IRONBARK ROAD, MUSWELLBROOK

STORMWATER SERVICING STRATEGY
19 APRIL 2024

PREPARED FOR

This report has been prepared by the office of Spiire
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Issue Date	Rev No	Authors	Checked	Approved
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1. BACKGROUND

Spiire has been engaged by Freedom Development Group (FDG) to undertake a Stormwater Management Strategy (SWMS) for the property located at Lot 101 & 103, Ironbark Road, Muswellbrook. The SWMS has been prepared to accompany a development application for a proposed residential development for submission to Muswellbrook Shire Council (MSC) and to inform the associated urban design.

The proposed development is for approximately 504 dwellings on an 81ha undeveloped site on Ironbark Road in Muswellbrook. The proposal is to develop as a combination of conventional and low development density residential with open space provisions.

The site is within the local government area of the Muswellbrook Shire Council (MSC). The subject site location is shown in Figure 1.

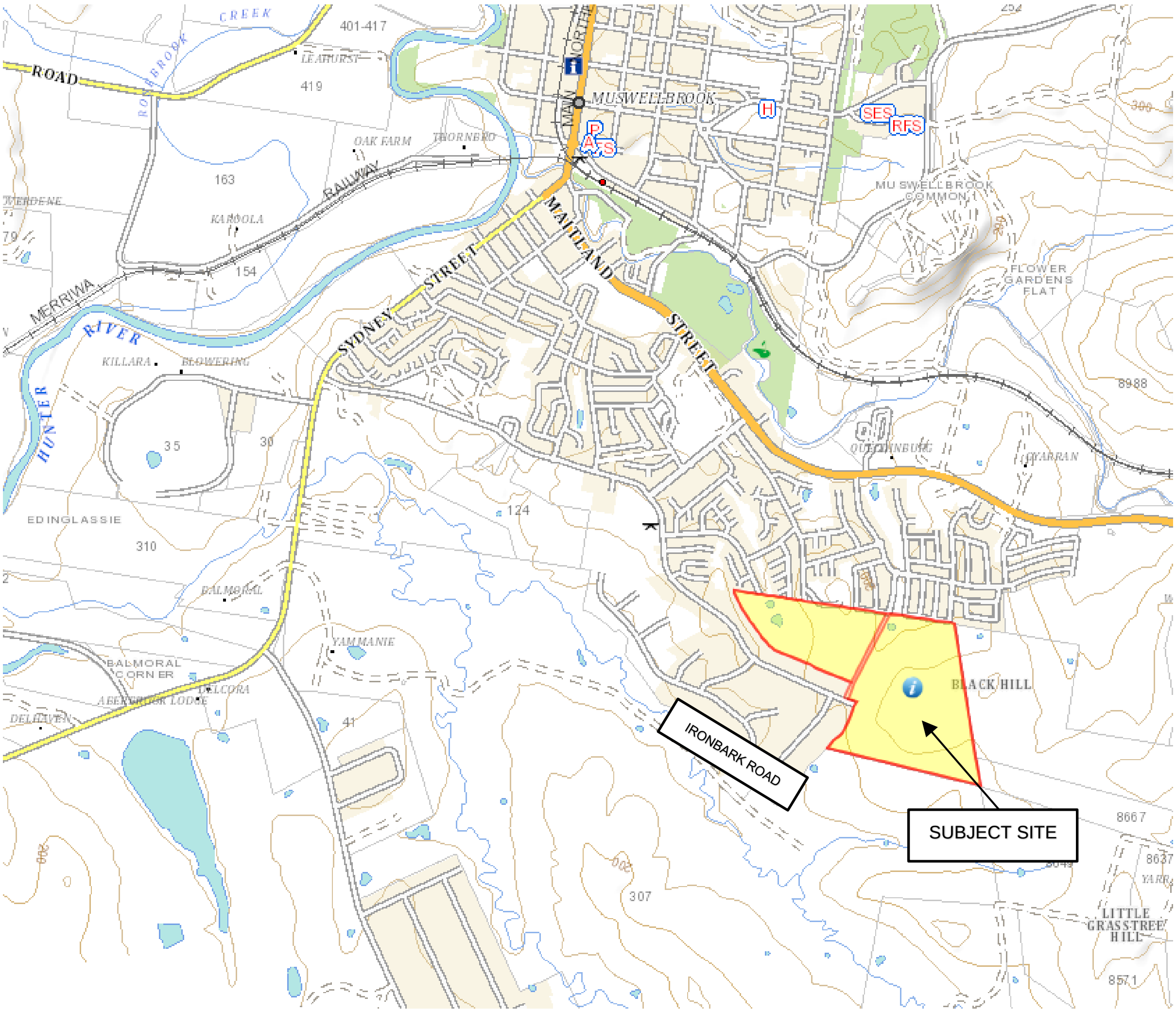

Figure 1 Site location (Source: SIX Maps)

1.1 SITE OVERVIEW

The site of works is located at Ironbark Road, Muswellbrook. The site is 81ha and currently has Large Lot Residential (R5), General Residential (R1), and Environmental Management (C3) classifications as indicated in Figure 2. The subject site is bordered by residential zoning to the north and west, and environmental management zoning to east and south. The site is currently sloped grassland draining to four low points – two of which already contain farm dams.

