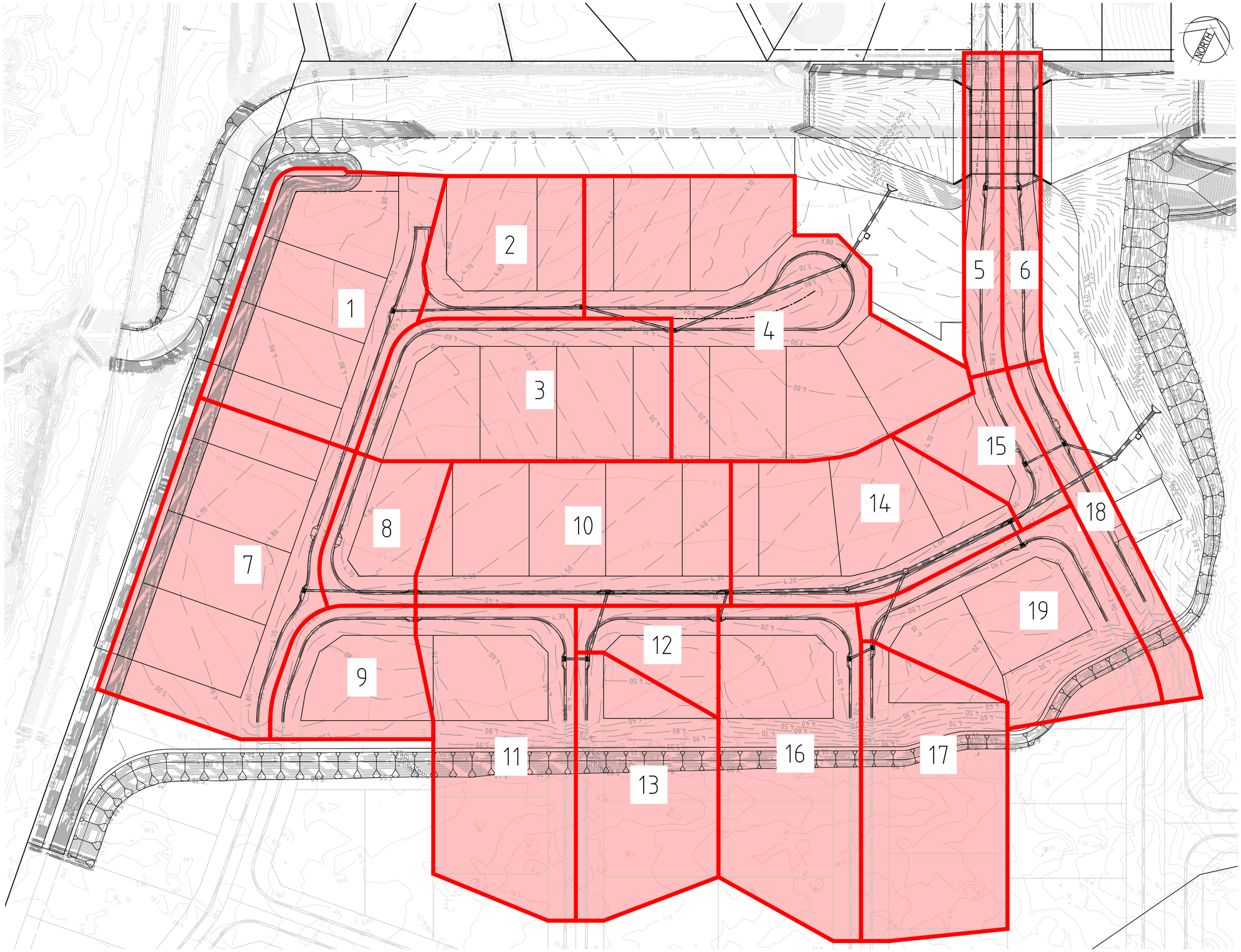
Drawing Number: Q184103-CI-1250
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-CI-GRADE STRINGS; XR-Q184103-SURV
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1250.dwg

CATCHMENT AREAS	
CATCHMENT	AREA (Ha)
1	0.307
2	0.149
3	0.283
4	0.489
5	0.084
6	0.082
7	0.359
8	0.089
9	0.126
10	0.296
11	0.297
12	0.071
13	0.218
14	0.242
15	0.087
16	0.301
17	0.266
18	0.097
19	0.256

LEGEND:

- CATCHMENT BOUNDARY
- CATCHMENT AREA
- 1 — CATCHMENT NUMBER
- 3.50 — DESIGN CONTOURS
- 3.50 — EXISTING CONTOURS



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: STORMWATER CATCHMENT PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

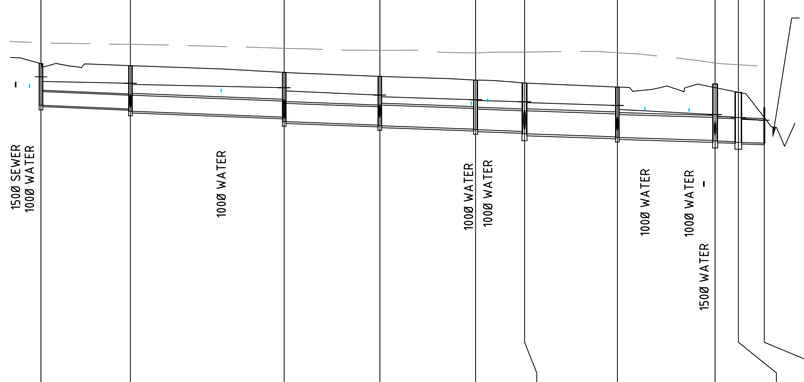
Drawing Number: Q184103-CI-1251
Revision: A

DATE PLOTTED: 11 October 2019 9:50 AM BY: JACK JONES

XREF's: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-EXST-CNTRS
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1251.dwg

DATE PLOTTED: 11 October 2019 2:27 PM BY : MAURICE SHEEHAN

STRUCTURE NAME	1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	1/11	2/1	1/12	2/12	3/1	1/13	4/1	1/14	2/14	6/1	1/15	7/1
STRUCTURE DESCRIPTION	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ACCESS CHAMBER 1200mm DIA	ACCESS CHAMBER 1200mm DIA	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ACCESS CHAMBER 1200mm DIA	GPT ROCLA CleansAll 600	HEADWALL	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	ACCESS CHAMBER 1200mm DIA	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C	SAG LIP IN LINE GULLY 2.4m LINTEL: MOUNTABLE K&C
PIPE SIZE mm	450	525	600	675	675	750	750	750	750		375		450	525		375		450	525		375	
PIPE CLASS	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(2)	(2)		(4)		(4)	(4)		(4)		(4)	(4)		(4)	
PIPE GRADE (%)	0.40%	0.38%	0.36%	0.35%	0.36%	0.33%	0.30%	0.30%	0.31%		0.70%		0.49%	0.41%		0.41%		0.45%	0.41%		0.56%	
PIPE SLOPE (1 in X)	249.63	262.83	276.33	284.02	280.88	303.00	332.24	330.44	326.21		142.10		203.50	243.12		246.82		222.64	242.26		177.62	
FULL PIPE VELOCITY (m/s)	0.80	0.91	1.43	1.30	1.29	1.40	1.80	1.94	1.94		0.37		0.61	0.71		0.26		0.61	0.75		0.89	
PART FULL VELOCITY (m/s)	1.23	1.34	1.43	1.58	1.59	1.65	1.80	1.94	1.94		1.14		1.25	1.31		0.85		1.21	1.33		1.31	
DATUM RL	-11.0										-10.0		-10.0			-10.0		-11.0			-11.0	
W.S.E IN STRUCTURE HYDRAULIC GRADE LINE	4.165	4.013	3.955	3.915	3.809	3.704	3.568	3.514	3.418	3.397	3.349	3.324	3.231	3.098	2.936	2.884	2.838	2.800	2.750	2.750	3.992	3.959	3.955	3.915	3.982	3.896	3.889	3.898	3.832	3.809	3.704	3.589	3.570	3.568	3.514	3.541	3.440	3.433	3.380	3.349	3.324	3.409	3.253	3.231	3.098
PIPE FLOW (CUMECS) PIPE CAPACITY AT GRADE (CUMECS)		0.127 0.181		0.197 0.265		0.405 0.370		0.467 0.499		0.460 0.502		0.616 0.640		0.795 0.611		0.859 0.613		0.856 0.617				0.040 0.147			0.097 0.200		0.154 0.276			0.029 0.112			0.097 0.191		0.163 0.276			0.098 0.132			
DEPTH TO INVERT	1.36	1.41	1.49	1.46	1.61	1.59	1.61	1.60	1.62	1.58	1.66	1.63	1.65	1.85	1.87	1.61	1.63	1.16	1.16		1.29	1.34	1.49		1.31	1.36	1.44	1.46	1.61		1.29	1.31	1.61		1.30	1.34	1.41	1.46	1.66		1.34	1.38	1.65
INVERT LEVELS	3.233	3.116	3.041	2.850	2.700	2.587	2.567	2.457	2.437	2.380	2.305	2.205	2.185	2.089	2.069	2.046	2.026	2.000	2.000		3.240	3.190	3.041		3.030	3.000	2.925	2.850	2.700		2.897	2.867	2.567		2.695	2.665	2.590	2.500	2.305		2.490	2.450	2.185
DESIGN SURFACE LEVELS	4.596	4.529		4.309		4.179		4.056		3.962		3.830		3.935		3.659		3.162			4.529	4.529			4.338	4.360		4.309			4.187	4.179			3.996	4.001		3.962			3.830	3.830	
STRUCTURE EASTING NORTHING	E336942.957 N8170429.735	E336969.378 N8170442.183		E337014.463 N8170464.259		E337042.507 N8170477.990		E337070.205 N8170492.442		E337081.927 N8170503.347		E337100.698 N8170527.132		E337117.892 N8170553.995		E337119.793 N8170561.354		E337121.914 N8170569.566			E336972.502 N8170435.802	E336969.378 N8170442.183			E337011.895 N8170443.575	E337017.378 N8170446.259		E337014.463 N8170464.259			E337043.759 N8170470.692	E337042.507 N8170477.990			E337078.804 N8170476.337	E337082.957 N8170481.568		E337081.927 N8170503.347			E337106.398 N8170522.891	E337100.698 N8170527.132	
RUNNING CHAINAGE	0.000	29.206	29.206	50.200	79.406	31.225	110.631	31.242	141.873	16.010	157.883	30.300	188.183	31.895	220.078	7.600	227.678	8.481	236.160		0.000	7.105	7.105		0.000	6.105	6.105	18.234	24.339		0.000	7.405	7.405		0.000	6.679	6.679	21.803	28.483		0.000	7.105	7.105	



LINE 1 11 12 13 14 15

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

XREFs:
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1252-1253.dwg

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

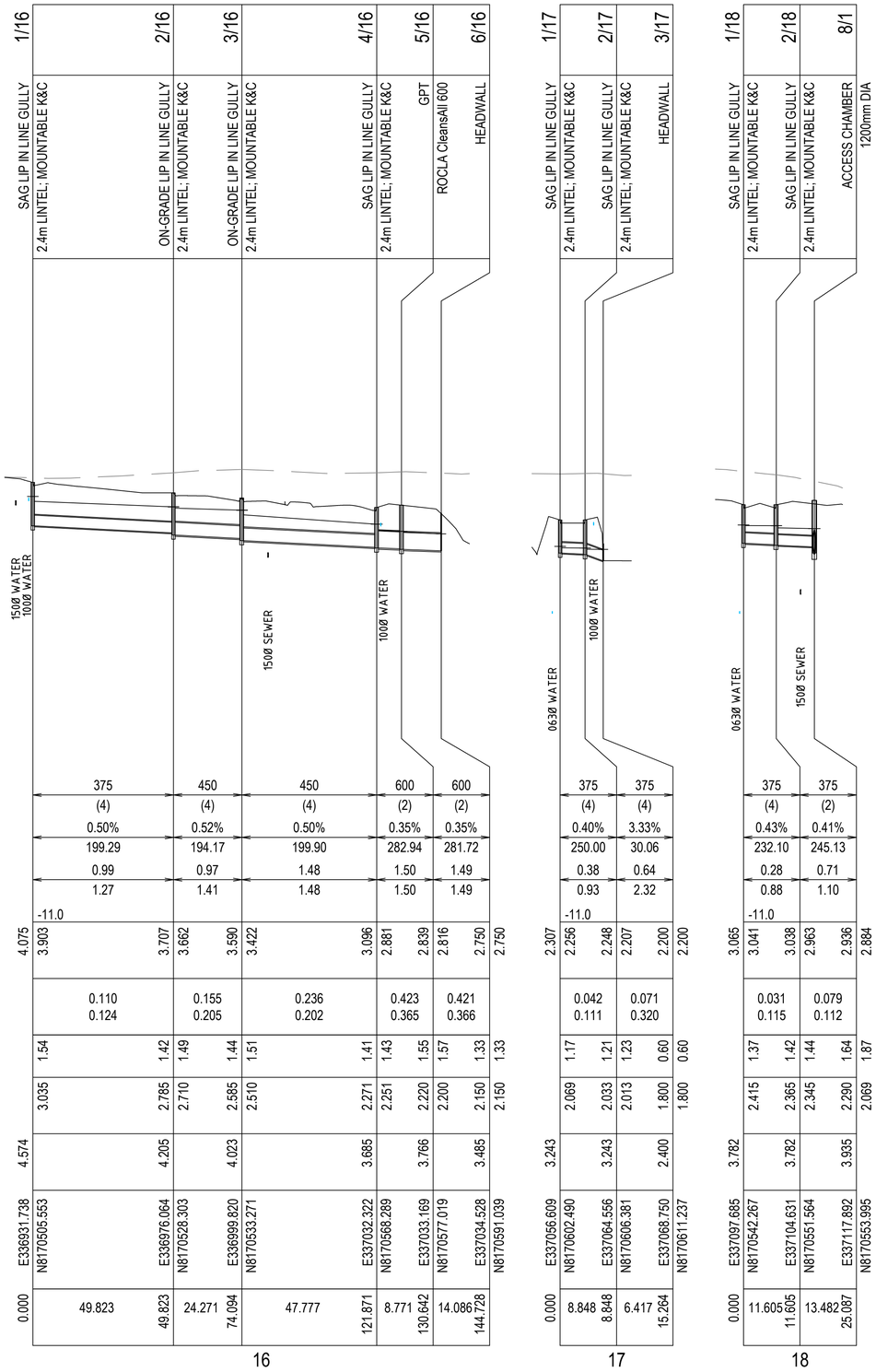
Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: STORMWATER LONGITUDINAL SECTIONS
SHEET 1 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1252
Revision: A

DATE PLOTTED: 11 October 2019 2:27 PM BY : MAURICE SHEEHAN



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: STORMWATER LONGITUDINAL SECTIONS
SHEET 2 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1253

Revision: A

XREFs:
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1252-1253.dwg

DATE PLOTTED: 11 October 2019 9:52 AM BY : JACK JONES

	LOCATION			TIME		SUB-CATCHMENT RUNOFF					INLET DESIGN												DRAIN DESIGN												HEAD LOSSES										PART FULL		DESIGN LEVELS							
				Tc	I	fi	C	A	CxA	Qc	Qa			Qrc		dg	Vg	dg.V g	STRUCTURE	Qg	Qb		Tc	I	+CA	Qt	Qp	L	S			Vf	Vcap	T			S / DO	V2/2 g	Ku	hu	Kw	hw	Sf	hf		Vp								
DESIGN ARI	STRUCTURE No	DS STRUCTURE No.	SUB-CATCHMENTS CONTIBUTING	SUB-CATCHMENT TIME OF CONCENTRATION	RAINFALL INTENSITY	FRACTION IMPERVIOUS	COEFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT IMPERVIOUS AREA	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	ROAD LONGITUDINAL GRADE AT INLET	ROAD XFALL AT INLET	HALF ROAD CAPACITY (AT INLET)	FLOW WIDTH	FLOW DEPTH	FLOW VELOCITY	Velocity-Depth	TYPE AND DESCRIPTION	FLOW INTO INLET [+ = in] [- = surcharge]	BYPASS FLOW	BYPASS STRUCTURE	CRITICAL TIME OF CONCENTRATION	RAINFALL INTENSITY	TOTAL (C x A)	MAJOR TOTAL FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE SIZE	PIPE CLASS	FLOW VELOCITY FULL (With Downstream Restrictions)	CAPACITY VELOCITY (No Downstream restrictions)	TIME OF FLOW IN REACH (t = L/<Assumed pipe velocity>)	12D KU Method	12D KU/KW CHART IDENTIFIER	SUBMERGENCE RATIO	VELOCITY HEAD	U/S HEAD LOSS COEFFICIENT	U/S HEAD LOSS	W.S.E COEFFICIENT (Kw = Ku where blank)	CHANGE IN W.S.E	PIPE FRICTION SLOPE (HGL grade)	PIPE FRICTION HEAD LOSS - (L x Sf)	PARTIAL DEPTH	PARTIAL DEPTH VELOCITY	PIPE U/S I.L	PIPE D/S I.L	PIPE U/S H.G.L	PIPE D/S H.G.L	UPSTREAM STRUCTURE W.S.E	GRATE LEVEL	FREEBOARD	STRUCTURE No
yrs				min	mm/h	%		ha	ha	l/s	l/s	%	%	l/s	m	m	m/s			l/s	l/s		min	mm/hr	ha	l/s	l/s	m	%	mm		m/s	m/s	sec				m		m		m	%	m	m	m/s	m	m	m	m	m	m	m	
Q5 Q100	1/1	2/1	; 1/1	15.0	138.9 220.5	50	0.88 0.98	0.239	0.225 0.237	127 216	127 216			224		0.059 0.088			SAG LIP IN LINE GULLY - 2.4m LINTEL; MOUNTABLE K&C	127 216			5.00	138.9 220.5	0.316 0.351	127 216	127 216	29.21	0.40	450	4	0.80 1.36	1.14	14.6	Ku,Kw - Missouri/Hare Charts	G1 G1	2.07 3.03	0.033 0.014	4.650 3.130	0.152 0.045		0.152 0.045	0.20 0.09	0.06 0.03	0.279	1.23	3.23	3.12	4.013 4.551	3.955 4.525	4.165 4.596	4.60	0.43 0.00	1/1
Q5 Q100	2/1	3/1	1/11; 1/1; 2/1	15.0	138.9 220.5	50	0.88 0.98	0.066	0.062 0.065	35 60	35 60	0.35	3.00	94	2.39 2.93	0.079 0.095	0.42 0.48	0.03 0.05	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	32 37	4 23	4/1	5.00	138.9 220.5	0.514 0.573	205 349	197 252	50.20	0.38	525	4	0.91 1.16	1.23	25.1	Ku,Kw - Missouri/Hare Charts	T2 T1/T2	1.74 2.83	0.042 0.069	0.956 0.637	0.040 0.044		0.040 0.044	0.21 0.34	0.11 0.17	0.337 0.408	1.34 1.39	3.04	2.85	3.915 4.481	3.809 4.309	3.955 4.525	4.53	0.57 0.00	2/1
Q5 Q100	3/1	4/1	1/12; 2/12; 1/11; 1/1; 2/1; 3/1	15.0	138.9 220.5	50	0.88 0.98	0.115	0.108 0.114	61 104	61 104			128	2.64 3.23	0.090 0.108	0.58 0.66	0.05 0.07	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	61 104			5.00	138.9 220.5	1.053 1.173	415 710	405 557	31.22	0.36	600	4	1.43 1.97	1.31	15.6	Ku,Kw - Missouri/Hare Charts	T2/T4 T2/T4	1.85 2.68	0.105 0.057	1.005 0.987	0.105 0.056		0.105 0.056	0.43 0.24	0.14 0.07			2.70	2.59	3.704 4.253	3.568 4.179	3.809 4.309	4.31	0.50 0.00	3/1
Q5 Q100	4/1	5/1	1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1	15.0	138.9 220.5	50	0.88 0.98	0.078	0.073 0.077	41 70	45 93	0.45	3.00	99	2.58 3.40	0.084 0.108	0.47 0.56	0.04 0.06	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	40 -69	5 162	7/1	5.00	138.9 220.5	1.219 1.357	474 817	467 506	31.24	0.35	675	4	1.30 1.41	1.39	15.6	Ku,Kw - Missouri/Hare Charts	T1/T2 T1/T2	1.48 2.39	0.087 0.102	0.626 0.214	0.054 0.022		0.054 0.022	0.31 0.36	0.10 0.11	0.518 0.562	1.58 1.59	2.57	2.46	3.514 4.156	3.418 4.043	3.568 4.178	4.18	0.61 0.00	4/1
Q5 Q100	5/1	6/1	1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1																ACCESS CHAMBER 1050mm DIA						1.219 1.357	468 812	460 500	16.01	0.36	675	4	1.29 1.40	1.40	8.0	Ku,Kw - Missouri/Hare Charts	T1/T2 T1/T2	1.45 2.38	0.084 0.100	0.248 0.248	0.021 0.025		0.021 0.025	0.30 0.35	0.05 0.06	0.509 0.551	1.59 1.60	2.44	2.38	3.397 4.018	3.349 3.962	3.418 4.043	4.06	0.64 0.01	5/1
Q5 Q100	6/1	7/1	1/14; 2/14; 1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1																ACCESS CHAMBER 1200mm DIA						1.635 1.821	628 1,090	616 740	30.30	0.33	750	4	1.40 1.67	1.45	15.2	Ku,Kw - Missouri/Hare Charts	T1/T2 T1/T2	1.39 2.21	0.099 0.111	0.254 0.260	0.025 0.029		0.025 0.029	0.31 0.34	0.09 0.10	0.592	1.65	2.31	2.21	3.324 3.933	3.231 3.829	3.349 3.962	3.96	0.61 0.00	6/1
Q5 Q100	7/1	8/1	1/15; 1/14; 2/14; 1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1; 7/1	15.0	138.9 220.5	50	0.88 0.98	0.166	0.156 0.164	88 150	93 312			224		0.039 0.090			SAG LIP IN LINE GULLY - 2.4m LINTEL; MOUNTABLE K&C	93 23	289	1/18	5.00	138.9 220.5	2.079 2.315	795 1,382	795 1,093	31.89	0.30	750	4	1.80 2.47	1.38	15.9	Ku,Kw - Missouri/Hare Charts	T1/T2 T2/T4	1.39 2.19	0.165 0.312	0.802 0.471	0.133 0.147		0.133 0.147	0.51 0.96	0.16 0.31			2.19	2.09	3.098 3.682	2.936 3.375	3.231 3.829	3.83	0.60 0.00	7/1
Q5 Q100	8/1	9/1	1/18; 2/18; 1/15; 1/14; 2/14; 1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1; 7/1																ACCESS CHAMBER 1200mm DIA						2.241 2.495	859 1,481	859 1,481	7.60	0.30	750	2	1.94 3.35	1.39	3.8	Ku,Kw - Missouri/Hare Charts	T2 T2/T4	1.16 1.74	0.193 0.574	0.270 0.396	0.052 0.227		0.052 0.227	0.59 1.77	0.05 0.13			2.07	2.05	2.884 3.148	2.838 3.014	2.936 3.375	3.93	1.00 0.56	8/1
Q5 Q100	9/1	10/1	1/18; 2/18; 1/15; 1/14; 2/14; 1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1; 7/1																ACCESS CHAMBER 1800mm DIA.						2.241 2.495	856 1,479	856 1,479	8.48	0.31	750	2	1.94 3.35	1.40	4.2	Ku,Kw - Missouri/Hare Charts	T1 T1	1.08 1.32	0.192 0.572	0.200 0.200	0.038 0.114		0.038 0.114	0.59 1.76	0.05 0.15			2.03	2.00	2.800 2.900	2.750 2.750	2.838 3.014	3.66	0.82 0.65	9/1
Q5 Q100	10/1	0	1/18; 2/18; 1/15; 1/14; 2/14; 1/13; 1/12; 2/12; 1/11; 1/1; 2/1; 3/1; 4/1; 7/1																OUTFALL															0.0																	2.750 2.750	3.16		10/1
Q5 Q100	1/11	2/1	; 1/11	15.0	138.9 220.5	50	0.88 0.98	0.084	0.079 0.083	45 76	45 76	0.40	3.00	94	2.63 3.22	0.086 0.103	0.45 0.51	0.04 0.05	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	40 2	4 75	1/12	5.00	138.9 220.5	0.111 0.124	45 76	40 2	7.11	0.70	375	4	0.37 0.01	1.33	3.6	Ku,Kw - Missouri/Hare Charts	G1 G1	2.00 3.43	0.007 0.000	4.791 2.851	0.033		0.033	0.05 0.00	0.00 0.00	0.134 0.028	1.14 0.44	3.24	3.19	3.959 4.525	3.955 4.525	3.992 4.525	4.53	0.54 0.00	1/11
Q5 Q100	1/12	2/12	; 1/12	15.0	138.9 220.5	50	0.88 0.98	0.174	0.163 0.172	93 157	97 232			167		0.042 0.075			SAG LIP IN LINE GULLY - 2.4m LINTEL; MOUNTABLE K&C	97 3	228	2/12	5.00	138.9 220.5	0.229 0.255	93 157	97 3	6.11	0.49	450	4	0.61 0.02	1.26	3.1	Ku,Kw - Missouri/Hare Charts	G1 G1	2.12 2.91	0.019 0.000	4.556 3.263	0.086		0.086	0.12 0.00	0.01 0.00	0.221 0.040	1.25 0.47	3.03	3.00	3.896 4.338	3.889 4.338	3.982 4.338	4.34	0.36 0.00	1/12

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn JJ	Date 10.10.2019	Client PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Checked MS	Date 10.10.2019	Project PORT DOUGLAS ESTATE - STAGE 1A & 1B SUBDIVISION OF LOT 2 ON SR431 CAPTAIN COOK HIGHWAY, CRAIGLIE
Designed MC	Date 10.10.2019	
Verified MS	Date 10.10.2019	Title STORMWATER CALCULATION TABLES SHEET 1 OF 2
Approved MB	RPEQ No. 10801 Date 10.10.2019	

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number	Revision
Q184103-CI-1260	A

XREF's:
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1260-1261.dwg

DATE PLOTTED: 11 October 2019 9:52 AM BY: JACK JONES

DESIGN ARI	LOCATION			TIME		SUB-CATCHMENT RUNOFF					INLET DESIGN											DRAIN DESIGN												HEAD LOSSES										PART FULL		DESIGN LEVELS							
	STRUCTURE No	DS STRUCTURE No.	SUB-CATCHMENTS CONTIBUTING	Tc	I	fi	C	A	CxA	Qc	Qa			Qrc		dg	Vg	dg.Vg	STRUCTURE	Qg	Qb		Tc	I	+CA	Qt	Qp	L	S			Vf	Vcap	T			S / DO	V2/2g	Ku	hu	Kw	hw	Sf	hf		Vp								
				SUB-CATCHMENT TIME OF CONCENTRATION	RAINFALL INTENSITY	FRACTION IMPERVIOUS	COEFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT IMPERVIOUS AREA	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	ROAD LONGITUDINAL GRADE AT INLET	ROAD XFALL AT INLET	HALF ROAD CAPACITY (AT INLET)	FLOW WIDTH	FLOW DEPTH	FLOW VELOCITY	Velocity-Depth	TYPE AND DESCRIPTION	FLOW INTO INLET [+ = in'] [- = surcharge]	BYPASS FLOW	BYPASS STRUCTURE	CRITICAL TIME OF CONCENTRATION	RAINFALL INTENSITY	TOTAL (C x A)	MAJOR TOTAL FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE SIZE	PIPE CLASS	FLOW VELOCITY FULL (With Downstream Restrictions)	CAPACITY VELOCITY (No Downstream restrictions)	TIME OF FLOW IN REACH (t = L'<Assumed pipe velocity>)	12D KU Method	12D KU/KW CHART IDENTIFIER	SUBMERGENCE RATIO	VELOCITY HEAD	U/S HEAD LOSS COEFFICIENT	U/S HEAD LOSS	W.S.E COEFFICIENT (Kw = Ku where blank)	CHANGE IN W.S.E	PIPE FRICTION SLOPE (HGL grade)	PIPE FRICTION HEAD LOSS - (L x Sf)	PARTIAL DEPTH	PARTIAL DEPTH VELOCITY	PIPE U/S I.L	PIPE D/S I.L	PIPE U/S H.G.L	PIPE D/S H.G.L	UPSTREAM STRUCTURE W.S.E	GRATE LEVEL	FREEBOARD	STRUCTURE No
yrs				min	mm/hr	%		ha	ha	l/s	l/s	%	%	l/s	m	m	m/s			l/s	l/s		min	mm/hr	ha	l/s	l/s	m	%	mm		m/s	m/s	sec				m		m		m	%	m	m	m/s	m	m	m	m	m	m	m	
Q5 Q100	2/12	3/1	1/12; 2/12	15.0	138.9 220.5	50	0.88 0.98	0.120	0.112 0.118	64 108	64 336	0.40	3.00	1,682	5.81 6.17	0.082 0.133	0.43 0.76	0.04 0.10	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	57 205	6 131	1/13	5.00	138.9 220.5	0.387 0.431	156 265	154 208	18.23	0.41	525	4	0.71 0.96	1.27	9.1	Ku,Kw - Missouri/Hare Charts	T9/T10 G1/T9 /T10	1.85 2.69	0.026 0.006	2.178 3.470	0.056 0.023	2.52	0.065 0.023	0.13 0.03	0.02 0.01	0.280 0.341	1.31 1.40	2.93	2.85	3.832 4.315	3.809 4.309	3.898 4.338	4.36	0.46 0.02	2/12
Q5 Q100	1/13	4/1	; 1/13	15.0	138.9 220.5	50	0.88 0.98	0.048	0.045 0.047	25 43	32 174	0.40	3.00	99	2.26 3.48	0.075 0.110	0.43 1.01	0.03 0.11	ON-GRADE LIP IN LINE GULLY 2.4m LINTEL; MOUNTABLE K&C	29 24	3 150	1/14	5.00	138.9 220.5	0.063 0.070	25 43	29 24	7.40	0.41	375	4	0.26 0.22	1.01	3.7	Ku,Kw - Missouri/Hare Charts	G1 G1	1.85 3.44	0.003 0.002	5.480 2.842	0.019 0.007		0.019 0.007	0.03 0.02	0.00 0.00	0.129 0.119	0.85 0.81	2.90	2.87	3.570 4.180	3.568 4.179	3.589 4.187	4.19	0.60 0.00	1/13
Q5 Q100	1/14	2/14	; 1/14	15.0	138.9 220.5	50	0.88 0.98	0.176	0.165 0.174	94 159	97 309			151		0.042 0.070			SAG LIP IN LINE GULLY - 2.4m LINTEL; MOUNTABLE K&C	97 3	306	2/14	5.00	138.9 220.5	0.232 0.258	94 159	97 3	6.68	0.45	450	4	0.61 0.02	1.20	3.3	Ku,Kw>0 - Missouri/Hare Charts	G1 G1	1.88 2.89	0.019 0.000	5.328 3.280	0.101		0.101	0.12 0.00	0.01 0.00	0.227 0.039	1.21 0.44	2.70	2.67	3.440 3.996	3.433 3.996	3.541 3.996	4.00	0.46 0.00	1/14

XREF's:
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1260-1261.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: STORMWATER CALCULATION TABLES
SHEET 2 OF 2

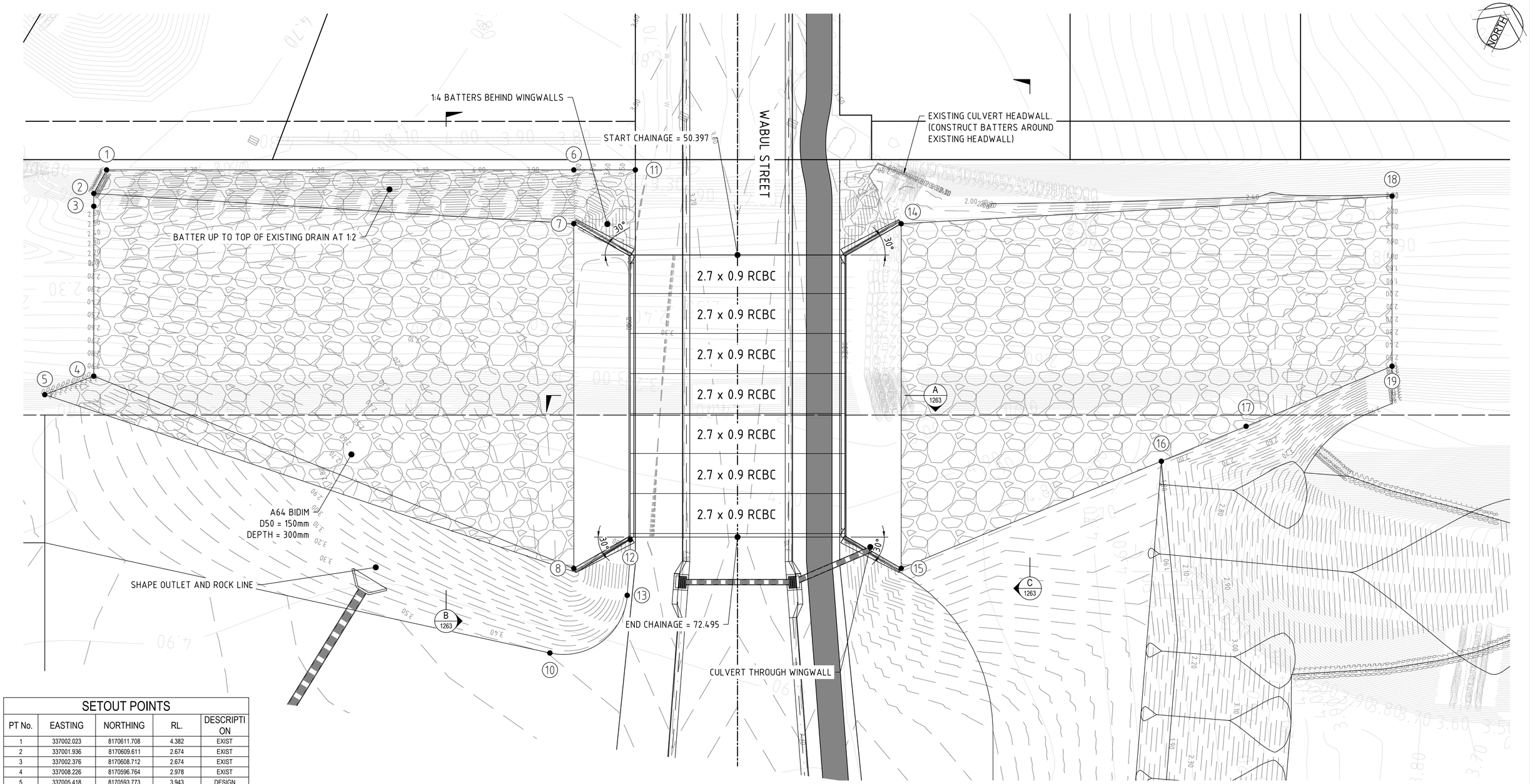
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1261

Revision: A

DATE PLOTTED: 11 October 2019 2:42 PM BY : MAURICE SHEEHAN



SETOUT POINTS

PT No.	EASTING	NORTHING	RL.	DESCRIPTION
1	337002.023	8170611.708	4.382	EXIST
2	337001.936	8170609.611	2.674	EXIST
3	337002.376	8170608.712	2.674	EXIST
4	337008.226	8170596.764	2.978	EXIST
5	337005.418	8170593.773	3.943	DESIGN
6	337034.875	8170627.795	3.824	DESIGN
7	337036.729	8170624.009	1.800	EXIST
8	337048.598	8170599.769	1.800	DESIGN
10	337049.831	8170592.994	3.497	DESIGN
11	337039.201	8170629.913	3.430	DESIGN
12	337051.579	8170603.723	3.341	DESIGN
13	337053.282	8170599.708	3.374	DESIGN
14	337059.747	8170635.277	1.800	DESIGN
15	337071.619	8170611.041	1.800	DESIGN
16	337086.222	8170627.529	1.783	DESIGN
17	337090.976	8170632.905	1.775	DESIGN
18	337093.311	8170654.123	2.204	EXIST
19	337099.169	8170642.159	2.578	EXIST

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: CULVERT DETAILS PLAN
SHEET 1 OF 2

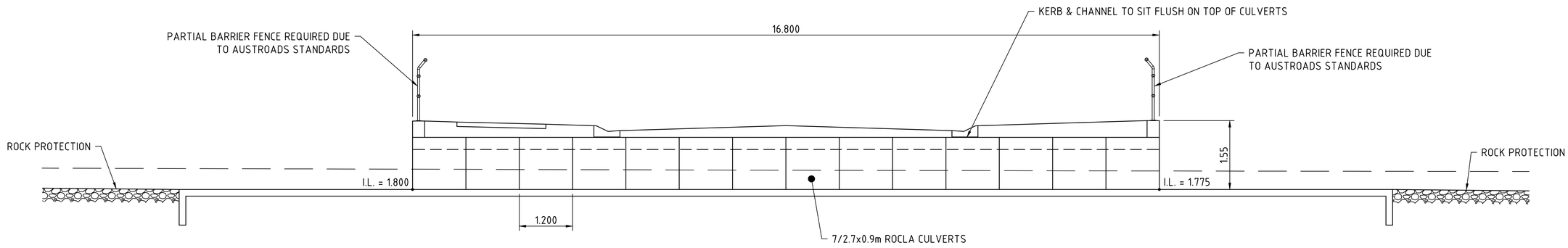
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

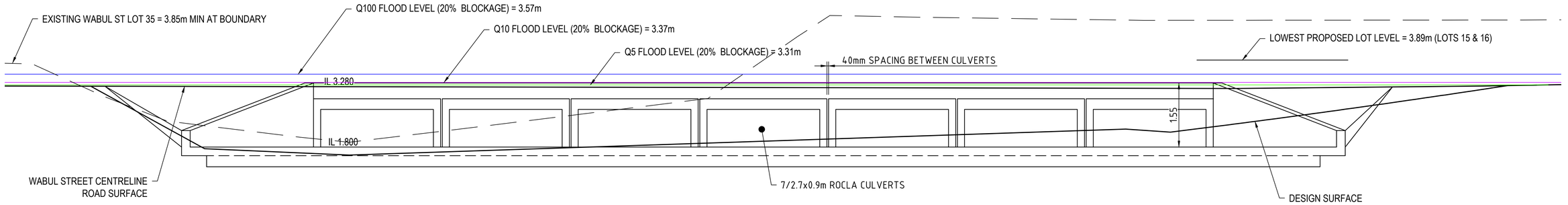
Drawing Number: Q184103-CI-1262
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-CL; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1262-1263.dwg

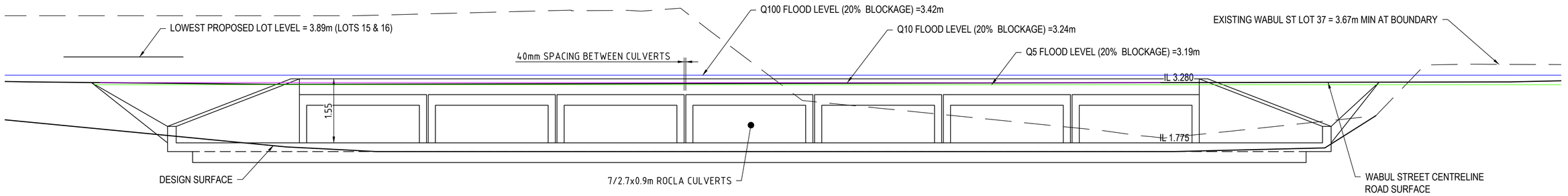
DATE PLOTTED: 11 October 2019 2:43 PM BY : MAURICE SHEEHAN



SECTION A
SCALE 1:50m
1262



SECTION B
SCALE 1:50m
1262



SECTION C
SCALE 1:50m
1262

NOTES:

1. TO BE INSTALLED AS PER DTMR STANDARD DRAWING 1250.
2. EXPOSURE CLASS B2.

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 3 4 5m
SCALE 1:50 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

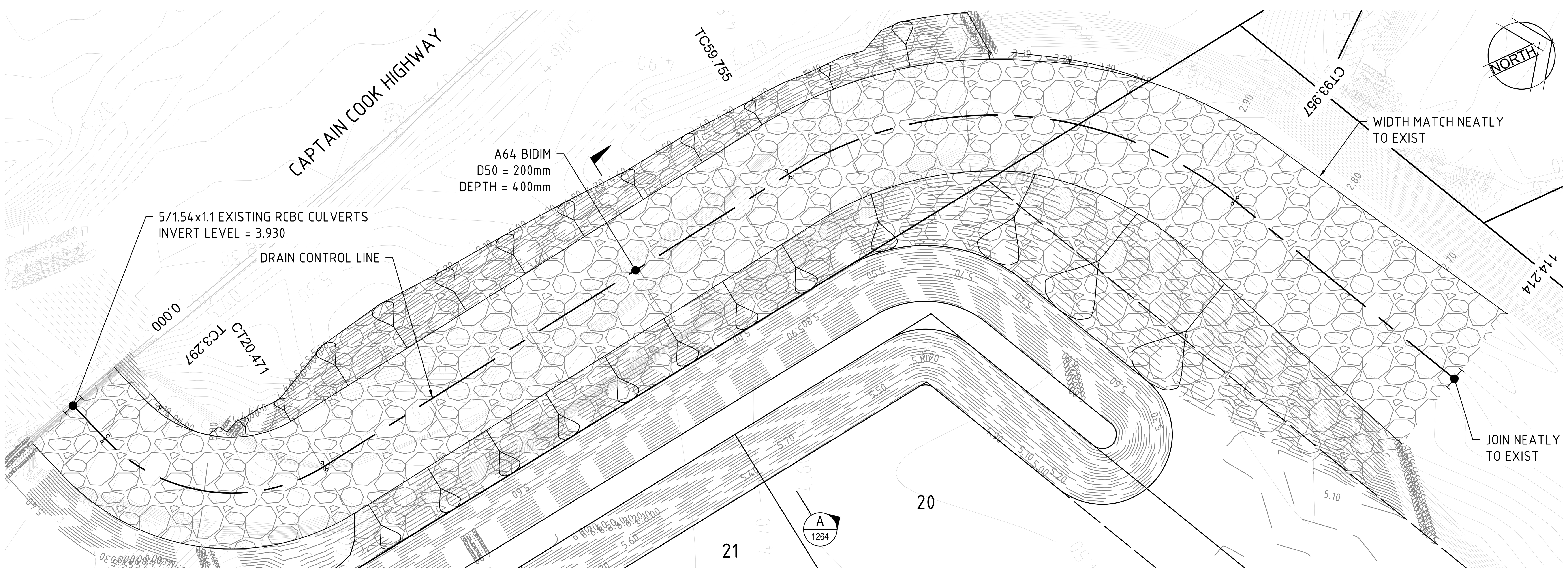
Title: CULVERT DETAILS PLAN
SHEET 2 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1263
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-CL; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models\ Acad\Q184103-CI-1262-1263.dwg