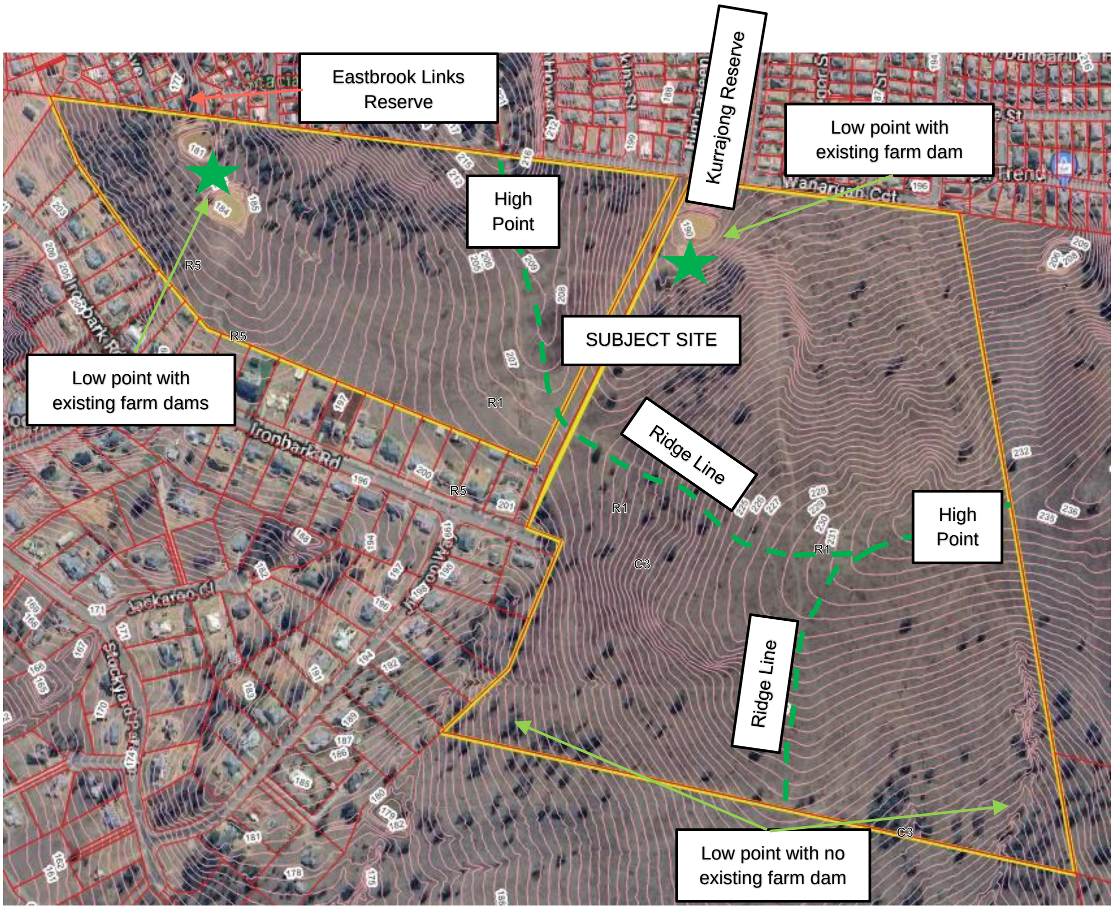

Figure 2 Site Topography

1.2 PROPOSED DEVELOPMENT

The current ultimate design (UD) layout (Figure 3) for the development consists of 504 lots across the 81ha site. Green space is provided for recreation and drainage reserves.

Figure 3: Urban Design UD C 02 (VERSION 10)

1.3 REPORT SCOPE

The intent of this report is to address requirements relating to drainage and stormwater as outlined in the MSC Development Control Plan (DCP) / 0074 Stormwater Drainage (Design). Specifically, the following are addressed:

1.3.1 DCP:

25.2.3

- *To ensure that post development runoff reflects pre-development conditions.*
- *To ensure that development does not result in environmental damage within existing drainage courses and receiving waters.*

25.5

- *All public stormwater management assets are to be installed outside the riparian zone of creek lines.*

1.3.2 0074 STORMWATER DRAINAGE DESIGN

- Design to the minor (20% AEP) and major (1% AEP) storms

1.4 SUPPORTING STUDIES

The following studies have been prepared for the development and have been used to inform this report:

1.4.1 FLORA & FAUNA ASSESSMENT (FEBRUARY 2024) BY WILDTHING ENVIRONMENTAL CONSULTANTS

The “Surveyed Habitat Trees” map on page 36 of this report shows “retain” flora within the areas of RB2, RB3, and RB4. This creates design challenges for basin location in relation to “retain” flora found on site.

1.4.2 ABORIGINAL CULTURAL HERITAGE ASSESSMENT BY INSITE HERITAGE

The Due Diligence Assessment did not relocate any evidence of Aboriginal occupation of the study area. The re-zoning will not impact on any known site and there is insufficient evidence of archaeological potential to warrant any further assessment.

2. EXISTING DRAINAGE INFRASTRUCTURE

Stormwater runoff from the site currently discharges via overland flow to four distinct outfalls at low points on the property boundary indicated in Figure 4. These are described further below:

2.1 OUTFALL1

Outfall 1 is located centrally in the northern portion of the development. This low point already contains a farm dam with discharge into the Eastbrook Links Reserve to the north via overland flow over an informal spillway when the existing dam overflows.

"WANARUAH" is a general location at which the catchment contributing to Eastbrook Links Reserve passes into the table drain in Wanaruah Cct road reserve to then traverse the road reserve to the west and into Eastbrook Links Reserve via a pit and pipe. Refer to Figure 4, below.

2.2 OUTFALL2

Outfall2 is located in the northwestern portion of the development. This low point already contains two farm dams linked via overland flow paths. These dams discharge into the Kurrajong Reserve to the north via overland flow over an informal spillway when these dams overflow.

2.3 OUTFALL3

Outfall 3 is located in the southwestern portion of the development. This low point does not contain a dam, however the catchment overland sheet flows into neighbouring property to the west to an unnamed surface drain located in the back of lots along Jillaroo Way.

A portion of the existing catchment from the site discharges stormwater runoff into this unnamed waterway via a pit and pipe network within Ironbark Road. The western end of Ironbark Road is a low point with a pipe collecting road runoff and discharging into this same waterway.

2.4 OUTFALL4

Outfall4 is located in the southeastern portion of the development. This low point does not contain a farm dam; however, the catchment discharges to a surface drain which passes through the southeastern corner of the site to then discharge into a network of farm dams along an unnamed waterway to the south in neighbouring property.

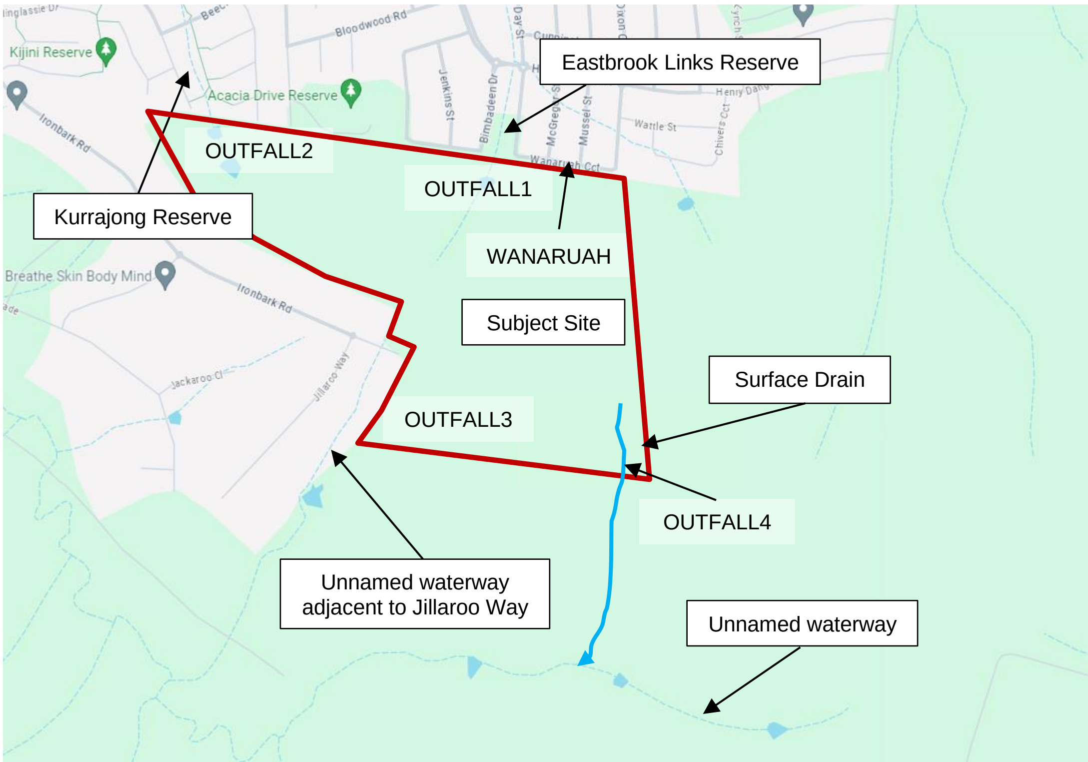

Figure 4: Drainage infrastructure within vicinity of subject site (Source: Google maps)

3. HYDROLOGY

Hydrological analysis forms the basis of sizing key infrastructure and ensuring the safe conveyance of flow. This includes defining catchments, determining flow paths, and estimating the critical flow for the pre- and post-developed conditions.

The existing site consists of four distinct catchments. Discharge from these catchments is to four separate waterways with a portion of some catchments passing through road reserve and pit/pipe network before reaching the same waterway as the rest of the catchment. These are proposed to be the four legal points of discharge from the development subject to MSC endorsement.

Development of the site will concentrate stormwater runoff from the development to these four points of discharge. Treatment of stormwater runoff rates is required for the development such that downstream property in infrastructure is not adversely impacted by the development. The proposed mitigation treatment is through on-site stormwater retardation basins at each site outfall to retard stormwater flow into downstream waterways to a permissible flow rate to reduce downstream impacts of the development.

The pre- and post-development flow rates have been calculated to size stormwater retardation infrastructure for the 1% AEP event.

3.1 RAINFALL DATA & APPROACH

The 2016 Intensity Frequency Duration (IFD) data has been used in this report and is derived from the Bureau of Meteorology (BOM) website. See Appendix B for IFD coefficients and design rainfall intensity charts utilised in calculations.

3.2 RUNOFF COEFFICIENT CALCULATIONS

3.2.1 PRE-DEVELOPMENT CONDITIONS

In order to determine pre-development runoff coefficients for varying event intensities, a 10% AEP event coefficient (C_{10}) was assumed as a baseline for grassed runoff conditions Other AEP events apply a frequency factor (F_y) to the C_{10} coefficient to create a runoff coefficient for the predeveloped catchment. Frequency factors are summarised in Table 1. A C_{10} of 0.15 was assigned to the predeveloped, grassed catchment.

Table 1: Frequency factors used in calculations.

AEP %	ARI	F_y	
		Developed	Rural
63.20%	1	0.80	0.75
20%	4.48	0.95	0.90
10%	10	1.00	1.00
5%	20	1.05	1.10
2%	50	1.15	1.20

AEP %	ARI	F_y	
1%	100	1.20	1.30

3.2.2 POST-DEVELOPMENT CONDITIONS

To define catchment characteristics, fraction impervious values by lot size and land use were adapted from the nearby municipality of Tamworth Regional Council (TRC) standard values in lieu of these not being available in MSC guidance documents.

The assumed fraction impervious for post development conditions as adapted from TRC are summarised below. A map of allocations of each land use type by fraction impervious can be found in Appendix A. Land use type within each post development catchment was then used to calculate weighted coefficients for each catchment; these results can be found in Appendix B.

The pre-development catchments are indicated in Figure 5 below, and shown in more detail in Appendix A.

Table 2: Fraction Impervious assigned to Land Use (Source: TRC)

Land Use	Fraction Impervious
Road Reserve Runoff	0.8
Large Lot Residential: 4,000m^2<	0.4
Large Lot Residential: 2,000m^2<	0.5
Residential Lot Runoff: 600m^2<	0.75
Residential Lot Runoff: <600m^2	0.8
Public Recreation Reserve Runoff	0.4

Table 3: Land type areas within each catchment

	Road Reserve ha	Lots (0.4ha<) ha	Lots (0.2<) ha	Lots (600m^2<) ha	Lots (<600m^2) ha	Open Space ha	External catchment	TOTAL ha
CA1	6.32	0	0	13.74	2.71	5.36	5.417	33.55
CA2	4.88	5.22	0.000	5.24	2.49	3.19	6.623	27.64
CA3	2.37	6.85	2.25	0.17	0.00	3.74	0.000	15.38
CA4	2.49	1.21	3.60	3.43	0.00	4.07	7.458	22.26

Table 4: Weighted coefficient of runoff for each catchment

Catchment	f	$C_{1\%}$	$C_{20\%}$
CA1	0.59	0.75	0.59
CA2	0.48	0.66	0.52
CA3	0.48	0.66	0.53
CA4	0.38	0.58	0.46