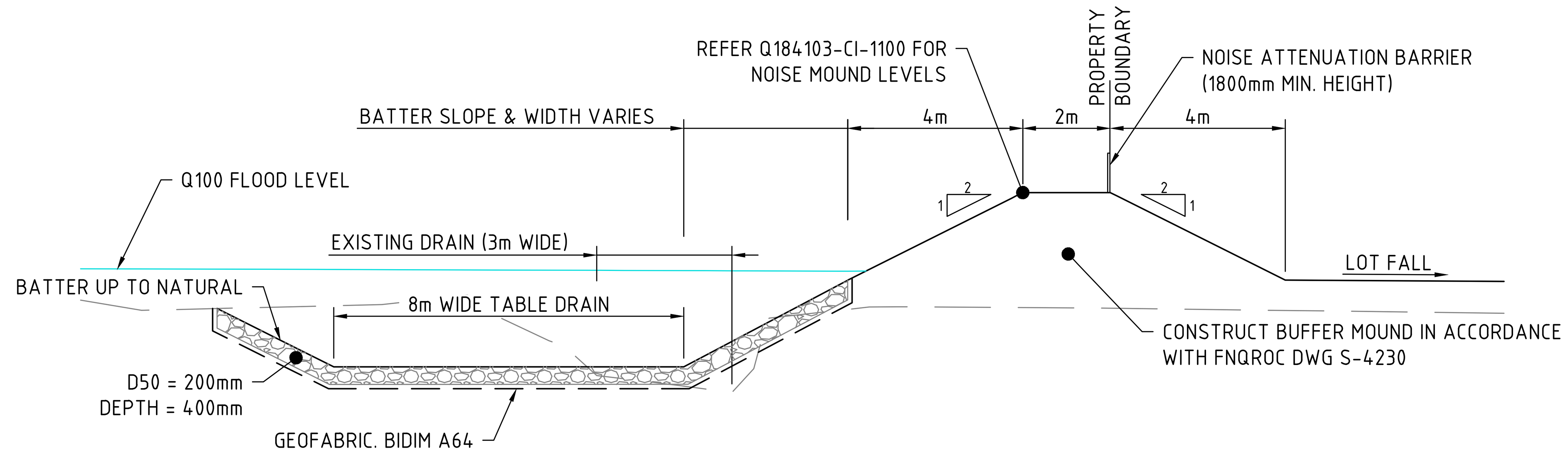
DRAIN LAYOUT PLAN
SCALE 1:200m

DATUM RL 0

HORZ. CURVE LENGTH (m) HORZ. CURVE RADIUS (m)		17.173m R-12.500m					34.202m R27.500m					
EXISTING SURFACE LEVELS ROAD CENTRELINE	5.654	4.204	3.558	3.930	4.565	3.505	3.494	3.206	2.606	2.662	2.637	
CUT/FILL DEPTH TO EXISTING SURFACE	-1.724	-0.311	0.146	-0.232	-1.088	-0.251	-0.244	-0.181	0.260	0.136	0.000	
DESIGN LEVELS ROAD CENTRELINE	3.930	3.893	3.704	3.698	3.477	3.253	3.251	3.024	2.866	2.798	2.637	2.637
CONTROL LINE CHAINAGE ROAD CENTRELINE	0.000	3.297	20.000	20.471	40.000	59.755	60.000	80.000	93.957	100.000	114.214	114.215

WABUL STREET
SCALE: H 1:200
V 1:200

DRAIN CONTROL LINE								
PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	336871.085	8170466.294	3.930	71°22'04.62"			
TC	3.297	336874.209	8170467.348	3.893	71°22'04.62"			
IP 2	11.884	336883.924	8170470.623	3.795		R = -12.500	17.173	78°43'00.00"
CT	20.471	336882.613	8170480.791	3.698	352°39'04.62"			
TC	59.755	336877.588	8170519.753	3.253	352°39'04.62"			
IP 3	76.856	336875.067	8170539.301	3.060		R = 27.500	34.202	71°15'36.94"
CT	93.957	336892.769	8170547.969	2.866	63°54'41.56"			
IP 4	114.214	336910.962	8170556.877	2.637	63°54'41.56"			



SECTION A
1264
SCALE 1:100m

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 3 4 5m
SCALE 1:50 @A1

H: 0 5 10 15 20m
V: 0 5 10 15 20m
SCALE: H:1:200 V:1:200 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn JJ	Date 10.10.2019
Checked MS	Date 10.10.2019
Designed MC	Date 10.10.2019
Verified MS	Date 10.10.2019
Approved MB	RPEQ No. 10801 Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: DRAIN DESIGN
SHEET 1 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

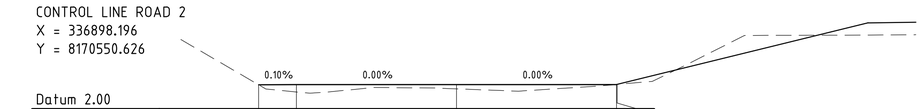
Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: Q184103-CI-1264 | Revision: A

DATE PLOTTED: 11 October 2019 2:23 PM BY : MAURICE SHEEHAN
XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-DRAIN1; XR-Q184103-CI-XS-DRAIN1; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1264-1265.dwg

DATE PLOTTED: 11 October 2019 9:57 AM BY: JACK JONES

CONTROL LINE ROAD 2
X = 336898.196
Y = 8170550.626

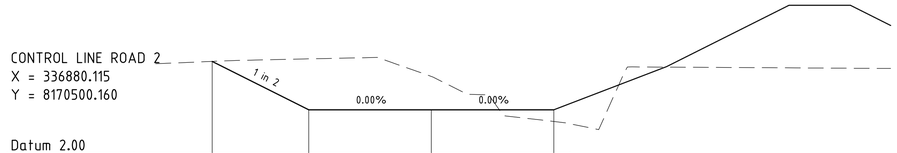


Datum 2.00

DESIGN HEIGHT	2.797	2.798	2.798	2.798	2.808
EXISTING SURFACE	2.797	2.558	2.662	2.806	2.808
OFFSETS	-6.461	-5.226	0.000	5.226	5.245

CHAINAGE 100.000

CONTROL LINE ROAD 2
X = 336880.115
Y = 8170500.160

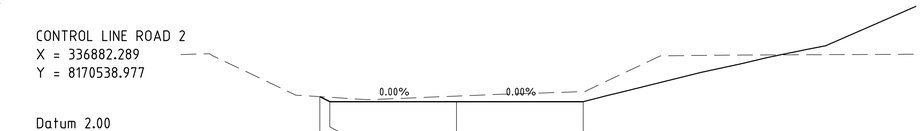


Datum 2.00

DESIGN HEIGHT	5.055	3.477	3.477	3.477
EXISTING SURFACE	5.055	5.138	4.565	3.095
OFFSETS	-7.155	-4.000	0.000	4.000

CHAINAGE 40.000

CONTROL LINE ROAD 2
X = 336882.289
Y = 8170538.977

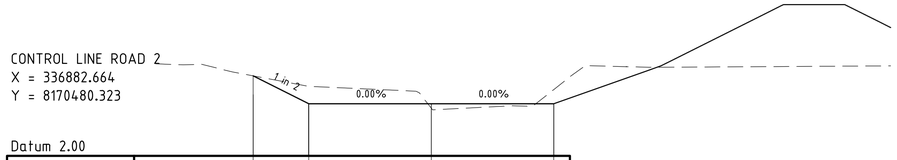


Datum 2.00

DESIGN HEIGHT	3.186	3.024	3.024	3.024
EXISTING SURFACE	3.186	3.165	3.206	3.349
OFFSETS	-4.460	-4.136	0.000	4.136

CHAINAGE 80.000

CONTROL LINE ROAD 2
X = 336882.664
Y = 8170480.323

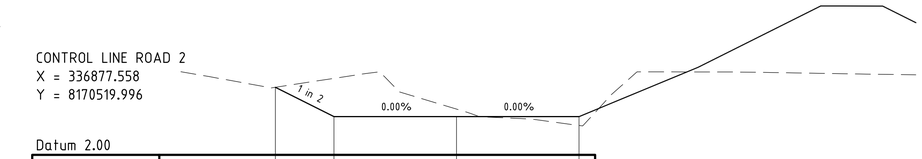


Datum 2.00

DESIGN HEIGHT	4.612	3.704	3.704	3.704
EXISTING SURFACE	4.612	4.269	3.558	4.165
OFFSETS	-5.817	-4.000	0.000	4.000

CHAINAGE 20.000

CONTROL LINE ROAD 2
X = 336877.558
Y = 8170519.996

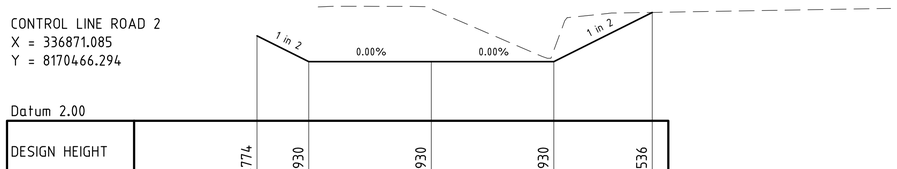


Datum 2.00

DESIGN HEIGHT	4.207	3.251	3.251	3.251
EXISTING SURFACE	4.207	4.498	3.494	2.960
OFFSETS	-5.913	-4.000	0.000	4.000

CHAINAGE 60.000

CONTROL LINE ROAD 2
X = 336871.085
Y = 8170466.294

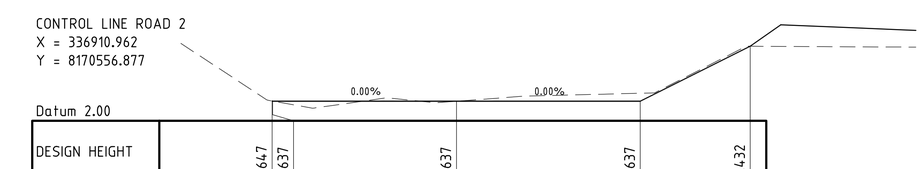


Datum 2.00

DESIGN HEIGHT	4.774	3.930	3.930	3.930	5.536
EXISTING SURFACE			5.654	4.294	5.536
OFFSETS	-5.688	-4.000	0.000	4.000	7.212

CHAINAGE 0.000

CONTROL LINE ROAD 2
X = 336910.962
Y = 8170556.877



Datum 2.00

DESIGN HEIGHT	2.647	2.637	2.637	2.637	4.432
EXISTING SURFACE	2.647	2.643	2.637	2.899	4.432
OFFSETS	-6.020	-6.000	0.000	6.000	9.590

CHAINAGE 114.214

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	MC	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: DRAIN DESIGN
SHEET 2 OF 2


Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

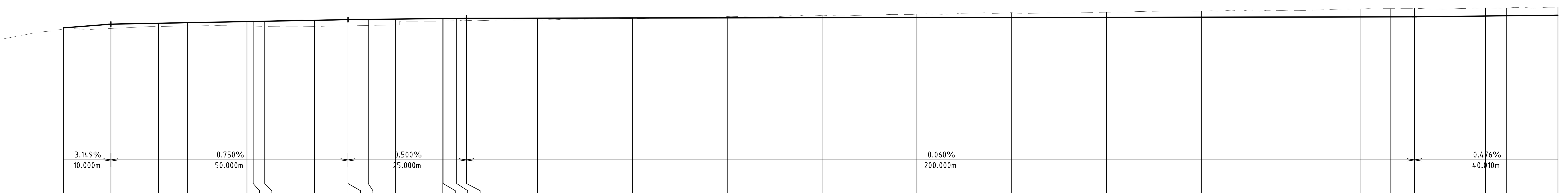
Drawing Number: Q184103-CI-1265
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DISGN-CNTRS; XR-Q184103-CI-LS-DRAIN1; XR-Q184103-CI-XS-DRAIN1; XR-Q184103-EXST-CNTRS
CAD File: \\cardno.com\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1264-1265.dwg

DATE PLOTTED: 11 October 2019 9:58 AM BY : JACK JONES



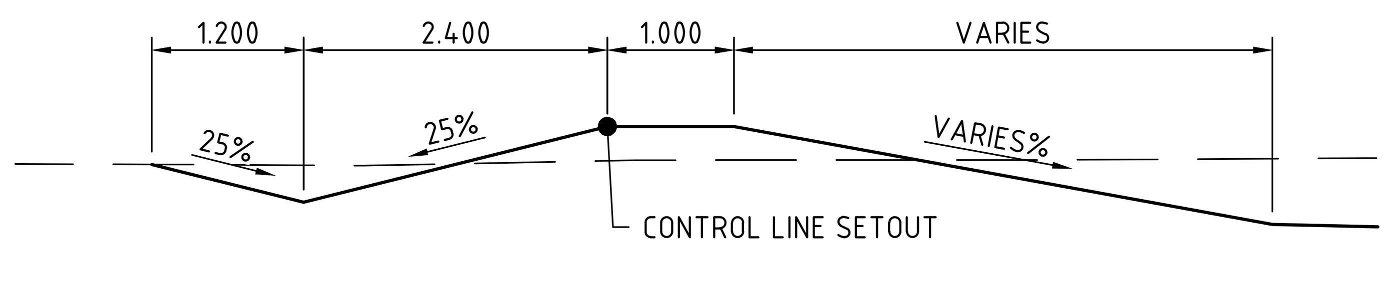
SOUTHERN DIVERSION DRAIN
SCALE 1:400m



VERT. CURVE LENGTH (m)	
VERT. CURVE RADIUS (m)	
VERT. GEOMETRY GRADE (%)	3.149% / 0.750% / 0.500% / 0.060% / 0.476%
VERT. GEOMETRY LENGTH(m)	10.000m / 50.000m / 25.000m / 200.000m / 40.010m
DATUM RL -10	
HORZ. CURVE LENGTH (m)	12.565m / 10.487m / 5.776m / 2.855m / 30.762m
HORZ. CURVE RADIUS (m)	R-20.000m / R9.500m / R-20.000m / R10.000m / R-25.000m

CONTROL LINE CHAINAGE ROAD CENTRELINE	EXISTING SURFACE LEVELS ROAD CENTRELINE	CUT/FILL DEPTH TO EXISTING SURFACE	DESIGN LEVELS ROAD CENTRELINE
0.000	4.054	0.105	4.159
9.990	4.109	0.365	4.474
20.000	4.277	0.272	4.549
26.117	4.318	0.276	4.595
38.682	4.311	0.378	4.689
40.000	4.299	0.400	4.699
42.432	4.277	0.440	4.717
52.919	4.275	0.521	4.796
59.990	4.335	0.514	4.849
60.000	4.335	0.514	4.849
64.276	4.365	0.505	4.870
70.052	4.393	0.506	4.899
80.000	4.724	0.224	4.949
80.065	4.725	0.224	4.949
82.920	4.768	0.195	4.963
84.990	4.791	0.182	4.974
100.000	4.819	0.164	4.983
120.000	4.939	0.055	4.995
140.000	5.109	-0.103	5.007
160.000	5.216	-0.197	5.019
180.000	5.315	-0.285	5.031
200.000	5.437	-0.394	5.043
220.000	5.475	-0.420	5.055
240.000	5.591	-0.524	5.067
260.000	5.612	-0.534	5.079
273.677	5.774	-0.688	5.087
280.000	5.780	-0.690	5.091
284.990	5.785	-0.691	5.094
300.000	5.844	-0.678	5.165
304.439	5.811	-0.625	5.186
315.261	5.904	-0.666	5.238

SOUTH DIVERSION DRAIN
SCALE: H 1:500
V 1:200



TYPICAL SECTION
SCALE 1:50m

SOUTHERN DIVERSION DRAIN CONTROL LINE TABLE

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	337151.059	8170522.242	4.159	216°39'29.44"			
TC	26.117	337135.467	8170501.291	4.595	216°39'29.44"			
IP 2	32.399	337131.587	8170496.079	4.642		R = -20.000	12.565	35°59'45.89"
CT	38.682	337131.512	8170489.581	4.689	180°39'43.55"			
TC	42.432	337131.469	8170485.831	4.717	180°39'43.55"			
IP 3	47.676	337131.401	8170479.982	4.756		R = 9.500	10.487	63°14'59.15"
CT	52.919	337126.147	8170477.409	4.796	243°54'42.70"			
TC	64.276	337115.948	8170472.415	4.870	243°54'42.70"			
IP 4	67.164	337113.336	8170471.136	4.884		R = -20.000	5.776	16°32'48.58"

SOUTHERN DIVERSION DRAIN CONTROL LINE TABLE

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
CT	70.052	337111.196	8170469.166	4.899	227°21'54.12"			
TC	80.065	337103.830	8170462.384	4.949	227°21'54.12"			
IP 5	81.493	337102.772	8170461.411	4.956		R = 10.000	2.855	16°21'33.24"
CT	82.920	337101.483	8170460.774	4.963	243°43'27.36"			
TC	273.677	336930.437	8170376.328	5.087	243°43'27.36"			
IP 6	289.058	336914.594	8170368.506	5.113		R = -25.000	30.762	70°30'05.58"
CT	304.439	336916.679	8170350.961	5.186	173°13'21.79"			
IP 7	315.261	336917.956	8170340.214	5.238	173°13'21.79"			

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

SCALE 1:50 @A1
SCALE 1:400 @A1
SCALE: H:1:500 V:1:200 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of or reliance by third party on the content of this document.


Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn JJ Date 10.10.2019
Checked MS Date 10.10.2019
Designed MC Date 10.10.2019
Verified MS Date 10.10.2019
Approved MB RPEQ No. 10801 Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: SOUTHERN DIVERSION DRAIN

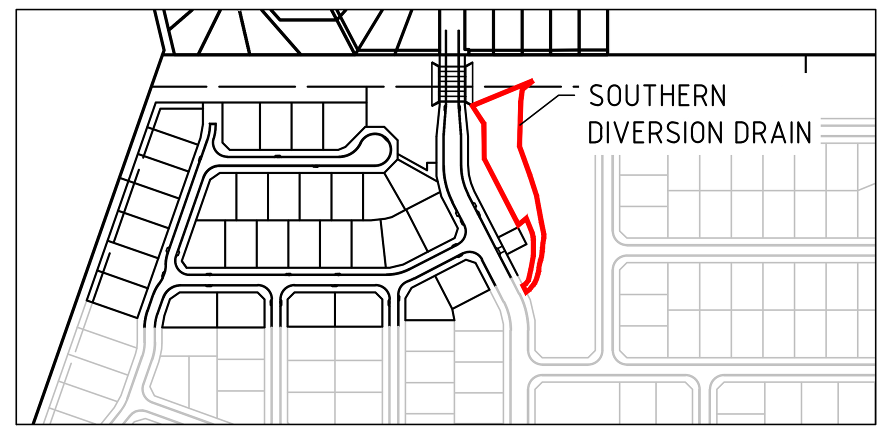
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum: AHD | Scale: AS SHOWN | Size: A1
Drawing Number: Q184103-CI-1266 | Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-CI-STH DRAIN CH; XR-Q184103-CI-LS-SOUTH DRAIN1; XR-Q184103-CI-STH DRAIN TABLE; XR-Q184103-CI-EAST DRAIN CH; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-EAST DRAIN1; XR-Q184103-CI-EAST DRAIN TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1266-1267.dwg



EASTERN DIVERSION DRAIN

SCALE 1:200m



KEYMAP

SCALE 1:4000m

VERT. CURVE LENGTH (m)
VERT. CURVE RADIUS (m)
VERT. GEOMETRY GRADE (%)
VERT. GEOMETRY LENGTH(m)
DATUM RL -10

VERT. GEOMETRY GRADE (%)	VERT. GEOMETRY LENGTH (m)
-3.149%	33.625m
-2.000%	30.502m
-0.100%	51.927m
-4.762%	20.000m

HORZ. CURVE LENGTH (m)	HORZ. CURVE RADIUS (m)
9.145m	R-10.000m
2.838m	R-15.000m
5.665m	R-15.000m
7.312m	R15.000m

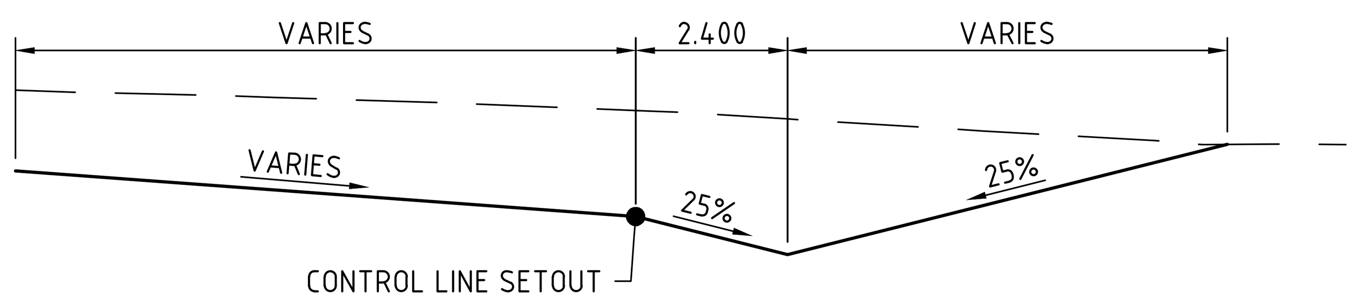
CONTROL LINE CHAINAGE ROAD CENTRELINE	EXISTING SURFACE LEVELS ROAD CENTRELINE	CUT/FILL DEPTH TO EXISTING SURFACE	DESIGN LEVELS ROAD CENTRELINE
0.000	4.054	0.105	4.159
0.080	4.051	0.105	4.156
9.224	3.828	0.040	3.868
20.000	3.446	0.083	3.529
20.948	3.431	0.069	3.499
23.786	3.468	-0.058	3.410
32.304	3.584	-0.443	3.142
33.625	3.622	-0.522	3.100
37.969	3.797	-0.784	3.013
40.000	3.875	-0.902	2.973
60.000	4.534	-1.961	2.573
60.226	4.540	-1.972	2.568
64.127	4.614	-2.124	2.490
80.000	4.778	-2.304	2.474
89.370	4.650	-2.185	2.465
96.682	4.682	-2.225	2.457
100.000	4.657	-2.203	2.454
116.054	4.528	-2.090	2.438
120.000	4.390	-2.140	2.250
136.051	3.273	-1.490	1.783

EAST DIVERSION DRAIN

SCALE: H 1:400
V 1:400

EASTERN DIVERSION DRAIN CONTROL LINE TABLE

PT	CHAINAGE	EASTING	NORTHING	HEIGHT	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	337151.059	8170522.242	4.159	36°39'33.38"			
TC	0.080	337151.107	8170522.306	4.156	36°39'33.38"			
IP 2	4.652	337154.045	8170526.253	4.012		R = -10.000	9.145	52°23'41.40"
CT	9.224	337152.710	8170530.989	3.868	344°15'51.98"			
TC	20.948	337149.531	8170542.273	3.499	344°15'51.98"			
IP 3	22.367	337149.145	8170543.643	3.455		R = -15.000	2.838	10°50'27.94"
CT	23.786	337148.508	8170544.916	3.410	333°25'24.04"			
TC	32.304	337144.697	8170552.534	3.142	333°25'24.04"			
IP 4	35.136	337143.415	8170555.097	3.070		R = -15.000	5.665	21°38'15.60"
CT	37.969	337141.278	8170557.007	3.013	311°47'08.44"			
IP 5	60.226	337124.682	8170571.838	2.568				
TC	89.370	337102.551	8170590.802	2.465	310°35'34.44"			
IP 6	93.026	337099.719	8170593.229	2.461		R = 15.000	7.312	27°55'45.99"
CT	96.682	337098.353	8170596.700	2.457	338°31'20.43"			
IP 7	136.051	337083.938	8170633.336	1.783	338°31'20.43"			



TYPICAL SECTION

SCALE 1:100m

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	MC	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 10 20 30 40m
SCALE 1:400 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Role	Name	Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	MC	10.10.2019
Verified	MS	10.10.2019
Approved	MB	RPEQ No. 10801 / 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: EASTERN DIVERSION DRAIN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: Q184103-CI-1267 | Revision: A

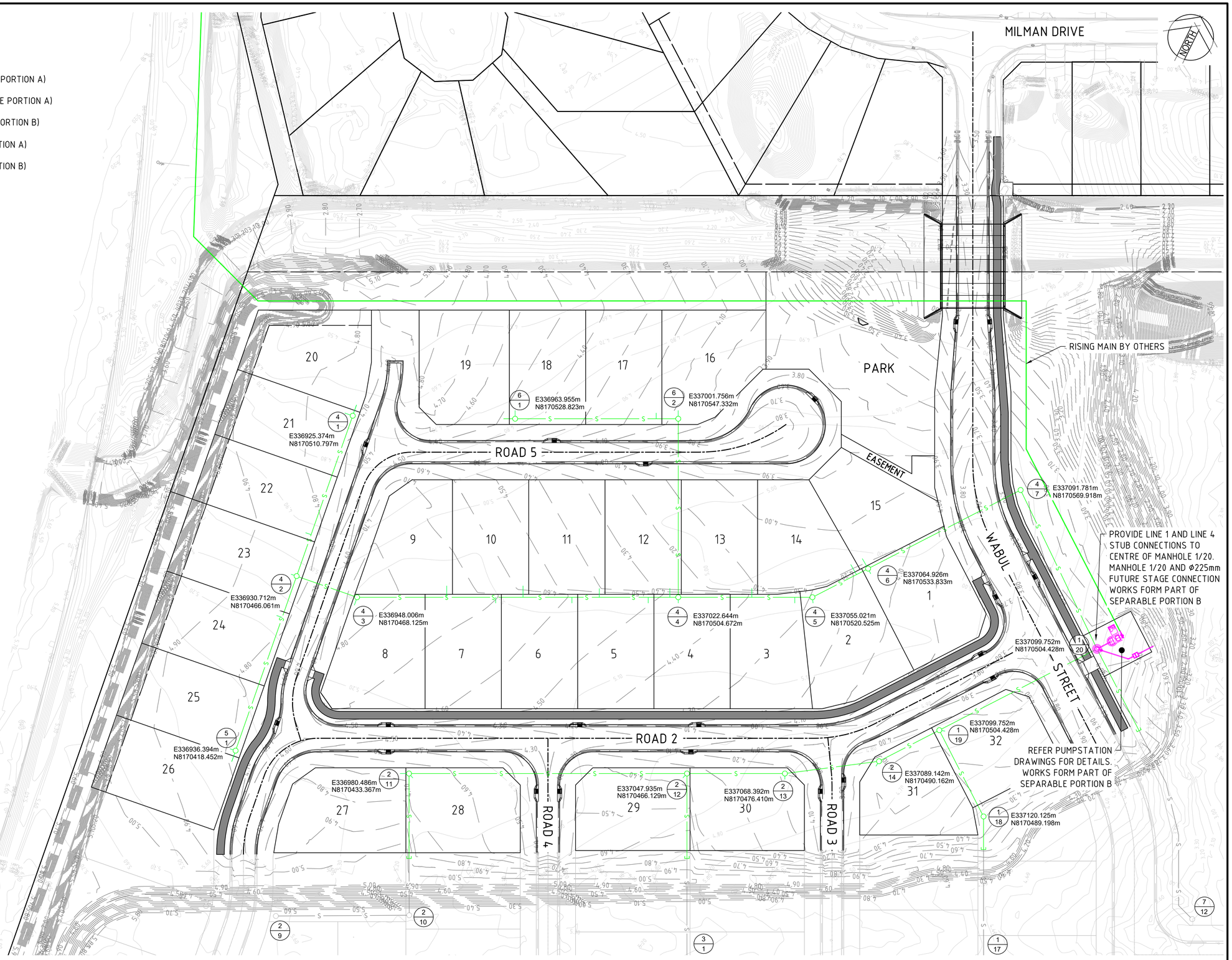
DATE PLOTTED: 11 October 2019 9:59 AM BY : JACK JONES
XREFs: XR-Q184103-CI-BASE; XR-Q184103-CI-STH DRAIN CH; XR-Q184103-CI-LS-SOUTH DRAIN1; XR-Q184103-CI-STH DRAIN TABLE; XR-Q184103-CI-EAST DRAIN CH; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-LS-EAST DRAIN1; XR-Q184103-CI-EAST DRAIN TABLE
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1266-1267.dwg

DATE PLOTTED: 11 October 2019 2:03 PM BY: - MAURICE SHEEHAN

XREFs: XR-Q184103-CI-BASE, XR-Q184103-SURV, XR-Q184103-DSGN-CNTRS, XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Claims Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1300.dwg

LEGEND

- 8/1 — MANHOLE NUMBER/SEWER LINE NUMBER
- NEW SEWER AND MANHOLE - (SEPARABLE PORTION A)
- HOUSE CONNECTIONS (HCB'S) - (SEPARABLE PORTION A)
- NEW SEWER AND ENDCAP - (SEPARABLE PORTION B)
- NEW SEWER MANHOLE - (SEPARABLE PORTION A)
- NEW SEWER MANHOLE - (SEPARABLE PORTION B)
- END CAP SEWER
- 3.50 — FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SEWER LAYOUT PLAN

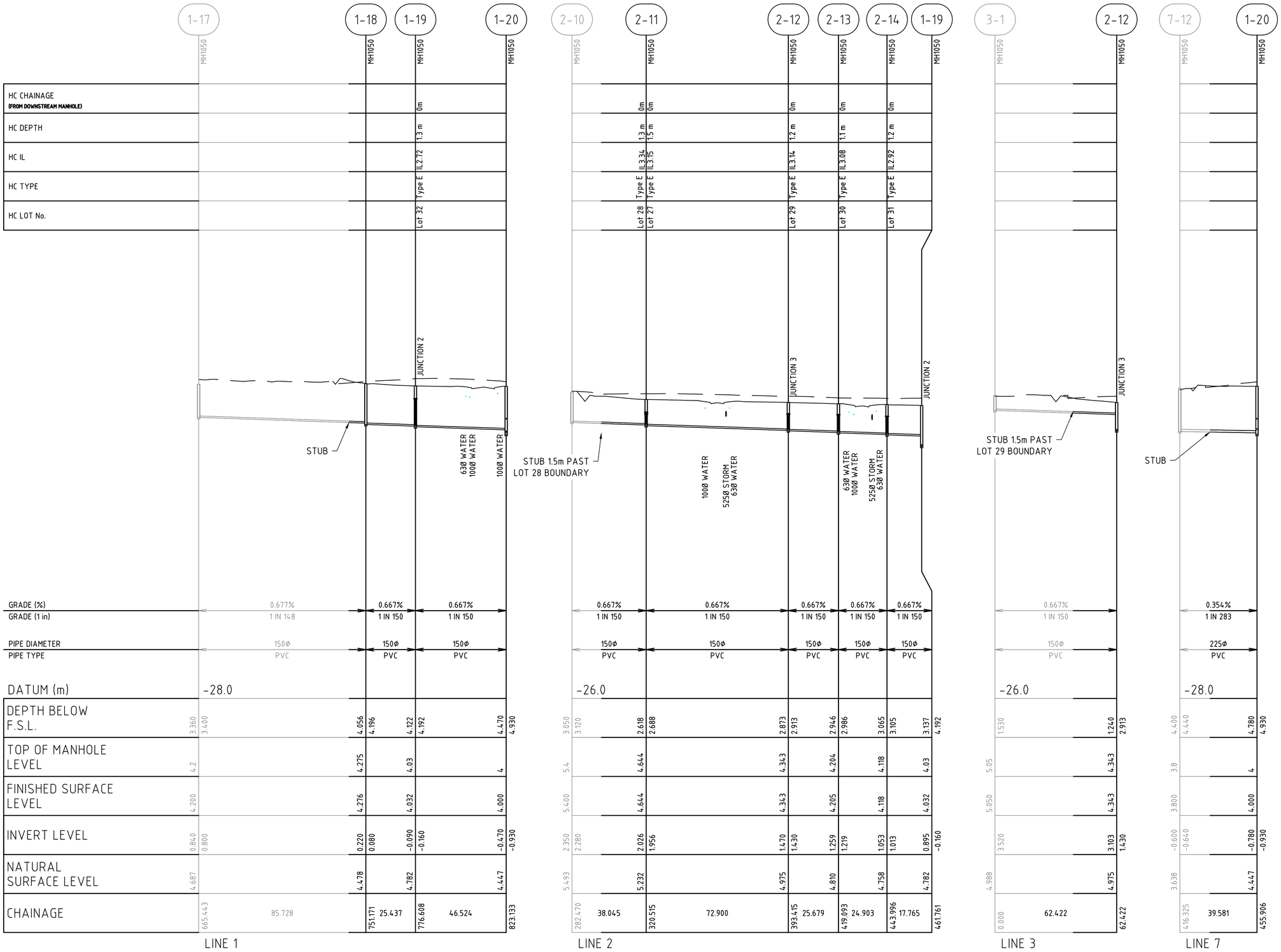
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1300

Revision: A

DATE PLOTTED: 11 October 2019 2:56 PM BY : MAURICE SHEEHAN



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	JJ	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SEWER LONGITUDINAL SECTIONS
SHEET 1 OF 2

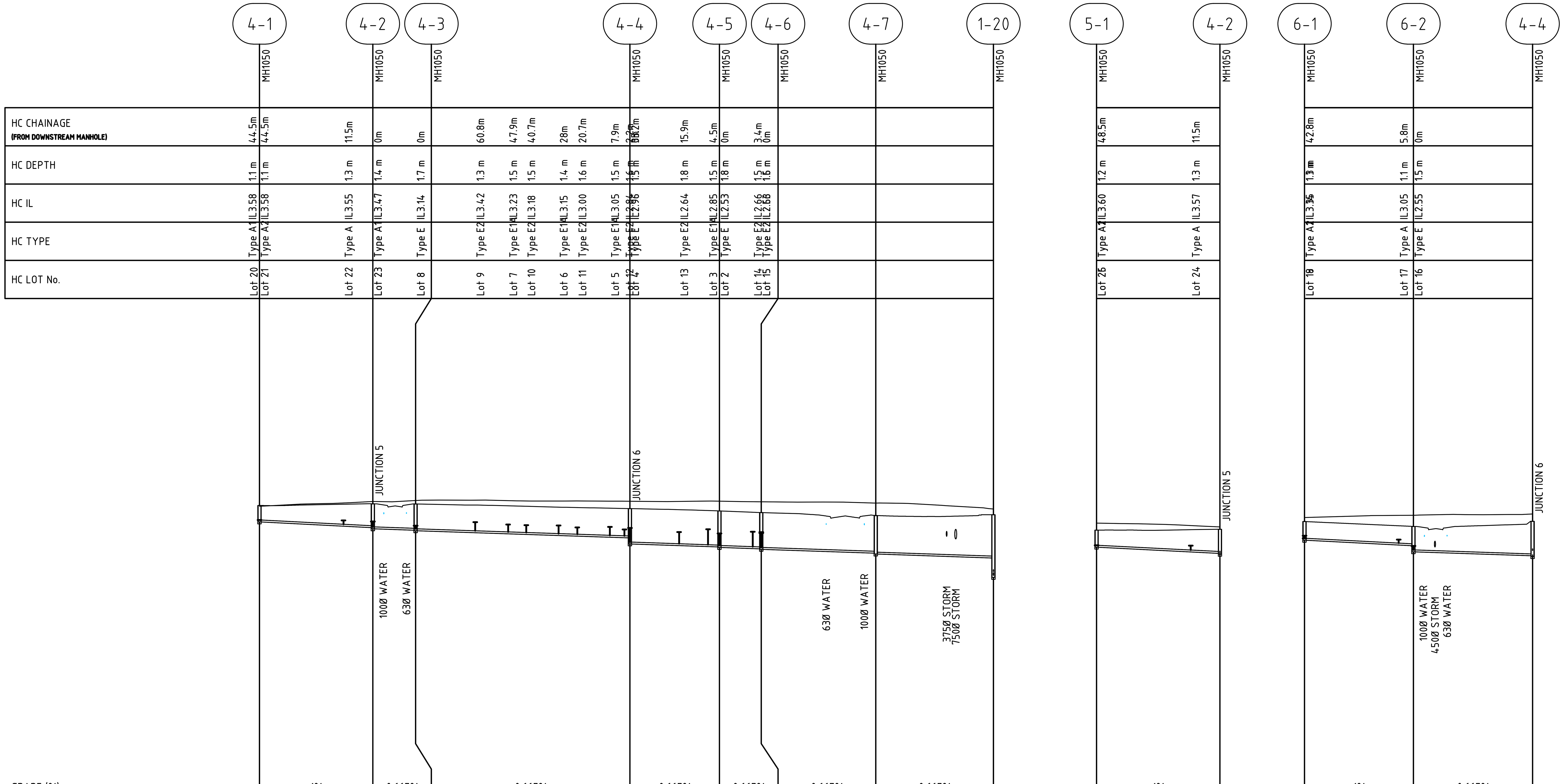
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1301
Revision: A

XREFs:
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1301-1302.dwg

DATE PLOTTED: 11 October 2019 2:56 PM BY : MAURICE SHEEHAN



LINE 4

	4-1 to 4-2	4-2 to 4-3	4-3 to 4-4	4-4 to 4-5	4-5 to 4-6	4-6 to 4-7	4-7 to 1-20
GRADE (%)	1%	0.667%	0.667%	0.667%	0.667%	0.667%	0.667%
GRADE (1 in)	1 IN 100	1 IN 150	1 IN 150	1 IN 150	1 IN 150	1 IN 150	1 IN 150
PIPE DIAMETER	150Ø	150Ø	150Ø	150Ø	150Ø	150Ø	150Ø
PIPE TYPE	PVC	PVC	PVC	PVC	PVC	PVC	PVC

DATUM (m) -27.0

DEPTH BELOW F.S.L.	1.298	1.873	1.968	2.071	2.111	2.303	2.781	2.828	2.868	2.852	2.892	2.959	3.029	3.402	4.930
TOP OF MANHOLE LEVEL	4.728	4.857		4.848		4.48		4.293		4.167		3.935		4	
FINISHED SURFACE LEVEL	4.728	4.858		4.849		4.480		4.293		4.167		3.935		4.000	
INVERT LEVEL	3.430	2.985	2.890	2.778	2.738	2.177	1.699	1.465	1.425	1.316	1.276	0.976	0.906	0.598	-0.930
NATURAL SURFACE LEVEL	4.664	5.040		5.116		5.058		5.069		5.015		4.916		4.447	
CHAINAGE	0.000	44.527	44.527	16.800	61.327	84.214	145.541	35.179	180.720	16.420	197.140	44.982	242.122	46.217	288.339

LINE 5

	5-1 to 4-2
GRADE (%)	1%
GRADE (1 in)	1 IN 100.00
PIPE DIAMETER	150Ø
PIPE TYPE	PVC

DATUM (m) -25.0

DEPTH BELOW F.S.L.	1.342	1.898	1.968
TOP OF MANHOLE LEVEL	4.786	4.857	
FINISHED SURFACE LEVEL	4.787	4.858	
INVERT LEVEL	3.445	2.960	2.890
NATURAL SURFACE LEVEL	5.341	5.040	
CHAINAGE	0.000	48.473	48.473

LINE 6

	6-1 to 6-2	6-2 to 4-4
GRADE (%)	1%	0.667%
GRADE (1 in)	1 IN 100	1 IN 150
PIPE DIAMETER	150Ø	150Ø
PIPE TYPE	PVC	PVC

DATUM (m) -26.0

DEPTH BELOW F.S.L.	1.472	1.515	1.997	2.711	2.781
TOP OF MANHOLE LEVEL	4.463	4.078		4.48	
FINISHED SURFACE LEVEL	4.464	4.079		4.480	
INVERT LEVEL	2.992	2.564	2.082	1.770	1.699
NATURAL SURFACE LEVEL	4.776	4.957		5.058	
CHAINAGE	0.000	42.789	42.789	46.800	89.589

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn JJ Date 10.10.2019
Checked MS Date 10.10.2019
Designed JJ Date 10.10.2019
Verified MS Date 10.10.2019
Approved RPEQ No. 10801 MB Date 10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: SEWER LONGITUDINAL SECTIONS
SHEET 2 OF 2

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum: AHD | Scale: AS SHOWN | Size: A1

Drawing Number: Q184103-CI-1302 | Revision: A

XREF's:
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1301-1302.dwg

DATE PLOTTED: 11 October 2019 2:03 PM BY - MAURICE SHEEHAN

NOTES

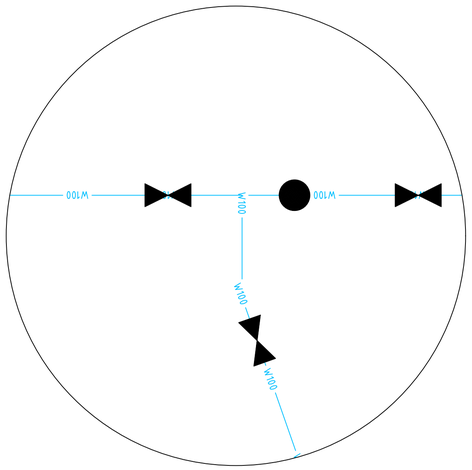
1. WHERE POSSIBLE, HYDRANTS ARE TO BE LOCATED IN LINE WITH ALLOTMENT BOUNDARIES
2. EXISTING HYDRANTS OR VALVES SHALL BE PROVIDED WITH NEW COVER BOXES AND SURROUNDS AS PER FNQROC STD. DWGS. S2000 AND S2005.
3. WHERE VALVE SURROUNDS ARE TO BE SET IN CONCRETE, A COMPRESSIBLE LAYER IS TO BE PROVIDED TO ALLOW FOR MAINTENANCE
4. LOWER WATER MAIN UNDER ROAD TO AVOID SUBGRADE IMPROVEMENT IF APPLICABLE
5. REFER FNQROC STANDARD DRAWING S2016 FOR TRENCH WIDTH & BEDDING DETAILS.