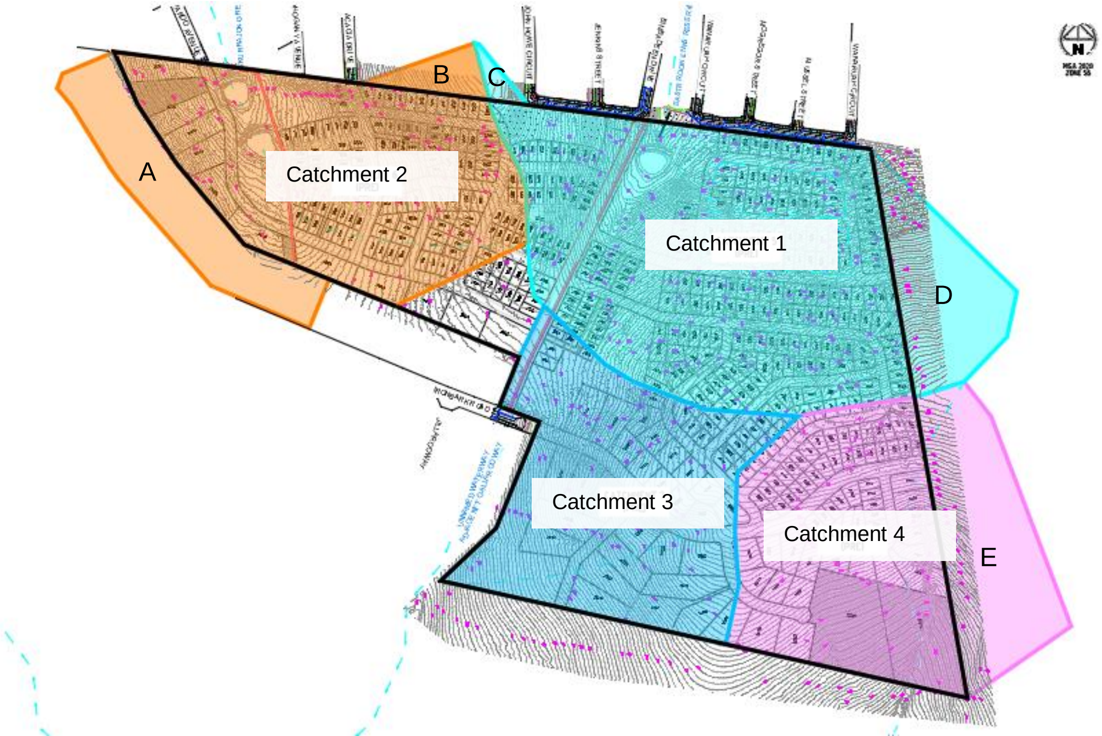

Figure 5 :Pre-development catchment plan.

3.2.3 EXTERNAL CATCHMENTS

There are five minor external catchments contributing to runoff from the site (labelled A-E in Figure 4 above). Stormwater runoff from these catchments is required to be conveyed across development of the without causing hazard or nuisance to the proposed development.

3.3 PRE-DEVELOPMENT FLOW CALCULATIONS

Each post-development catchment is intended to be retarded to the pre-development catchment flow rates for the 1% AEP event.

The pre-development flow rates for both events for all catchments are shown below. The C_{10} applied to the pre-development catchment is 0.15 for open grassed area.

Pre-development flowrates were found through the Rational Method using the Bransby Williams t_c equation:

$$t_c = 58L/A^{0.1}S_e^{0.2}$$

Where:

L	Length of flow path (km)
A	Area of catchment (ha)
S_e	Slope of flow path (m/km)

The equation used to calculate the resulting flow was then:

$$C_{10} \text{ x } F_y \text{ x } I_{y,tc} \text{ x } A = Q_y$$

Table 5: Pre-development 20% AEP event flow calculations

POST-DEV CATCHMENT	RB	FLOW LENGTH	SLOPE	$C_{20\%}$	t_c	$I_{20\%,tc}$	A	$Q_{20\%}$
		km	m/km		min	mm/hr	ha	m³/s
CA1	1	0.592	81.08	0.135	15.92	67.03	33.09	0.83
CA2	2	0.672	41.67	0.135	21.22	57.43	25.11	0.54
CA3	3	0.558	84.19	0.135	15.89	67.10	17.41	0.44
CA4	4	0.551	70.78	0.135	15.83	67.22	22.41	0.56

Table 6: Pre-development 1% AEP event flow calculations

POST-DEV CATCHMENT	RB	FLOW LENGTH	SLOPE	$C_{1\%}$	t_c	$I_{1\%,tc}$	A	$Q_{1\%}$
		km	m/km		min	mm/hr	ha	m³/s
CA1	1	0.592	81.08	0.195	15.92	128.77	33.09	2.31
CA2	2	0.672	41.67	0.195	21.22	109.98	25.11	1.50
CA3	3	0.558	84.19	0.195	15.89	128.90	17.41	1.22
CA4	4	0.551	70.78	0.195	15.83	129.14	22.41	1.57

4. PROPOSED DRAINAGE STRATEGY

There are four proposed retardation basins (RB) to be located in designated drainage reserves at in the development as noted on the layout plan below.

- RB1 – discharging to the Eastbrook Links Reserve running north adjacent to Bimbadeen Drive.
- RB2 – discharging to Kurrajong Reserve running north adjacent to Calgaroo Ave.
- RB3 – discharging to unnamed waterway adjacent to Jillaroo Way.
- RB4 – discharging to the south per existing conditions to be collected in the natural river system running east to west traversing the southern border of the site.

All waterways surrounding the site eventually discharge into the Hunter River.

In this strategy, the underground drainage system surrounding the site is not utilised, rather the receiving waterways, hence RBs will need to be designed so that downstream property and infrastructure is not adversely impacted. The designs allow for retardation to pre-development 1% AEP event discharge rates.

5. STORAGE CALCULATIONS

Peak RB storage volume (Vs) requirements of the retardation basins have been calculated using the Swinburne Technology method which is a modified version of the Boyds Method. All RBs were sized to discharge peak flow rate for the 1% AEP event and to the predevelopment 1% AEP catchment flow rates. Refer to Table 6 for 1% AEP predevelopment flow rates for catchments CA5 to CA8.

Summarised results of modelling are below:

Table 7: 1% AEP Required Storage

RB	Pre-dev catchment	Post-dev catchment	Storm Duration at Peak Storage	$I_{1\%}$	$Vs_{1\%}$
RB1	CA1	1	35	80.062	5,945
RB2	CA2	2	37	77.079	4,986
RB3	CA3	3	28	92.787	2,071
RB4	CA4	4	34	81.649	3,706

5.1 PRELIMINARY RETARDATION BASIN LAYOUT

A preliminary layout of basins is provided in Appendix C, indicating basins sized to adequately store stormwater runoff from each catchment area respectively. These are preliminary layouts to be finalised during detailed design of the development.

Each basin is to discharge via pipe outfall to ground within the development. For outfall1, outfall2, and outfall 4, flow will then pass directly into the existing channel. Outfall 3 flow passes overland to discharge into the unnamed water way through lots on Jillaroo way per existing conditions.

5.2 STORMWATER CONVEYANCE

5.2.1 INDICATIVE PIPE SIZING

Indicative pipe sizes for conveyance of the 20% AEP flow for each catchment within the site is detailed below.

MSC requires minimum pipe gradient to be 0.5% (1 in 200) with a minimum velocity of 0.6m/s for inter allotment drainage systems.

See Appendix B for calculation of post-development flows used in Table 8. An indicative pipe layout for major drainage infrastructure is shown in Appendix C.

Table 8: Indicative outlet pipe size for each post-development catchment

Contributing Catchment	20% Catchment Discharge m³/s	Pipe Size mm	Q_{Pipe} m³/s	V_{Pipe} m/s
CA1	3.70	1,350	3.77	2.6
CA2	2.60	1,200	2.76	2.4
CA3	1.66	1,050	1.93	2.2
CA4	1.71	1,050	1.93	2.2

5.2.2 GAP FLOWS

The indicative gap flows to be conveyed within in road reserves and drainage reserves is shown below. Calculations of gap flows can be found in Appendix B.