NOTES

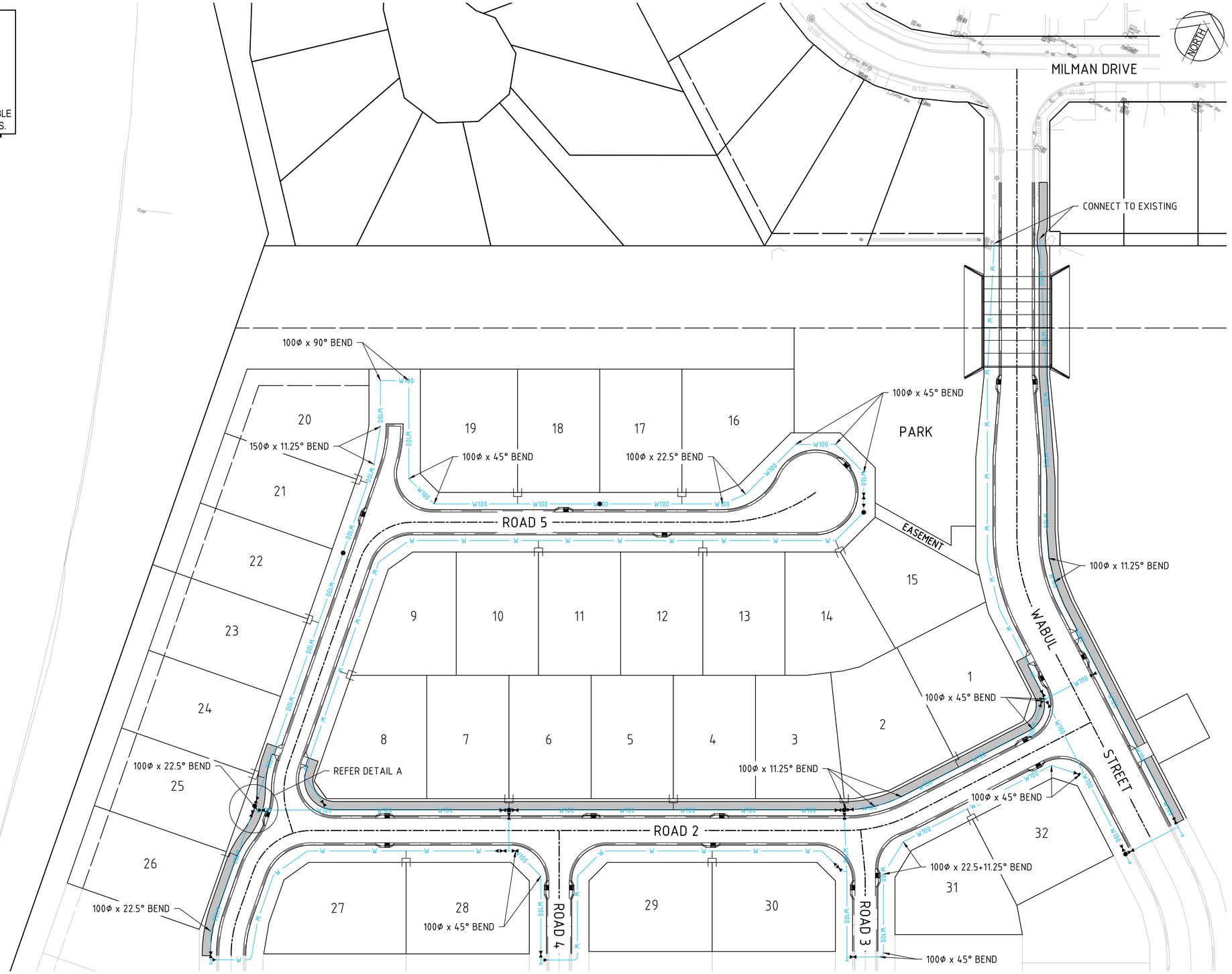
1. LOCATION OF EXISTING WATER MAIN TO BE LOCATED USING GROUND PENETRATING RADAR PRIOR TO EXCAVATION. ALIGNMENT SHOWN PLOTTED FROM COUNCIL RECORD.

LEGEND

- W — 63Ø WATERMAIN (MDPE RN16)
- W100 — 100Ø WATERMAIN (PVC-U PN16)
- FIRE HYDRANT
- VALVE
- REDUCER
- END CAP
- HOUSE CONNECTION (REFER FNNQROC STD DWG 2038)



DETAIL A
SCALE 1:30m 1350



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: WATER LAYOUT PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1350
Revision: A

XREF's: XR-Q184103-CI-BASE; XR-Q184103-SURV
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1350.dwg

DATE PLOTTED: 11 October 2019 2:03 PM BY - MAURICE SHEEHAN

DUST CONTROL

1. TOPSOIL STOCKPILES ARE TO BE WATERED AND LIGHTLY COMPACTED TO ENSURE MINIMAL DUST DISTURBANCE PRIOR TO RESPREADING.
2. SITE TO BE KEEP MOIST AT ALL TIMES TO ENSURE DUST CONTROL.
3. UNCOMPLETED WORKS ARE TO BE WATERED AND ROLLED AT THE END OF EACH WORKING DAY TO ENSURE A FIRM SEALED SURFACE TO CONTROL DUST.
4. HYDROSEEDING IS REQUIRED TO BE MAINTAINED THROUGH THE REMAINDER OF THE CONSTRUCTION PERIOD TO ENSURE DUST AND EROSION CONTROL.
5. ALL OPEN DRAINS TO BE FULLY TURFED IMMEDIATELY UPON COMPLETION.

SEDIMENT CONTROL

1. CONTROL WILL BE VIA THE INSTALLATION OF SILT FENCING, CATCH DRAINS, HAYBALE BARRIERS AND SEDIMENT PONDS.
2. TOPSOIL STOCK-PILES ARE TO BE LOCATED IN AREAS CLEAR OF SERVICING, WATERCOURSES, ROAD AND DRAINAGE WORKS AND PROVIDED WITH SILT FENCING ON THEIR DOWNSTREAM SIDE.
3. DURING THE PROJECTS CONSTRUCTION, ALL PITS ARE TO BE BLOCKED OFF AT THE SURFACE AND RUNOFF FLOWS ARE TO BE DIRECTED TO THE SEDIMENT PONDS WHERE CONTAMINATED WATERS CAN BE TREATED UNTIL THE SURROUNDING LANDSCAPE HAS BEEN STABLISIED TO THE SATISFACTION OF THE SITE SUPERINTENDENT. ONLY ON THE COMPLETION OF WORKS ARE THE SEDIMENT PONDS ARE TO BE REMOVED,
4. REFER TO IPWEAQ STD DWG No. D-0040 AND D-0041 FOR FURTHER DETAILS.
5. ALL BATTERS TO BE STABILISED WITHIN 10 DAYS OF COMPLETION OF BULK EARTHWORKS (eg. HYDROMULCHING, TURFING etc.).
6. SURROUNDING CARRIAGEWAYS TO BE KEPT CLEAN OF ANY MATERIAL CARRIED ONTO ROADWAY BY CONSTRUCTION VEHCILES FROM SITE.

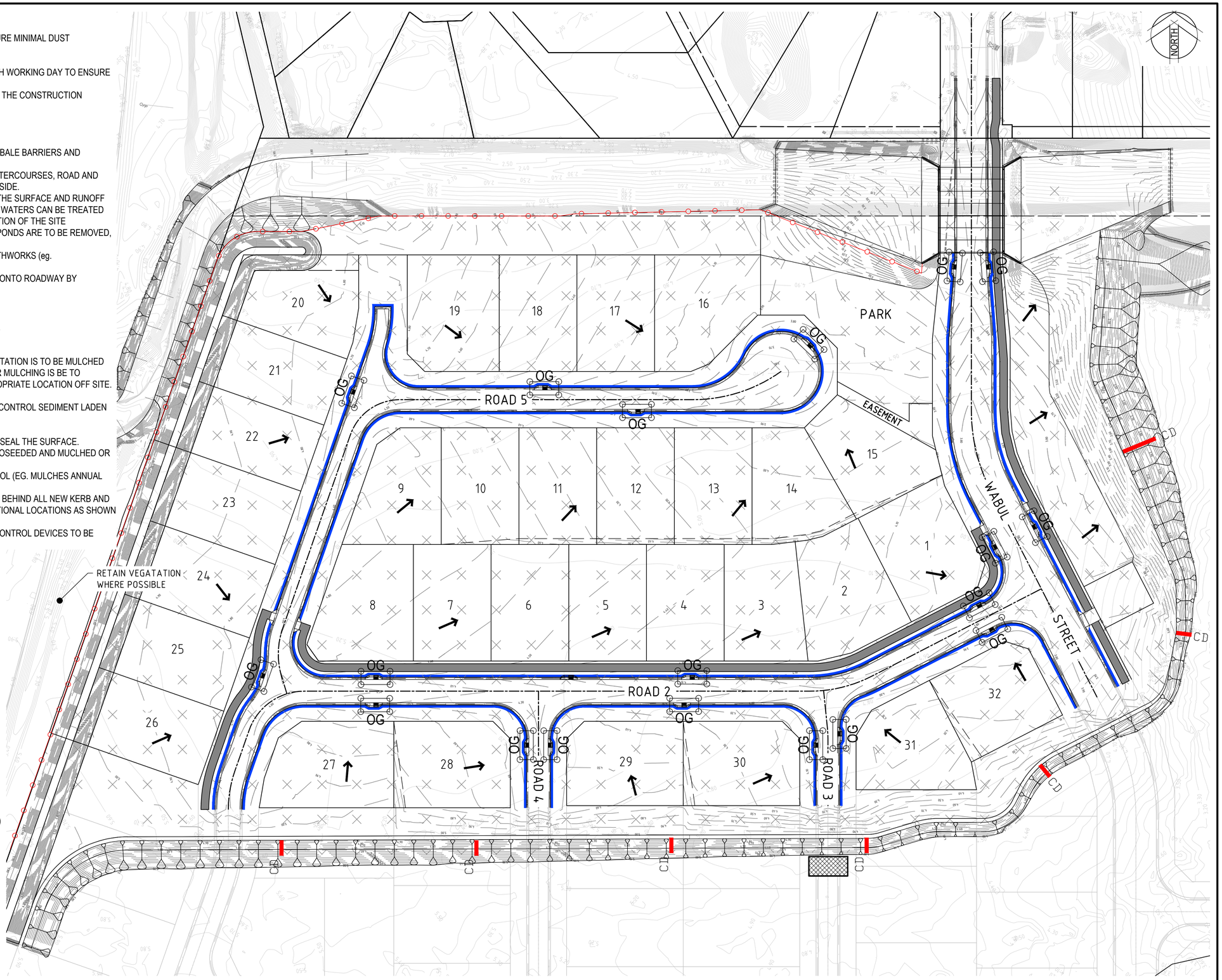
PHASING OF WORKS

1. INSTALL TRUCK SHAKER RAMP AND WASHDOWN AT ENTRY TO NEW WORK AREA.
2. INSTALL ALL BARRIER AND SILT FENCING.
3. INSTALL ALL CATCH DRAINS AND DIVERSION BANKS.
4. CARRY OUT CLEANING FROM ALL DRIVE AND SITE REGRADING AREAS. ALL VEGETATION IS TO BE MULCHED AND STOCKPILED FOR LATER USE. ONLY RUBBISH AND TIMBER UNSUITABLE FOR MULCHING IS BE TO STOCKPILED FOR LATER USE. ONLY MULCHING IS BE DISPOSED OF TO AN APPROPRIATE LOCATION OFF SITE.
5. STRIP SITE AND STOCKPILE TOPSOIL.
6. FORM SEDIMENT BASINS AND EXCAVATE DIVERSION DRAINS TO THE BASINS TO CONTROL SEDIMENT LADEN FLOWS IF REQURED.
7. UNDERTAKE SITE WORKS, COMPACT AND REVEGETATE DISTURBED AREAS.
8. UNCOMPLETED EARTHWORKS ARE TO BE ROLLED AT THE END OF EACH DAY TO SEAL THE SURFACE.
9. AS EARTHWORKS ARE COMPLETED THOSE AREAS ARE TO BE TOPSOILED, HYDROSEEDED AND MUCLHED OR PAVED IMMEDIATELY ON COMPLETION OF WORKS IN THAT AREA.
10. IN AREAS WHERE WORKS BY WET SEASON RAINS, TEMPORARY EROSION CONTROL (EG. MULCHES ANNUAL ETC.) ARE TO BE INSTALLED.
11. ON COMPLETION OF REGRADING STRIPS OF TURF 0.8m WIDE ARE TO BE PLACED BEHIND ALL NEW KERB AND GUTTER IN EACH ROAD, TOP AND BOTTOM OF ALL BATTER SLOPES AND IN ADDITIONAL LOCATIONS AS SHOWN ON THE PLAN OR AS DIRECTED BY THE SITE SUPERVISOR.
12. ONLY AT THE COMPLETION AND STABLISATION OF AREAS UPSTREAM ARE ANY CONTROL DEVICES TO BE REMOVED.

NOTE:
REFER IPWEAQ STANDARD DRAWINGS D-0040 AND D-0041 FOR TYPICAL DETAILS

LEGEND

- 3.50 — NATURAL SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- 3.50 — FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- TOP OF BATTER
- OG — SEDIMENT TRAP
- 0.6m WIDE TURF STRIPS
- PROPOSED AREA OF CLEAR AND STRIP
- CD — ROCK CHECK DAM (EVERY 50m OF DIVERSION DRAINS)
- LOT FLOW PATH
- SEDIMENT FENCE
- ENTRY / EXIT PAD



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD
Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE
Title: EROSION AND SEDIMENT CONTROL STRATEGY

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1400
Revision: A

XREFs: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-DSGN-CNTRS; XR-Q184103-CI-GRADE STRINGS; XR-Q184103-EXST-CNTRS
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1400.dwg

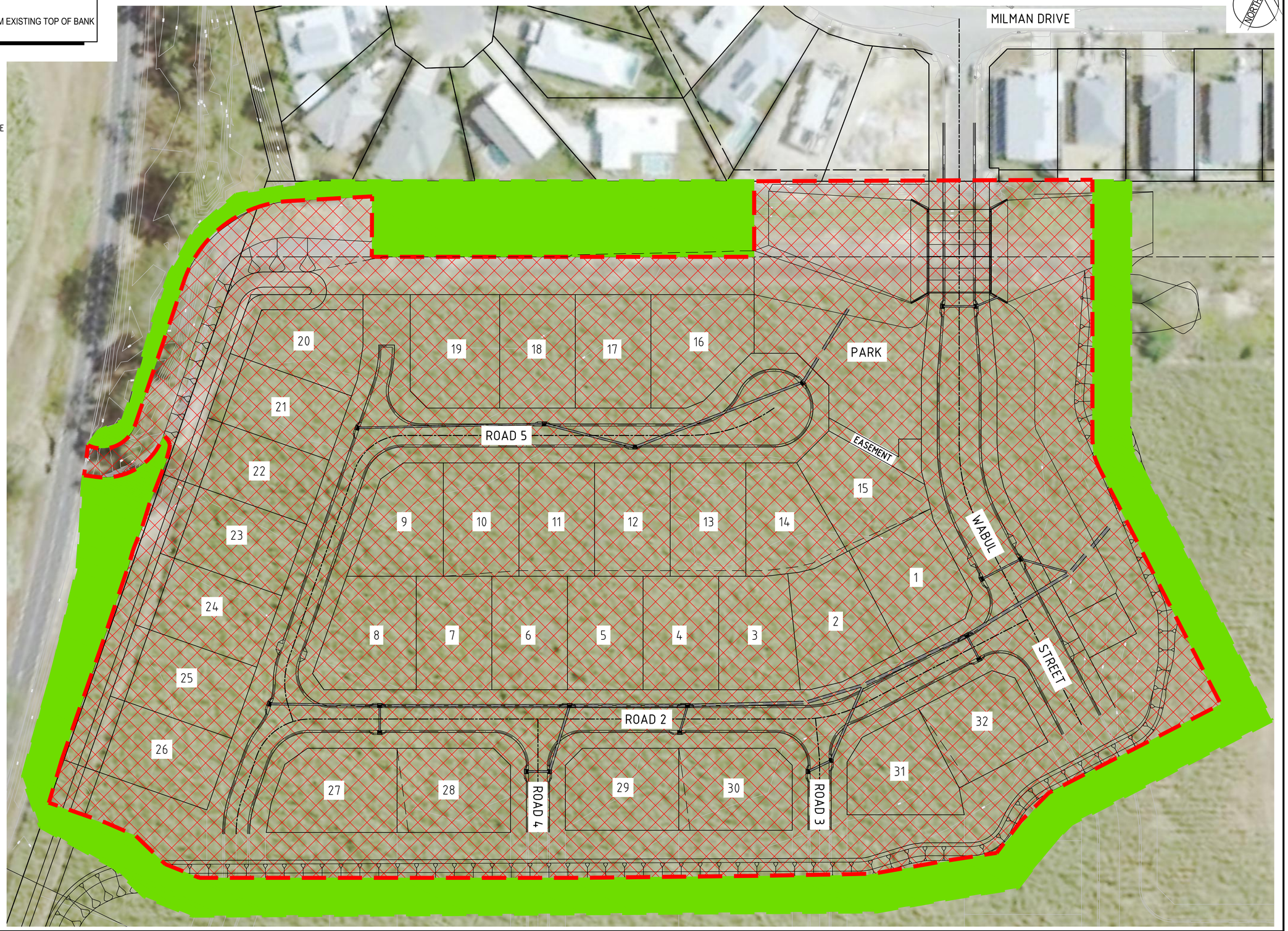
DATE PLOTTED: 11 October 2019 2:03 PM BY: - MAURICE SHEEHAN

NOTES

1. INTERFACE WITH EXISTING SURFACE 1m BACK FROM EXISTING TOP OF BANK

LEGEND:

- 3.50 — EXISTING CONTOURS
- TOP OF BATTER
- AREAS OF VEGETATION TO BE CLEARED
- AREA OF VEGETATION TO BE RETAINED WHERE POSSIBLE



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m

SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: VEGETATION MANAGEMENT PLAN

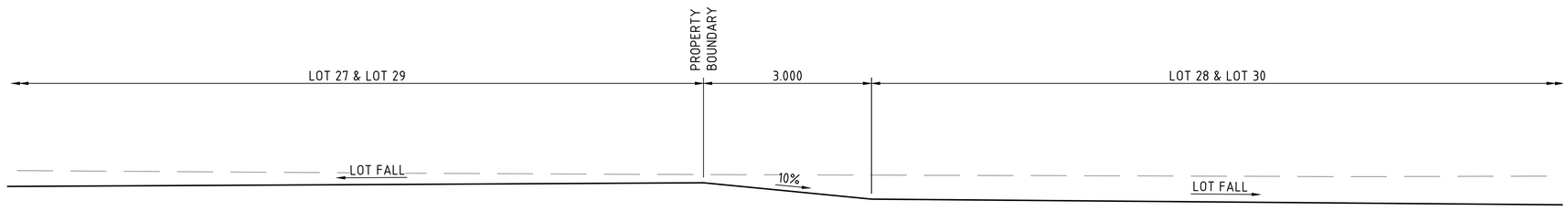
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

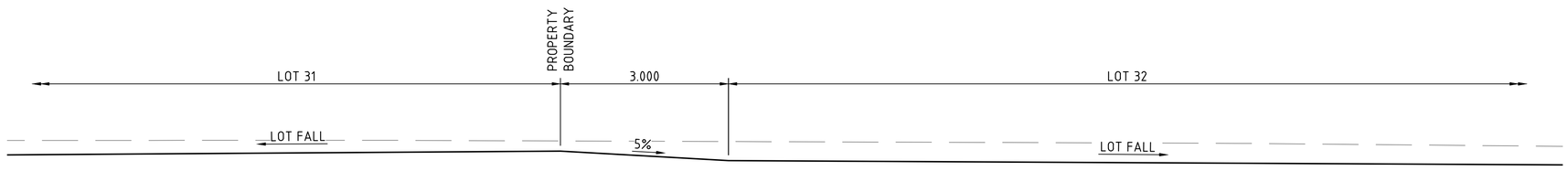
Drawing Number: Q184103-CI-1401

Revision: A

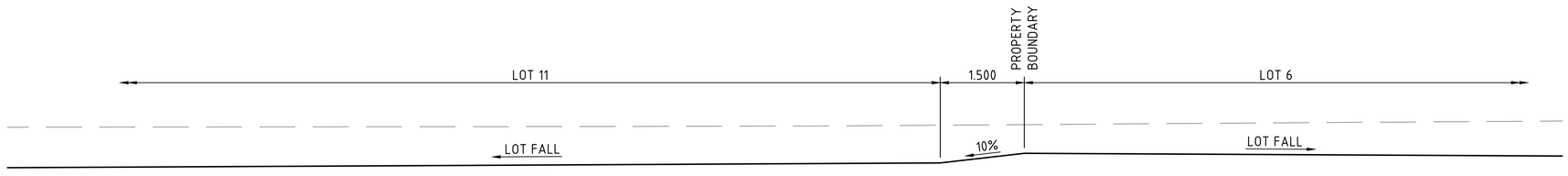
XREF's: XR-Q184103-CI-BASE; XR-Q184103-SURV; XR-Q184103-CI-GRADE STRINGS; GOOGLE EARTH
CAD File: Q:\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1401.dwg



SECTION A
SCALE 1:50m 1100



SECTION B
SCALE 1:50m 1100



SECTION C
SCALE 1:50m 1100

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 1 2 3 4 5m
SCALE 1:50 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

		Date
Drawn	JJ	10.10.2019
Checked	MS	10.10.2019
Designed	JJ	10.10.2019
Verified	MS	10.10.2019
Approved	RPEQ No. 10801	
	MB	10.10.2019

Client PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title MISCELLANEOUS DETAILS PLAN

Status FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number Q184103-CI-1402

Revision A

DATE PLOTTED: 11 October 2019 10:06 AM BY: - JACK JONES
XREF's:
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1402.dwg

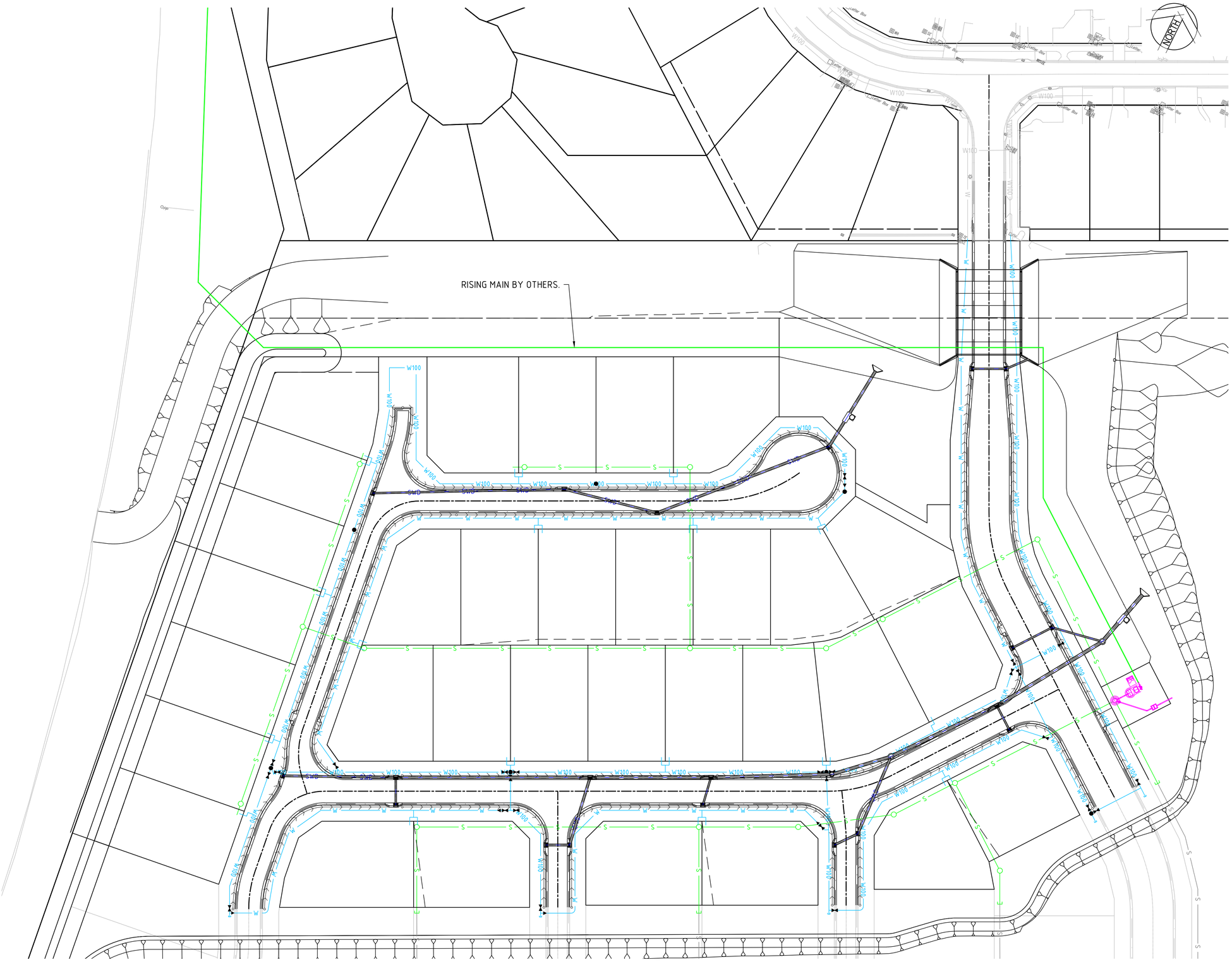
DATE PLOTTED: 11 October 2019 10:07 AM BY: JACK JONES
XREFs: XR-Q184103-CI-BASE; XR-Q184103-CI-GRADE STRINGS; XR-Q184103-SURV
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1403.dwg

NOTE

*** - CONTRACTOR TO LIASE WITH SPA AND ELECTRICAL CONTRACTOR TO ENSURE ADEQUATE CLEARANCE BETWEEN SERVICES

LEGEND

- 3.50 — FINISHED SURFACE CONTOUR (0.1m CONTOUR INTERVAL)
- TOP OF BATTER
- LAYBACK KERB & CHANNEL (REFER FNQROC STD. DWG S1000F)
- KERB RAMP (REFER FNQROC STD. DWG S1016C)
- KERB INLET PITS (REFER FNQROC STD. DWG S1050B & 1055D)
- S — NEW SEWER AND MANHOLE
- S — HOUSE CONNECTIONS (HCB'S)
- NEW SEWER MANHOLE
- END CAP SEWER
- W — 63Ø WATERMAIN
- W100 — 100Ø WATERMAIN
- FIRE HYDRANT
- VALVE
- END CAP WATER
- WATER SERVICE



Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 10 20 30 40 50m
SCALE 1:500 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	JJ	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

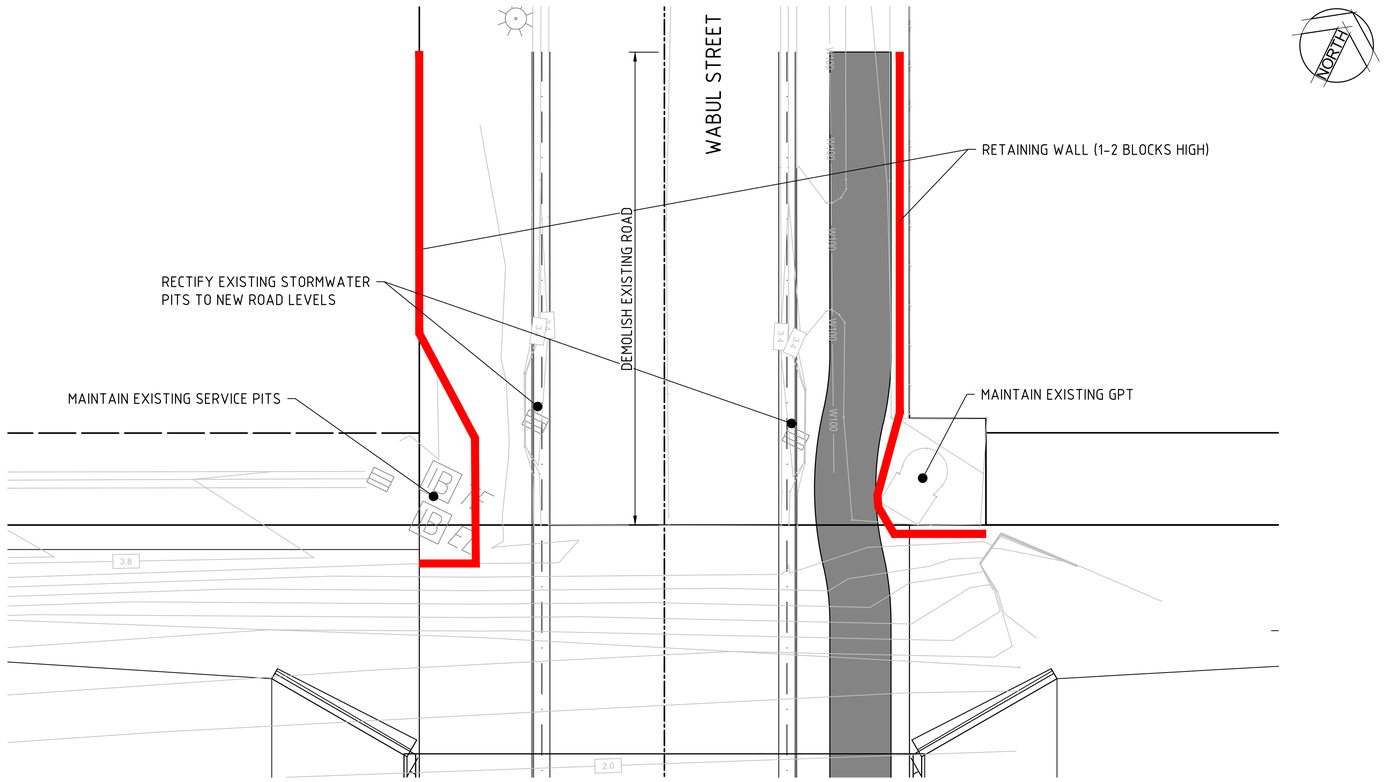
Title: COMBINED SERVICES PLAN

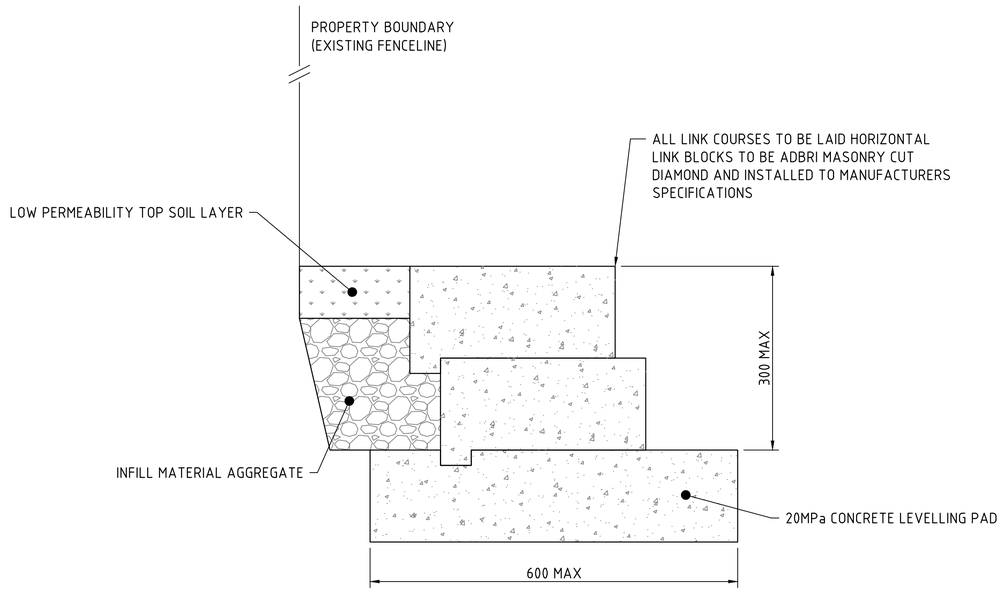
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
AHD	AS SHOWN	A1

Drawing Number: Q184103-CI-1403
Revision: A

DATE PLOTTED: 11 October 2019 11:12 AM BY: - JACK JONES





TYPICAL RETAINING WALL DETAIL

Rev.	Date	Description	Des.	Verif.	Appd.
A	10.10.2019	FOR OPERATIONAL WORKS APPROVAL	JJ	MS	MB

0 1 2 4 6 8 10m
SCALE 1:100 @A1

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno®
Cardno (QLD) Pty Ltd | ABN 57 051 074 992
15 Scott Street, Parramatta Park
Cairns QLD 4870
Tel: 07 4034 0500
Web: www.cardno.com.au

Drawn	JJ	Date 10.10.2019
Checked	MS	Date 10.10.2019
Designed	JJ	Date 10.10.2019
Verified	MS	Date 10.10.2019
Approved	RPEQ No. 10801	Date 10.10.2019
	MB	

Client: PORT DOUGLAS LAND DEVELOPMENTS PTY LTD

Project: PORT DOUGLAS ESTATE - STAGE 1A & 1B
SUBDIVISION OF LOT 2 ON SR431
CAPTAIN COOK HIGHWAY, CRAIGLIE

Title: RETAINING WALL DETAILS PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum		Scale	Size
AHD		AS SHOWN	A1

Drawing Number: Q184103-CI-1404
Revision: A

XREFs: XR-Q184103-I-BASE; XR-Q184103-SURV
CAD File: \\cardno.corp\apac_collab\Regional_QLD\Projects\North Queensland\Cairns Based Projects\Q184103 - Port Douglas Estate Subdivision\005 - Civil Engineering\Design_CAD & Models_Acad\Q184103-CI-1404.dwg

APPENDIX

E

1% AEP CC BLOCKAGE IMPACTS



Cardno

Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
17/09/2019
Size
A3
Scale
1:6000

0 500
metres

APPENDIX E.1
DEVELOPED 1% AEP CC EVENT - PEAK FLOOD LEVEL

Flood Impact Assessment
Port Douglas Estate
AppD

N

Legend

Site Boundary

Stage 1

Flood Depth (m)

< 0.1

0.1 to 0.2

0.2 to 0.3

0.3 to 0.4

0.4 to 0.5

> 0.5

bing © 2019 Microsoft Corporation © 2019 DigitalGlobe ©CNES (2019) Distribution Airbus DS

Cardno

Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
17/09/2019
Size
A3
Scale
1:6000

0 500
metres

APPENDIX E.2
DEVELOPED 1% AEP CC EVENT - PEAK FLOOD DEPTH

Flood Impact Assessment

Port Douglas Estate

AppD



Cardno

Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
17/09/2019
Size
A3
Scale
1:6000

0 500
metres

APPENDIX E.3
DEVELOPED 1% AEP CC EVENT - PEAK FLOOD VELOCITY

Flood Impact Assessment
Port Douglas Estate
AppD



Cardno

Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
17/09/2019
Size
A3
Scale
1:6000

0 500
metres

APPENDIX E.4
DEVELOPED 1% AEP CC EVENT - PEAK FLOOD IMPACTS

Flood Impact Assessment
Port Douglas Estate
AppD

APPENDIX

F

COUNCIL RESPONSE

Zac McCosker

Subject: FW: Douglas Shire Council Advice RE: Craiglie Subdivision ROL 2966/2018

From: Jenny Elphinstone <Jenny.Elphinstone@douglas.qld.gov.au>
Sent: Thursday, 22 August 2019 2:08 PM
To: Maurice Sheehan <maurice.sheehan@cardno.com.au>
Subject: Douglas Shire Council Advice RE: Craiglie Subdivision ROL 2966/2018

Hi Maurice,

Based on Cardno's modelling outputs and advices to date, Council Officers accept that the proposed 900mm high box culverts represents the preferred solution for the extension of Wabul Drive.
Council notes that the above statement is subject to Council's review of the final report and design drawings as part to the Operational Works approval process.

Advice statement:
Council has been provided with provided selected model outputs and has not had the opportunity to review the model inputs (particularly the channel geometry data).
Accordingly, Council notes that it has not fully assessed the modelling process. Until the final report is provided, Council officers can only comment on the information presented.

Additional commentary:

- Council Officers understand that the 900mm high box culvert array is Cardno's preferred scenario and that lower (600mm high) boxes or higher (1200mm high) boxes do not improved the flooding impacts;
- Cardno's advice is that the 900mm high boxes are an appropriate design response and the advice backs this up with overtopping scenarios for various recurrence interval events;
- Council Officers understand that for a 20% culvert blockage, the operation of the network road for events up to and including the 10 year ARI appear to be consistent with the FNQROC requirements.
- From Cardno's table of results, (20 % culvert blockage), the crossing would generally be considered trafficable to all vehicles during the peak flows of the 20 year event.
  Trafficability to larger vehicles – trucks/SES vehicles - would appear to be possible during the 100 year ARI event (non-climate change). Note, higher blockage factors would impact the advised trafficability during the peak depth and flow scenario. Council notes and accepts Cardno's representations regarding the operational factors with the upstream DTMR culvert array;
- Council notes Cardno's advice that its updated model shows the existing lots on the north side of the drain are not inundated (even after the future development of Lot X);
- The preliminary model outputs provided to date show the "Impacts" and do not currently report actual water levels. Council understands that this additional information will be provided in the final report and will confirm flow depths;
- The model inputs for channel sections must be included in the final report so Council Officers can assess whether the model appropriately reflects the final drain profiles;

It is appropriate for Cardno to finalise its reporting and documentation of the culvert design for the purposes of the operational works application.

Should you require further assistance please do not hesitate to call or email via the contacts below.

Kind Regards

Jenny Elphinstone | Senior Planning Officer

Environment & Planning | Douglas Shire Council
P: 07 4099 9482 | **F:** 07 4098 2902
E: enquiries@douglas.qld.gov.au | **W:** www.douglas.qld.gov.au
Mail: PO Box 723, Mossman Q 4873 | **Office:** 64-66 Front St, Mossman Q 4873

From: Maurice Sheehan <maurice.sheehan@cardno.com.au>
Sent: Thursday, 22 August 2019 10:58 AM
To: Jenny Elphinstone <Jenny.Elphinstone@douglas.qld.gov.au>
Subject: Craiglie Subdivision

Hi Jenny,

Just checking if we have any updates from Council regarding the proposed culvert configuration for the Wabul St Crossing?

Maurice Sheehan
SENIOR CIVIL ENGINEER
CARDNO

Phone +61 7 4034 0500 Direct +61 7 4034 0522
Address 15 Scott Street, Parramatta Park, Cairns, Queensland 4870 Australia

Email maurice.sheehan@cardno.com.au Web www.cardno.com

CONNECT WITH CARDNO

Cardno's management systems are certified to ISO9001 (quality) and AS4801/OHSAS18001 (occupational health and safety)

This email and its attachments may contain confidential and/or privileged information for the sole use of the intended recipient(s). All electronically supplied data must be checked against an applicable hardcopy version which shall be the only document which Cardno warrants accuracy. If you are not the intended recipient, any use, distribution or copying of the information contained in this email and its attachments is strictly prohibited. If you have received this email in error, please email the sender by replying to this message and immediately delete and destroy any copies of this email and any attachments. The views or opinions expressed are the author's own and may not reflect the views or opinions of Cardno.

Port Douglas Estate, Captain Cook Highway Craiglie

Development Application for Water and Sewerage Services

Q184103



Prepared for
Port Douglas Land Developments.Pty Ltd

14 October 2019

Cardno
Shaping the Future

Contact Information

Cardno (Qld) Pty Ltd

ABN 57 051 074 992

Level 11, North Tower
515 St Paul's Tce
Fortitude Valley QLD 4006

Telephone: 3369 9822
Facsimile: 3369 9722
International: +61 7 3369 9822

cardno@cardno.com.au
www.cardno.com.au

Author(s):
Sunil Simkhada
Project Engineer

Approved By:
Matt Walsh
Technical Lead

Document Information

Prepared for	Port Douglas Land Developments.Pty Ltd
Project Name	Development Application for Water and Sewerage Services
File Reference	CraiglieDev-Report-v06.docx
Job Reference	Q184103
Date	14 October 2019
Version Number	6
Effective Date	14 October 2019
Date Approved:	14 October 2019

Document History

Version	Effective Date	Description of Revision	Prepared by:	Reviewed by:
1	18/07/2019	Draft	Sunil Simkhada	Matt Walsh
2	19/08/2019	Comments incorporated after review	Sunil Simkhada	
3	26/08/2019	Appendix D changed to show the existing Pump Station catchments	Sunil Simkhada	
4	28/08/2019	Additional water and sewage network at northern side included in the analysis	Sunil Simkhada	
5	16/09/2019	Report amended upon review from Cardno Cairns Office	Sunil Simkhada	
6	14/10/2019	"Draft" watermark removed	Sunil Simkhada	

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document

Table of Contents

1 Introduction 5

2 Assumptions 6

2.1 Design Criteria 6
2.2 Development Population 6
2.3 Water Supply Demand 6
2.4 Sewage Flow 6

3 Network Planning 7

3.1 Water Supply 7
3.1.1 Existing Infrastructure 7
3.1.2 Future Infrastructure 7
3.1.3 Hydraulic Modelling 7
3.1.4 Maximum Hour Results – Existing Scenario 8
3.1.5 Fire Flow Results – Existing Scenario 10
3.1.6 Maximum Hour Results – Ultimate Scenario 12
3.1.7 Fire Flow Results – Ultimate Scenario 15
3.2 Sewerage Infrastructure 17
3.2.1 Existing Infrastructure 17
3.2.2 Future Infrastructure 17
3.2.3 Hydraulic Modelling 18
3.2.4 Model Set-Up 18
3.2.5 Model Results 18

4 Conclusions 19

4.1 Water Supply 19
4.2 Sewerage 19

Appendices

Appendix A Development Layout Plans
Appendix B FNQROC Design Criteria
Appendix C Water Servicing Strategy
Appendix D Sewerage Servicing Strategy

Tables

Table 2-1 Estimated Development Water Demand and Sewage Load 6
Table 2-2 Estimated Total Water Supply Demand 6
Table 2-3 Estimated Total Sewage Flow 6

Figures

Figure 1-1 Location Plan of Development Site at Captain Cook Highway, Craiglie QLD 4877 5
Figure 3-1 Existing - Peak Hour Pressure Map Without the Craiglie Development Demand and Milman Drive Demand 8
Figure 3-2 Existing - Peak Hour Pressure Map With the Stage 1 Craiglie Development Demand and Milman Drive Demand 9
Figure 3-3 Existing – Fire-flow Pressure Map Without the Development Demand and Milman Drive Demand 10
Figure 3-4 Existing – Fire-flow Pressure Map With the Stage 1 Craiglie Development Demand and Milman Drive Demand - Unaugmented 11
Figure 3-5 Existing – Fire-flow Pressure Map With the Stage 1 Craiglie Development Demand and the Milman Drive Demand – Augmented 12
Figure 3-6 Ultimate - Peak Hour Pressure Map Without the Craiglie Development Demand 13
Figure 3-7 Ultimate - Peak Hour Pressure Map With the Craiglie Development Demand 14
Figure 3-8 Ultimate – Fire-flow Pressure Map Without the Craiglie Development Demand 15
Figure 3-9 Ultimate – Fire-flow Pressure Map With the Craiglie Development Demand 16

1 Introduction

Port Douglas Land Developments Pty Ltd commissioned Cardno to undertake a water supply and sewerage analysis for the proposed Stage 1 development at Lot 2 Captain Cook Highway, Craiglie 4877 near Port Douglas. The development is situated on Lot 2 SR 431 and will consist of 32 freehold residential lots in Stage 1. Other stages will be developed in the future and will consist of 285 residential lots in total.

The development site is shown in Figure 1-1 below.



Figure 1-1 Location Plan of Development Site at Captain Cook Highway, Craiglie QLD 4877

Douglas Shire Council (DSC) invited Stantec to undertake the fire-flow performance assessment for Mossman and Whyanbeel water supply areas (WSA). Cardno received the water model and fire-flow assessment report from Stantec upon Council's request. This model was used for the analysis.

2 Assumptions

The following section details the assumptions used to assess this development.

2.1 Design Criteria

The water supply and sewerage design criteria have been adopted from the *FNQROC Development Manual Design Manual Version No. 03/17 – D6 for Water Reticulation and D7 for Sewerage System*. Appendix B details the extracts from this code that have been used to calculate EP loadings, associated water & sewerage demands and the level of service standard for the development.