Gap flows will need to be conveyed overland through the road and drainage reserves, or to be reduced via oversized underground infrastructure to achieve this.

Table 9: Peak possible gap flows in each catchment

Catchment	Peak gap flow (m³/s)
CA1	4.080
CA2	2.884
CA3	1.868
CA4	1.879

6. STORMWATER QUALITY TREATMENT

Requirements for treatment in line with the MSC Development Control Plan Section 25 is as below:

Stormwater management systems are to be designed to capture and remove all litter larger than 5mm in size.

II. Pollution reduction devices. The objective of pollution reduction devices e.g. Gross Pollutant Traps, is to remove contaminants such as oil, sediment and other pollutants before stormwater discharges into the receiving system beyond the site of the development. Pollution reduction devices must be installed for the following developments:

- *residential developments with more than five dwellings or new greenfield residential subdivisions*

Within this development, is it proposed that at each outlet into retardation basins will be a Gross Pollutant Trap (GPT) to treat stormwater from the development. Selection and specification of these GPTs will occur during detailed design for the development.

7. SUMMARY

This SWMS details how the proposed development can manage the stormwater runoff leaving the site. Peak flows coming from the site have been managed by routing all stormwater from the site through retardation basins at each low point to then be discharged at pre-development 1% AEP rates.

The minimum size of retardation basins in order to release at pre-development rates has been nominated for each catchment, however the size, shape, and elevations on each basing will be determined through detailed design phase of this development. A preliminary layout of how these basins can be achieved has been provided.

Every outlet into basins will need to discharge via a GPT to promote stormwater quality.

This demonstrates at a high level that the proposed development is feasible and that there are no major drainage issues that cannot be addressed to ensure that the development can be successfully completed.

APPENDIX A

DRAINAGE AND CATCHMENT LAYOUT PLANS

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Authorised | Date

IRONBARK ROAD
MUSWELLBROOK
DRAINAGE
DRAINAGE CATCHMENT PLANS - PREDEVELOPMENT CATCHMENT LAYO
MUSWELLBROOK SHIRE COUNCIL
FREEDOM DEVELOPMENT

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DRAINAGE
DRAINAGE CATCHMENT PLANS - POST DEVELOPMENT CATCHMENT LAY
MUSWELLBROOK SHIRE COUNCIL
FREEDOM DEVELOPMENT

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IRONBARK ROAD
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DRAINAGE
DRAINAGE CATCHMENT PLANS - COEFFICIENT CALCULATION LAYOU
MUSWELLBROOK SHIRE COUNCIL
FREEDOM DEVELOPMENT

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APPENDIX B

HYDROLOGY

Intensity-Frequency-Duration Chart for Muswellbrook
Rainfall Intensity (mm/hr)

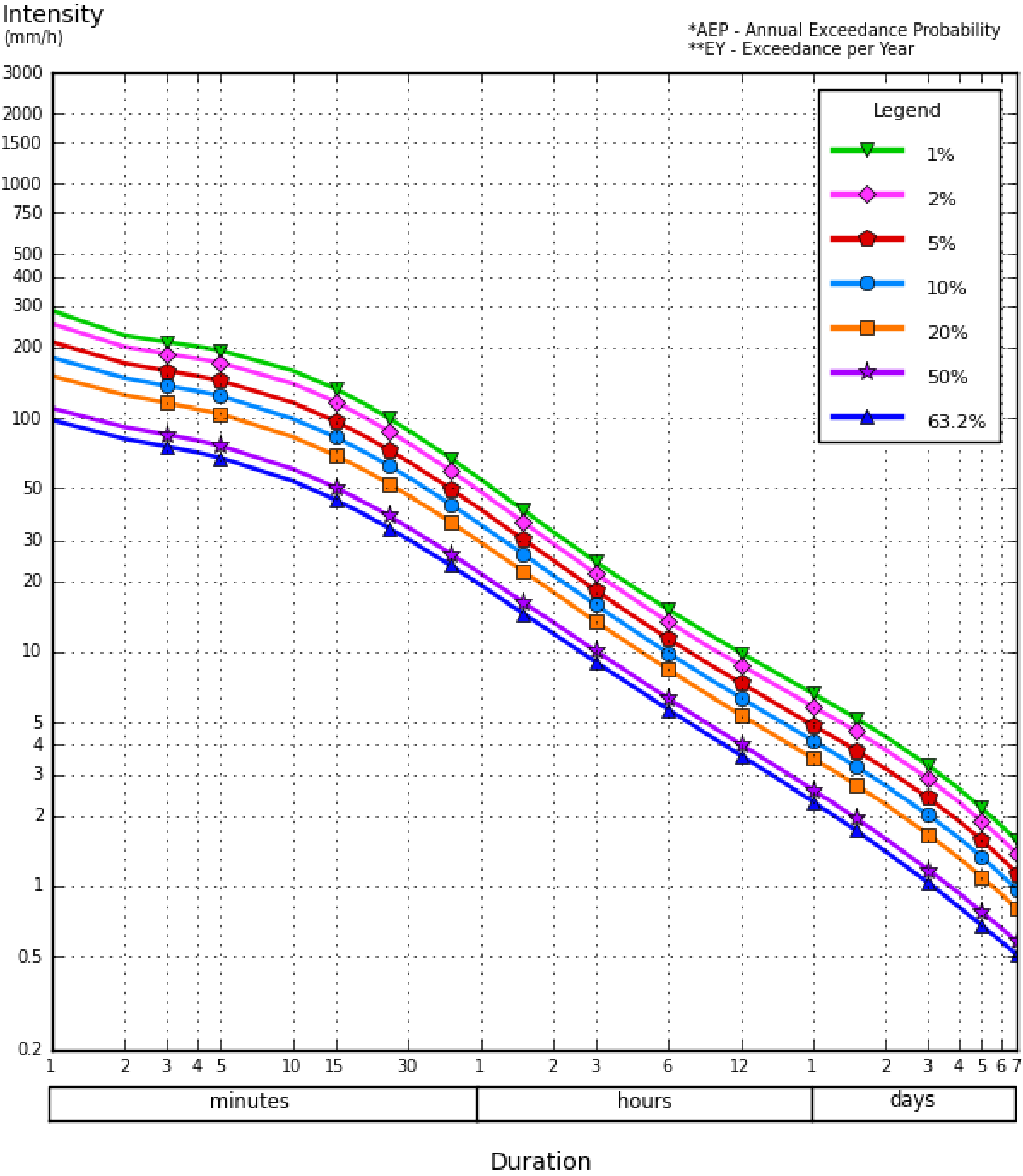
Time of Concentration (tc)	eturn Period					
	50%	**20%**	**10%**	**5%**	**2%**	**1%**
6 min	72.3	98.8	118	137	164	186
7 min	68.9	94.3	113	131	158	179
8 min	65.8	90.2	108	126	151	172
9 min	63	86.4	103	121	145	165
10 min	60.4	82.9	99.2	116	140	159
11 min	58.1	79.7	95.4	111	134	153
12 min	55.9	76.7	91.8	107	129	147
13 min	53.9	74	88.6	104	125	142
14 min	52	71.4	85.5	100	121	137
15 min	50.3	69.1	82.7	96.7	117	133
16 min	48.7	66.9	80.1	93.6	113	128
17 min	47.2	64.8	77.6	90.7	109	124
18 min	45.8	62.9	75.3	88	106	121
20 min	43.3	59.4	71.1	83.1	100	114
21 min	42.1	57.8	69.1	80.8	97.3	111
22 min	41	56.3	67.3	78.7	94.7	108
23 min	40	54.8	65.6	76.7	92.3	105
24 min	39	53.5	64	74.8	89.9	102
25 min	38.1	52.2	62.4	72.9	87.7	99.7
26 min	37.2	51	61	71.2	85.6	97.3
27 min	36.4	49.9	59.6	69.6	83.6	95
29 min	34.8	47.7	57	66.6	79.9	90.7
30 min	34.1	46.7	55.8	65.1	78.2	88.7
31 min	33.4	45.8	54.7	63.8	76.6	86.8
32 min	32.8	44.9	53.6	62.5	75	85
33 min	32.1	44	52.5	61.3	73.5	83.3
34 min	31.5	43.2	51.5	60.1	72	81.6
35 min	31	42.4	50.6	59	70.6	80.1
36 min	30.4	41.6	49.6	57.9	69.3	78.5
37 min	29.9	40.9	48.7	56.8	68	77.1
38 min	29.4	40.1	47.9	55.8	66.8	75.7
39 min	28.9	39.5	47.1	54.8	65.6	74.3
40 min	28.4	38.8	46.3	53.9	64.5	73
45 min	26.3	35.9	42.7	49.7	59.4	67.2
1 hour	21.6	29.4	35	40.6	48.4	54.6
1.5 hour	16.3	22.1	26.2	30.3	35.9	40.4
2 hour	13.4	18	21.2	24.6	29	32.6
3 hour	10.1	13.5	15.9	18.3	21.6	24.3
4.5 hour	7.66	10.2	12	13.8	16.3	18.3

Requested coordinate Latitude: -32.2939 Longitude: 150.9092
Nearest grid cell Latitude: 32.2875 (S) Longitude: 150.9125 (E)

IFD Design Rainfall Intensity (mm/h)

Issued: 09 April 2024

Rainfall intensity in millimetres per hour for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).



Project:	IRONBARK ROAD, MUSWELLBROOK	Designed:	C GYORFFY
Reference No:	321570	Checked:	K WILKINSON

Annual Exceedance Probability (%)

AEP Coefficients	63.20%	50%	20%	10%	5%	2%	1%
C0	0.4909506	0.6100568	0.9244128	1.1020782	1.2563614	1.4384123	1.5643057
C1	0.5938798	0.5876669	0.5812842	0.5563000	0.5296245	0.4525656	0.4059761
C2	0.2907322	0.2952219	0.2942725	0.3202914	0.3491743	0.4385401	0.4921428
C3	-0.1544340	-0.1546032	-0.1491189	-0.1580583	-0.1687263	-0.2056633	-0.2275589
C4	0.0293016	0.0289054	0.0265907	0.0278026	0.0294758	0.0363847	0.0404144
C5	-0.0024628	-0.0023855	-0.0020531	-0.0021115	-0.0022241	-0.0028233	-0.0031660
C6	0.0000768	0.0000727	0.0000572	0.0000574	0.0000600	0.0000796	0.0000906

AEP to ARI Conversion

AEP %	ARI
63.20%	1
50%	1.44
20%	4.48
10%	10
5%	20
2%	50
1%	100

1% AEP URBAN ARI Drainage Calculations

DEVELOPED CATCHMENT

Catchment	Street	Area (ha)	∑A (ha)	C 1%	C 20%	Ae 1% (ha)	∑Ae 1% (ha)	Ae 20% (ha)	∑Ae 20% (ha)	Flow Length (m)	Velocity 1% (m/s)	Velocity 20% (m/s)	Tc 1% (mins)	Tc 20% (mins)	Int 1% (mm/hr)	Int 20% (mm/hr)	Q 1% m3/s	Qpipe m3/s	Qgap m3/s	Comments
CA1		28.13	28.13	0.84	0.66	23.61	23.61	18.69	18.69	813	1	1.5	18.55	14.03	118.71	71.35	7.784	3.704	4.080	
CA2		21.01	21.01	0.78	0.62	16.43	16.43	13.01	13.01	787	1	1.5	18.12	13.74	120.26	72.06	5.488	2.603	2.884	
CA3		15.38	15.38	0.66	0.53	10.21	10.21	8.08	8.08	720	1	1.5	17.00	13.00	124.44	73.97	3.528	1.660	1.868	
CA4		14.80	14.80	0.74	0.58	10.92	10.92	8.64	8.64	820	1	1.5	18.67	14.11	118.30	71.16	3.588	1.709	1.879	