2.2 Development Population

DSC adopts an Equivalent Population (EP) as the basis for water supply and sewerage infrastructure planning which represents the water supply and sewerage load associated with the proposed development. The development EP was calculated by converting the corresponding number of dwellings with the conversion rate specified in the *Design Manual* shown in Appendix B. The development lot plans for Stage 1 are detailed in Appendix A. Appendix A also depicts the Master Plan Layout for overall development. The estimated water and sewerage load in EPs for the development are shown in Table 2-1, which is 90 EP for Stage 1 (1A & 1B) and 798 overall.

Table 2-1 Estimated Development Water Demand and Sewage Load

Development Type	Stage	Lot Count	Development Unit	Water Demand (EP)	Sewage Load (EP)
Residential Lots	1 (1A & 1B)	32	2.8 EP/connection[1]	89.6	89.6
Residential Lots	Overall	285	2.8 EP/connection[1]	798	798

1 For Single Family Residential (401m^2 to 900m^2)

2.3 Water Supply Demand

DSC previously adopted 400L/EP/d as the average daily consumption rate for water for ultimate scenario analysis as this was evident in Stantec's fire-flow report for Mossman and Whyanbeel WSA. This analysis also assumes 400L/EP/d as average daily water consumption rate to derive the peak day and peak hour flow in ultimate scenario.

Based on the adopted design criteria, the table below shows a summary of the projected water supply demand for the proposed development.

Table 2-2 Estimated Total Water Supply Demand

Stage	Water Demand (EP)	Average Day (L/s)	Max Day (L/s)	Max Hour (L/s)
1 (1A & 1B)	89.6	0.4	0.9	1.9
Overall	798	3.7	8.3	16.6

2.4 Sewage Flow

Based on the adopted design criteria, the table below shows a summary of the projected sewage flows for the proposed development.

Table 2-3 Estimated Total Sewage Flow

Stage	Sewer Demand (EP)	Average Dry Weather Flow (L/s)	Peak Wet Weather Flow, PWWF (L/s)
1 (1A & 1B)	89.6	0.3	2.1
Overall	798	2.5	13

3 Network Planning

This section details the existing and proposed water supply and sewerage infrastructure required to service the development while maintaining FNQROC's Design Criteria.

3.1 Water Supply

The water supply analysis was undertaken in H_2OMap Water software using the Stantec supplied model. The hydraulic analysis was undertaken for existing (2016) and ultimate planning horizons for both Maximum Hour and Fire Flow simulations. All the assumptions in the model remain unchanged in this analysis. The scope of this analysis includes assessing the water supply zone where this development exists.

3.1.1 Existing Infrastructure

The development site is located beside Captain Cook Highway. There are existing water supply network on the north and west of the development site supplied from Craiglie Reservoir. The reservoir is located to the north-west of the site near Captain Cook Highway.

There are two (2) potential water supply connection points near the development site. The first connection points are to the 63mm and 100mm diameter mains at Wabul Street (Off Milman Drive) north of the development site. The second connection point is to the 150mm diameter network located on Captain Cook Highway located to the west of the site. The connection is done along Andreassen Road. The first connection can serve up to 585 EP (209 lots). Any demand beyond this EP warrants the second connection. The existing water supply infrastructure near the development is shown in **Appendix C**.

3.1.2 Future Infrastructure

The network in the development will consist of DN150, DN100 and DN63 pipes to serve the future lots. The Stage 1 development will be served by connecting to the first connection points, i.e. to the north. When other stages are developed, then the second connection point will come in place to serve the entire 285 lots. As mentioned above, the first connection can handle up to 585 EP. **Appendix C** shows the future connection points shown in existing (2016) and ultimate planning horizons.

3.1.3 Hydraulic Modelling

3.1.3.1 Water Model

Late last year, Stantec carried out Whyanbeel and Mossman Fire Flow Assessment for DSC using H_2OMap Water model. Stantec provided Cardno the same model to undertake the analysis. However, the model did not include the water network along Milman Drive immediate north of the development. The model is:

> V15_Fireflow_Assessment.H_2O

3.1.3.2 Model Set-Up

In the above model, the following updates are done:

Existing Scenario:

- Stantec's model is updated by adding the missing water network to the north of the property along Milman Drive. The demands generated there are allocated in the model.
- 90 EP is distributed to various nodes in the water network in Stage 1
- The water connections are made to the DN63 and DN100 network located at Wabul Street (Off Milman Drive), north of the development shown in **Appendix C Figure 1**.

Ultimate Scenario:

- The remaining 708 EP is distributed to the nodes in other stages
- The second water connection is made to the existing DN150 network located at Captain Cook Highway, west of the development in **Appendix C Figure 3.**

3.1.4 Maximum Hour Results – Existing Scenario

The result is analysed without the Stage 1 development in Stantec's original model, which also don't have the demands from the missing lots in Milman Drive. Stantec's model is then modified to add demands from the Stage 1 development along with the demands from missing lots in Milman Drive.

The hydraulic analysis indicates that the additional demand from the proposed development and the missing Milman Drive lots do not result in any failures under maximum hour flow conditions in existing planning horizon. All the nodes have pressures above 22m. **Appendix C, Figure 1** shows the minimum pressures at the nodes in the development site in existing planning horizon.

The following figures **Figure 3-1** and **Figure 3-2** show the pressure map in the relevant water supply zone in existing scenario without and with the development demand plus the demand from the missing lots respectively.

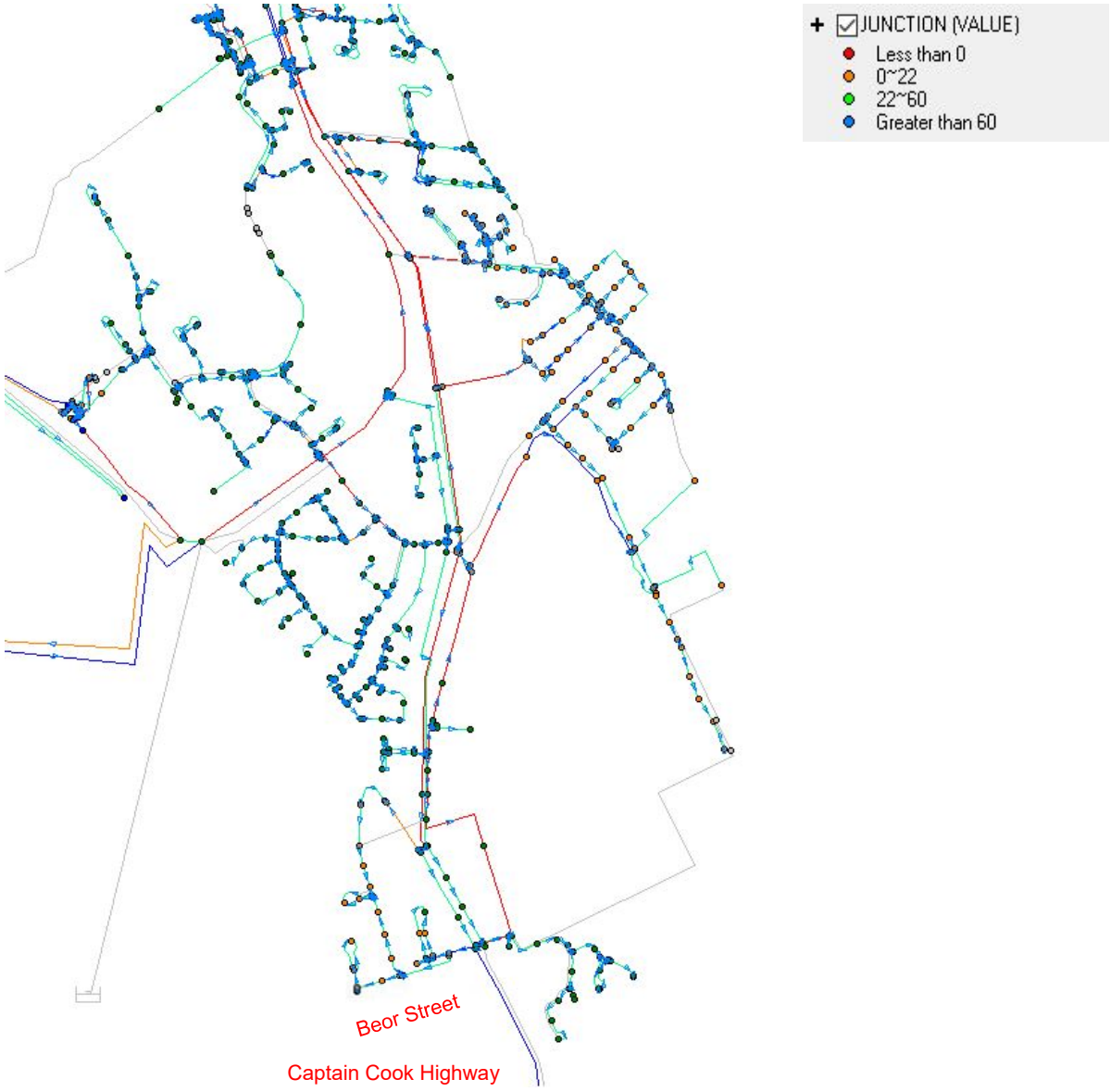


Figure 3-1 Existing - Peak Hour Pressure Map Without the Craiglie Development Demand and Milman Drive Demand

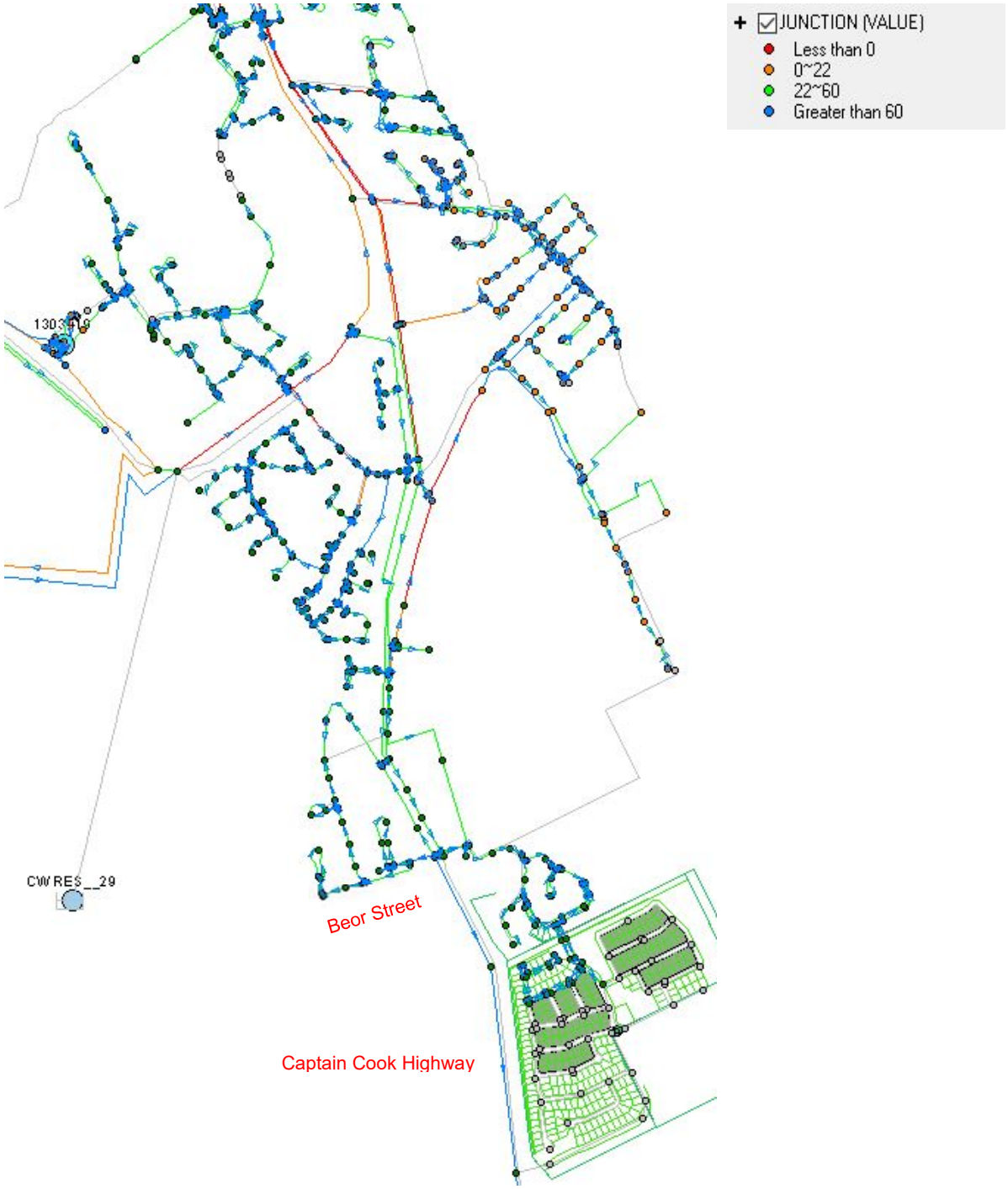


Figure 3-2 Existing - Peak Hour Pressure Map With the Stage 1 Craiglie Development Demand and Milman Drive Demand

As can be seen, the addition of Craiglie development demand and demands from missing lots in Milman Drive hardly changes or worsen the minimum pressure regime in the water supply zone. To improve the flow to the industrial area (west of the Captain Cook Highway and north-west of the development site, a 21m long DN150 augmentation (CW_295) is recommended at Beor Street/Captain Cook Highway intersection. This main was already present in the model but was inactive. This pipe is shown in **Appendix C Figure 1** inset.

3.1.5 Fire Flow Results – Existing Scenario

FNQROC has designated 15 L/s flow for fire-flow simulation in this area. The analysis confirms that in existing scenario with Stage 1 development and with missing lots in Milman Drive, the minimum residual pressure of 12m is maintained at all active nodes in the development area, shown in **Appendix C Figure** 2.

Figure 3-3 shows the fire-flow pressure map obtained from Stantec's original model without the Stage 1 demand and the demand from the missing lots in Milman Drive. Similarly, **Figure 3-4** shows the fire-flow pressure map with the development demand plus the demand from the missing lots in Milman Drive.

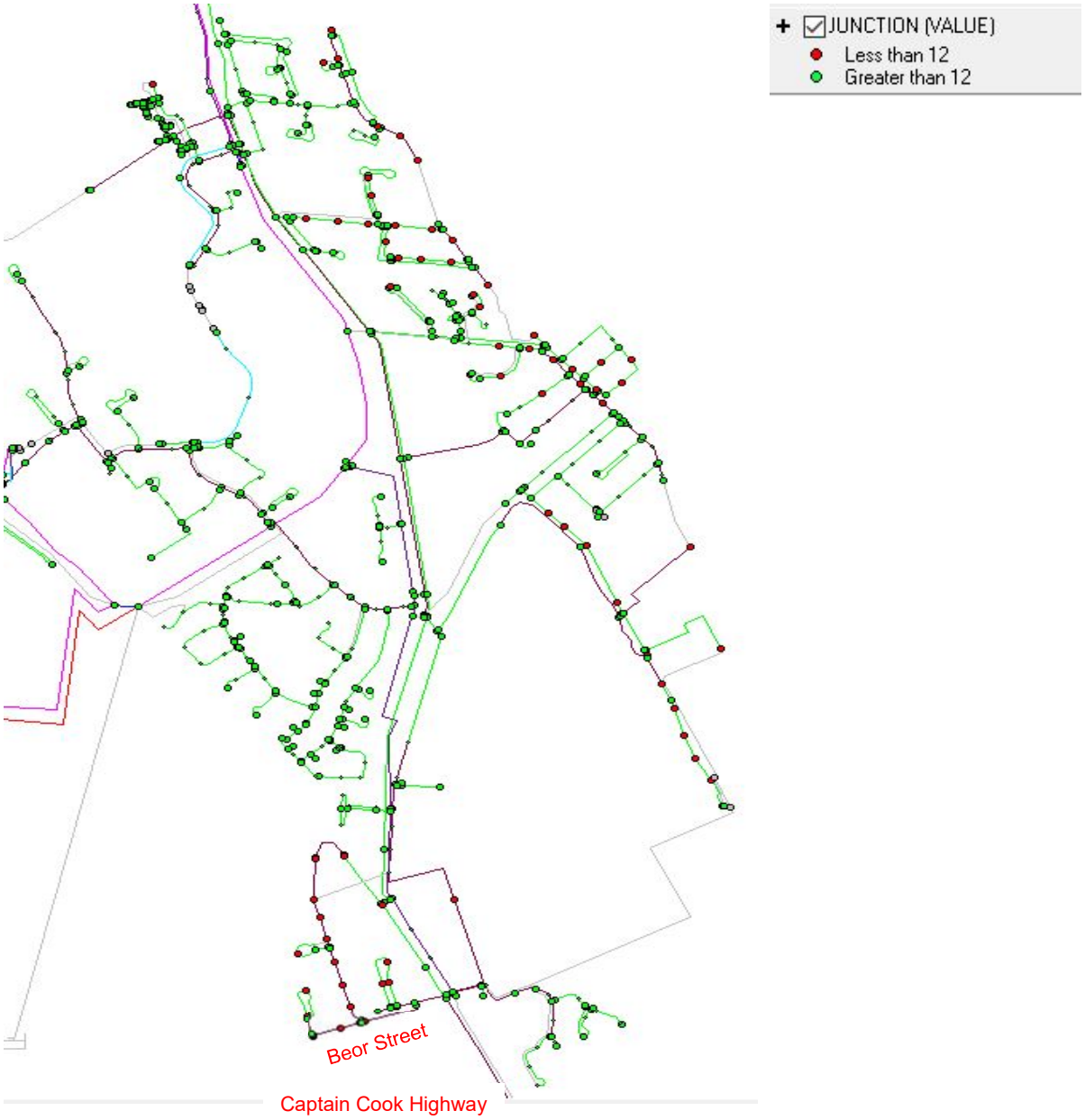


Figure 3-3 Existing – Fire-flow Pressure Map Without the Development Demand and Milman Drive Demand

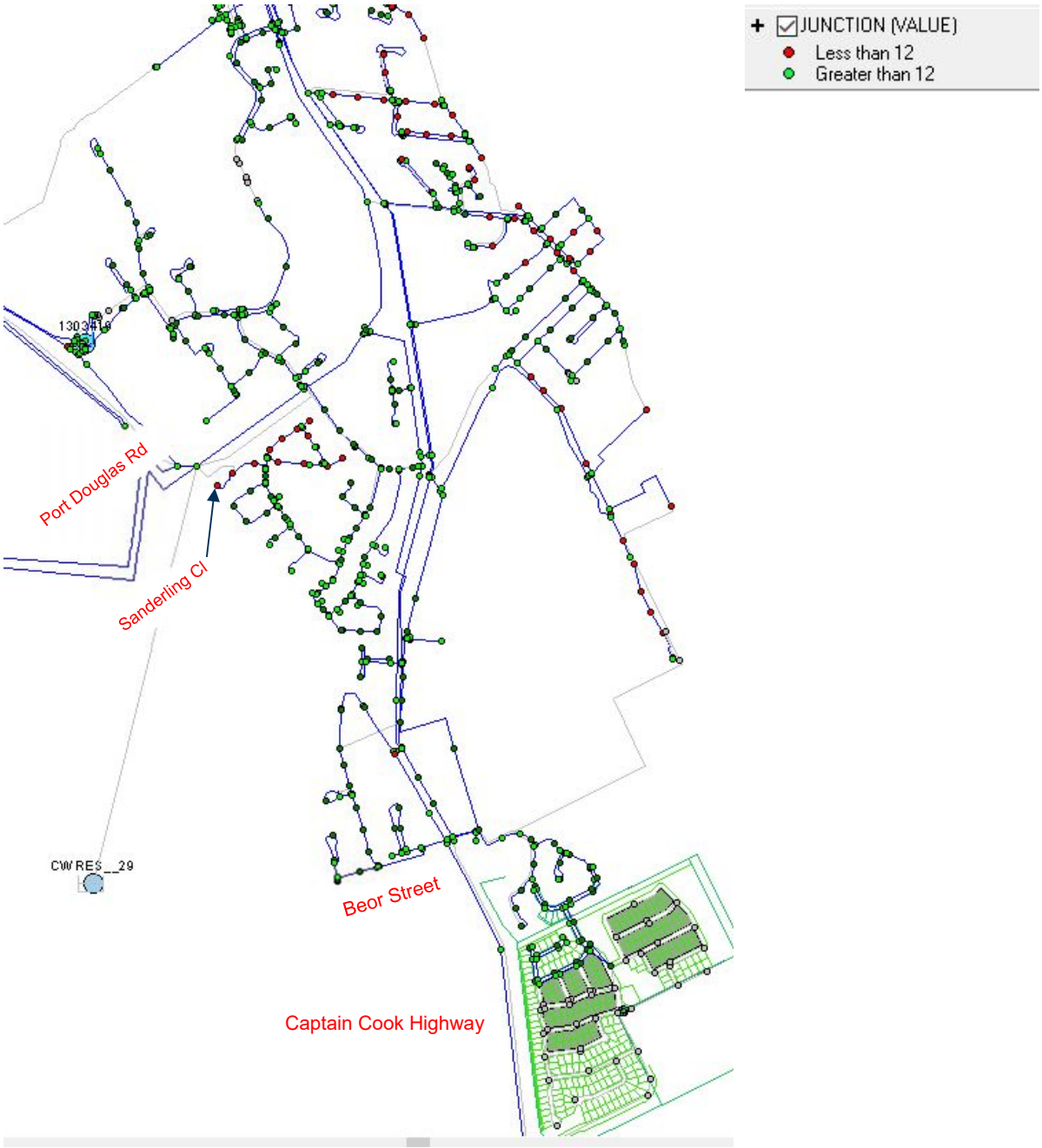


Figure 3-4 Existing – Fire-flow Pressure Map With the Stage 1 Craiglie Development Demand and Milman Drive Demand - Unaugmented

As can be seen, the addition of Craiglie development demand and missing lots in Milman Drive Demand hardly change or worsen the available fire-flow pressure regime in the water supply zone except the area around Sanderling Close south of Port Douglas Road, shown in **Figure 3-4**. The residual pressure in this area reduces below 12m.

Hence, to improve the fire-flow pressure to this area, a 168m long DN100 augmentation (CW_609), shown in **Appendix C Figure 2** is recommended. This main was already present in the model but was inactive. The fire-flow pressure after the augmentation is shown in following **Figure 3-5**. This shows the improved pressure in that area.

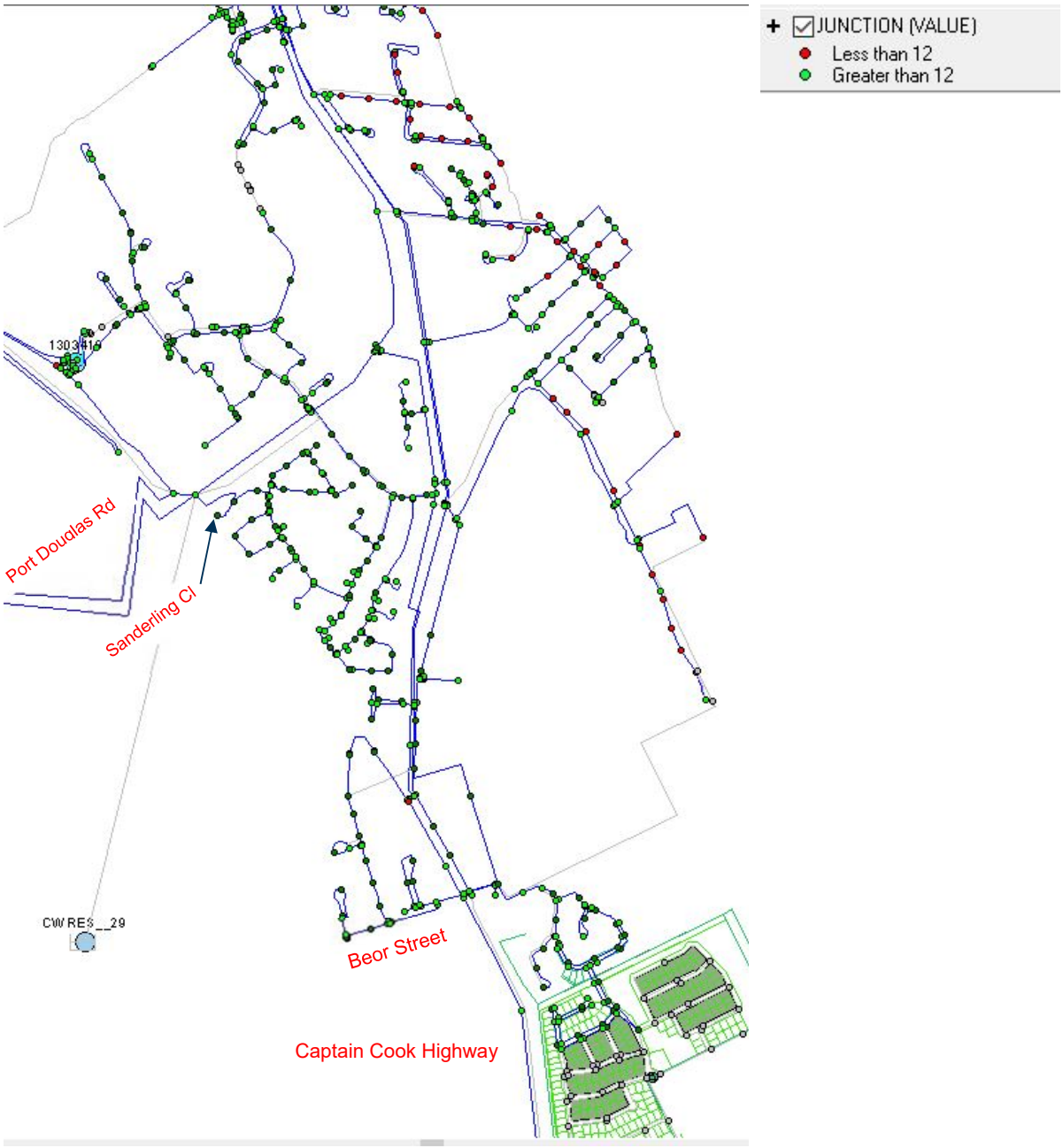


Figure 3-5 Existing – Fire-flow Pressure Map With the Stage 1 Craiglie Development Demand and the Milman Drive Demand – Augmented

3.1.6 Maximum Hour Results – Ultimate Scenario

The second water connection is made to the existing DN150 network on Captain Cook Highway, west of the development as mentioned in Item 3.1.2. The connection is made along Andrreassen Road. It is assumed the entire development will happen by ultimate planning horizon. This second connection must be done when EP from Craiglie development exceeds 585 EP (209 lots).

The result is analysed for ultimate scenario in Stantec's original model, which does not include the Craiglie development demand but includes the demands from the missing lots in Milman Drive (though the network in Milman is not shown in the original model). The pressure map for this original model is shown in **Figure 3-6.** The result is also analysed for ultimate scenario in the updated model with the entire Craiglie development. The pressure map for this updated model is shown in **Figure 3-7**.

The hydraulic analysis indicates that the additional demand from the entire Craiglie development and the Milman drive development do not result any failures under maximum hour flow conditions in ultimate planning horizon. All the nodes have pressures above 22m as shown in **Appendix C Figure 3**.

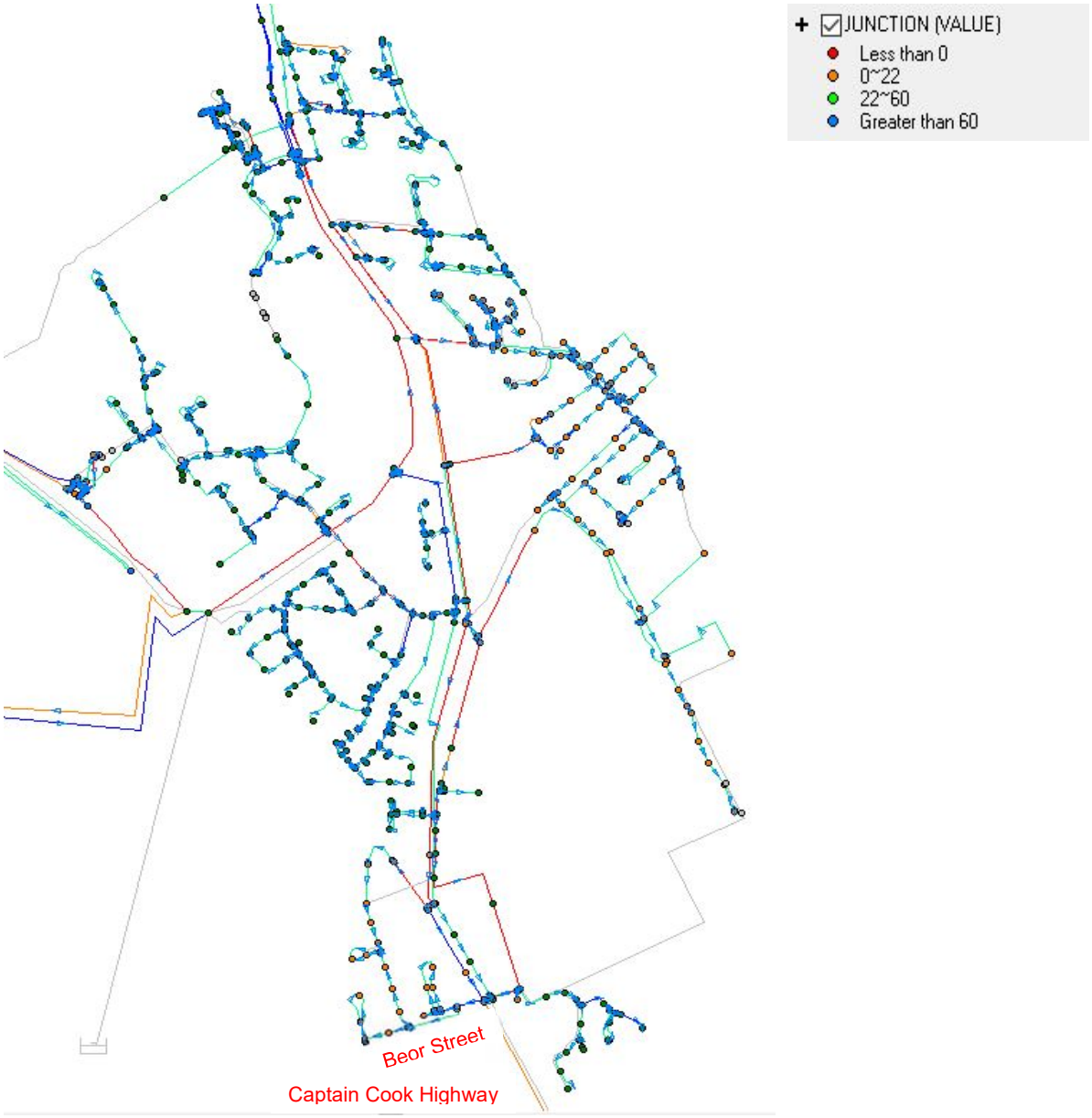


Figure 3-6 Ultimate - Peak Hour Pressure Map Without the Craiglie Development Demand

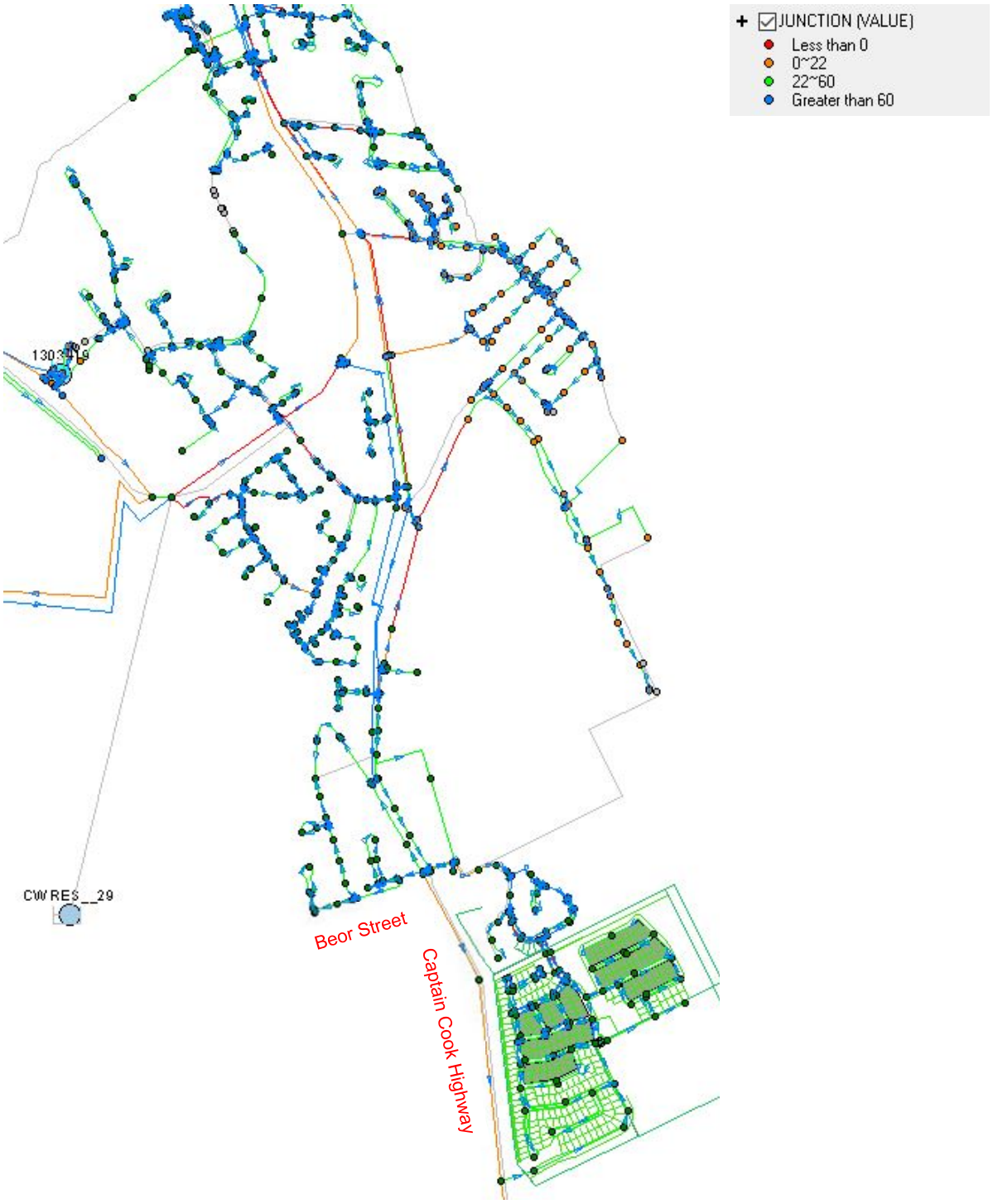


Figure 3-7 Ultimate - Peak Hour Pressure Map With the Craiglie Development Demand

As can be seen, the addition of Craiglie development and the demands from missing lots in Milman Drive do not change the minimum pressure regime in the water supply zone.

3.1.7 Fire Flow Results – Ultimate Scenario

The analysis confirms that in the ultimate planning horizon with the entire development in place and the demands from the missing lots in Milman Drive, the minimum residual pressure of 12m is maintained at all nodes in the development area, shown in **Appendix C Figure** 4.

The following figures **Figure 3-8** and **Figure 3-9** compare the fire-flow pressure map in the relevant water supply zone in ultimate scenario without the development demand in Stantec's original model and with the entire demand in the updated model respectively.

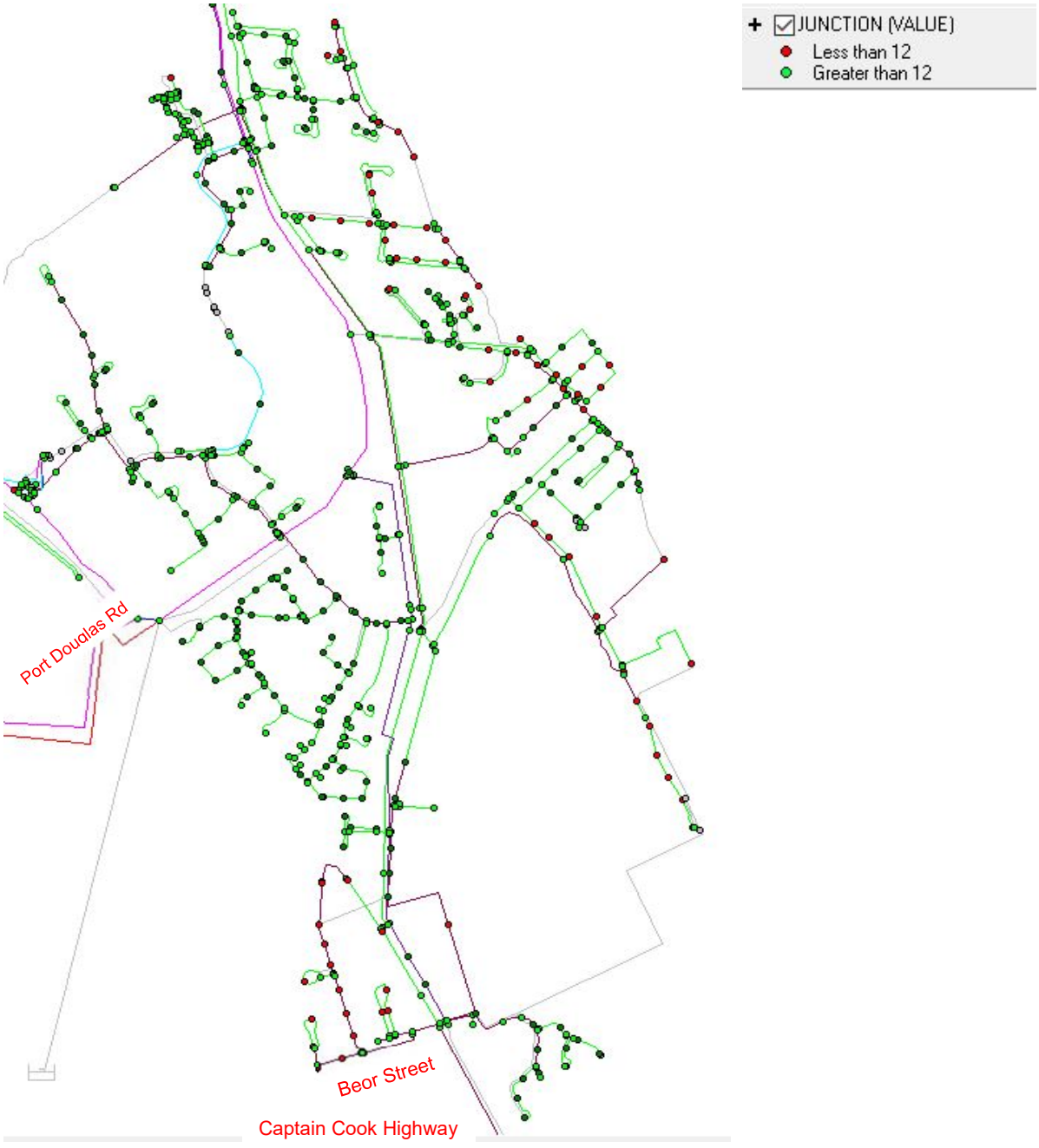


Figure 3-8 Ultimate – Fire-flow Pressure Map Without the Craiglie Development Demand

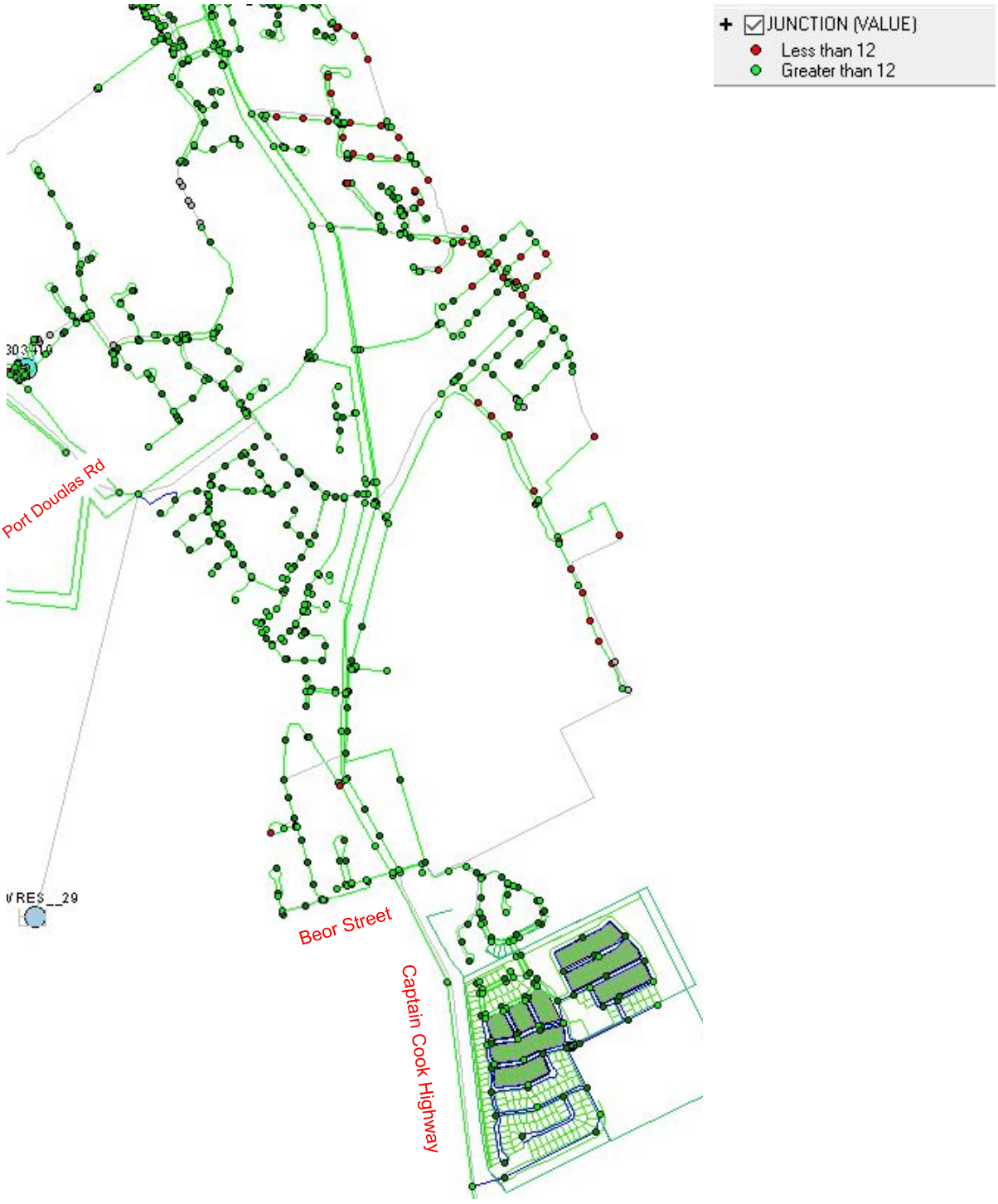


Figure 3-9 Ultimate – Fire-flow Pressure Map With the Craiglie Development Demand

As seen, the addition of Craiglie development demand does not worsen the fire-flow pressure in the water supply zone.

3.2 Sewerage Infrastructure

This section details the future sewerage infrastructure required to discharge the sewage flow from the development to the existing network whilst maintaining FNQROC's Design Criteria.

3.2.1 Existing Infrastructure

The development site is within the catchment of Port Douglas Wastewater Treatment Plant (PDWWTP) located about 6km north-west from the development site.

There is existing sewerage network near the development area. A gravity sewer network exists north of the development site. This network is in a pump station PDPP catchment. On the western side of the development, there is a DN80 rising main running along Captain Cook Highway. This DN80 rising main discharges to the gravity network of pump station PDCL catchment. There is also DN300 trunk rising main about 700m north of the development site at the intersection of Captain Cook Highway and Beor Street (Junction ID: 69246). All other existing pump stations inject to this trunk DN300 rising main which transfers sewage direct to PDWWTP. The existing sewerage network near the development site and these existing pump catchments are shown in Appendix D Figure 1.

3.2.2 Future Infrastructure

Due to the quantity of the sewage generated from the entire 285 lots, it is not advisable to discharge the flow in gravity network of PDPP catchment or DN80 rising main of PDCL catchment. This will trigger the network and pumps augmentation in these catchments. Hence, it is recommended to inject the discharge from the development area to DN300 rising main at Beor Street and Captain Cook Highway intersection.

The topography of the development area is such that the land falls towards north from the south. Hence, a future pump station is proposed at the Stage 1 location on the northern side of the development area. The sewage generated from the entire development area will then flow by gravity to this pump station. From here, a proposed rising main running along Captain Cook Highway will convey sewage to the existing DN300 rising main.

The characteristics of the wet well for the proposed pump station is as follows:

ITEM		LEVEL (A.H.D.)	HEIGHT FROM BASE (m)
A	TOP OF SLAB	4 m	6.55
B	GRAVITY MAIN INLET	-0.9 m	1.65
C	DUTY START	-1.2 m	1.35
D	PUMP STOP	-1.7 m	0.85
E	FLOOR SLAB	-2.55 m	
F	PUMP STATION DEPTH	N/A	
H	EXISTING GROUND LEVEL	3.95 m	6.5
J	HIGH LEVEL ALARM	-0.95 m	1.6
K	OVERFLOW LEVEL	3.7 m	6.25
L	PRE-OVERFLOW ALARM	3.4 m	5.95
M	Q100 LEVEL	3.5 m	6.05

3.2.3 Hydraulic Modelling

3.2.3.1 Sewerage Model

Stantec provided Cardno the sewage model to complete the sewerage assessment. However, the model did not include the sewerage network along Milman Drive immediate north of the development. The model is:

> Mossman and Port Douglas Sewer Model_V9.HSM

3.2.4 Model Set-Up

Stantec's model is updated by adding the loads from the missing lots along Milman Drive. The sewage generated from these lots are discharged to pump station. The rising main then conveys sewage to manhole in PDPP catchment shown in Appendix D. The total EP from these lots is added to PDPP wet well.

Hydraulic analysis is undertaken for ultimate planning horizon when the entire development takes place. The scope of the work is to analyse the infrastructure required to discharge the flow from the development area to the existing sewerage network and the impacts of this additional load to existing development. It does not include the analysis of the internal reticulation in the proposed development.

The proposed wet well is updated with above levels and the total PWWF (13L/s) generated from the entire development area is applied to this wet well.

In terms of proposed rising main, we analyse the network with two (2) options – DN100 and DN150 when all existing pump stations are running simultaneously.

3.2.5 Model Results

Option 1 – DN100 rising main

The first option is using DN100 rising main to inject the sewage generated from the development area to the existing DN300 rising main. Upon modelling, the following results are observed:

- Head gained = 82.3m
- Velocity = 1.53m/s

Option 2 – DN150 rising main

The second option is using DN150 rising main. Upon modelling, the following results are observed:

- Head gained = 65.8m
- Velocity = 0.74m/s

The head gained in Option 1 is very high due to increased head loss in DN100. Hence, Option 2 with bigger rising main (DN150) is selected as it gives comparatively lower head for the proposed pumps to overcome.

We also analyse the network with DN150 rising main when other existing pumps are not working except the proposed pumps. The idea is to find the range of the head the proposed pumps need to overcome. The findings are given below:

- Head gained = 10.7m
- Velocity = 0.74m/s

Hence, the future pumps selected at the development area must have variable frequency drive (VFD) to discharge the flow at variable head between from 10.7m to 65.8m. The future proposed sewer infrastructure is shown in Appendix D Figure 1.

Impact on Existing Pump Stations

The wet well levels of existing individual pump stations injecting into the DN300 rising main are analysed to see if the proposed demand from this development have any detrimental effects on the wet well levels as the development demand is also injected into this rising main. The analysis shows, all the pumps operate without any problem.

4 Conclusions

The following conclusions are made from the water supply and sewerage assessment.

> The proposed entire development will have a water supply demand of 798 EP contributing Maximum Hour Demand of 16.6 L/s. In Stage 1, water supply demand is 90 EP with 1.9 L/s of Maximum Hour Demand

> The proposed development will generate a sewage load of 798 EP contributing PWWF of 13 L/s.

> An assessment of the existing water supply and sewerage network was undertaken using Stantec's water and sewer model, which were updated with the water demand and sewerage load from the missing lots in Milman Drive constructed approximately 5 years ago.

4.1 Water Supply

> The internal reticulation main in the development area will consists of DN150, DN100 and DN63 mains

> The Stage 1 development will be serviced by connecting to the DN63 and DN100 network located at Wabul Street (Off Milman Drive), north of the development

> A DN150 augmentation (CW_295) is proposed at the time of Stage 1 development to maintain the residual pressure in the industrial area (west of the Captain Cook Highway and north-west of the development site)

> A 168m long DN100 augmentation (CW_609) is proposed at the time of Stage 1 development to improve the fire-flow in the area around Sanderling Close south of Port Douglas Road (north-west of the development site)

> All Stage 1 development junctions will meet the minimum pressure and fire-flow requirements

> In the ultimate when all stages are developed, the second connection will be made to existing DN150 main running on Captain Cook Highway. This second connection will come in place when the development EP exceeds 585 EP (209 lots).

> All junctions in the entire development area will satisfy the minimum pressure criteria and fire-flow criteria. The surrounding areas will not be impacted by our development.

4.2 Sewerage

> The development site is within the catchment of Port Douglas Wastewater Treatment Plant

> The topography of the lot is such that the site falls towards north from the south. Hence, a pump station is proposed at the Stage 1 location on the northern side of the development area.

> At present, there is gravity network exists to the north of the proposed site and DN80 rising main running along Captain Cook Highway to the west of the proposed site. Also, DN300 trunk rising main exists at the intersection of Captain Cook Highway and Beor Street, about 700m north of the development which conveys sewage directly to Port Douglas Wastewater Treatment Plant.

> The sewage generated from the development area is recommended to inject into existing DN300 rising main to avoid the network or pump station augmentations, which otherwise would have been required if sewage discharged to other catchments

> DN150 rising main is recommended to maintain reasonable pumping head to inject to DN300 rising main

> The head at which the proposed pumps at the development site have to work, varies between 10.7m and 65.8m depending whether other existing pumps are running or not. Hence, variable frequency drive pumps are preferred

> The additional load from the proposed development does not impact on the performance of existing pumps.

Development Application for Water and Sewerage Services

APPENDIX A

DEVELOPMENT LAYOUT PLANS

Figure A-1 Stage 1 Development (Stage 1A + Stage 1B)
Figure A-2 Port Douglas Estate Master Plan

Cardno
Shaping the Future

FIGURE A-1

STAGES 1A & 1B

PORT DOUGLAS ESTATE
CAPTAIN COOK HIGHWAY
CRAIGLIE

north

STAGE 1B

STAGE 1A

DULKU CLOSE

WABUL STREET

CAPTAIN COOK HIGHWAY

ROAD 14.5m Wide

ROAD 15.5m Wide

20m Wide

Drainage Reserve 5265m²

Park 2000m²

Emt A

PROPOSED DRAINAGE RESERVE & NOISE AMELIORATION FENCE

Future Park & Drainage Reserve

Future Residential

Future Residential

Future Residential

SP252226

Lot	Area
1	700m²
2	700m²
3	601m²
4	600m²
5	600m²
6	600m²
7	700m²
8	700m²
9	600m²
10	600m²
11	600m²
12	600m²
13	600m²
14	600m²
15	600m²
16	700m²
17	600m²
18	600m²
19	700m²
20	702m²
21	612m²
22	612m²
23	680m²
24	680m²
25	680m²
26	680m²
27	669m²
28	655m²
29	641m²
30	641m²
31	625m²
32	614m²

Cardno®
Tel: (07) 4034 0500

Date: 28th May 2019 | Scale: 1 : 1000 @ A3 | Drawn: MC | Job No.: Q184103 | Plan No.: Q184103-MP02B

This plan is conceptual and for discussion purposes only. All areas, dimensions and land uses are preliminary, subject to investigation, survey, engineering, and Local Authority and Agency approvals.

north

MASTER PLAN

PORT DOUGLAS ESTATE
CAPTAIN COOK HIGHWAY
CRAIGLIE

FIGURE A-2



Cardno®

Tel: (07) 4034 0500

This plan is conceptual and for discussion purposes only. All areas, dimensions and land uses are preliminary, subject to investigation, survey, engineering, and Local Authority and Agency approvals.

PRELIMINARY ONLY

Date: 28th May 2019 | Scale: 1 : 1500 @ A1 | Drawn: MC | Job No.: Q184103 | Plan No.: Q184103-MP01C

Development Application for Water and Sewerage Services

APPENDIX B

FNQROC DESIGN CRITERIA

Figure B-1 Water Design Criteria
Figure B-2 Sewerage Design Criteria

Cardno
Shaping the Future

B-1: WATER DESIGN CRITERIA

D6.07 DESIGN CRITERIA [CRC]

1. Flow Parameters

Unless advised otherwise by Council, the Average Daily consumption and peaking factors for the design of Water Supply Schemes shall be as follows:

Average Daily Consumption (AD)	400 litre/EP/day for Cairns Regional Council
	500 litre/EP/day for all other Councils
Mean Day max Month (MDMM)	1.50 x AD
Peak Day (PD)	2.25 x AD
Peak Hour (PH)	1/12 x PD

In the absence of specific flow consumption data the Average Daily Consumption shall be calculated using the equivalent demands shown in Table 6.1.

Table 6.1 Equivalent Demands

Description	Equivalent Persons (EP)/Connection
Single Family Dwelling	
Lot > 1500m²	3.7
Lot 1101m²	3.4
Lot 901m² to 1100m²	3.1
Lot 401m² to 900m²	2.8
Lot < 400m²	2.5

2. Pressure Parameters

a) Minimum Service Pressure (excluding fire fighting)

Minimum Pressure	22 metres head at peak hourly consumption
Minimum Pressure Location	For lots at or below road reserve level at the property boundary. For lots above the road reserve level at a nominated level practical building site. Or in the absence of a natural or benched building site the mean lot level shall be used.
Minimum Pressure Network Condition (for modelling from a reservoir).	Based on the reservoir level for Peak Hour of the third day of three consecutive Peak Day events (for dynamic models). In the absence of dynamic model results the minimum reservoir level shall be assumed at 15% of storage height. Liaise with Council to confirm minimum pressure constraints available at the connection to the existing system.

Note 1: The minimum pressure in the table is for the purpose of design and is not a guaranteed minimum pressure. Refer to the service providers Customer Service Standards.

Note 2: Where building envelope pressure is less than 30m, a notation will be placed on the rates file advising the owner that any booster pump required to augment pressures to the building is to be supplied, installed, maintained and replaced at the property owners expense.

b) Maximum Pressure

Maximum Pressure	60 metres head, see Note 1
Maximum Pressure Location	At the building pad
Maximum Pressure Network Condition (for modelling from a reservoir).	Based on reservoir level at 95 percent of top water level

Note 1: Where the pressure in a main exceeds 600 kPa, Council may require the installation of Pressure Reducing Valves (PRV) that may (at Council's discretion) include telemetry control. Prior to proceeding with any design, Council shall be provided with details of the area affected and the number of lots involved.

3. Fire Fighting Parameters

Category	Fireflow Requirement	Number & Duration
Residential (i.e. Residential dwellings of a maximum of 3 storeys)	15 L/s for 2 hours	1 @ 2 hours
Commercial (i.e. Shop and office accommodation of a maximum of 3 storeys) **and Industrial**	30 L/s for 4 hours	1 @ 4 hours
High Risk (i.e. A development where there is a probability of a fire occurring or there is a high cost of resultant damage (personal injury or property)	To be determined in consultation with council. Alternative methods of provision may be required (i.e. on-site storage).	Adopt a special hazard or risk fire
Residual pressure is to be 12m minimum at an adjacent hydrant at the required background demand time, assuming that the elevation of the supply point is equal to the ground elevation at the hydrant. 6m minimum residual pressure is to be retained in the mains for all other areas of the water supply zone at the required background demand time. Positive residual pressures must exist at peak hour, within the reticulation during the fire event.		

(Refer: "Planning Guidelines for Water Supply and Sewerage")

a. Background Demand

The following minimum criteria should be adopted for background demand during a fire event:

- Predominantly Residential Areas
  - The minimum residual pressure specified should be exceeded with a background demand of 2/3 Peak Hour demand
  - A check should be undertaken at Peak Hour demand to ensure that pressures in the network remain positive.
  - The calculated background demand should not be less than Average Day demand.
- Predominantly Commercial / Industrial Areas – In this case, the following scenarios should be investigated with the worst case being adopted:
  - At Peak Hour demand of the Commercial / Industrial area (e.g. between 10am to 4pm). The intent of this scenario is to assess the local reticulation performance.
  - At 2/3 Peak Hour demand of the water supply zone (e.g. around 6pm). The intent of this scenario is to assess the zone trunk performance.
- Mixed Residential / Commercial / Industrial Areas – In such cases a combination of background demand conditions similar to the Predominantly Commercial / Industrial Areas above should be examined.

B-2: SEWERAGE DESIGN CRITERIA

D7.08 DESIGN CRITERIA

1. Capacity

   a. Population estimates shall be based on those equivalent demands detailed in Table 7.1

Table 7.1 Equivalent Demands

Description	Equivalent Persons/Connection
Single Family Dwelling	
Lot > 1500m²	3.7
Lot 1101m² to 1500m²	3.4
Lot 901m² to 1100m²	3.1
Lot 401m² to 900m²	2.8
Lot < 400m²	2.5
Multi Unit Accommodation	
Units > 3 bedrooms	0.4 +(0.6 x no. bedrooms)
Units = 3 bedrooms	2.2
Units = 2 bedrooms	1.6
Units < 2 bedrooms	1.0
Caravan Parks	
Van Site / Camping Site	1.2
Shops / Offices	
Per 90m² GFA	1.0

Notes:

1. Based on 2.8 Equivalent Persons / Equivalent Domestic Connection (EP/EDC), with 1 EDC equivalent to a single residential dwelling on a standard size allotment (401m² to 900m²).
2. For undeveloped land equivalent populations shall be calculated in accordance with the maximum allowable population density in the Planning Scheme for that land use, or estimation of maximum allowable density agreed with Council prior to design

   b. The minimum pipe capacity shall be based on the criteria detailed in Table 7.2

Table 7.2 Sewerage Loading

1	Average Dry Weather Flow (ADWF)	270 L / EP / d	Based upon analysis of pump station flows and STP inflow records during dry weather
2	Peak Wet Weather Flow (PWWF)	5 x ADWF or C_1 x ADWF whichever is greater	C_1 Peaking Factor $= 15 \times (EP)^{-0.1587}$ Minimum Value C_1 to be 3.5
3	Peak Dry Weather Flow (PDWF)	C_2 x ADWF	C2 Peaking Factor = $4.7 \times (EP)^{-0.105}$
4	Vacuum Sewer Peak wet weather flow (PWWF)	4xADWF	Peaking factor of 4
5	Smart Sewer Peak wet weather flow (PWWF)	4xADWF	Peaking factor of 4

2. Pipe Velocity

   a. Pipe velocities shall be based on the details shown in Table 7.3

Table 7.3 Pipe Velocities

Design Criteria	Recommended value
Mannings 'n' (PVC)	0.0128
Mannings 'n' (Poly)	0.0128
Minimum velocity @ PWWF	0.7 m/s
Minimum velocity @ PDWF	0.3 m/s
Depth of Flow @ PWWF – Proposed sewers	Max Flow depth shall not exceed ¾ pipe full

3. Minimum Grades

   a. Minimum grades for sewer reticulation mains are to be as summarised in Table 7.4.

D7.19 PRESSURE MAINS

1. For detailed design of sewer pressure mains (rising mains) the requirements of Design Manual D6 Water Reticulation should be noted and the mains shall be designed as per the procedures relevant to Water Supply Mains with the exception of the following:

   a. Air release valving should be provided to high points as required.

   b. Scour valving should be provided to low points as required. Scouring must be to a scour manhole or adjacent gravity sewer system.

   c. Thrust Block and Trenching Details shall be as per the Standard Drawings S2015 and S2016.

   d. Line valves, scours and air valves are to be provided as required to reduce scour volume.

2. Consideration needs to be given to the potential for sulphide generation in pressure mains.

3. Sewer pressure mains shall be a minimum 100mm uPVC Class 12 unless approved otherwise by Council. Sewer pressure mains shall be colour 'cream'.

4. All Discharge manholes shall be fitted with a HDPE or wound PVC manhole liner suitable for exposure to sewerage. Where the discharge manhole is an existing manhole, the manhole internal surfaces shall be adequately dried and then coated with an approved epoxy coating.

5. Sewer pressure mains shall be designed in accordance with the minimum specific design criteria shown in Table 7.15 and WSA 04-2005.

Table 7.15 Pressure Main Design

Item	Description	Adopted Design Parameter	Comments
1	Flow Equation	Darcey-Weisbach formula	
2	Minimum Diameter	100mm – unless approved otherwise by Council.	
3	Friction Factors	Refer Item 10 in Table 7.14	
4	Minimum Velocity (on a daily basis)	0.75m/s	To prevent the deposition of solid material such as grit
5	Preferred Minimum Velocity	1.5 m/s	To provide for slime stripping on a regular basis
6	Maximum Velocity	2.5 m/s	To prevent damage to pipe lining
7	Configuration	Pressure Mains should be sized to optimise the balance between reduction of detention times and life cycle cost. Factors to be considered include but not be limited to: • Population growth • Staging • Operational features to provide for	

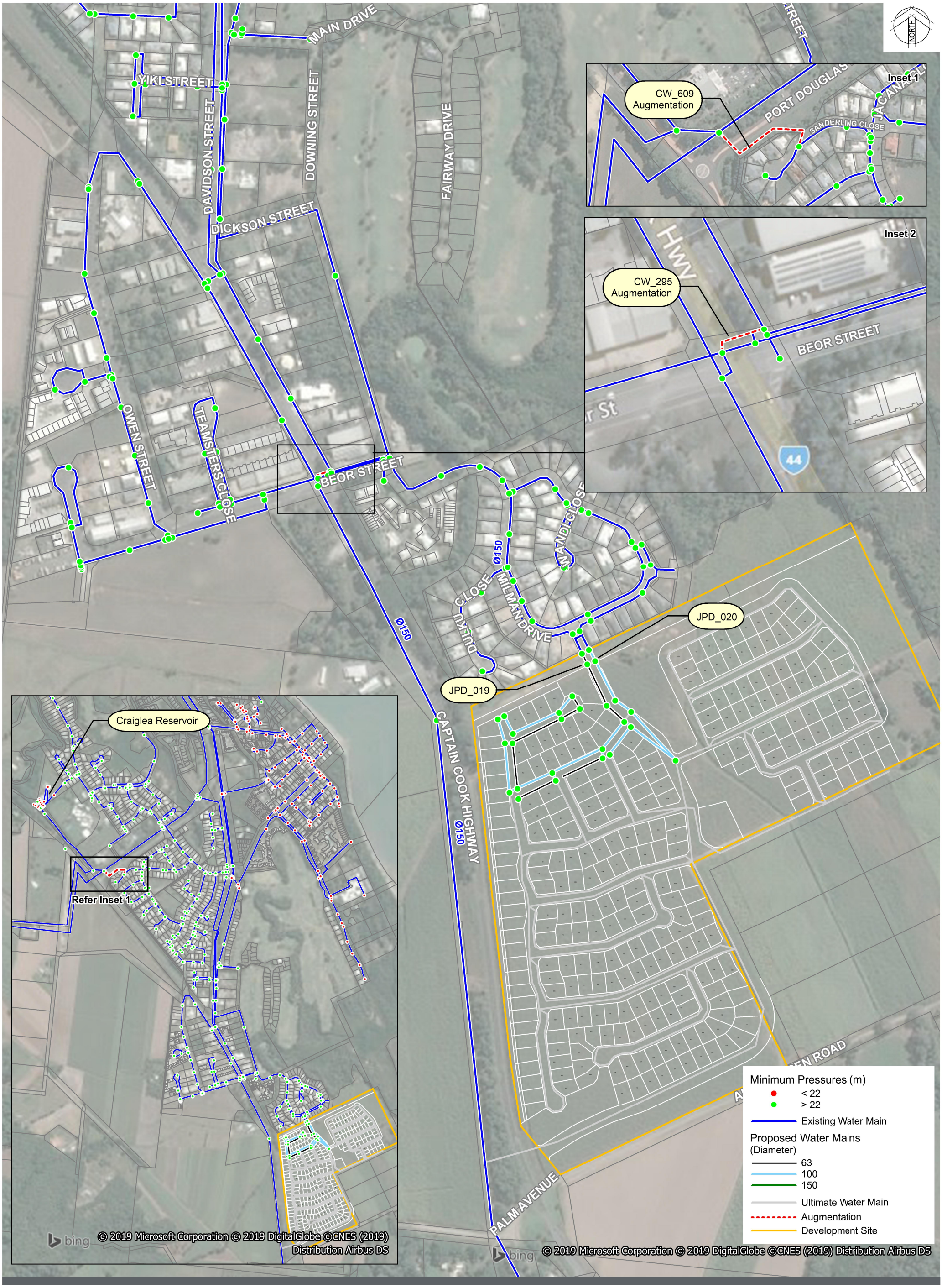
Development Application for Water and Sewerage Services

APPENDIX C

WATER SERVICING STRATEGY

Figure 1 Stage 1 Minimum Pressures
Figure 2 Stage 1 Minimum Fire-flow Pressures
Figure 3 All Stages Minimum Pressures
Figure 4 All Stages Minimum Fire-flow Pressures

Cardno
Shaping the Future



DATE PLOTTED: 16/09/2019 BY: Les Wright
FILE: M:\Q184103 - Craiglea Water and Sewerage Design_Project material\GIS\MapInfo\Figures\Figures_Water_v3.wor

Cardno

Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
16/09/2019

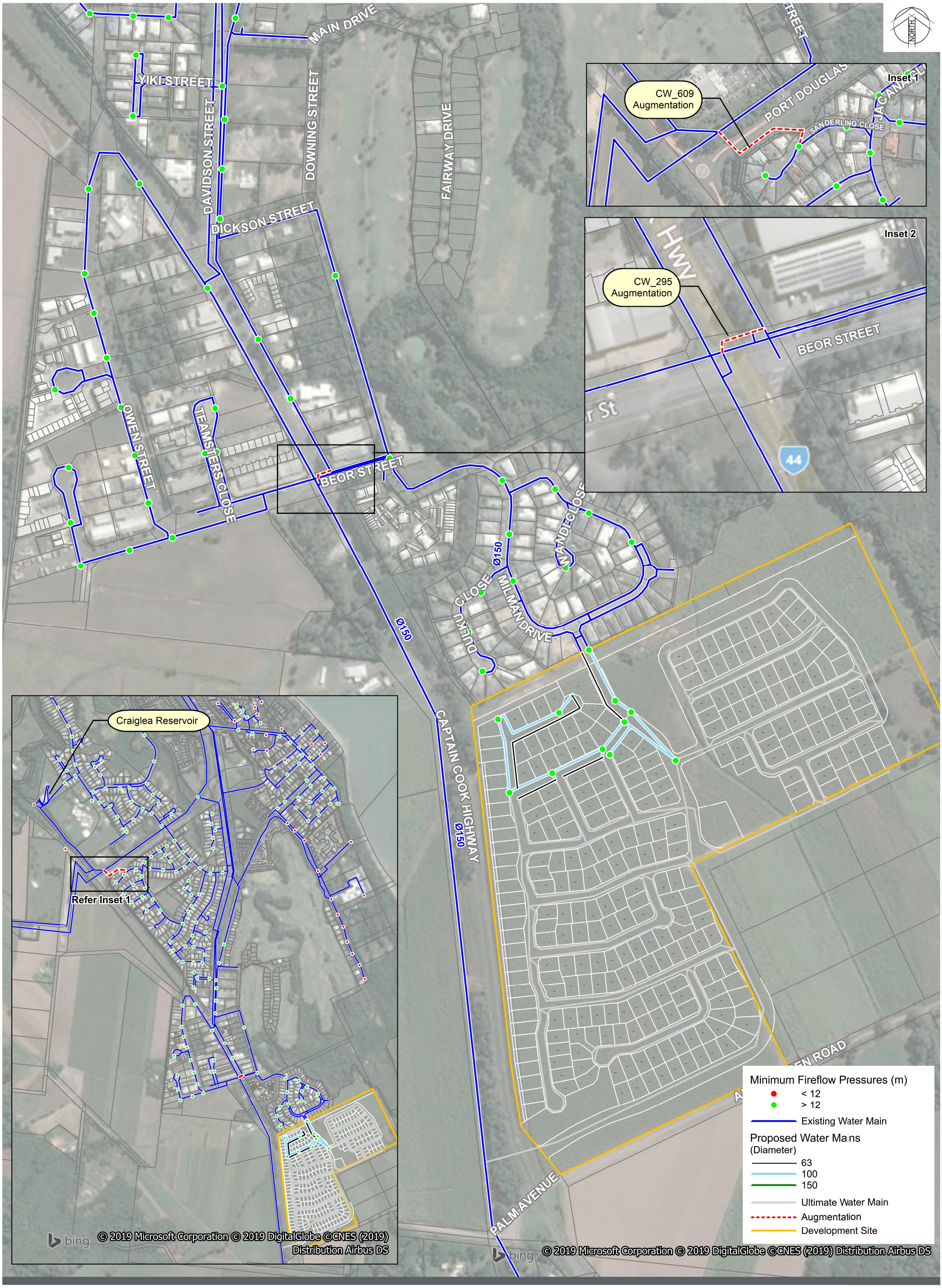
Size
A3

Scale
1:5,000

50 0 50 100 150
Metres

CRAIGLIE WATER AND SEWER DESIGN
WATER SUPPLY - MINIMUM PRESSURES
STAGE 1 - 2016

FIGURE 1



Cardno

Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
16/09/2019

Size
A3

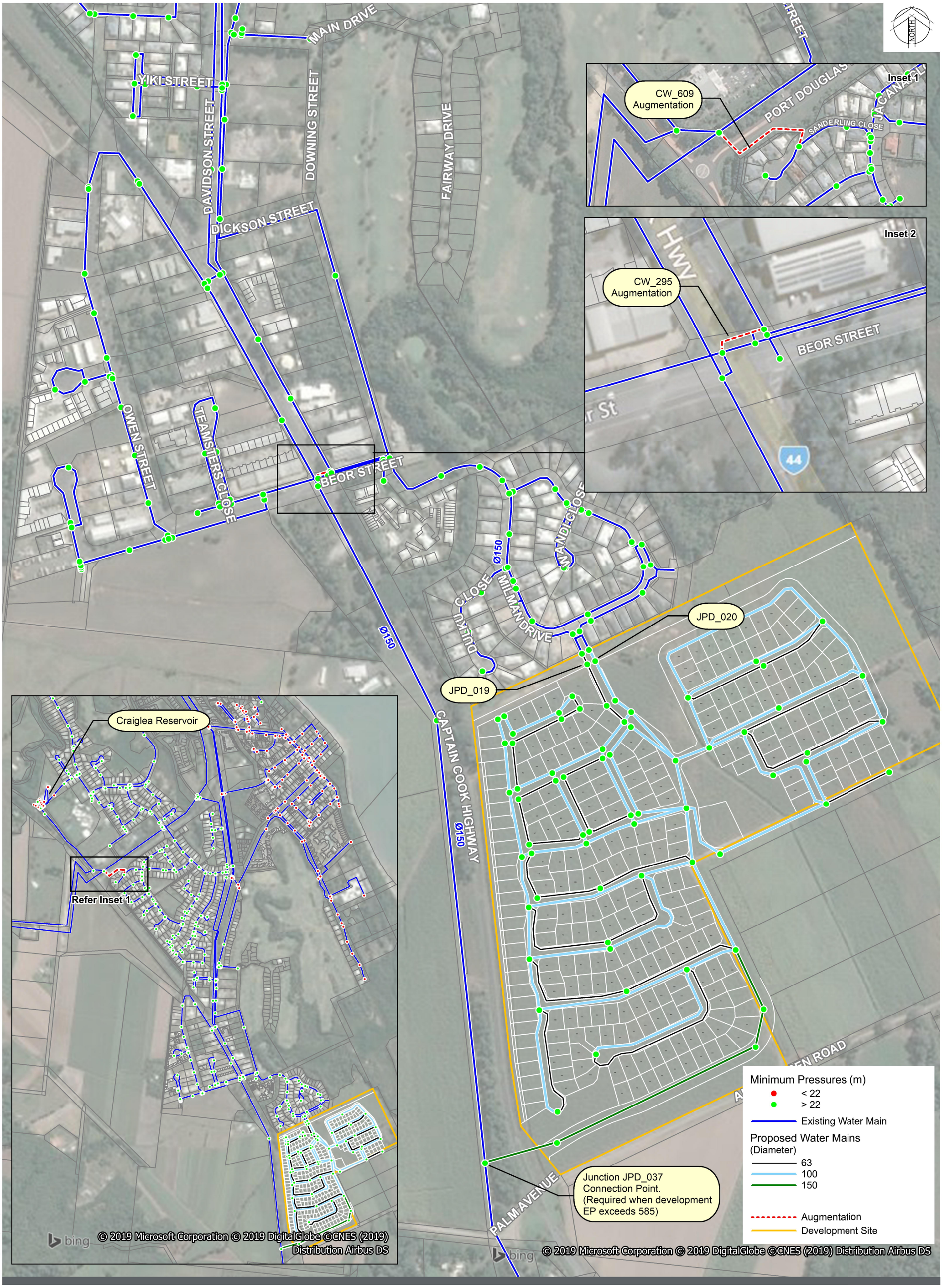
Scale
1:5,000

50 0 50 100 150
Metres

CRAIGLIE WATER AND SEWER DESIGN
WATER SUPPLY - MINIMUM FIREFLOW PRESSURES
STAGE 1 - 2016

FIGURE 2

DATE PLOTTED: 16/09/2019 BY: Les Wright
FILE: M:\Q184103 - Craiglea Water and Sewerage Design_Project material\GIS\MapInfo\Figures\Figures_Water_v3.wor



Cardno
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
16/09/2019

Size
A3

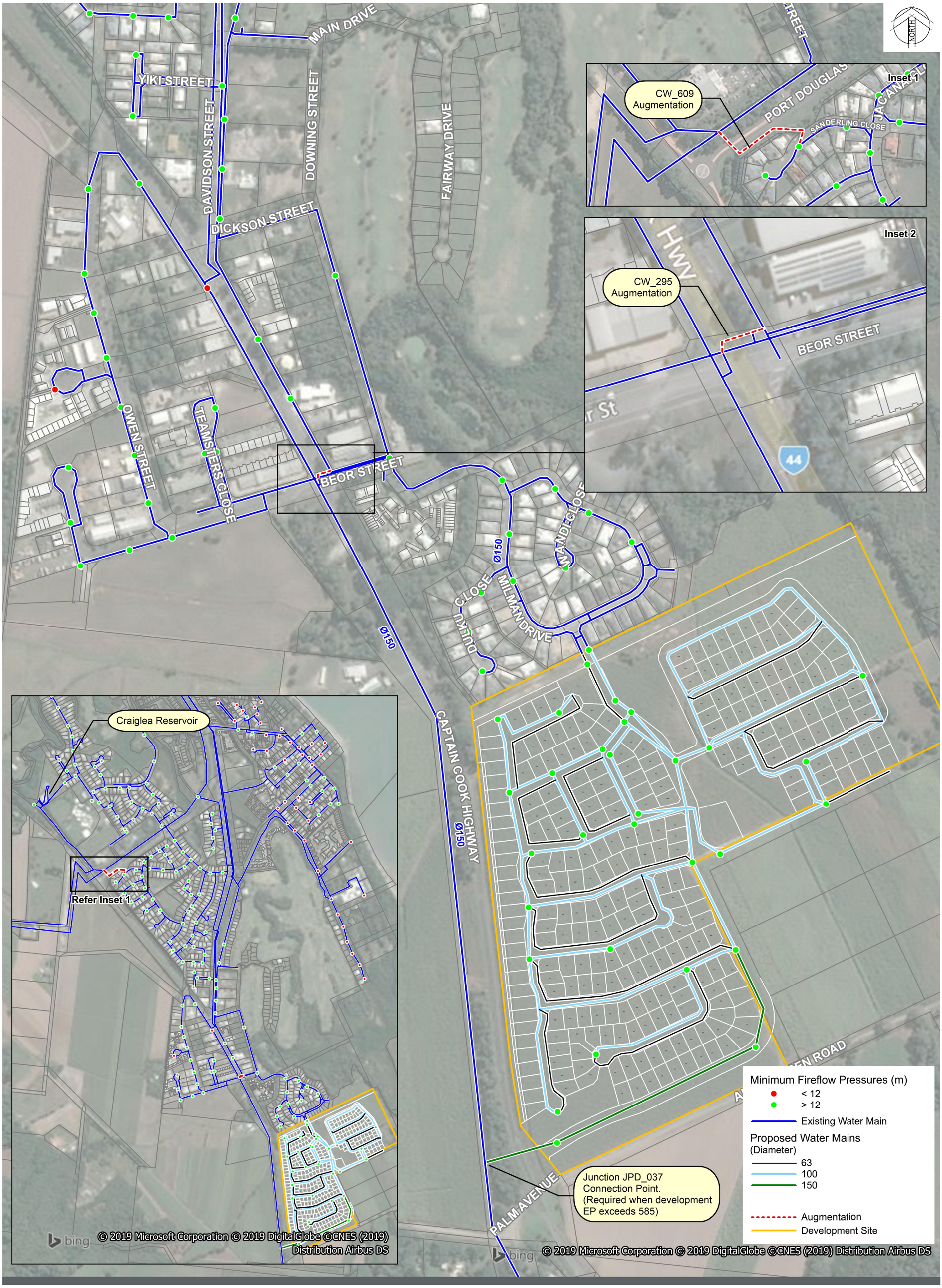
Scale
1:5,000

50 0 50 100 150
Metres

CRAIGLIE WATER AND SEWER DESIGN
WATER SUPPLY - MINIMUM PRESSURES ULTIMATE

FIGURE 3

DATE PLOTTED: 16/09/2019 BY: Les Wright
FILE: M:\Q184103 - Craiglea Water and Sewerage Design_Project material\GIS\MapInfo\Figures\Figures_Water_v3.wor



Cardno
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
16/09/2019

Size
A3

Scale
1:5,000

50 0 50 100 150
Metres

CRAIGLIE WATER AND SEWER DESIGN
WATER SUPPLY - MINIMUM FIREFLOW PRESSURES ULTIMATE
FIGURE 4

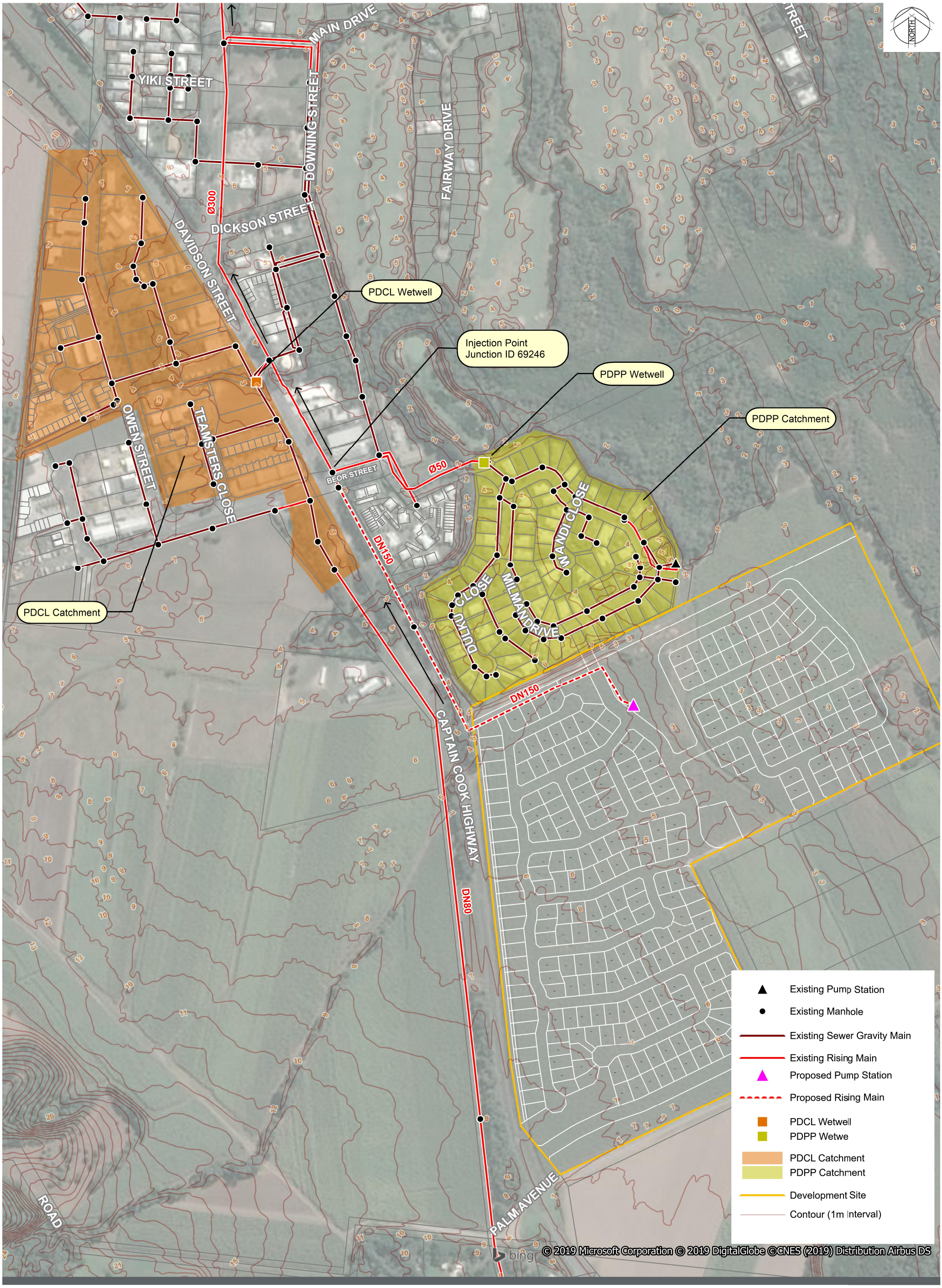
DATE PLOTTED: 16/09/2019 BY: Les Wright
FILE: M:\Q184103 - Craiglea Water and Sewerage Design_Project material\GIS\MapInfo\Figures\Figures_Water_v3.wor

APPENDIX

D

SEWERAGE SERVICING STRATEGY

Cardno
Shaping the Future



DATE PLOTTED: 16/09/2019 BY: Les Wright
FILE: M:\Q184103 - Craiglea Water and Sewerage Design_Project material\GIS\MapInfo\Figures\Figures_Sewer_v2.wor

Cardno

Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Date
16/09/2019

Size
A3

Scale
1:5,000

50 0 50 100 150
Metres

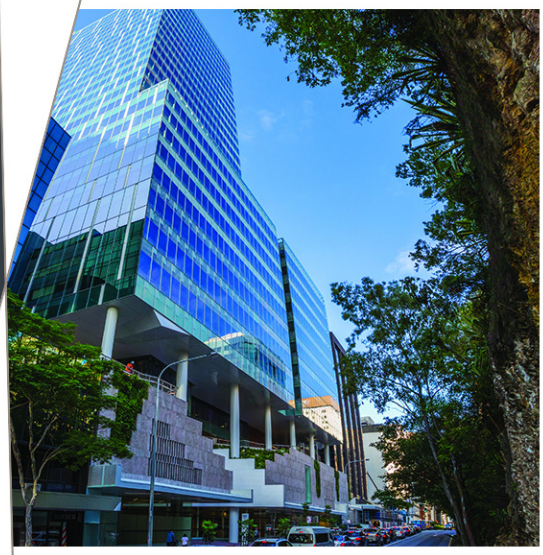
CRAIGLIE WATER AND SEWER DESIGN
SEWER INFRASTRUCTURE
ULTIMATE

FIGURE 1

ROAD SAFETY AUDIT (Existing Road)

PORT DOUGLAS ESTATE
CRAIGLIE LOT 2 DA

Q184103



Prepared for

Port Douglas Land Development Pty Ltd

3 July 2019

Cardno

Contact Information

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

Level 11
515 St Paul's Terrace
Fortitude Valley QLD 4006
Australia

www.cardno.com
Phone +61 7 3369 9822
Fax +61 7 3369 9722

Document Information

Prepared for	Port Douglas Land Development Pty Ltd
Project Name	PORT DOUGLAS ESTATE CRAIGLIE LOT 2 DA
File Reference	Q184103 Existing Road RSA V1 20190628 Craiglie DA - FINAL.docx
Job Reference	Q184103
Date	3 July 2019
Version Number	V1
Author(s):	
	3/07/2019
Dana Geaboc	Effective Date
Senior Road Safety Auditor	
Approved By:	
	3/07/2019
John Peace	Date Approved
Senior Road Safety Auditor	

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
V2	3-Jul-19	V2 Final for Client	Dana Geaboc	John Peace

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Table of Contents

1 Introduction 1
2 About the Road Safety Audit 2
2.1 Safe system findings 2
2.2 The audit team 2
2.3 Responding to the audit report 2
2.4 Disclaimer 3
3 Audit background 4
3.1 The project 4
3.2 RSA study extent 6
3.3 Previous Road Safety Audits 7
3.4 Crash history 7
3.5 Traffic volume data 7
4 Audit findings 10
4.1 Site visit 10
4.2 Audit criteria 10
4.3 Specific issues and recommendations 10
5 Audit team statement 21

Appendices

Appendix A RSA FINDINGS LOCATION

Tables

Table 4-1 RSA – priority ranking 10
Table 4-2 Specific issues and recommendations 11

Figures

Figure 3-1 Site Location 4
Figure 3-2 Proposed development 5
Figure 3-3 RSA study extent 6
Figure 3-4 Captain Cook Highway/Beor Street intersection layout 7
Figure 3-5 Captain Cook Highway/Beor Street AM peak total traffic volumes 8
Figure 3-6 Captain Cook Highway/Beor Street AM peak heavy vehicles traffic volumes and percentage of total volumes 8
Figure 3-7 Captain Cook Highway/Beor Street PM peak total traffic volumes 9
Figure 3-8 Captain Cook Highway/Beor Street PM peak heavy vehicles traffic volumes and percentage of total volumes 9

1 Introduction

The Cardno Road Safety Auditing team has been commissioned by Port Douglas Land Developments Pty Ltd to undertake a Road Safety Audit (RSA) for the existing roads between Captain Cook Highway and Milman Drive and Wabul Drive, comprising the intersection of Captain Cook Highway and Beor Street and the road links and intersections on Beor St east of Captain Cook Highway, Downing Street, Milman Drive and Wabul Drive connection to the proposed development (Lot 2 Captain Cook Highway).