APPENDIX C

PRELIMINARY BASIN CONCEPTS

Rev	Amendments	Approved	Date

Scale

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IRONBARK ROAD MUSWELLBROOK

DRAINAGE

DRAINAGE LAYOUT PLANS - SHEET 1

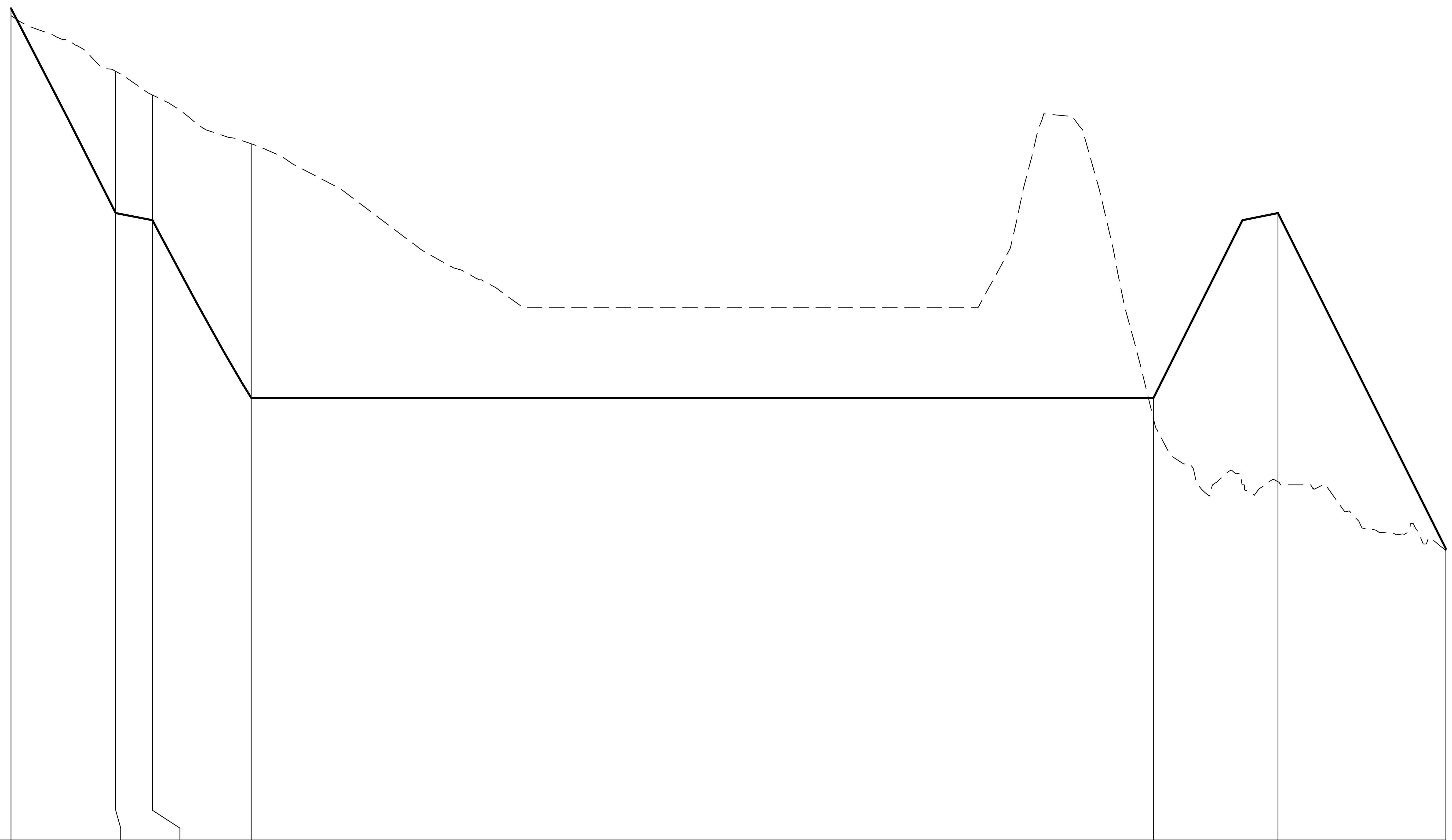
MUSWELLBROOK SHIRE COUNCIL

FREEDOM DEVELOPMENT

PRELIMINARY

Drg No 321570-000CD200 Rev -

file name 321570-000CD200.dwg layout name CD200 plotted by Carlin Gyorffy
file location \\spiire\meldata\Data\32\321570\000\Civil\ACAD plot date 18/04/2024 5:36 PM Sheet 1 of 10 Sheets



DATUM RL 185.0

DESIGN CENTRELINE	192.026	190.296	190.236	188.736	188.736	190.296	187.460
EXISTING SURFACE	191.964	191.493	191.293	190.882	188.554	188.026	187.445
CHAINAGE	115.732	124.575	127.688	136.019	212.228	222.730	236.911

SECTION A-A: RB1

file name 321570-000CD600.dwg layout name CD600 plotted by Carlin Gyorffy
file location R:\32\321570\000\Civil\ACAD plot date 18/04/2024 5:34 PM Sheet 6 of 10 Sheets

Rev	Amendments	Approved	Date

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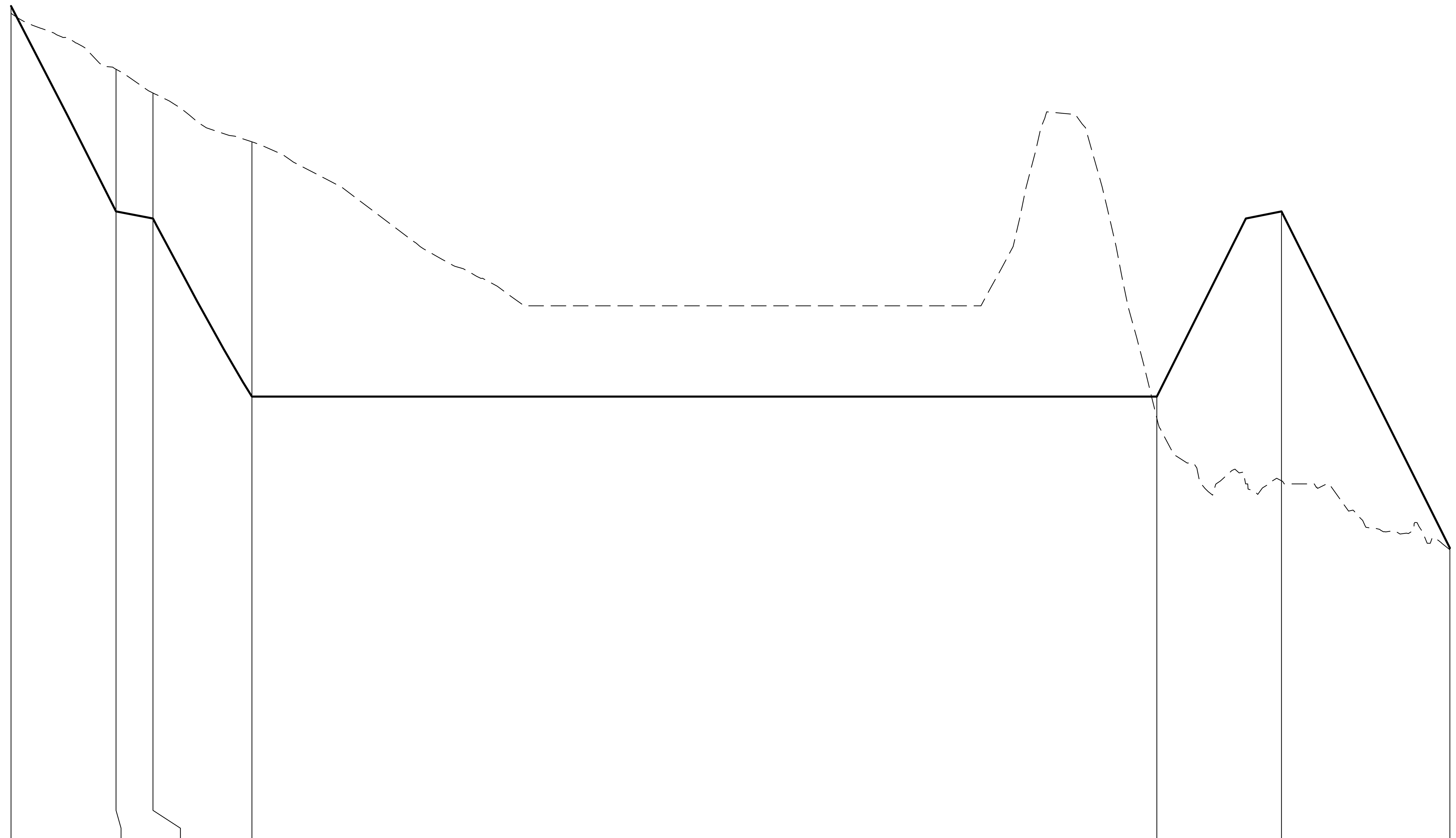
IRONBARK ROAD
MUSWELLBROOK
DRAINAGE
DRAINAGE MISCELLANEOUS - SHEET 1
MUSWELLBROOK SHIRE COUNCIL
FREEDOM DEVELOPMENT