This report identifies possible safety issues and these are noted by the audit team using a combination of onsite investigations and a review of background material. Recommendations for potential remedial treatments will be made in response to each safety issue that is raised as part of this audit process.

2 About the Road Safety Audit

A Road Safety Audit (RSA) is a formal, systematic assessment of the potential road safety risks associated with, in this case, existing roads, conducted by an independent qualified audit team. The assessment considers all road users and suggests measures to eliminate or mitigate any risks identified by the audit.

The Road Safety Audit has been undertaken in accordance with the requirements of Austroads' *Guide to Road Safety Part 6: Managing Road Safety Audits – Edition 1.2 (February 2019)* and *Guide to Road Safety Part 6A: Implementing Road Safety Audits – Edition 1.2 (February 2019)*. The following sections identify the audit findings and recommendations.

All the findings described in Section 4 of this report are considered by the audit team to require action in order to improve the safety of the proposed project and to minimise the risk of crash occurrence and reduce potential crash severity.

2.1 Safe system findings

The aim of 'safe system findings' is to focus the RSA process on considering safe speeds and by providing forgiving roads and roadsides. This is to be delivered through the Road Safety Audit process by accepting that people will always make mistakes and by considering the known limits to crash forces the human body can tolerate. This is to be achieved by focusing the Road Safety Audit on particular crash types that are known to result in higher severity outcomes at relatively lower speed environments to reduce the risk of fatal and serious injury crashes.

The additional annotation "IMPORTANT" is used to provide emphasis to the road safety audit finding that has the potential to result in fatal or serious injury or findings that are likely to result in the following crash types above the related speed environment:

- head on (>70km/h);
- right angle (>50km/h);
- run off road impact object (>40km/h); and
- crashes involving vulnerable users (>30km/h)

As these crash types are known to result in higher severity outcomes at relatively lower speed environments.

The exposure and likelihood of crash occurrence shall then be considered for all findings deemed "IMPORTANT" and evaluated based on the auditor's professional judgement. Auditors should consider factors as traffic volumes and movements, speed environment, crash history and the road environment and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either VERY HIGH, HIGH, MODERATE or LOW and this additional annotation shall be displayed following the IMPORTANT annotation on applicable findings.

2.2 The audit team

The RSA team comprises the following members:

- **John Peace** Senior Road Safety Auditor (Qld) – CARDNO – Audit Team Leader
- **Dana Geaboc** Senior Road Safety Auditor (Qld), RPEQ – CARDNO – Audit Team Member

This Road Safety Audit has been carried out by the audit team based in Brisbane. Whilst both the audit team and the traffic engineering team are parts of Cardno, the team members responsible for the RSA will have no involvement with the traffic impact assessment, therefore impartiality (integrity) of the audit will be maintained.

2.3 Responding to the audit report

As set out in the road safety audit guidelines, responsibility for the road design always rests with the client, and not with the auditing team. A client is under no obligation to accept all the audit recommendations. Also, it is not the role of the auditor to agree or approve of the client's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the client, in conjunction with all the other project considerations.

This formal road safety audit report should be responded in writing, giving reasons for each rejection of an audit finding or recommendation. Acceptance of a recommendation may require no further comment, but explanation of how or when the action will be taken may be useful.

2.4 Disclaimer

The RSA carried out for the existing roads has adhered to the procedures set out in *Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audit (2019)*. The audit covers physical features of the project which may affect road user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this report were to be followed, this would not guarantee that the site is safe; rather, adoption of the recommendations should improve the level of safety.

3 Audit background

3.1 The project

Douglas Shire Council issued a decision notice for the development application ROL 2966/2018 for stages 1A and 1B for the development on Lot 2 SR431 in Craiglie. One of the conditions for the development approval related to traffic and transport engineering, which has reproduced below for reference.

Road Safety Assessment

6. *Provide a Road Safety Assessment by an accredited Road Safety Auditor for the Milman Drive and Wabul Drive road link extending from the proposed new southern drain crossing through to, and including, the intersection with the Captain Cook Highway.*

The proposed masterplanned development is located on Lot 2 SR431 in Craiglie, Port Douglas. The site is bound by medium density residential to the north, Captain Cook Highway to the west and open land to the east and south. The site location is illustrated on Figure 3-1.

Figure 3-1 Site Location



Source: Nearmap

This RSA focuses on the existing road condition but taking into account the possibility of the Stage 1A and 1B and of the proposed development having an impact on the existing roads, in response to the Council condition.

Stage 1A and 1B comprise 32 lots, a drainage reserve and park area.

In the ultimate form, the subdivision proposes to comprise 282 lots with various parks featured around the development.

The proposed development layout, with Stage 1A and 1B highlighted is included in Figure 3-2.

Figure 3-2 Proposed development

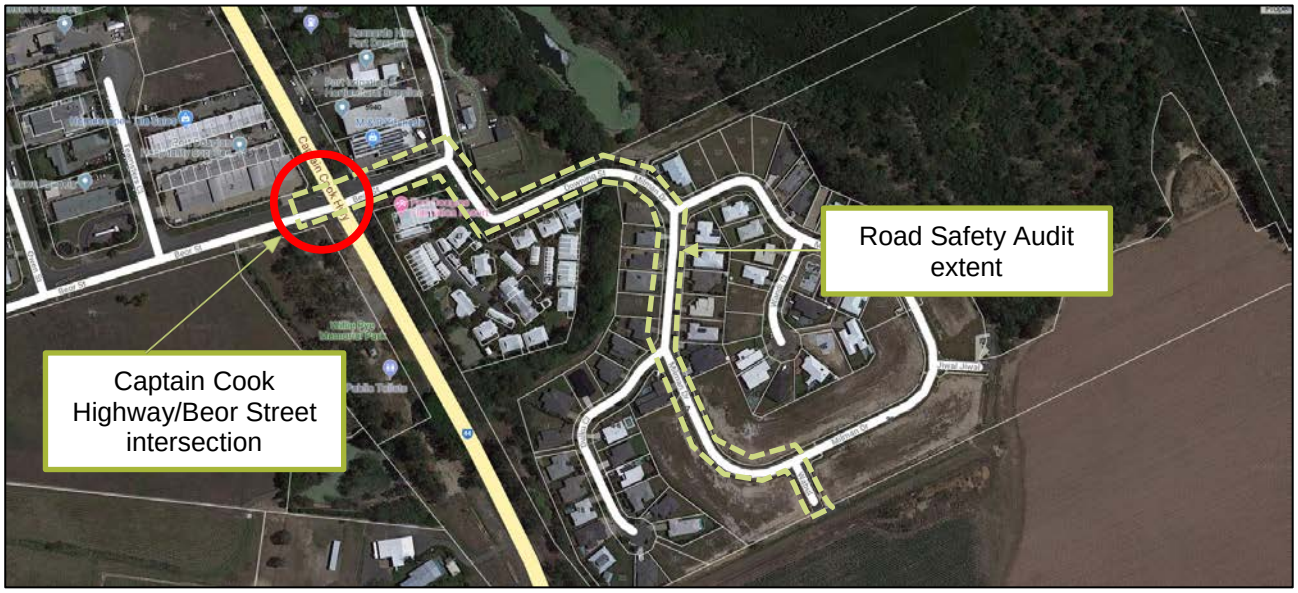


Source: Nearmap, Cardno drawing Q184109-MP01C

3.2 RSA study extent

The location of the Port Douglas Estate Craiglie is off Captain Cook Highway, south west of Port Douglas, North Queensland. The RSA extent is highlighted in Figure 3-3.

Figure 3-3 RSA study extent



Source: Nearmap

3.2.1 Captain Cook Highway

Captain Cook Highway is a state-controlled road (SCR) under the jurisdiction of Department of Transport and Main Roads (TMR), which connects Cairns to Mossman in North Queensland. Captain Cook Highway is a B-doubles 23 and 25 metre approved route.

The highway is frequently trafficked by general public for tourism purpose. Other road users are local residents, tourism operators, commercial operators, buses, pedestrians, cyclists, motorcyclists, agricultural machinery, emergency services, etc.

Speed limit on Captain Cook Highway on both approaches to Beor Street intersection is 70km/h.

3.2.2 Beor Street

Beor Street is a local road under the Douglas Shire jurisdiction. It is a two-lane two-way road connecting to a few residential and commercial properties with no through route to the west and providing a connection to the Craiglie development through Downing Street/Milman Drive. There is no through fare or further links on the eastern side of Beor Street. Speed limit on Beor Street is 50km/h.

3.2.3 Downing Street and Milman Drive

Downing Street and Milman Drive are local residential roads with a speed limit of 50km/h. The geometry and layout of the roads are appropriate for this type of road and have been designed to discourage driving at higher speeds. Width of the road is minimum 7.0m and footpath is provided on one side of the road throughout the audit area.

3.2.4 Captain Cook Highway/Beor Street intersection

At Captain Cook Highway/Beor Street intersection (the study intersection), the Captain Cook Highway has one lane in each direction on both approaches to the intersection. The speed limit on the northbound direction is generally 80km/h but decreases to 70km/h approximately 300m south of the intersection. In southbound direction, the speed limit on the Captain Cook Highway the intersection approach is 70km/h.

Beor Street approaches to the intersection are two-way, two lanes at 50km/h.

Basic left turns treatments (BAL) are provided at Beor Street left turns into Captain Cook Highway and at Captain Cook Highway turn into Beor Street. An auxiliary left turn treatment (AUL) is provided at Captain Cook Highway southbound approach.

The right turns at the intersection are allocated on shared right turn/through lanes on Captain Cook Highway and all movements on Beor Street.

Figure 3-4 Captain Cook Highway/Beor Street intersection layout



Source: Nearmap

3.2.5 Adjoining land uses

Within the RSA study area, prevalent land uses are commercial and a BP petrol station at the north-eastern side of Captain Cook Highway/Beor Street intersection, a resort hotel at the south-eastern side, a local park at the south-western corner and a commercial development at the north-west.

The BP petrol station has been recently built (late 2018). In order to provide access to the petrol station, a right turn auxiliary lane and widening of the pavement to accommodate an additional lane for left turning into the petrol station have been included on Captain Cook Highway southbound, north of the study intersection.

3.3 Previous Road Safety Audits

None available.

3.4 Crash history

A study of the recent crash history has been conducted in the vicinity of the proposed project for the five-year period to June 2018 (from Webcrash database). The results off the investigation showed that there was one reported crash within the study area data. The crash was ‘Intersection from adjacent approaches’ type (DCA 101), which required medical treatment.

3.5 Traffic volume data

Traffic data collected by TMR in 2018 shows that the Annual Average Daily Traffic (AADT) on Captain Cook Highway at a location 500m north of Port Douglas is approximately 6,500 vehicles per day, with the percentage of heavy vehicles being 9.1%.

Cardno obtained traffic counts at the Captain Cook Highway intersection undertaken on 18 June 2019. The results for AM peak hour total volumes (Figure 3-5), AM peak hour Heavy Vehicles volumes and percentage of total volumes (Figure 3-6), PM peak hour total volumes (Figure 3-7) and PM peak hour Heavy Vehicles volumes and percentage of total volumes (Figure 3-8) are shown below.

Figure 3-5 Captain Cook Highway/Beor Street AM peak total traffic volumes

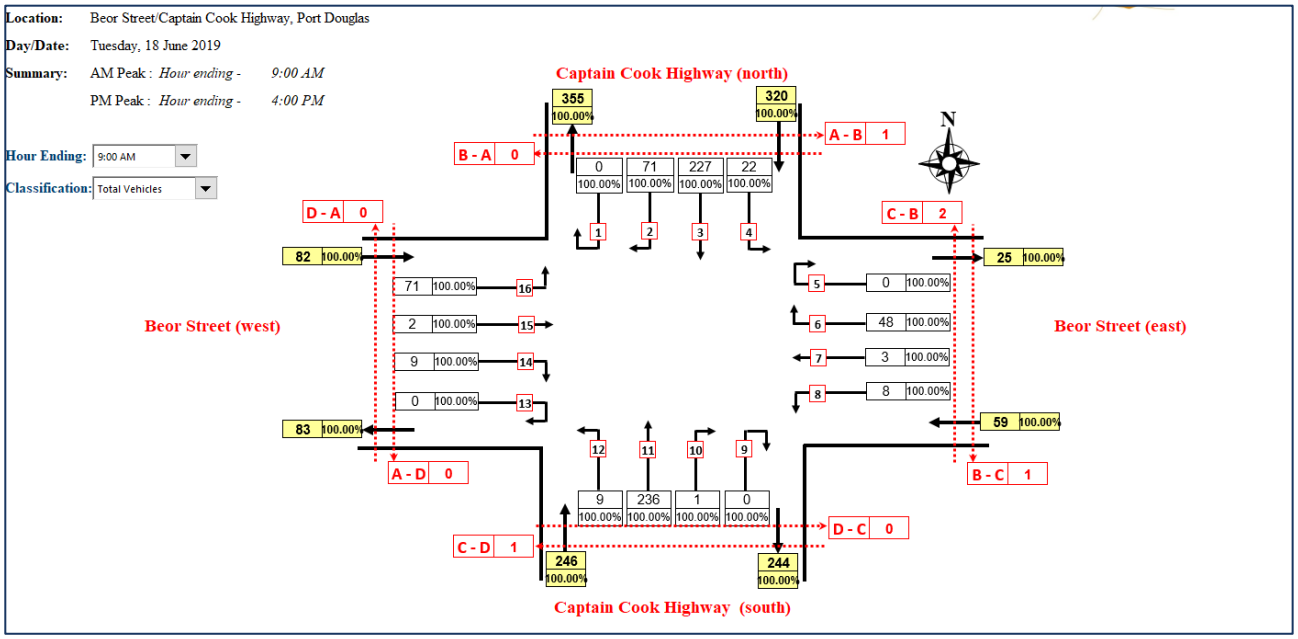


Figure 3-6 Captain Cook Highway/Beor Street AM peak heavy vehicles traffic volumes and percentage of total volumes

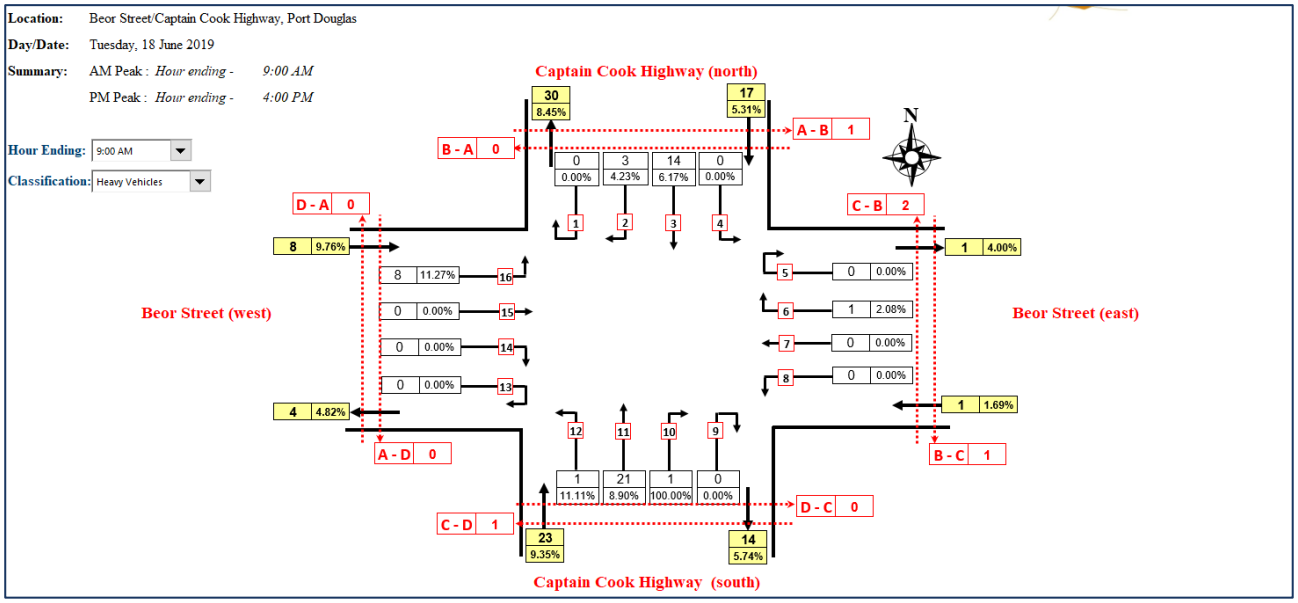


Figure 3-7 Captain Cook Highway/Beor Street PM peak total traffic volumes

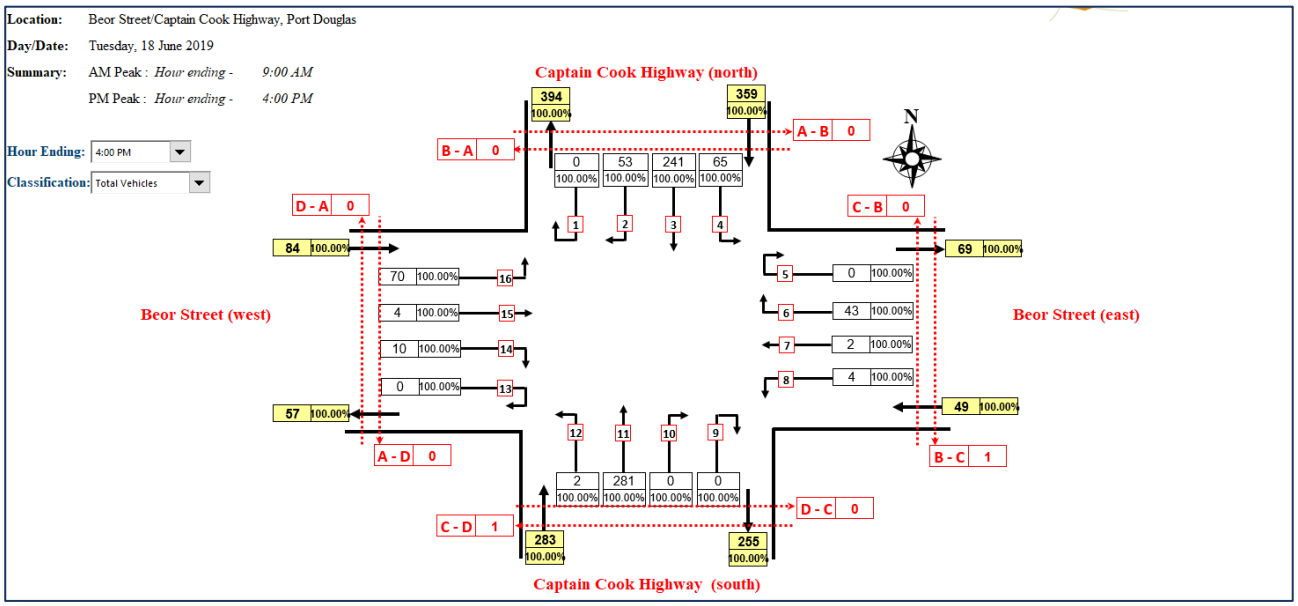
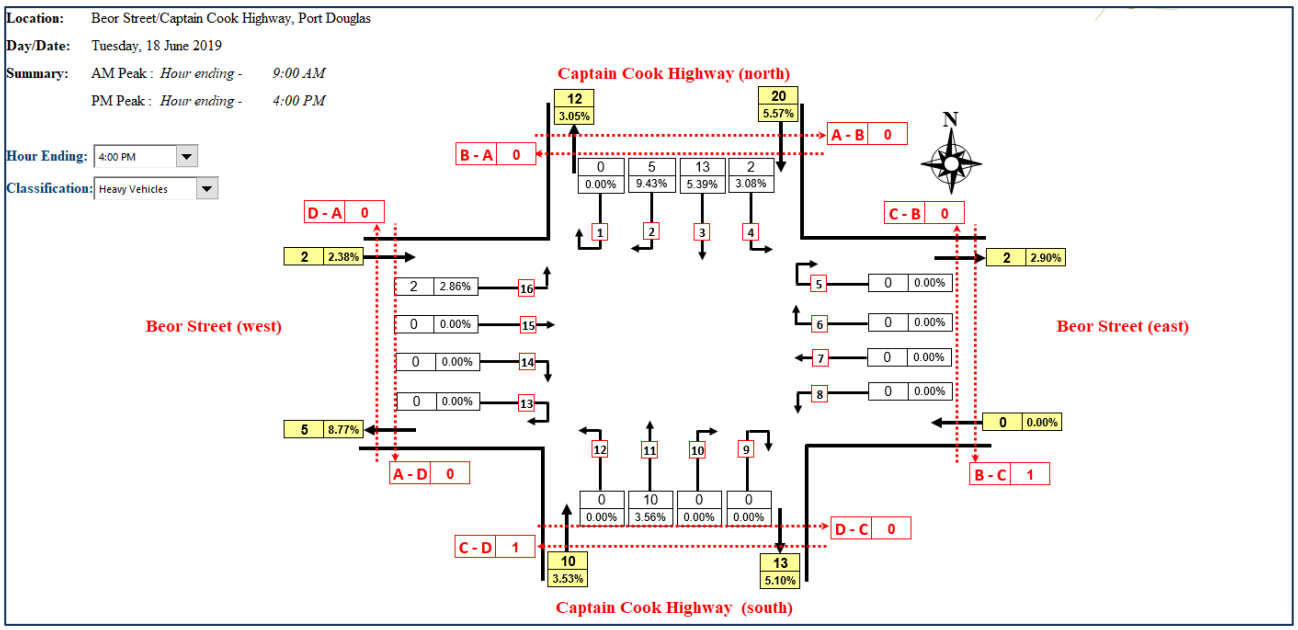


Figure 3-8 Captain Cook Highway/Beor Street PM peak heavy vehicles traffic volumes and percentage of total volumes



The analysis of the traffic counts confirmed the observations made on site, in terms of major movements and the traffic mix through the intersection.

4 Audit findings

4.1 Site visit

Several site inspections of the audit area were conducted on 11 and 12 June 2019, as follows:

- 11 June 2019 – daytime (including PM peak) and night inspections. Weather condition during the inspection was dry but cloudy and the road surface wet in places.
- 12 June 2019 – daytime (including AM peak) inspection. Weather condition was rainy and the road wet.

The inspections were carried out on foot and vehicle. Video recording and photographs of the site highlights were taken during day and night inspections.

4.2 Audit criteria

A ranking system for each of the issues has been adopted using the following priority rating (Table 4-1).

Table 4-1 RSA – priority ranking

Priority	Suggested treatment approach
High	Highest priority for action from a safety view point
Medium	Action needs to be taken from safety view point
Low	Action is desirable from a safety view point
Comment	An observation which may improve overall performance or safety, be of wider significance and possibly outside the scope of this RSA, but where action should be considered

It is noted that the priority ranking is based on the subjective assessment of the audit team.

4.3 Specific issues and recommendations

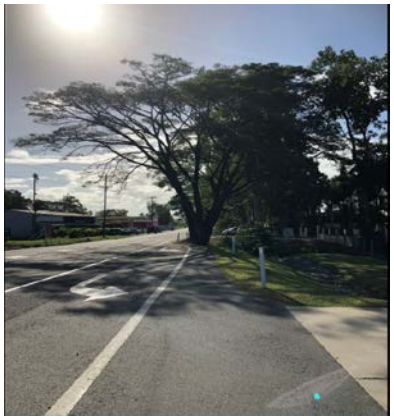
Audit findings were established and comments are provided based on a desktop review of the design plans, and the information gathered during the site visit. The findings focus on road safety for all road users, from a road use and network issues perspective, auditing the road safety elements as set out in *the Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019).*

The findings are presented by general location; hence the findings are not presented in order of relative safety importance or priority for treatment. The Road Safety Audit has documented its findings by numbered issues referenced to locations within the study area. Recommendations for potential remedial treatments have been identified and each issue is allocated with a priority.

Locations of the issues identified have been referenced in the relevant maps included in Appendix A.

Table 4-2 Specific issues and recommendations

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
1	Captain Cook Highway Northbound	Approximately 400m north of Captain Cook Highway/Beor Street intersection	Bicycle path terminates abruptly, with no advance signage		Install bicycle path signage according to current standards	**MEDIUM**
2	Captain Cook Highway Southbound	Approximately 300m north of Captain Cook Highway/Beor Street intersection, left side of the road	Unprotected creek/big tree/non-frangible power pole with no slip base, culvert head wall within clear zone		Install protection barriers	**HIGH** **IMPORTANT**
3	Captain Cook Highway Southbound	Approximately 200m north of Captain Cook Highway/Beor Street intersection, left side of the road	Unprotected creek – approximately 1.0 -1.5m depth		Install protection barriers	**HIGH** **IMPORTANT**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
4	Captain Cook Highway Southbound	Approximately 200m north of Captain Cook Highway/Beor Street intersection, left side of the road	Mature tree (non-frangible vegetation) within clear zone and reduced shoulder width. The tree is located at the beginning of the left turn lane from Captain Cook Highway into Beor Street. The area is dark during night time and the tree is barely visible to the drivers	 	Install warning devices as a minimum short-term solution but install protection barriers as long-term solution.	**HIGH** **IMPORTANT**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
5	Captain Cook Highway Southbound	Extending 300m from the Captain Cook Highway/Beor Street intersection on the left side of the road	Mature trees (non-frangible vegetation) and non-frangible power poles within the clear zone		Install protection barriers	**HIGH** **IMPORTANT**
6	Captain Cook Highway Southbound	BP petrol station	Entry and exit movements into/from the petrol station are segregated by the provision of two driveways but there is not sign within the petrol station to restrict exit through the entry driveway		Install 'no exit' sign within the petrol station, at the entry driveway	**LOW**
7	Captain Cook Highway Northbound and Southbound	Several locations along Captain Cook Highway within the audit area	Blocked drainages/culverts		Clean drainages during maintenance and replaced damaged areas/equipment	**MEDIUM**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
8	Captain Cook Highway/Beor Street intersection	At Beor Street crossing east side of the intersection	Footpath leads pedestrians to crossing the Beor Street but no pedestrian connection is provided on the other side		Redesign footpath end at Beor Street crossing in order to discourage pedestrians to cross the street at this location	**LOW**
9	Captain Cook Highway/Beor Street intersection	At Beor Street westbound approach to the intersection	Give Way sign obstructed by vegetation		Cut back vegetation during routine maintenance	**MEDIUM**
10	Captain Cook Highway/Beor Street intersection	Throughout the intersection	Pavement linemarking worn out and missing RRPMs		Reinstate pavement linemarking and install missing RRPMs	**MEDIUM**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
11	Captain Cook Highway	Captain Cook Highway northbound approach to the intersection	No advance signs on Captain Cook Highway to advise on approaching the intersection. The intersection can be easily missed, particularly during night time, considering that the approach speed is 70km/h (or higher)		Install 'intersection ahead' signage	**MEDIUM**
12	Captain Cook Highway/Beor Street intersection	Captain Cook Highway northbound departure from the intersection	Provisions for a bike path have been included sparsely within the study area, on Captain Cook Highway and through Captain Cook Highway/Beor Street intersection but signage and linemarking for bicycle paths have not included as required by current standards		Install bicycle path signage and linemarking in accordance to current standards and specifications, including painted bicycle lanes	**MEDIUM** **IMPORTANT**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
13	Captain Cook Highway Northbound	Approximately 100m south of the Captain Cook Highway/Beor Street intersection, at the rest area entry driveway	Unprotected culvert at the rest area entrance driveway within the clear zone		Install protection barriers or install trafficable headwall	**HGH** **IMPORTANT**
14	Captain Cook Highway Northbound	Approximately 100m south of the Captain Cook Highway/Beor Street intersection, at the rest area entry	Rest area identification sign is located very close to the rest area entry. Sudden breaking can occur when drivers observe the sign and decide to access the area.		Relocate the existing rest area sign at a distance which allow drivers to indicate the intention and turn into the rest area	**MEDIUM**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
15	Captain Cook Highway Northbound	Approximately 50m south of the Captain Cook Highway/Beor Street intersection	Unprotected water meter located within the clear zone		Install protection barriers or relocate the water meter outside the clear zone	**HGH** **IMPORTANT**
16	Captain Cook Highway/Beor Street intersection	Left and right side of Beor Street, at the eastbound approach to the intersection	Unprotected non-frangible power poles within the clear zone		Replace existing power poles with frangible poles or provide protection barrier for the existing	**HIGH** **IMPORTANT**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
17	Beor Street, Downing Street and Milman Drive	Beor Street, Downing Street and Milman Drive	No linemarking provided beyond intersection (e.g. dividing line).		Install dividing line, particularly on Beor Street on both approaches to the Captain Cook Highway/Beor Street intersection	**MEDIUM**
18	Captain Cook Highway/Beor Street intersection	Turning facilities	Right turn from Captain Cook Highway into Beor Street on both approaches to Captain Cook Highway/Beor Street intersection are performed from a shared through/right turn shared lane. It's been observed during the site inspections that some queuing occurs on this lane and occasional sudden breakings occur in order to avoid the end of queue crashes. Left turn and right into Captain Cook Highway northbound from Beor Street are the main movements for both AM and PM peak. Queuing on Beor Street have been observed on both approaches to the intersection.		It is recommended to undertake turn warrant and intersection assessment (using current and future demands) to determine appropriate safe intersection form.	**HIGH**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
19	Captain Cook Highway Southbound	At Port Irrigation driveway	Unprotected culvert headwall		Consider protecting the headwall or install trafficable headwall	**MEDIUM**
20	Captain Cook Highway Northbound	Approximately 200m north of Captain Cook Highway/Beor Street intersection, left side of the road	Unprotected culvert >1m depth		Consider installing protection barriers	**HIGH** **IMPORTANT**

Item/ Reference	Approximate Location		Description of the identified issue	Photo	Recommendations	Priority
21	Captain Cook Highway/Beor Street intersection	Beor Street approaches to the intersection	Beor Street is not sufficiently illuminated at both approaches to the intersection. The westbound to approach to Captain Cook Highway/Beor Street intersection seems particularly dark		Consider improving illumination at Beor Street, at the approaches to Captain Cook Highway/Beor Street intersection in particular. Investigate the illumination provided to Captain Cook Highway/Beor Street intersection and ensure it is according to current requirements	**MEDIUM**
22	Beor Street	Eastbound and westbound approach to the right angle curve	No indication of the bent approach, no linemarking and no hazard markers. Dark in the night		Install appropriate signage to indicate the presence of the curve	**COMMENT – outside the study area**

5 Audit team statement

I hereby certify that the audit team have examined the documents provided to us by Port Douglas Land Development Pty Ltd (the Client) and undertaken a site investigation for the purpose of this RSA. I also confirm that the audit has been carried out independently of the design team following the general principles detailed in *Austroads 'Guide to Road Safety Part 6A: Implementing Road Safety Audits' (AGRS06A-19 Published: 20 February 2019).*

The audit has been carried out for the sole purpose of identifying any features of the existing roads which could be altered or removed to improve the safety of the proposal. The identified issues have been noted in the report. The accompanying findings and recommendations are put forward for consideration by the Client.

Dana Geaboc

Senior Traffic Engineer

CARDNO

dana.geaboc@cardno.com.au

Phone +61 7 3100 2201

Direct +61 7 3369 9822

Mobile +61 400 100 126

Signature/Date

Disclaimer

This report contains findings and recommendations based on examination of the site and/or relevant documentation. The report is based on the drawings provided to Cardno and is relevant at the time of production of the report. Information and data contained within this report is prepared with due care by the Road Safety Team. While the Road Safety Audit Team seeks to ensure accuracy of the data, it cannot guarantee its accuracy.

Readers should not solely rely on the contents of this report or draw inferences to other sites. Users must seek appropriate expert advice in relation to their own particular circumstances.

The Road Safety Team does not warrant, guarantee or represent that this report is free from errors or omissions or that the information is exhaustive. Information contained within may become inaccurate without notice and may be wholly or partially incomplete or incorrect. Before relying on the information in this report, users should carefully evaluate the accuracy, completeness and relevance of the data for their purpose.

Subject to any responsibilities implied in law which cannot be excluded, the Road Safety Audit Team is not liable to any party for any losses, expenses, damages, liabilities or claims whatsoever, whether direct in contract, tort, statute or otherwise.

APPENDIX A

RSA FINDINGS LOCATION

Captain Cook Highway/Beor Street RSA Map 1

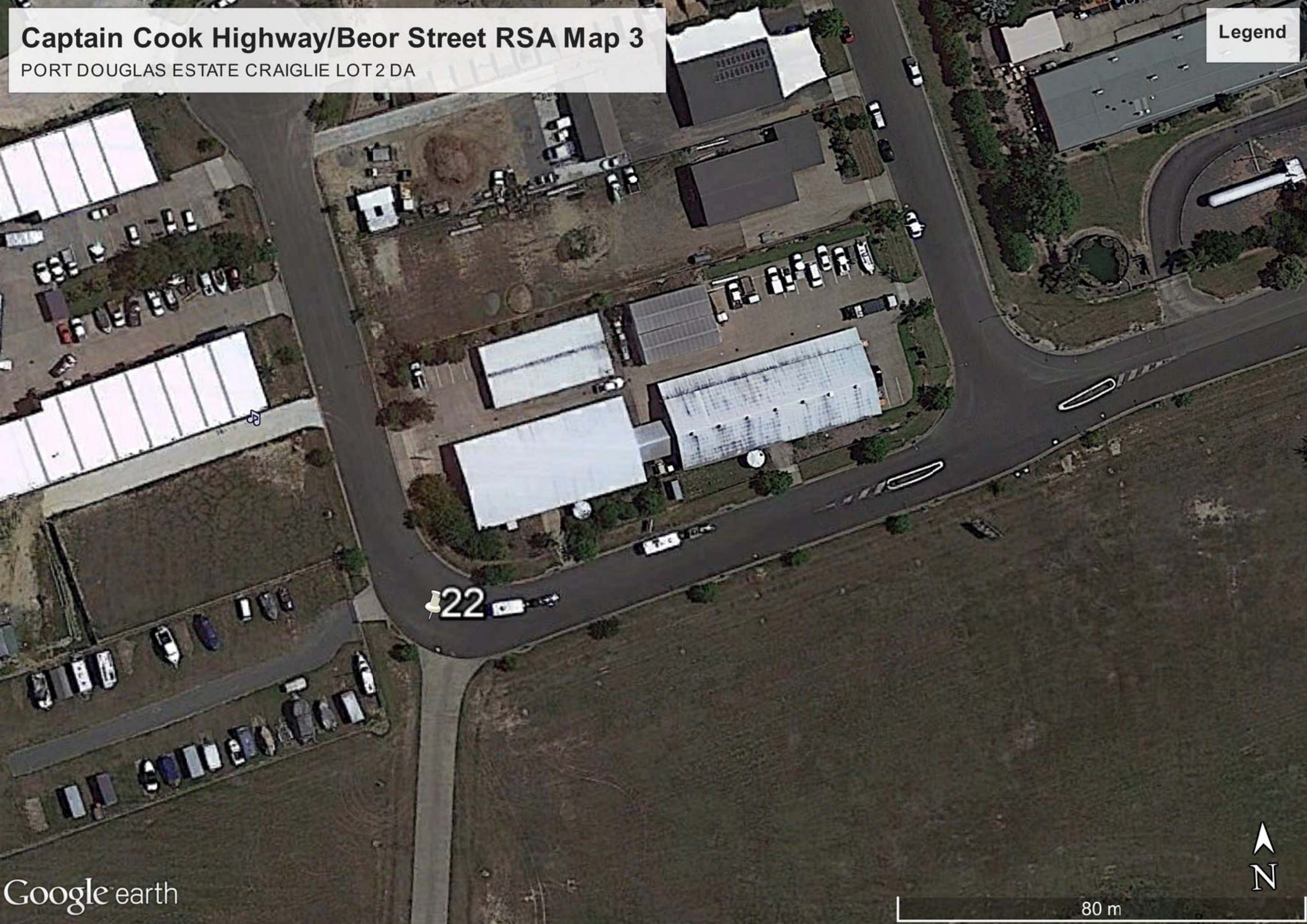
PORT DOUGLAS ESTATE CRAIGLIE LOT 2 DA




Captain Cook Highway/Beor Street RSA Map 2
PORT DOUGLAS ESTATE CRAIGLIE LOT 2 DA
Legend
12
18
8
21
17
9
10
18
16
15
5
13
14
11
N
80 m
Google earth

Captain Cook Highway/Beor Street RSA Map 3

PORT DOUGLAS ESTATE CRAIGLIE LOT 2 DA



About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Contact

Level 11
515 St Paul's Terrace
Fortitude Valley QLD 4006
Australia

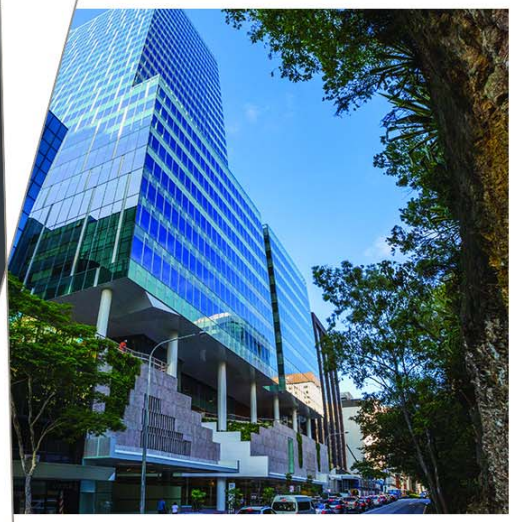
Phone +61 7 3369 9822
Fax +61 7 3369 9722

Web Address
www.cardno.com

Traffic Impact Assessment

Craiglie Subdivision, Port Douglas

Q184103



Prepared for
Port Douglas Land Development Pty Ltd

16 October 2019

Cardno

Contact Information

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

Level 11
515 St Paul's Terrace
Fortitude Valley QLD 4006
Australia

www.cardno.com
Phone +61 7 3369 9822
Fax +61 7 3369 9722

Document Information

Prepared for	Port Douglas Land Development Pty Ltd
Project Name	Craiglie Subdivision, Port Douglas
File Reference	Q184103-REP-20191016.docx
Job Reference	Q184103
Date	16 October 2019
Version Number	03

Author(s):

Madison Elliott
Graduate Traffic Engineer

Effective Date 16/10/2019

Approved By:

Harj Singh
Senior Traffic Engineer

Date Approved 16/10/2019

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
01	28/06/2019	Draft for Client Review	Madison Elliott & Jai Patel	Harj Singh
02	03/07/2019	Final	Madison Elliott	Harj Singh
03	16/10/2019	Updated for Council queries	Madison Elliott	Harj Singh

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Table of Contents

1	Introduction		1
	1.1	Overview	1
	1.2	Background	1
	1.3	Scope of Work	2
	1.4	References	2
	1.5	Limitations	2
2	Site Context		3
	2.1	Site Location	3
	2.2	Local Road Network	4
	2.3	Proposed Development	5
	2.4	Development Staging	5
3	Traffic Assumptions and Characteristics		6
	3.1	Study Intersection	6
	3.2	Background Traffic Volumes	6
	3.3	Traffic Growth	6
	3.4	Traffic Distribution	7
	3.5	Traffic Generation	8
	3.6	Development Directional Distribution	8
	3.7	Development Volumes	8
4	Operational Assessment		9
	4.1	Assessment Scenarios	9
	4.2	Assessment Criteria	9
	4.3	Captain Cook Highway / Milman Drive Intersection	10
5	Design Considerations		13
	5.1	Internal Road Network	13
	5.2	External Road Network Layout	14
	5.3	Servicing Facility Design Review	15
6	Recommendations and Conclusion		17

Appendices

Appendix A Development Plans

Appendix B Swept Path Analysis

Tables

Table 2-1	Local Road Network	4
Table 3-1	Adopted Trip Generation Rates	8
Table 3-2	Directional Distribution	8
Table 3-3	Development Volumes	8
Table 4-1	Adopted Intersection Performance Threshold – Degree of Saturation	9
Table 4-2	SIDRA Results – Captain Cook Highway / Milman Drive Intersection	10
Table 4-3	SIDRA Results – Trigger Assessment - Captain Cook Highway / Milman Drive Intersection	11
Table 4-4	SIDRA Results – Captain Cook Highway / Milman Drive Intersection - reconfigured	12
Table 5-1	Internal Road Characteristics	13
Table 5-2	External Road Characteristics	14

Figures

Figure 2-1	Site Location	3
Figure 2-2	Existing Road Network	4
Figure 2-3	Proposed Development	5
Figure 3-1	Study intersection	6
Figure 3-2	In Movement Traffic Distribution	7
Figure 3-3	Out Movement Traffic Distribution	7
Figure 4-1	Current and SIDRA assessed layout - Captain Cook Highway / Milman Drive Intersection	10
Figure 4-2	SIDRA assessed layout - Captain Cook Highway / Milman Drive Intersection – reconfigured	12
Figure 5-1	Stage 1 Internal Road Network	13
Figure 5-2	Stage 1 External Road Network	14
Figure 5-3	Recommended Line-marking – Downing Street	15
Figure 5-4	Lot 26 Interim RCV Swept Path	15
Figure 5-5	Lot 20 Stub Road RCV Swept Path	16

1 Introduction

1.1 Overview

Cardno Qld Pty Ltd (Cardno) has been engaged by Port Douglas Land Development Pty Ltd to provide traffic and transport engineering advice in relation to the proposed masterplanned residential development located in Craiglie, Port Douglas.

The purpose of this report is to assess the traffic and transport components of the proposed developments against the requirements of the Douglas Shire Council (Council) Planning Scheme. Therefore, the report addresses the following:

- External traffic impacts
- External and internal road design

1.2 Background

Douglas Shire Council issued a decision notice for the development application ROL 2966/2018 for stages 1A and 1B for the development on Lot 2 SR431 in Craiglie. One of the conditions for the development approval related to traffic and transport engineering, which has reproduced below for reference.

Road Safety Assessment

6. *Provide a Road Safety Assessment by an accredited Road Safety Auditor for the Milman Drive and Wabul Drive road link extending from the proposed new southern drain crossing through to, and including, the intersection with the Captain Cook Highway.*

   The intersection analysis for the Captain Cook Highway/Milman Drive intersection is to be undertaken in an approved modelling package (SIDRA or equivalent). All upgrades identified in the Road Safety Audit or the intersection analysis will need to be identified in engineering design plans and associated reports.

   a. *Where the intersection analysis demonstrates that the additional Stage 1 lots create an unacceptable level of service for the intersection operation, the applicant must identify and provide the upgrades necessary to ensure the intersection operates with an acceptable level of service.*

      The plan of the works must be endorsed by the Chief Executive Officer prior to the issue of a Development Permit for Operational Works. The agreed traffic improvement works must be carried out in accordance with the approved plans, to the requirements and satisfaction of the Chief Executive Officer, prior to the lodgement of the Survey Plan with Council for endorsement.

      There is to be no cost to Council for these associated works.

   And

   b. *Where the intersection analysis demonstrates there is a component of existing use that contributes to an unacceptable standard of service, then the applicant must obtain an agreement in writing from the Department of Main Roads and Council regarding the timing, costs and responsibility for the necessary works. All works are to be at no cost to Council. The agreement must be to the satisfaction of the Chief Executive Officer and achieved prior to the lodgement of the application for operational work for the subdivision.*

1.3 Scope of Work

Cardno has undertaken the following tasks to complete this traffic report:

- Commission traffic surveys for the Captain Cook Highway / Milman Drive intersection
- Estimate the traffic generation and timing associated with the proposed development
- Develop a desktop model to estimate the distribution of the development traffic on the local network
- Undertake an assessment of the study intersection using SIDRA Intersection for the baseline and with development scenarios
- Investigate mitigation measures in the event that the operation of the existing intersection forms will be compromised
- Undertake a review of the existing and proposed road cross sections including Milman Drive leading to the start of the development as well as internal site road layout

1.4 References

The following resources were referred to in the preparation of the report:

- Australian Standards, *AS2890.1:2004 Parking Facilities Part 1: Off-street Car Parking,* 2004
- Roads and Maritime Services (RMS), NSW Government, *Guide to Traffic Generating Developments: Updated Traffic Surveys,* August 2013
- Douglas Shire Council (DSC), *Douglas Shire Council Planning Scheme 2018*
- Queensland Department of Transport and Main Roads (TMR), Guide to Traffic Impact Assessments (GTIA), 2017

1.5 Limitations

Cardno has completed this traffic report in accordance with the usual care and thoroughness of the consulting profession. The assessment is based on accepted traffic engineering practises and standards applicable at the time of undertaking the assessment. The assessment was completed in July 2019, and is based upon the conditions encountered and project information available at the time. Cardno disclaims responsibility for any changes to project planning or road conditions that may occur after completion of the assessment.

2 Site Context

2.1 Site Location

The proposed masterplanned development is located on Lot 2 SR431 in Craiglie, Port Douglas. The site is bound by medium density residential to the north, Captain Cook Highway to the west and open land to the east and south. The site location is illustrated on Figure 2-1.

Figure 2-1 Site Location



Source: Nearmap

2.2 Local Road Network

The site has frontage along Captain Cook Highway to the west and connections to Wabul Street to the north. The key roads related to the development are illustrated on Figure 2-2, with the key characteristics of these roads summarised in Table 2-1.

Figure 2-2 Existing Road Network



Source: Nearmap

Table 2-1 Local Road Network

Road	Authority	Classification	Posted Speed	Typical Form
Captain Cook Highway	TMR	Arterial Road	70km/h	Two lane two way, undivided, sealed
Milman Drive	Council	Access Road	50km/h	Two lane two way, undivided, sealed

2.3 Proposed Development

This report focuses on Stage 1A and 1B of the proposed development in response to the Council condition. However, the ultimate form of the master planned site will also be analysed for completeness, and to inform of the traffic engineering aspects associated with the ultimate development yield.

Stage 1A and 1B comprise 32 lots, a drainage reserve and park area.

In the ultimate form, the subdivision proposes to comprise 282 lots with various parks featured around the development.

The proposed development layout, with Stage 1A and 1B highlighted is included in Figure 2-3.

Figure 2-3 Proposed Development



Source: Nearmap, Cardno drawing Q184109-MP01C

2.4 Development Staging

The staging for the full development has not been indicated by the client. Therefore, it has been assumed that Stage 1 will be complete by 2021 and that the ultimate development will be fully built out by 2031. These years have been included into the operational assessment.

3 Traffic Assumptions and Characteristics

3.1 Study Intersection

As per Condition 6 of the Council decision notice, the traffic impact analysis has been conducted on the Captain Cook Highway / Milman Drive intersection. The study intersection is indicated on Figure 3-1.

Figure 3-1 Study intersection



Source: Nearmap

3.2 Background Traffic Volumes

To understand the existing traffic conditions, traffic surveys were undertaken by Austraffic during the 3-hour AM and PM peak periods on Tuesday, 18 June 2019 for the Captain Cook Highway / Milman Drive intersection.

A review of the surveys indicated that the AM peak period was between 8:00-9:00am and the PM peak period was between 3:00-4:00pm.

3.3 Traffic Growth

Cardno has adopted a linear growth of 2% p.a to forecast potential future traffic demands at the key study intersection, in accordance with previous assessments. Based on previous experience in similar projects, Cardno believes this is an appropriate growth rate to adopt.

3.4 Traffic Distribution

The traffic network assignment has been based on the local traffic patterns observed from the traffic surveys. Figure 3-2 and Figure 3-3 illustrate the 'in' movement distribution and the 'out' movement distributions, respectively, which have been assigned to the development traffic.

Figure 3-2 In Movement Traffic Distribution



Source: Nearmap

Figure 3-3 Out Movement Traffic Distribution



Source: Nearmap

In summary the proportion of vehicles travelling north towards Port Douglas is 80% and south towards Cairns is 20%.

3.5 Traffic Generation

The peak generation rates for the land uses have referenced the NSW Roads and Maritime Services (RMS) Guide to Traffic Generating Developments (August 2013 technical direction), as well as the background traffic surveys.

The traffic analysis will consist of two scenarios, the stage 1 of development and the ultimate development. A summary of the peak trip generation has been summarised in Table 3-1.

Table 3-1 Adopted Trip Generation Rates

Scenario	Land Use	Development Yield	Trip Generation Rate		Trip Generation		Source
			AM	PM	AM	PM	
Stage 1	Low Density Residential	32 dwellings	0.85 trips per dwelling	0.85 trips per dwelling	27 vph	27 vph	RMS
Ultimate	Low Density Residential	282 dwellings	0.85 trips per dwelling	0.85 trips per dwelling	240 vph	240 vph	RMS

As outlined in Table 3-1, it is estimated that stage 1 of development will generate 27 vph during the peak periods and the ultimate development generating 240 vph in the peak, a net increase of 213 vph in the peak hour. Stage 1 generates 11% of the estimated traffic for the ultimate development.

3.6 Development Directional Distribution

The directional distribution has been estimated based on industry standards for residential land uses. This typically follows the pattern of people leaving for work in the morning and arriving home from work in the evening. The distribution has been summarised in Table 3-2.

Table 3-2 Directional Distribution

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
Low Density Residential	30%	70%	60%	40%

3.7 Development Volumes

Based the above, the peak hour development generated traffic volumes are summarised in Table 3-3.

Table 3-3 Development Volumes

Scenario	Land Use	Yield	AM Peak		PM Peak	
			IN	OUT	IN	OUT
Stage 1	Low Density Residential	32 dwellings	8 vph	19 vph	16 vph	11 vph
Ultimate	Low Density Residential	282 dwellings	72 vph	168 vph	144 vph	96 vph

4 Operational Assessment

4.1 Assessment Scenarios

As per Council's request, the study intersection has been assessed for the Stage 1 year of opening and design horizon. Additionally, analysis has been undertaken for the ultimate development yield, to understand how the study intersection will operate once the full build out is complete.

4.2 Assessment Criteria

The performance of the study intersections have been analysed using SIDRA Intersection 8.0 (SIDRA). SIDRA is an industry recognised analysis tool that estimates the capacity and performance of intersections based on input parameters, including geometry and traffic volumes, and provides estimates of an intersection's Degree of Saturation (DOS), queues and delays.

4.2.1 Intersection Delay

The TMR *Guide to Traffic Impact Assessments* (GTIA) recognises the intersection delay as a greater indicator of intersection performance in comparison to the previous TMR *Guidelines for Assessment of Road Impacts of Development* (GARID) significance on the degree of saturation (DOS).

The desired outcome outlined by the GTIA is to ensure that the sum of all intersection delays on the base traffic within the study area does not significantly worsen (i.e. does not increase average delays by more than 5% in aggregate) as a result of the development. The proposed development should seek to achieve no net worsening to efficiency across the impact assessment area.

Intersection mitigation measures (avoid, manage or mitigate) must be considered where the sum of all intersection delays on the base traffic is greater than 5% in aggregate. Furthermore, for priority controlled intersections, where the average peak hour delays for any movement exceeds 42 seconds, the intersection should be upgraded for safety reasons.

4.2.2 Intersection Degree of Saturation

While the movement delay is considered to provide a better indication of intersection performance and safety for priority-controlled intersections and roundabouts, the DOS should still be considered when assessing the performance of the intersection.

Table 4-1 provides the DOS thresholds adopted for the assessment.

Table 4-1 Adopted Intersection Performance Threshold – Degree of Saturation

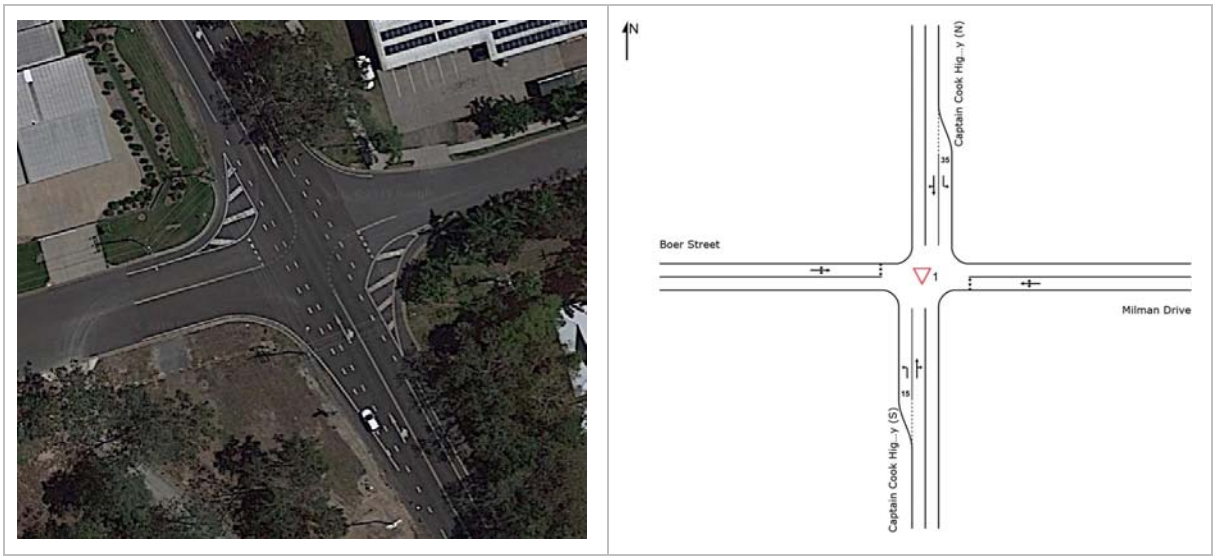
Intersection Treatment	DOS Threshold
Signalised Intersections	Less than or equal to 0.90
Roundabouts	Less than or equal to 0.85
Priority controlled intersections	Less than or equal to 0.80

Source: TMR Guidelines for Assessment of Road Impacts Development

4.3 Captain Cook Highway / Milman Drive Intersection

The current configuration of this intersection is a four-way priority controlled arrangement. The aerial and adopted SIDRA layout are illustrated in Figure 4-1.

Figure 4-1 Current and SIDRA assessed layout - Captain Cook Highway / Milman Drive Intersection



Source: Nearmap, SIDRA 8.0

The results of the SIDRA assessment, for all assessed scenarios, are summarised in Table 4-2.

Table 4-2 SIDRA Results – Captain Cook Highway / Milman Drive Intersection

Scenarios	AM Peak			PM Peak		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
2019 BG	0.198	14 sec	5m	0.192	15 sec	4m
2021 BG	0.204	15 sec	5m	0.199	16 sec	5m
2031 BG	0.234	18 sec	6m	0.230	19 sec	5m
2021 BG + Stage 1	0.224	15 sec	6m	0.203	16 sec	5m
2031 BG + Stage 1	0.273	19 sec	8m	0.243	21 sec	6m
2031 BG + Ultimate	0.829	43 sec	52m	0.657	36 sec	25m

The results of the analysis indicate that the four-way priority-controlled arrangement operates within the typical performance thresholds (DOS ≤ 0.80 for priority controlled, and delay <42 seconds), for the assessed Stage 1 scenarios. When the ultimate development yield is included in the intersection volumes, the 2031 BG + Ultimate scenario exceeds a DOS of 0.80, and delay <42 seconds in the AM peak period.

4.3.2 Trigger Analysis

At the construction of 238 lots in the ultimate development, the road capacity limits set out by Far North Queensland Regional Organisation of Council (FNQROC) require Milman Drive to be upgraded to meet FNQROC standards, therefore it is recommended that the southern Andreassen Drive access is constructed prior (refer Section 5.2).

Therefore, a preliminary trigger assessment was undertaken to determine at what development yield of the ultimate development the Captain Cook Highway / Milman Drive intersection capacity is triggered to require upgrade.

Table 4-3 summarises the SIDRA results for the trigger analysis to determine at what development yield the intersection will require upgrade.

Table 4-3 SIDRA Results – Trigger Assessment - Captain Cook Highway / Milman Drive Intersection

Scenarios	AM Peak			PM Peak		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
2031 BG + 270 lots	0.803	40 sec	47m	0.631	35 sec	24m

The results of the SIDRA analysis indicate that when 270 lots are constructed, the four-way priority controlled intersection operates above the typical performance thresholds (DOS ≤ 0.80 for priority controlled, and delay <42 seconds), in the AM peak period.

Therefore, based on this assessment, the construction of the Andreassen Drive access will be required based on the trigger of the road capacity of Milman Drive (238 lots), rather than the intersection capacity of the Captain Cook Highway / Milman Drive intersection (270 lots).

4.3.3 Captain Cook Highway / Milman Drive Intersection Reconfiguration

Item 18 of the Cardno's Road Safety Audit Report dated 1 July 2019 indicates that there is an existing safety concern relating to the shared lane use for turning movements leading to queuing with potential risk for rear end crashes. Therefore, potential intersection improvements have been investigated to determine an intersection layout to improve safety and operation.

This safety concern was observed during the site visit in the intersections existing shape and form, therefore it is recommended that this intersection reconfiguration should occur regardless of whether the development of the Craiglie Estate were to be constructed. While the reconfigured form improves the operation of the intersection as summarised in Table 4-4, the timing of this reconfiguration is not dependent on the quantity of lots constructed within the development.

Cardno has investigated the potential form for the reconfigured intersection based on relevant standards. Austroads Guide to Road Design Part 4: Intersections and Crossings indicates that lane widths are desirable to be 3.5m wide. The design requirements of the intersection approaches with proposed changes are discussed below.

Due to the wide lane widths present at the Captain Cook Highway / Milman Drive intersection, the configuration was able to be amended to add a short left/through lane on the eastern approach and western approach and a right turn pocket on the southern approach to improve safety and operation. The northern approach is proposed to remain as existing.

Eastern Approach

The carriageway of the eastern approach to the intersection measures approximately 21m at the intersection and narrows down to a uniform width of 7.0m. Therefore, while the carriageway width is tapering down, it is proposed to include a consistent 3.5m exiting lane and major right turning lane with approximately a 15-20m left/through short lane utilising the extra width at the intersection approach.

Western Approach

Based on aerial imagery, the carriageway width of the western approach to the intersection measures approximately 13m. For the major left turn lane, short through/right lane and the exiting lane, a total desirable width of 10.5m is required, which can be accommodated by the existing carriageway. As this approach is trafficked by heavy vehicles (up to 11% recorded during peak periods in the traffic surveys), it is recommended that the additional carriageway width (2.5m) is allocated to the turning lanes to provide heavy vehicles with extra lane width to perform the turning movements.

Southern Approach

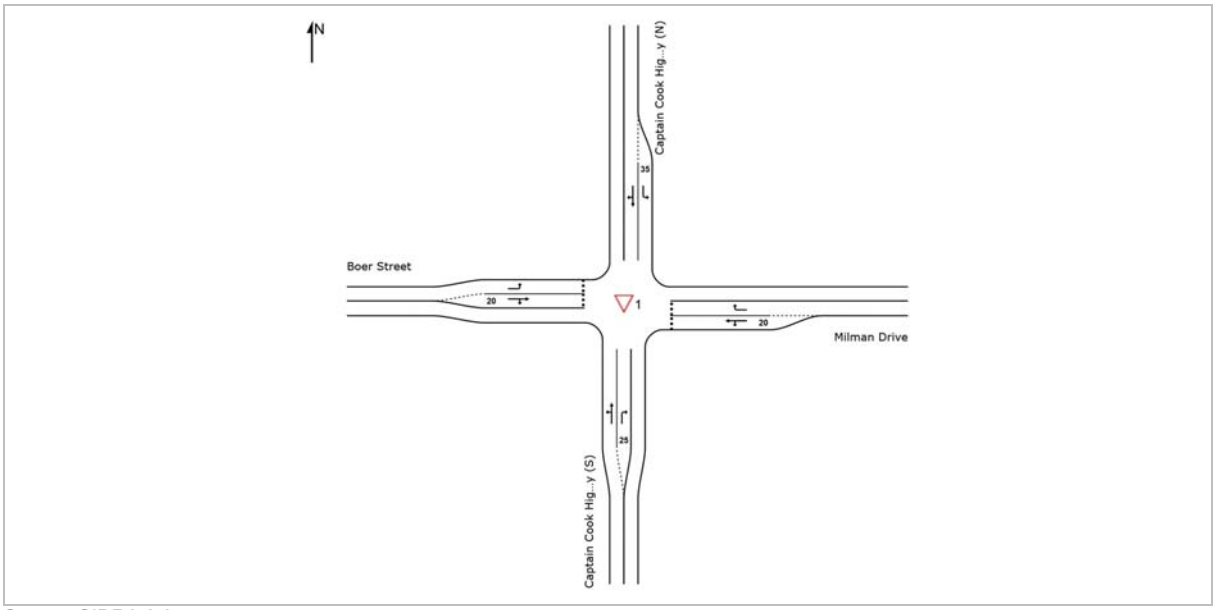
The southern leg of the intersection measures approximately 15m across the carriageway. It is noted that the western side of Captain Cook Highway does not appear to have a sealed kerb. It is proposed to have a continuous left/through lane and a short lane dedicated for right turning traffic. Additionally, there is one exiting lane on this leg. This requires 10.5m carriageway width to accommodate three traffic lanes which can be accommodated with the existing carriageway width. The additional carriageway width may be allocated to cycle provision or shoulders.

The exact functional layout of the intersection should be determined through site survey and detailed design phase to ensure that the intersection is designed according to appropriate standards.

It is recommended to include guidelines for the traffic lanes that do not directly line up as a result of the reconfiguration.

The reconfigured layout, as assessed in SIDRA is shown on Figure 4-2.

Figure 4-2 SIDRA assessed layout - Captain Cook Highway / Milman Drive Intersection – reconfigured



Source: SIDRA 8.0

The results of the SIDRA assessment, for assessed scenario are summarised in Table 4-4.

Table 4-4 SIDRA Results – Captain Cook Highway / Milman Drive Intersection - reconfigured

Scenarios	AM Peak			PM Peak		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
2031 BG + Ultimate	0.778	38 sec	39m	0.622	35 sec	22m

The results of the analysis indicate that the four-way priority-controlled arrangement operates within the typical performance thresholds (DOS ≤ 0.80 for priority controlled, and delay <42 seconds), for the assessed 2031 background with ultimate development traffic scenario utilising a reconfigured layout.

Alternatively, if the southern Andreassen Drive access is constructed prior to the construction of the ultimate yield, it is anticipated that the demand on the Captain Cook Highway / Milman Drive intersection will be reduced, thus improving the operational performance of the intersection in 2031.

It is recommended that the turn treatments indicated in the reconfigured intersection form (Figure 4-2) are incorporated into the layout regardless of the intersection operation, to improve the overall safety at this location.

5 Design Considerations

5.1 Internal Road Network

The proposed internal road design follows a modified grid structure and is accessible via Wabul Street which is expected to be built as part of Stage 1 of the overall development. Wabul Street is the only ingress/egress option residents of Stage 1 have available. Figure 5-1 outlines the proposed internal road network for Stage 1 of development.

The requirements of The Douglas Shire Council indicates road design is compliant to the relevant standards in accordance with FNQROC's Development Manual.

Figure 5-1 Stage 1 Internal Road Network



Source: Nearmap, Cardno drawing Q184109-MP01C

The proposed internal road network has been reviewed against the requirements set out in Table D1.1 of FNQROC's development manual (Design Manual D1 Road Geometry).

Table 5-1 provides a summary of the road characteristics.

Table 5-1 Internal Road Characteristics

Road	Proposed Typical Cross Section	Catchments Gaining Access	FNQROC Road Hierarchy Classification	FNQROC Requirement	FNQROC Compliant
Road 1	14.5m	19 lots	Access Place	14.5m (5.5m sealed) cross section for 0-26 lots	✓
Road 2	15.5m	32 lots	Access Street	15.5m (6.5m sealed) cross section for 26-90 lots	✓
Wabul Street	20.0m	32 lots (stage 1) 282 lots (ultimate)	Major Collector	20.0m (11m sealed) cross section for 301-600 lots	✓

As indicated in Table 5-1, the traffic carrying capacity and proposed typical cross section of the internal roads is considered generally in accordance with the requirements set out in FNQROC's development manual.

5.2 External Road Network Layout

The external roads which provide access to the development are outlined in Figure 5-2 with their respective characteristics summarised in Table 5-2.

Figure 5-2 Stage 1 External Road Network



Source: Nearmap

Table 5-2 External Road Characteristics

Road	Existing Typical Cross Section	Catchment Lots Gaining Access from Road		FNQROC Road Hierarchy Classification	FNQROC Requirement	FNQROC Compliant
Stage 1		**Existing**	**Proposed**			
Milman Drive	16.5m	62 lots	32 lots	Minor Collector	16.5m (7.5m sealed) cross section for 91-300 lots	✓ (94 lots)
Ultimate		**Existing**	**Proposed**			
Milman Drive	16.5m	62 lots	282 lots	Minor Collector	16.5m (7.5m sealed) cross section for 91-300 lots	× (344 lots)

The proposed external road network has been reviewed against the requirements set out in Table D1.1 of FNQROC's development manual (Design Manual D1 Road Geometry. As indicated in Table 5-2, the traffic carrying capacity and typical cross section of the external roads is considered generally in accordance with the requirements set out in FNQROC's development manual for Stage 1, however in the ultimate form, the catchment size exceeds the road hierarchy classification requirement.

It is noted that Milman Drive exceeds the FNQROC requirement of 91-300 lots for the minor collector when 238 out of the total 282 lots are built for the ultimate staging of the development. Therefore, as it is not likely that the existing carriageway of Milman Drive can be upgraded, it is recommended to have the southern Andreassen Drive access constructed prior to the construction of 238 lots.

Additionally, it is understood that Downing Street, extending north from Boer Street operates as a driveway currently. As traffic volumes increase on Downing Street, it is recommended that this section of road/driveway is delineated as a 'giveway' sign control with Boer Street as the major road. This has been illustrated on Figure 5-3.

Figure 5-3 Recommended Line-marking – Downing Street



Source: Nearmap

5.3 Servicing Facility Design Review

According to the Access, parking and servicing code in the Douglas Shire Planning Scheme (2018), Table 9.4.1.3.b *Access, parking and servicing requirements* indicates a dwelling house has no service vehicle requirement.

However, swept path assessment for a Refuse Collection Vehicle (RCV) has been undertaken for manoeuvres within the Stage 1 area. The swept path assessment reveals all internal roads are successfully serviced by an RCV. It is noted that a reversing movement will be required for Lot 26 in the interim until future internal roads are constructed. This has been shown on Figure 5-4.

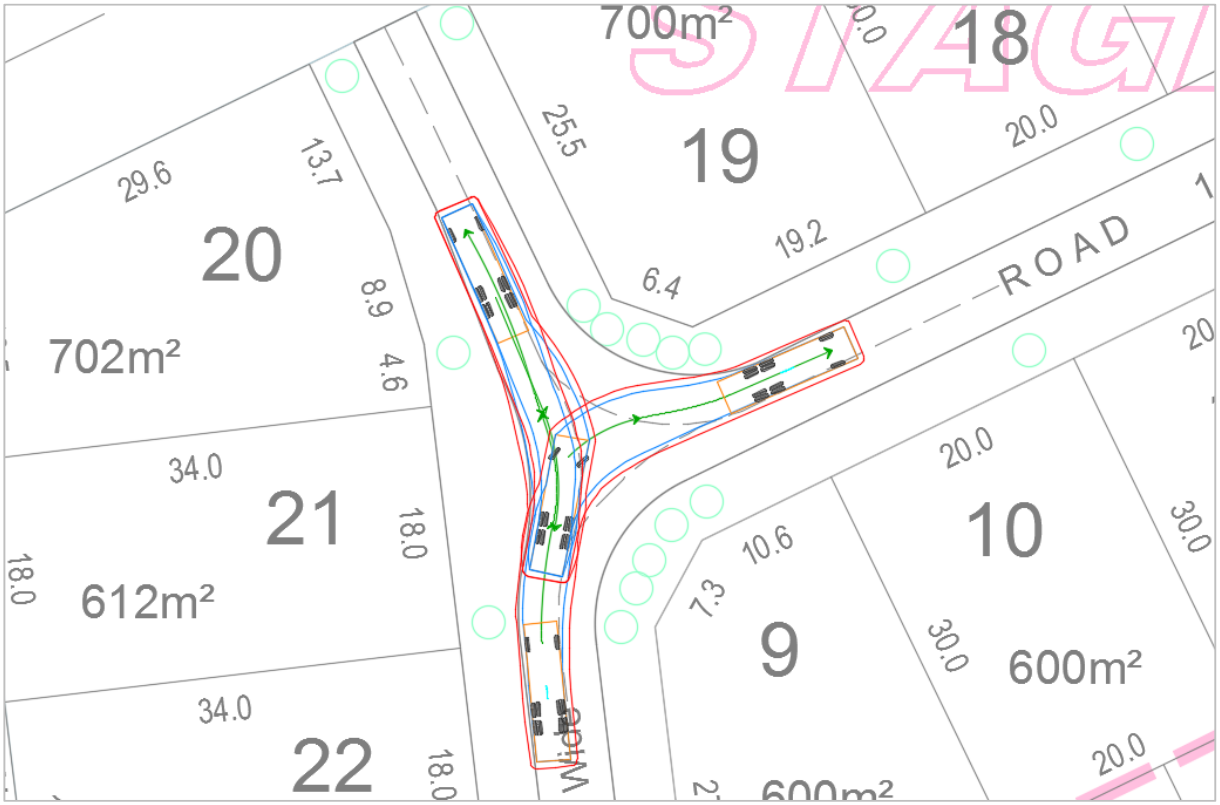
Figure 5-4 Lot 26 Interim RCV Swept Path



Source: Cardno drawing Q184109-MP01C

Additionally, a reversing manoeuvre is required for Lot 20 as this is a stub road arrangement. This has been shown on Figure 5-5.

Figure 5-5 Lot 20 Stub Road RCV Swept Path



Source: Cardno drawing Q184109-MP01C

The detailed swept path drawings are attached in Appendix B.

6 Recommendations and Conclusion

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Port Douglas Land Development Pty Ltd to prepare a traffic engineering assessment for a proposed master planned residential development located in Craiglie, Port Douglas.

The proposal focuses on Stage 1 of the masterplan and consists of 32 residential dwellings.

This traffic engineering assessment has identified the following:

Traffic Assessment

- Stage 1 (32 lots) of the development generates a total of 27 vph in the peak period (3.7% proportional impact on the Captain Cook Highway intersection), which is considered to be quite low, therefore the impact on the external network is deemed to be negligible
- The ultimate development of 282 lots generates a total of 240 vph in the peak period.
- SIDRA analysis of the Captain Cook Highway / Milman Drive intersection indicated that the year of opening and design horizon scenarios for Stage 1 development traffic operated within the typical performance thresholds for a priority controlled intersection with a maximum DOS of 0.273 in the 2031 AM peak period
- For the ultimate development yield, the assessment of the Captain Cook Highway / Milman Drive intersection revealed the intersection is anticipated above typical thresholds for a priority controlled intersection at the ultimate opening year (2031) in the AM peak period (DOS of 0.829)
- Based on this, potential reconfiguration forms of the intersection were investigated to improve the intersection operation and safety as informed from the Road Safety Audit as an existing safety concern was observed during the site visit
- It is recommended to reconfigure the Captain Cook Highway / Milman Drive intersection to include the following, regardless of the development yield:
  - Major right turn lane and minor left/through short lane on the eastern approach
  - Major left/through lane and minor short right turn lane on the southern approach
  - Major left turn and minor short through/right lane on the western approach
  - Northern approach unchanged
- The SIDRA analysis undertaken on the reconfigured intersection form indicates that the 2031 Background with ultimate development traffic operates with the typical performance thresholds for a priority controlled intersection with a maximum DOS of 0.778 in the 2031 AM peak period
- Trigger analysis for the ultimate development indicates that at the construction of 270 lots, the Captain Cook Highway / Milman Drive intersection exceeds the typical performance threshold of DOS < 0.80 in the AM peak period

Road Network Assessment

- The proposed internal road network for Stage 1 meets the requirements of the FNQROC for the catchment sizes and road hierarchy classification
- The external road network utilised by the development (Milman Drive) is classified as a minor collector with a maximum catchment size of 300 lots as outlined in the FNQROC. When the Stage 1 development is constructed, Milman Drive will provide access for 94 lots which is within the maximum catchment size.
- However, when the ultimate development of 282 lots is developed, Milman Drive will provide access to 344 lots which exceeds the maximum catchment size for a Minor Collector
- As it is unlikely that Milman Drive can be upgraded to a higher order road, it is recommended that the southern Andreassen Drive access is constructed to alleviate the demand on Milman Drive and subsequently the Captain Cook Highway / Milman Drive intersection. These works are recommended to be taken out prior to the construction of 238 lots in the ultimate design.
- It is recommended that the northern section of Downing Street, currently operating as a driveway, is line-marked as ‘giveway’ control as traffic volumes increase on this section of road.
- Further, based on Council’s queries, restrictions may be put on residential parking in the area at the discretion of Council to limit on-street parking. It is noted that Queensland Road Rules apply where no Council enforced parking limits are implemented which allows parking on local roads under certain circumstances

Based on the traffic and road network assessment of the Stage 1 development, the impact to the Captain Cook Highway / Milman Drive intersection and internal and external road network is considered to be appropriate for the development. Following the recommendations outlined in this report, the development is considered to be adequate from a traffic engineering perspective.

Craiglie Subdivision, Port Douglas

APPENDIX A

DEVELOPMENT PLANS

north

MASTER PLAN

PORT DOUGLAS ESTATE
CAPTAIN COOK HIGHWAY
CRAIGLIE



Cardno®

Tel: (07) 4034 0500

This plan is conceptual and for discussion purposes only. All areas, dimensions and land uses are preliminary, subject to investigation, survey, engineering, and Local Authority and Agency approvals.

PRELIMINARY ONLY

Date: 28th May 2019 | Scale: 1 : 1500 @ A1 | Drawn: MC | Job No.: Q184103 | Plan No.: Q184103-MP01C

north

STAGES 1A & 1B

PORT DOUGLAS ESTATE
CAPTAIN COOK HIGHWAY
CRAIGLIE

STAGE 1B

STAGE 1A

DULKU CLOSE

WABUL STREET

CAPTAIN COOK HIGHWAY

ROAD 14.5m Wide

ROAD 15.5m Wide

20m Wide

Drainage Reserve 5265m²

Park 2000m²

Future Park & Drainage Reserve

Future Residential

Future Residential

Future Residential

PROPOSED DRAINAGE RESERVE & NOISE AMELIORATION FENCE

Easement A

SP252226

Cardno

Tel: (07) 4034 0500

Date: 28th May 2019 | Scale: 1 : 1000 @ A3 | Drawn: MC | Job No.: Q184103 | Plan No.: Q184103-MP02B

This plan is conceptual and for discussion purposes only. All areas, dimensions and land uses are preliminary, subject to investigation, survey, engineering, and Local Authority and Agency approvals.

Craiglie Subdivision, Port Douglas

APPENDIX B

SWEPT PATH ANALYSIS

CONCEPT ONLY

STAGE 1A

CLOSE

15 SP192596

16 SP192596

17 SP192596

18 SP192596

19 SP192596

20 SP192596

21 SP192596

Emt A

WABUL

Drainage Reserve 5265m²

Park 2000m²

20m Wide

STREET

Future Park & Drainage Reserve

ROAD 14.5m Wide

ROAD 15.5m Wide

ROAD 14.5m Wide

PROPOSED DRAINAGE RESERVE & NOISE AMELIORATION FENCE

CAPTAIN COOK HIGHWAY

1 700m² | 2 700m² | 3 601m² | 4 600m² | 5 600m² | 6 600m² | 7 700m² | 8 600m² | 9 600m² | 10 600m² | 11 600m² | 12 600m² | 13 600m² | 14 600m² | 15 600m² | 16 700m² | 17 600m² | 18 700m² | 19 700m² | 20 702m² | 21 612m² | 22 612m² | 23 680m² | 24 680m² | 25 680m² | 26 680m² | 27 669m² | 28 655m² | 29 641m² | 30 641m² | 31 625m² | 32 614m²

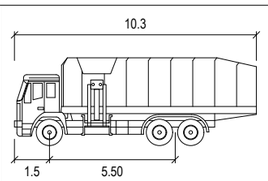
Future Residential

Future Residential

Future Residential

SWEPT PATH LEGEND

- VEHICLE BODY
- VEHICLE PATH
- VEHICLE CLEARANCE (500mm)
- VEHICLE



TAPS Code Side Loader

		Meters
Width	:	2.50
Track	:	2.50
Lock to Lock Time	:	6.0
Steering Angle	:	39.9
Travel Height	:	4.0
Operating Height	:	4.50

NORTH

0 10 20 30 40 50m

10 8 6 4 2

SCALE 1:1000 @ A3

© Cardno Limited
All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Port Douglas Land Development Pty Ltd
Craiglie Subdivision
10.3m BCC Side Lift RCV
Stage 1 Development Manoeuvring
Swept Path Analysus

Drawn	Date	Scale	Size
M.Elliott	28/06/2019	1:1000	A3

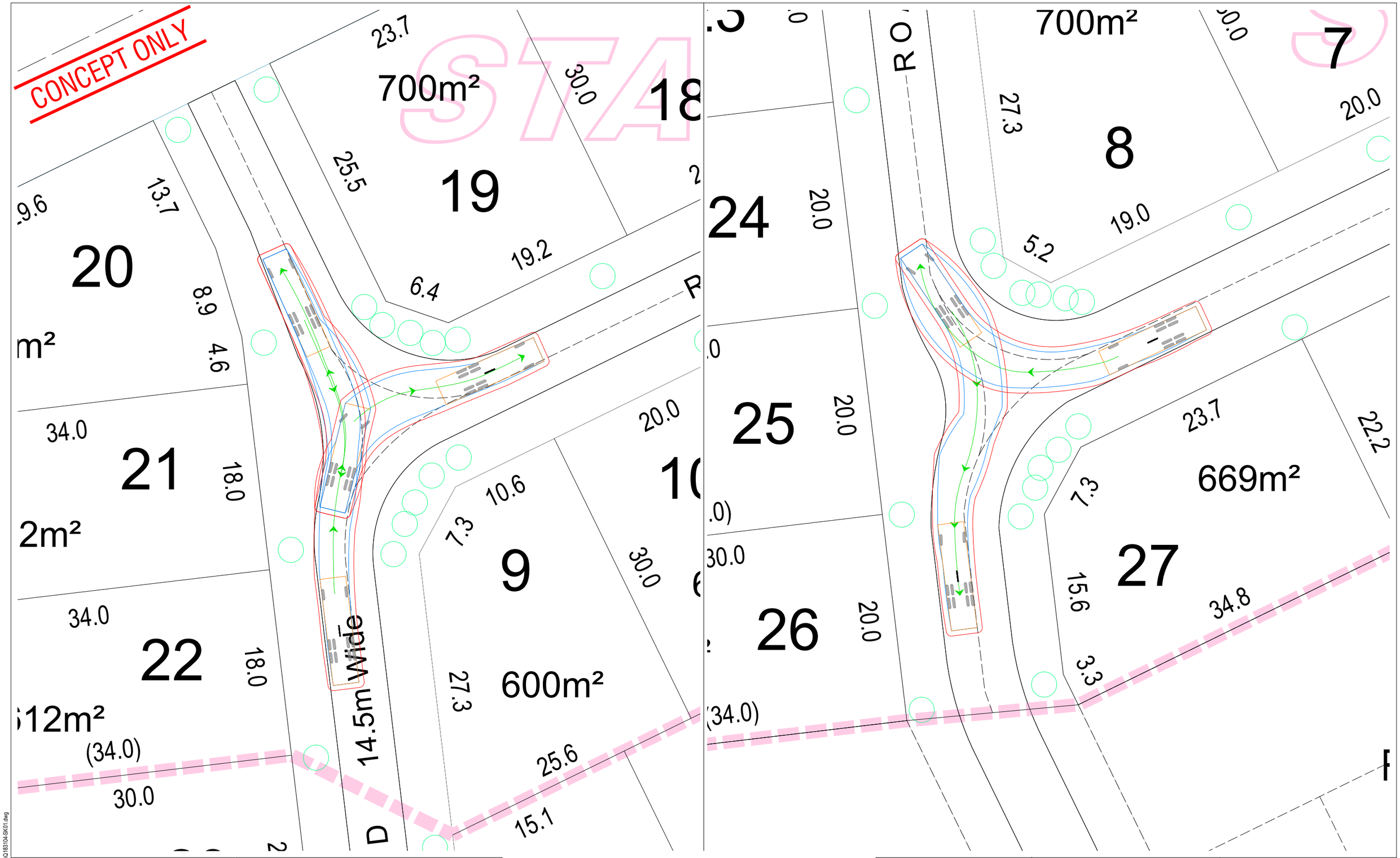
Drawing Number: Q184103-SK01
Revision: A

CAD File: G:\Q184103 - Craigie DA\TA\ACAD\Q183104-SK01.dwg

Imagery supplied by nearmap, June 2019

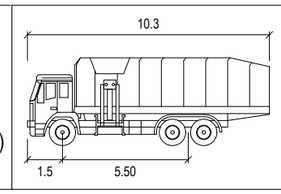
CONCEPT ONLY

STA



SWEPT PATH LEGEND

- VEHICLE BODY
- VEHICLE PATH
- VEHICLE CLEARANCE (500mm)
- VEHICLE



TAPS Code Side Loader

Meters

Width	:	2.50
Track	:	2.50
Lock to Lock Time	:	6.0
Steering Angle	:	39.9
Travel Height	:	4.0
Operating Height	:	4.50

NORTH

0 2 4 6 8 10 12 14 16m

3 2.5 2 1.5 1 0.5

SCALE 1:300 @ A3

© Cardno Limited
All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (Qld) Pty Ltd | ABN 57 051 074 992
Level 11, 515 St Paul's Terrace
Fortitude Valley, QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722
Web: www.cardno.com.au

Port Douglas Land Development Pty Ltd
Craiglie Subdivision
10.3m BCC Side Lift RCV
Reversing Manoeuvres Lot 20 & 26
Swept Path Analysus

Drawn	Date	Scale	Size
M.Elliott	28/06/2019	1:300	A3

Drawing Number: Q184103-SK02
Revision: A

CAD File: G:\Q184103 - Craiglie DA\TA\ACAD\Q183104-SK01.dwg

Imagery supplied by nearmap, June 2019

Report on Beor Street & Captain Cook Highway intersection Lighting

Prepared by SPA Consulting Engineers (QLD) Pty Ltd
10/10/19



Jane Errey
Senior Engineer



Shaun Weldon
Senior Designer

REVISION HISTORY

Date	By	Revision notes
10/10/19	SW	Initial issue

consulting engineers (QLD)

SPA Consulting Engineers (QLD) Pty Ltd
PO Box 664 North Cairns QLD 4870
Ph: 07 4032 3311
Email: admin@spaconsulting.com.au

Contents

1. INTRODUCTION 3
2. BRIEFING FOR THE PROJECT 3
3. UPGRADE TO EXISTING LIGHTING 3
   - 3.1. EXCLUSIONS FROM THE ESTIMATE 3
   - 3.2. ITEMS INCLUDED IN THE ESTIMATE 3
4. RECOMMENDATIONS 3
5. ATTACHMENT 1 – RSA STUDY EXTENT. 4
6. ATTACHMENT 2 – AGI LAYOUT OF EXISTING INFRASTRUCTURE. 4
7. ATTACHMENT 3 – SITE PICKUP INFORMATION 5
8. ATTACHMENT 4 – AGI LAYOUT OF NEW LIGHTING REQUIRED 6
9. ATTACHMENT 5 - ESTIMATE 7

© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

1. Introduction

Cardno (Cairns) engaged SPA Consulting Engineers (Qld) Pty Ltd (SPA) to carry out a review of the existing lighting at Beor St / Captain Cook Highway Intersection to confirm compliance of the intersection.

2. Briefing for the project

Maurice Sheehan initially provided by email to SPA a Road safety report (see attachment 1) of the existing roads and the intersection of Beor Street & Captain Cook Highway.

We (SPA) carried out a site inspection where we determined each light location and type. (Attachment 3).

3. Upgrade to Existing Lighting

We have modelled the existing lighting shown in attachment 2 and it does not comply on the south eastern corner of the intersection.

To make the intersection compliant we propose to install a new OPTISPAN MKII 250W HPS Aeroscreen 10.5m height base mounted steel pole with a 4.5m outreach on the south eastern corner of the intersection as shown in attachment 4.

We have estimated the cost of installing the light to be $50,883.89, as per attachment 5

3.1. Exclusions from the Estimate

- The estimate does not include GST or any contingencies.

3.2. Items included in the Estimate

- The estimate includes an SPA design fee as the lighting modeled has not been through a detailed design process and needs to be fully designed and coordinated.
- We have included contractors travel and freight costs in the estimate.
- We have include approximate costing for Ergon works, which will be confirmed in design.

4. Recommendations

We recommend the following:

- That a new OPTISPAN MKII 250W HPS Aeroscreen be installed on a 10.5m steel base mounted pole with a 4.5m outreach on the south eastern corner of the Beor Street & Captain Cook Highway intersection.

© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

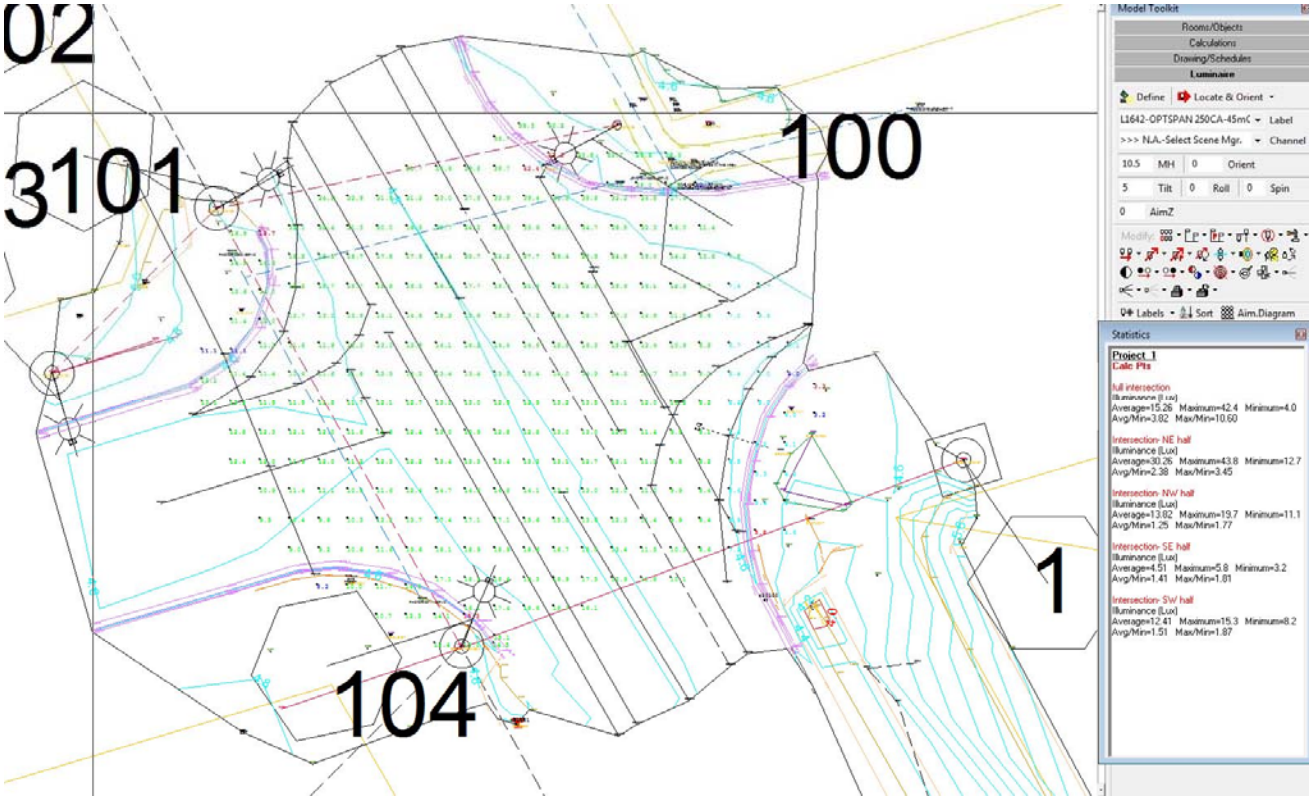
5. Attachment 1 – RSA Study Extent.

Figure 3-3 RSA study extent



Source: Nearmap

6. Attachment 2 – AGI layout of existing infrastructure.



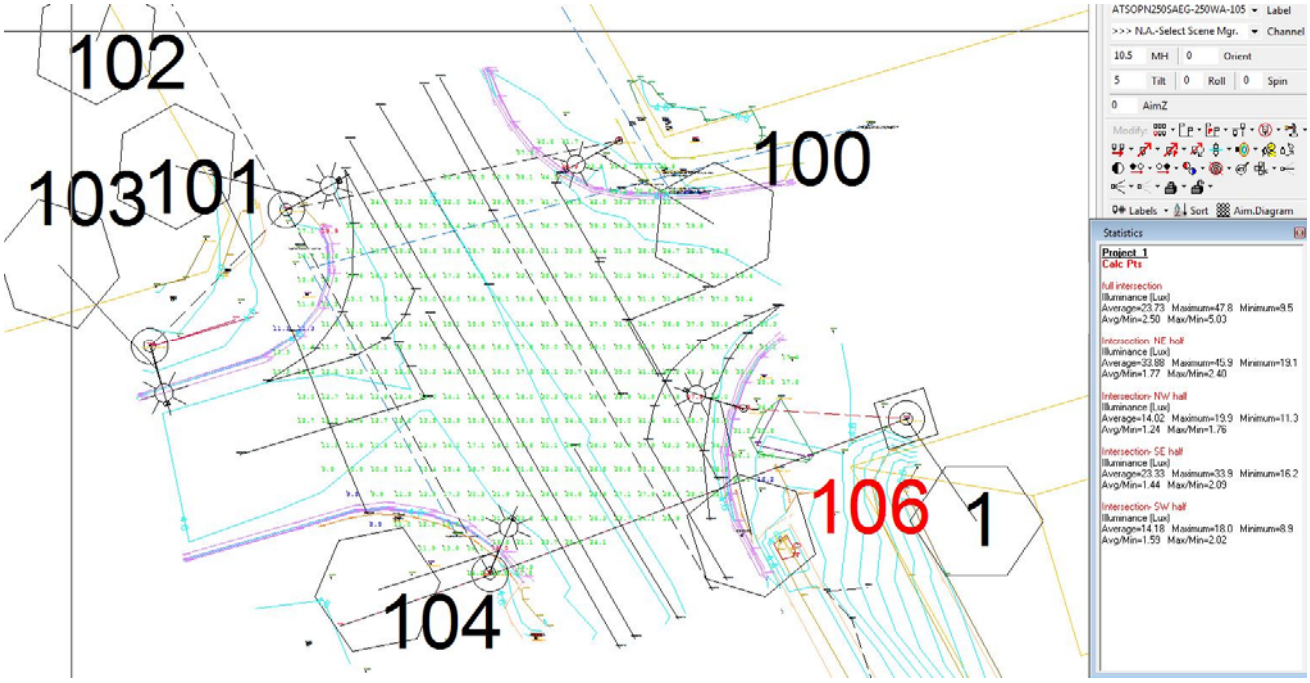
© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

7. Attachment 3 – Site Pickup Information



© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

8. Attachment 4 – AGI layout of New Lighting required



© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

9. Attachment 5 - Estimate

Project:	Beor Street/ Captain Cook Highway Intersectio
Project No:	3160
Prepared By:	SW
Approved	
Date:	9/10/2019

spa
consulting engineers (QLD)

Template Rev
30/03/2016

NOTE : FOR REVISION HISTORY DETAILS REFER TO REVISION TABS

TOTAL AMOUNT (excluding contingency and GST) $50,883.88

ITEM No	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
	CONSULTANCY FEES				
	Design and documentation	1	Item	$0.00	$5,900.00
	Tendering phase	1	Item	$900.00	$900.00
	Contract administration	1	Item	$0.00	$1,450.00
	MANAGEMENT, TRAVEL, ACCOMMODATION ETC				
	Project Management & administration	3	Item	$312.72	$938.15
	Mobilisation	1	Item	$470.79	$470.79
	Travel to and from site	3	Day/5 person crew	$3,160.00	$9,480.00
	Freight for materials, etc	1	Item	$127.64	$127.64
	Demobilisation	1	Item	$235.37	$235.37
	TRENCHING AND EXCAVATION FOR ELECTRICAL AND COMMS				
	Trench LV & Comms only in verge. Excavate trench 900 mm deep, 600 wide, sand, install conduit, sand fill, then backfill with tape and hard cover where required.	13	lin m	$32.00	$416.00
	ELECTRICAL CONDUITS SUBSTATION PLINTHS POLE FOOTINGS, ETC				
	Conduit40 mm heavy duty underground electrical	28	lin m	$21.00	$588.00
	Conduit bend 40 mm 90 Deg / 300 Radius electrical	2	Item	$17.50	$35.00
	Major Road light pole footing (fixed base)	1	Item	$1,100.00	$1,100.00
	ELECTRICAL & STREET LIGHTING WORKS				
	Cat V Road Light (S150CA) Fixed Base	1	Item	$3,830.00	$3,830.00
	Electrical LV 1 X 2C 16mm2 Cu XLPE (m)	28	lin m	$14.75	$413.00
	WORKS BY ERGON REQUIRED FOR PROJECT				
	Approximate contestable fees	1	Item	$0.00	$25,000.00

Page 1 of 1 11/10/2019 Template_SPA_Estimate Spreadsheet.xls

© This document is copyright with copyright retained by SPA Consulting Engineers (QLD) Pty Ltd. Reproduction in whole or part is not permitted without written permission from SPA Director/s. **PRINT WARNING:** Printed "Uncontrolled" copies of this manual/reference/policy or part thereof should not be relied upon as a current manual/reference document. **ALWAYS** refer to a "Controlled" copy of the manual/reference/policy for the latest version. **Version:**

Maurice Sheehan

From: Developer Liaison <developerliaison@nbnco.com.au>
Sent: Tuesday, 22 October 2019 3:45 PM
To: Maurice Sheehan
Subject: Master Developer Agreement acceptance received - DEV-00083796

Development Reference: **DEV-00083796**
Your Development: **Port Douglas Estate Craiglie**

Dear Ernest Duval,

Thank you for choosing **nbn**.

This e-mail is to confirm acceptance of **nbn**'s proposal for the delivery of the **nbn™** broadband access network to **Port Douglas Estate Craiglie – DEV-00083796**. Please see the General Conditions.

To register for nbn™ New Developments Portal

If this is your first time using the **nbn**™ New Developments portal, please register your account using the six character registration code. This code was sent to you in a separate email following acceptance

If you have any questions, log in to the **nbn**™ New Developments Portal or contact your **nbn**™ Relationship Manager:

Relationship Manager:

Name: Barrie Mason

Email: barriemason@nbnco.com.au

Phone:

Sales Executive:

Name: David McCrae

Email: davidmccrae@nbnco.com.au

Phone:

Kind Regards,
nbn™ New Developments team

Visit our **nbn**™ New Developments Portal: https://www.nbnco.com.au/newdevsportal

View our privacy policy: www.nbnco.com.au/Privacy

Notice to recipient: This e-mail is intended only to be read or used by the addressee. It is confidential and may contain information that is subject to legal professional privilege or protected by copyright. If you are not the addressee indicated in this message (or responsible for delivery of the message to that person), you may not copy or deliver this message to anyone, and you should destroy this message and kindly notify the sender by reply e-mail. Copyright, confidentiality and legal professional privilege are not waived or lost by reason of mistaken delivery to you. Emails to/from nbn co limited ABN 86 136 533 741 may undergo email filtering and virus scanning, including by third party contractors, however, nbn co limited does not guarantee that any email or any attachment is secure, error-free or free of viruses or other unwanted or unexpected inclusions. Any views expressed in this message are those of the individual sender, except where the sender specifically states them to be the views of nbn co limited.
PLEASE CONSIDER OUR ENVIRONMENT BEFORE PRINTING

Queensland Government

Department of
State Development, Manufacturing, Infrastructure and Planning

Our reference: 1910-13764 SPL
Your reference: Q184103
Council reference: ROL 2966/2018

6 November 2019

Port Douglas Land Developments Pty Ltd
C/- Cardno Qld Pty Ltd
15 Scott Street
PARRAMATTA PARK QLD 4870
maurice.sheehan@cardno.com.au

Attention: Maurice Sheehan

Dear Sir/Madam

Pre-lodgement advice

Thank you for your correspondence received on 23 October 2019 in which you sought pre-lodgement advice from the Department of State Development, Manufacturing, Infrastructure and Planning regarding the proposed development described below.

Reference information

Departmental role:	Referral Agency
Departmental jurisdiction:	**Schedule 10, Part 6, Division 4, Subdivision 3, Table 1** – Operational work that is constructing or raising waterway barrier works
Assessment manager reference:	ROL 2966/2018

Location details

Street address:	Captain Cook Highway, Craiglie
Real property description:	Lot 2 on SR431
Local government area:	Douglas Shire Council
Existing use:	Rural – Cane farming
Relevant site history:	Development approval (ref. ROL 2966/2018) for 1 into 32 residential

Far North Queensland regional office

Ground Floor, Cnr Grafton and Hartley Street, Cairns

PO Box 2358, Cairns QLD 4870

subdivision, issued by Douglas Shire Council on 28 May 2019.

Details of proposal

Development type:	Operational works
Development description:	Operational works associated with 32-lot subdivision and drainage upgrades to TMR road reserve. Installation of new sewer pump station and associated new rising main.

Supporting information

Drawing/report title	Prepared by	Date	Reference no.	Version/issue
State Assessment and Referral Agency Lot plan report	Department of State Development, Manufacturing, Infrastructure and Planning	23 Oct 2019	4RP745566	
Request for pre-lodgement advice	Maurice Sheehan	23 Oct 2019	-	-
Drawing Schedule and Locality Plan	Cardno	23 Oct 2019	Q184103-CI-1001	B
Overall Site Plan	Cardno	23 Oct 2019	Q184103-CI-1003	B
Bulk Earthworks Plan	Cardno	23 Oct 2019	Q184103-CI-1100	B
Vegetation Management Plan	Cardno	23 Oct 2019	Q184103-CI-1401	A

The department has carried out a review of the information provided and the impacts of the proposal. The following advice outlines the matters of interest to the department and matters that should be addressed if you lodge your development application with the assessment manager.

Please note the pre-lodgement advice is valid for a period of nine months form the date of issue, unless a change in legislation or policy occurs that would affect the pre-lodgement advice.

Item	Advice
Proposal	
1.	The proposed development is for operational works associated with a reconfiguration of a lot approval issued by Douglas Shire Council dated 28 May 2019 (ref. ROL 2966/2018). The works include drainage works and vegetation clearing within the state-controlled road reserve (Captain Cook Highway). From imagery it can be seen there is already drainage associated with the proposed area on the dedicated road. This consists of a culvert and drainage channel that connects into a larger constructed drainage channel.
State Development Assessment Provisions (SDAP)	
2.	The current State Development Assessment Provisions (SDAP) will be used in assessing the

Item	Advice
	application. Based on the location and scale of the proposed development, the following state codes are applicable: • State code 18: Constructing or raising waterway barrier works in fish habitats. To address the SDAP the applicant must demonstrate how the acceptable outcomes of the state code will be achieved. An application that complies with all applicable acceptable outcomes is considered to satisfy the corresponding performance outcome. If the development cannot meet an acceptable outcome, the applicant must provide evidence on how the proposal meets the performance outcome. To assist applicants in addressing the SDAP criteria the department has prepared SDAP version 2.5 response templates. Please note, the SDAP is continually amended to reflect updates to legislation and policies, and the version current at the time of application lodgement will be used for assessment.
State transport corridor	
3.	The premises is mapped within 25m of Captain Cook Highway, a state-controlled road, and within 100m of the state-controlled road intersection with Palm Avenue and Andreassen Road. There is no direct access to Captain Cook Highway, and the approved access for Stage 1A and 1B of the residential subdivision is via Wabul Street/Millman Drive road link to the Millman Drive/Captain Cook Highway intersection. Based on the information provided, the proposed development does not trigger referral agency assessment under Schedule 10, Part 9, Division 4, Subdivision 2, Table 5 – Operational work on premises near a State transport corridor, of the Planning Regulation 2017, as the works relate to reconfiguring a lot.
Native vegetation clearing	
4.	The premises is mapped as containing the following features and vegetation types: • Category R area (regrowth watercourse and drainage feature area, containing endangered regional ecosystem) • Category X area Based on the information provided, the proposed development does not trigger referral agency assessment under Schedule 10, Part 3, Division 4, Table 2 – Clearing native vegetation of the Planning Regulation 2017, as the works may be carried out under the following exemptions: • Schedule 21 part 2, item 2(g) allows for the clearing of native vegetation for an urban purpose in an urban area. • Schedule 21, part 2, item 5(a)(ii) allows for clearing in a mapped category R or category X area and on land dedicated as road, providing the clearing is carried out by a local government, or by or for the chief executive (i.e. the Department of Transport and Main Roads). NOTE: The road reserve at this location is considered an urban area. Exempt clearing carried out under Schedule 21, part 2, item 2(g), will require a road corridor permit from DTMR (as described in item 13, below).
Water Act 2000	

Item	Advice
5.	Works involving an unmapped feature The proposal involves works (i.e. a culvert upgrade) within a feature(s) that is yet to be mapped on the Department of Natural Resources, Mines and Energy's Watercourse Identification Map. A watercourse determination may be required if the proponent intends to undertake any of the following activities within an unmapped feature/s: • Take or interfere with water • Place fill, excavate material, or remove vegetation (outside of the limitations of the "Riverine Protection Permit Exemption requirements"). • Excavate riverine quarry materials. If any of the above works are proposed within an unmapped feature(s), it is recommended that a request for a watercourse determination be submitted via waterinfonorth@dnrme.qld.gov.au. The Department of Natural Resources, Mines and Energy will seek information to determine whether such features are a drainage feature or a watercourse for the purposes of the *Water Act 2000*. If a feature is determined to be a watercourse, certain works may require approval under the *Water Act 2000* and/or *Planning Act 2016.* Placing fill, excavating material or removing vegetation in a watercourse Landowners may excavate up to 500 cubic metres of material from, or place up to 150 cubic metres of fill in, a non-tidal watercourse that is on or adjacent to their property without approval under the *Water Act 2000*. These activities may only occur where the works can be undertaken in accordance with the document; "Riverine protection permit exemption requirements", available at: www.dnrme.qld.gov.au/?a=109113:policy_registry/riverine-protection-permit-exemption-requirements.pdf. Material excavated as a waste product must be disposed of in accordance with the exemption document and is not to be used for a beneficial purpose (i.e. on-sold or used in construction). If the proposed works meet the requirements of the exemption document, a request for a watercourse determination of the unmapped feature will not be required. A riverine protection permit must be applied for under section 218 of the *Water Act 2000* if the proposed works do not meet the exemption requirements. There is no fee for this permit. The application to apply for a riverine protection permit is available at: www.business.qld.gov.au/industry/water/managing-accessing/accessing-water/authorisations/riverine-protection. Using excavated material for a beneficial purpose (removing quarry material from a watercourse or lake) Proponents seeking to excavate riverine quarry materials (such as sand, gravel, rocks, soil) from within a watercourse or lake for any purpose other than waste material will require a quarry material allocation notice. These notices are issued by the Department of Natural Resources, Mines and Energy under the *Water Act 2000* and will be in addition to a development permit under the *Planning Act 2016*. Any associated clearing of vegetation within a watercourse may also require

Item	Advice
	assessment. Watercourse water (water in a watercourse, lake or spring) Where a feature has been determined to be a watercourse for the purposes of the *Water Act 2000* landholders can take water for stock or domestic use (as defined in the dictionary, Schedule 4 of the *Water Act 2000*) or for prescribed activities listed under Schedule 3 of the Water Regulation 2016 (subject to any applicable limitations) without an authority under the *Water Act 2000*. To take water for any other purpose (e.g. irrigation), or to interfere with water (e.g. to construct an impoundment or weir across a watercourse), an entitlement will be required under the *Water Act 2000*. A development permit may also be required under the *Planning Act 2016*. Underground water Lot 2 on SR431 is located within the Mossman Groundwater Management Area, managed under the Wet Tropics Water Plan. In this area underground water may only be taken without a water entitlement for stock or domestic purposes. Proponents seeking to take underground water for any other purpose will require an entitlement under the *Water Act 2000*. Planning approval under the *Planning Act 2016* for the drilling of new subartesian bores may be required in this area, and a registered water bore driller is required to drill a bore deeper than six metres. The proponent should contact the Department of Natural Resources, Mines and Energy on 4017 0140 or waterinfonorth@dnrme.qld.gov.au for further advice regarding the above water advice if required.
Waterway barrier works	
6.	The premises is mapped as containing a major risk (purple) waterway and a moderate risk (amber) waterway for waterway barrier works. Desktop research and the application material indicate that there are errors in the mapping (refer **Attachment 1**) as follows: • There is no purple waterway, with spatial data appearing to align with a cane headland. • The mapped alignment of the amber waterway is incorrect. The actual alignment shows the waterway entering the north-west corner of the subject lot, running along the northern boundary of the subject lot, then along the north western boundary of Lot 120 on SP276038, and eventually entering the tidal area of Lot 119 on SP276040. Based on the information provided, the proposed works of diverting and modifying, and constructing a culvert crossing constitute waterway barrier works. Referral agency assessment is triggered under Schedule 10, Part 6, Division 4, Subdivision 3, Table 1 – operational work that is constructing or raising waterway barrier works, of the Planning Regulation 2017, unless the work can comply with the Department of Agriculture and Fisheries accepted development requirements. The proposed works cannot comply with the accepted development requirements (ADR) as the proposal to divert and modify this waterway cannot meet any of the prescribed work types. A development approval will be required for assessable development that is constructing or raising waterway barrier works. The applicant should note that the modification of the waterway constitutes the barrier and the

Item	Advice
	diversion of the waterway is the subsequent fish passage way. Although the ADR has provisions for the construction of culverts in an amber waterway, it is highly recommended to include this aspect of development in the development application for constructing and raising waterway barrier works. The Department of Agriculture and Fisheries has also prepared the following factsheets for more information on waterway barrier works: - What is a waterway? - What is a waterway barrier work? - What is not a waterway barrier work?
7.	The development application will need to address the performance outcomes in SDAP State code 18: Constructing or raising waterway barrier works in fish habitats – Table 18.2.2. Based on the information provided, the performance outcomes listed below will require particular consideration: **PO1: Demonstrated need** The applicant is advised to explain why the stream re-alignment and modification is required. What alternatives have been considered? In addition, the design of the culverts must be justified. Current design plans indicate that the proposed culverts overtop in Q5 events. This may not be adequate to provide for fish passage in all flow conditions. **PO2: Functional requirement** Only those aspects of a development that have a functional requirement to be located within a waterway are supported. **PO3: Number and extent** The applicant is advised to explain why a certain design of stream modification and culvert crossing was chosen and how this design minimises impacts to the waterway. **PO4: For the life of the barrier** A number of acceptable outcomes (AO) would achieve compliance with this PO for the proposed culverts, AO4.1 to AO4.5 and AO4.13 to AO4.22 are relevant. The applicant is advised to incorporate relevant designs into the culvert crossing. If not all of the relevant acceptable outcomes can be incorporated, the development application must demonstrate that adequate fish passage is provided for in other ways. No acceptable outcomes are applicable for the waterway diversion and modification. The applicant must demonstrate that adequate fish passage is provided for from the downstream to the upstream extent of the proposed works. **PO5 and PO6: Fish passage** Lateral and longitudinal fish passage must be provided for all members of the fish community. Natural features incorporated in the stream diversion and modification are likely to enable fish to avoid predators during migration. In addition, such features are likely to provide feeding and resting places for fish. **PO7: Drownout characteristics** This concerns predominantly the culvert aspect of the proposed development. Provided plans indicate that culverts overtop at Q5 events. The applicant is advised to explain how and when the culvert crossing drowns out completely and provides for fish passage. Alternatively, culverts can be designed to not drown out until Q50 events, provided their design enables adequate fish passage up to culvert capacity. **PO8: Fisheries resources** The development does not increase the risk of mortality, disease or injury, or compromise the health, productivity, marketability or suitability for human consumption of fisheries resources,

Item	Advice
	having regard to (but not limited to): • biotic and abiotic conditions, such as water and sediment quality • substances that are toxic to plants or toxic to or cumulative within fish • design of structures • impacts on reproductive success • effect on fish energy reserves • whether fish may be physically damaged, injured, killed, trapped or stranded • fish passage and access to habitat generally • the impacts of pest fish and other relevant pest species **PO9: Unnatural modification** The applicant must demonstrate how the design of the diverted and modified waterway addresses the following: • avoids non-essential hardening or unnatural modification of the main channel of the waterway • retains natural fish habitat and features such as rock outcrops and boulders, wherever possible • avoids channelisation (i.e. straightening) of meandering waterways or where channels need to be significantly modified, simulates natural waterways and habitat features (for example, by including meanders, pools, riffles, shaded and open sections, deep and shallow sections and different types of substrata) • avoids construction during times of elevated flows If natural fish habitat cannot be retained, the application should detail how natural features are replicated in the diverted waterway. Consideration should be given to instream and riparian vegetation and associated landscaping. **PO10: Modification of water level and flow** Where waterway barrier works will modify water levels or flow characteristics of the waterway, existing up and downstream structures are upgraded to provide adequate fish passage in accordance with the new levels or flow characteristics. **PO11: Water exchange and flow** Sufficient water exchange and flow is maintained and provided to sustain and where necessary restore, water quality and the health and condition of fisheries resources, ecological functions and fish passage. The applicant is advised to explain how additional stormwater runoff from the residential development will impact the flow characteristics and hydrological conditions of the waterway. Considerations must be given to all future development that will divert stormwater runoff to the subject waterway, not only stage 2 and 3 of the proposed development. **PO12: Acid sulphate soils** Considering the vicinity of the proposed work site to tidal lands, it is likely that active or potential acid sulfate soils are present. The application material must explain how acid sulfate soils will be managed. **PO13-15: Construction impacts to waterway bed and bank** Inevitably, the operational works proposed will have direct and indirect impacts. The applicant is advised to demonstrate that these impacts will not result in adverse effects on fish habitats, i.e. by restoration, rehabilitation and other efforts made to provide fish habitats. **PO19 and PO20: Fish movement hydrology** For the life of the waterway barrier works, the hydrology of the development allows for adequate fish movement. The application material should provide information of hydrological conditions within the modified waterway and the culvert crossing to demonstrate compliance with these performance outcomes. **PO22: Fish way design**

Item	Advice
	The waterway must be modified such that: • adequate hydraulic conditions and minimum water depth for fish passage is maintained throughout the waterway • predation on fish using the waterway is avoided • rubbish and debris do not impede fish passage or cause blockages or damage the modified waterway • delays in fish movement are avoided when fish are undertaking upstream spawning migrations **PO25: Operational issues** Mechanisms must be in place to ensure that operational issues in the modified waterway are promptly rectified for the life of the modified waterway including but not limited to: • all components are designed to be durable, reliable and adequately protected from damage during high flow and flood events • all components can be replaced • a contingency plan ensures provision of alternate adequate fish passage during the fish way re-instatement process **PO32-35: Temporary waterway barrier works** The placement of temporary waterway barriers (if required) to facilitate construction of the culverts and the diversion and modification of the waterway may be conducted under DAF's Accepted development requirements for operational work that is constructing or raising waterway barrier works. If any proposed temporary waterway barrier works cannot meet the accepted development requirements, this aspect of the works will need to be covered under the development approval. The applicant should note that time limitations apply to all temporary waterway barriers in place under the ADR (360 days for amber waterways). If there is any possibility (e.g. due to weather) the barriers need to be in place for longer than the prescribed period under the ADR, the applicant is advised to include proposed temporary waterway barrier works in a development application. **PO36: Matters of state environmental significance (MSES)** The department maintains an 'avoid, mitigate, offset' requirement that applies to those activities that will, or are likely to, have a significant residual impact on matters of State environmental significance (MSES). Depending on the type of works being proposed and impact to waterways providing for fish passage (an MSES), the works may have a Significant Residual Impact. The applicant will need to provide details on how the impacts to waterways providing for fish passage will be avoided or minimised and where this cannot be reasonably achieved, offset. Refer to item 10 environmental offsets below, for further information on significant residual impacts and environmental offsets. **Application material** The development application should include scaled and sufficiently detailed plans as per DA Forms guide: Relevant plans, and supporting documentation which clearly identify all aspects of the proposed operational works development in relation to the waterway. In particular, this should include the following: • Detailed plans clearly showing the location of the proposed works in relation to existing mapped waterways. • Detailed plans clearly showing a cross section of the proposed waterway barrier works in relation to the existing bed and banks of each impacted waterway. • A longitudinal section of the proposed waterway barrier works in relation to the bed of

Item	Advice
	the waterway upstream and downstream of the works. NOTE: All plans should be able to be read to scale at A3 size • Written documentation discussing the following (as per performance outcomes above): o details of the purpose of the proposed works (e.g. single/multi-span bridge for pedestrian access, bed level crossing for vehicular access, etc.); o a description of the waterway proposed to be impacted (e.g. condition, size, connectivity, general hydrology) and nature of the impact; o a description of the work method (e.g. timing, equipment to be used); o a detailed description of the alternatives considered to reduce impacts on the waterway, as applicable (e.g. alternative designs, locations, setbacks/buffer distances, etc.); o details of on-site mitigation actions, during and after the development; o the extent of any future maintenance works required for the continued safe operation of the proposed structure or facility; and o impacts to fish passage. It must firstly be demonstrated that impacts to waterways providing for fish passage have been avoided. Where avoidance is not reasonably possible, impacts to waterways providing for fish passage must be mitigated. An environmental offset pursuant to the *Environmental Offsets Act 2014* may need to be provided for any significant residual impact.
Removal, destruction or damage of marine plants	
8.	Due to the vicinity of tidal lands to the subject site, inherent marine plants such as salt couch are likely to be present at the site and within the amber waterway. The applicant is advised to undertake some ground truthing to identify the flora on the subject lot. The applicant should note that plants such as mangroves, mangrove fern, saltcouch or samphire species are considered marine plants regardless of whether or not they are above or below the level of HAT (highest astronomical tide). If marine plants are present at the site and proposed to be removed, destroyed or damaged, then a development approval will be required for assessable development that is the removal, destruction or damage of marine plants. Referral agency assessment is triggered under Schedule 10, Part 6, Division 3, Subdivision 3, Table 1 – Operational work involving marine plants of the Planning Regulation 2017.
9.	If marine plant disturbance can't be avoided, then the development application will need to address the performance outcomes in SDAP State code 11: Removal, destruction or damage of marine plants – Table 11.2.1. The following performance outcomes will require particular consideration: **PO1-PO15: All development** **PO29-PO30: Restoration (if applicable)** **PO36: Matters of state environmental significance (MSES)** **Application material** The development application should include relevant plans as per DSDMIP's DA Forms guide: Relevant plans, and supporting documentation which clearly identify all aspects of the proposed development in relation to marine plants. In particular this should include the following: • the total amount of marine plants that will be disturbed, identifying the portion of permanent and/or temporary disturbance (in square meters or hectares)

Item	Advice
	• the location of the marine plants to be disturbed in relation to the development works • the level of highest astronomical tide (HAT), mean high water spring tide, and low water spring tide • the location and extent of fish habitat within the development area, including creeks, sand and/or yabby banks, drainage lines, lagoons and marshes if applicable, a plan clearly showing the location of the marine plants to be disturbed that will result in a significant residual impact (SRI) as defined under the *Environmental Offsets Act 2014*. Refer to item 10 environmental offsets below, for further information on significant residual impacts and environmental offsets.
Environmental offset	
10.	The department's Significant Residual Impact Guideline provides guidance for which an environmental offset condition may be imposed for certain prescribed environmental matters (matters of state environmental significance) where the department has a role in assessing the application against the State Development Assessment Provisions. Where an offset is provided for any acceptable significant residual impact, the development application should demonstrate / provide all of the following: • How the impacts have been reasonably avoided. • How the impacts have been reasonably minimised / mitigated. • Whether there is a significant residual impact (the department's Significant Residual Impact Guideline, may assist). • How the significance of the impact can likely be addressed through a suitable offset. Where a significant residual impact will occur, the offsets framework provides three offset delivery options: • proponent-driven offsets i.e. land-based offsets or a Direct Benefit Management Plan • financial settlement offset, or • a combination of the two. The Queensland Environmental Offsets Policy and the Guide for Determining Terrestrial Habitat Quality can assist in determining whether a proposed land-based offset is of a suitable size and scale. The documents provide details on the characteristics of suitable offset sites and a step-by-step process explaining how to measure habitat quality and the suitability of an offset proposal relative to the impact. The environmental offsets calculator can assist in determining financial settlement offsets.
Development assessment fees and forms	
11.	Based on the information provided, the applicable fees under the Planning Regulation 2017 for the proposed development are: • Schedule 10, Part 6, Division 4, Subdivision 2, Table 1, Item 5(b)(ii) – Operational work for waterway barrier works: $6,625.00 for each waterway barrier works as the waterway is moderate risk (amber). Please note that the assessment fees are subject to change. It is recommended you check Schedule 10 of the Planning Regulation 2017 or contact the department prior to the lodgment of

Item	Advice
	your application, to confirm the assessment fees applicable at the time. The development application will need to include DA Form 1. To assist in completing DA Form 1, the department has prepared the DA forms guide: Forms 1 and 2.
Further pre-lodgement advice	
12.	To request further pre-lodgement advice please use the 'related actions' tab in the 1910-13764 SPL MyDAS2 record and select 'Request more pre-lodgement advice from SARA'. You will be given an option to select either a meeting or written advice.
Other* advice – *not within the department's jurisdiction	
Road corridor permit	
13.	The Overall Site Plan, Drawing Q184103-CI-1003 shows that part of the 'limit of works' for the operational works development is required to be undertaken within the Captain Cook Road reserve. To undertake the necessary operational works (realignment of the existing drain and vegetation clearing) within the state-controlled road reserve, the applicant will require a 'road corridor permit' under section 50(2) and Schedule 6 of the *Transport Infrastructure Act 1994* and Part 5 and Schedule 1 of the Transport Infrastructure (State-Controlled Roads) Regulation 2006 for any ancillary works and encroachments. The applicant should contact the Cairns regional office of the Department of Transport and Main Roads (DTMR) on 4045 7144 to make an application for a road corridor permit. The approval process will require the approval of engineering designs of the proposed works, certified by a Registered Professional Engineer of Queensland (RPEQ). NOTE: Ancillary works and encroachments include but are not limited to: advertising signs or other advertising devices, paths or bikeways, buildings/shelters, vegetation clearing, landscaping and planting.
Road access	
14.	The Department of Transport and Main Roads notes the operational works development is proposing vehicle access via a proposed access road via Andreassen Road as shown by Drawing Schedule and Locality Plan, Drawing Number Q184103-CI-1001. The approved access for Stage 1A and 1B of the residential subdivision is via Wabul Street/Millman Drive road link to the Millman Drive/Captain Cook Highway intersection. The Department of Transport and Main Roads advises the operational works development application should confirm that the proposed access road is temporary and will only be used for the duration of the operational works.

This pre-lodgement advice does not constitute an approval or an endorsement that the department supports the development proposal. Additional information may be required to allow the department to properly assess the development proposal when a formal application has been lodged.

For further information please contact Anthony Westbury, Planning Officer, on 0740373215 or via email CairnsSARA@dsdmip.qld.gov.au who will be pleased to assist.

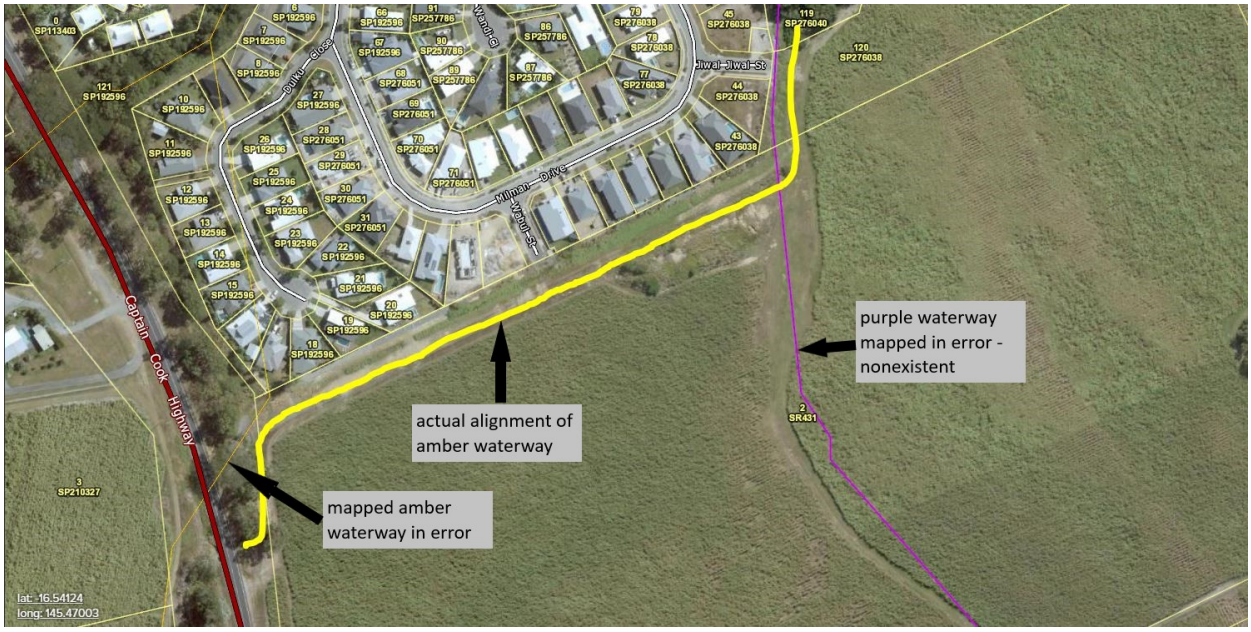
Yours sincerely



Joanne Manson
A/Manager (Planning)

enc Attachment 1 – Waterway mapping

Attachment 1—Waterway mapping



Our Ref **500/482**
Your Ref **Port Douglas Estate, Craiglie**
Enquiries Lawrence Wah Day

Queensland Government

Department of
Transport and Main Roads

25 September 2019

Gary Paterson
Cardno
Douglas Shire
gary.patterson@cardno.com.au

Dear Gary

Road Corridor Permit
Captain Cook Highway, Beor Street to 410m south
Port Douglas Road, Intersection of Ribbon Avenue
Maintain and operate a 150mm rising sewer main
Maintain and operate a 300mm water main connection
Maintain and operate a 125mm water main and road crossing
2019PD/P010

Thankyou for your email of 6 September 2019.

I advise that the attached Road Corridor Permit for Douglas Shire Council will be validated by the following:

1. The conditions specific to the activity are complied with:
    a. The attached site specific works conditions;
    b. The attached Road Corridor Information Sheet.

Conducting this work constitutes accepting the conditions of approval. Approval is in accordance with the provisions of:

- Section 50 of the Transport Infrastructure Act 1994;
- DTMR Manual of Uniform Traffic Control Devices (MUTCD);
- any other relevant legislation/policy/guideline/manual.

Providing conditions are met, the attached Road Corridor Permit will remain valid for the term shown on the Road Corridor Permit

Program Delivery and Operations
Far North Region/Cairns District Office
Level 4, Cairns Corporate Tower, 15 Lake Street
Cairns Queensland 4870
PO Box 6185 Cairns Queensland 4870
ABN 39 407 690 291

Telephone +61 7 4045 7262
Facsimile +61 7 4045 7138
Email **cairns.office**@tmr.qld.gov.au

A Road Corridor Permit information sheet covering requirements of approval, is attached. If you have any queries regarding this matter please contact Mr Lawrence Wah Day on telephone No. 4045 7262.

Yours sincerely



for Darryl Jones
Manager (Project Planning and Corridor Management)

*Enc (2)
1. Road Corridor Information Sheet
2. Site Specific Works Conditions

Site Specific Works Conditions

Road Corridor Permit

Captain Cook Highway, Beor Street to 410m south

Port Douglas Road, Intersection of Ribbon Avenue

Maintain and operate a 150mm rising sewer main

Maintain and operate a 300mm water main connection

Maintain and operate a 125mm water main and road crossing

2019PD/P010

I. All works carried out within the State-controlled road reserve shall comply with;
- the Work Health and Safety Act;
- the Biosecurity Act (eg Electric and Crazy Ants)
- the Manual of Uniform Traffic Control Devices;
- the Environmental Protection Act, and
- any other Act or Local Government requirement which may be relevant to these works.

II. Where works may impact upon vulnerable road users such as pedestrians and cyclists, provisions shall be made for their safety as required by:
- the MUTCD
- the Work Health and Safety Act.

III. TMR, as the authority responsible for the worksite, advise that Douglas Shire Council (the permit holder) are appointed as Principal Contractor for the works.

As Principal Contractor, you are required to comply with all provisions of the Work Health and Safety Act.

IV. Douglas Shire Council shall be responsible for liaison with all other Service Authorities, and shall repair any damage incurred as a result of operation, maintenance or removal of the "150mm rising main, water main connection, 125mm water main and road crossing".

V. For road maintenance and safety purposes, any pit or valve box within the State-controlled road reserve shall be constructed such that it is flush with existing surface levels and is clearly indicated with a marker.

VI. Any damage caused to the State-controlled road or reserve due to operation, maintenance or removal of the proposed “150mm rising main, water main connection, 125mm water main and road crossing” shall be repaired by the Douglas Shire Council to the satisfaction of the District Director or District Director’s Representative.

VII. The "150mm rising main, water main connection, 125mm water main and road crossing" shall be placed as per Cardno plans Q184103-CI-001 to 007 Rev 2 and Q184103-CI-008 & 009 Rev 1 as per Cardno email of 6 September 2019.

VIII. Should instances arise during the installation or maintenance of the proposed “150mm rising main, water main connection, 125mm water main and road crossing” where it is necessary to interfere with traffic flows, the following conditions apply.

In the interests of the general community, traffic delays are to be avoided during peak flow periods, which shall be:-

Monday to Friday	7.00 am to 9.00 am
	4.00 pm to 6.00 pm
Saturday	8.00 am to 12.30 pm

These curfew hours only apply to the peak flow direction.

Traffic delays are allowed during off-peak periods subject to:-

(a) Department of Transport and Main Roads approval being given;
(b) Submission of a Traffic Control Application Form ROP-01B.
(c) press statements (which are to be reviewed by this office before release) are issued prior to any offpeak traffic delays occurring, and
(c) a minimum of one lane, two way traffic flow maintained by accredited traffic controllers on two lane two way roads
(d) overall delay to any motorist not exceeding two minutes.

IX. In order to avoid any possible works conflicts, Douglas Shire Council shall contact the Department of Transport and Main Roads Area Engineer responsible for Douglas Shire at least one week prior to commencement of construction work on the proposed “150mm rising main, water main connection, 125mm water main and road crossing”.

In this respect you are advised to contact Telephone No. 4045 7144.

X. Douglas Shire Council shall be responsible for all maintenance costs of the "150mm rising main, water main connection, 125mm water main and road crossing".

XI. The installation of the "150mm rising main, water main connection, 125mm water main and road crossing" in the proposed location is approved subject to Douglas Shire Council being responsible for:

- "150mm rising main, water main connection, 125mm water main and road crossing" relocation costs if and when The Director-General, of The Department of Main Roads for and on behalf of the State of Queensland deems it necessary
- any additional costs associated with adjustment of the road alignment design due to the location of the "150mm rising main, water main connection, 125mm water main and road crossing" within the State-controlled road reserve.