PRELIMINARY
Drg No **321570-000CD600** Rev **-**



DATUM RL 185.0

DESIGN CENTRELINE	192.026	190.296	190.236	188.736	188.736	190.296	187.460
EXISTING SURFACE	191.964	191.493	191.293	190.882	188.554	188.026	187.445
CHAINAGE	115.732	124.575	127.688	136.019	212.228	222.730	236.911

SECTION A-A: RB1

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IRONBARK ROAD
MUSWELLBROOK
DRAINAGE
DRAINAGE MISCELLANEOUS - SHEET 2
MUSWELLBROOK SHIRE COUNCIL
FREEDOM DEVELOPMENT

PRELIMINARY

Drg No **321570-000CD601** Rev **-**

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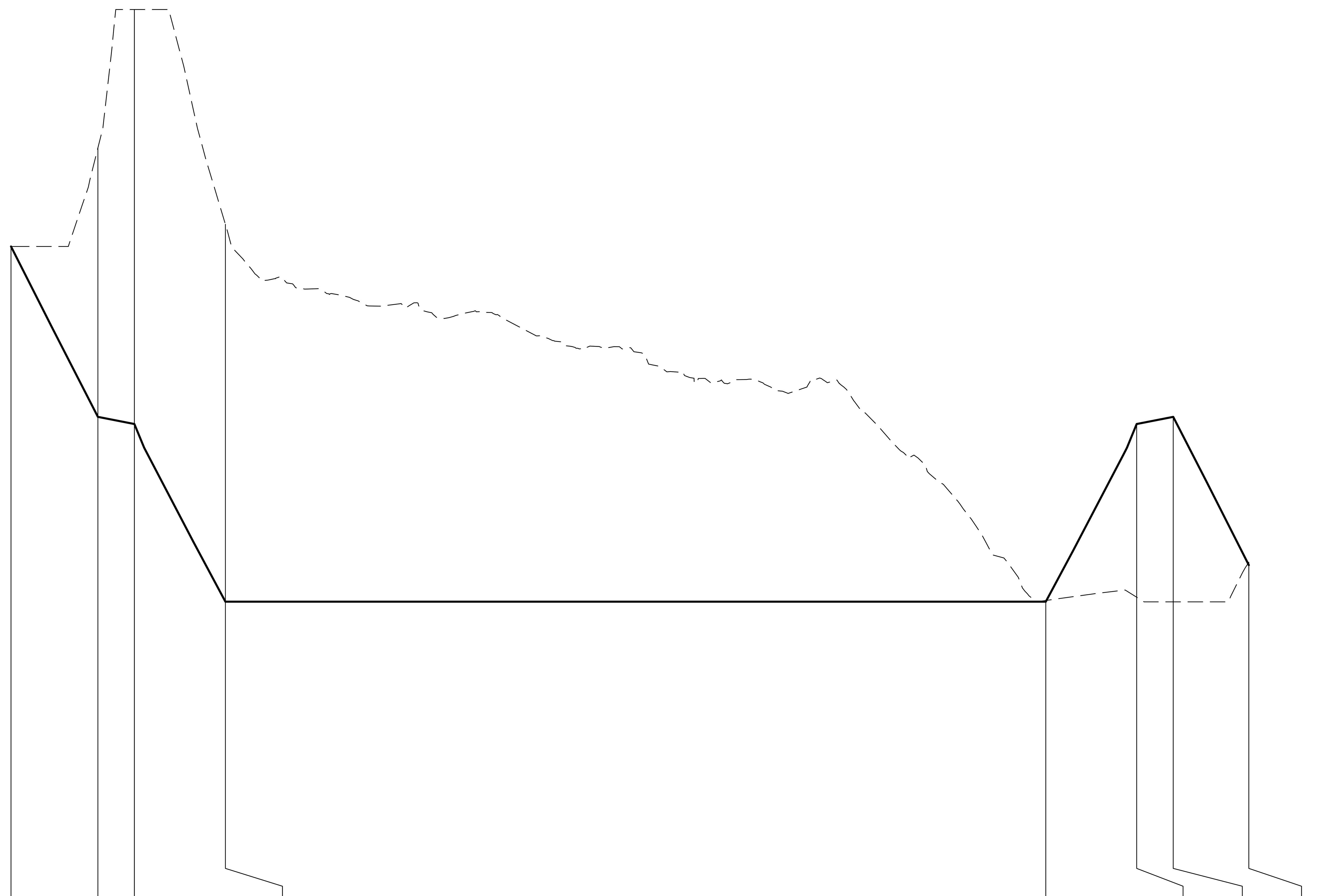
file location R:\321\321570\000\Civil\ACAD plot date 18/04/2024 5:34 PM Sheet 7 of 10 Sheets



HORIZONTAL GEOMETRY

VERTICAL GEOMETRY

DESIGN GRADELINE

DATUM RL 178.5

DESIGN CENTRELINE	184.000	182.561	182.501	181.001	181.001	182.501	182.561	181.310
EXISTING SURFACE	184.000	184.832	186.000	184.187	181.011	181.039	181.000	181.334
CHAINAGE	24.151	31.488	34.567	42.248	111.499	119.177	122.261	128.643

SECTION B-B: RB2

file name 321570-000CD600.dwg layout name CD602 plotted by Carlin Gyorffy
file location R:\32\321570\000\Civil\ACAD plot date 18/04/2024 5:34 PM Sheet 8 of 10 Sheets

Rev	Amendments	Approved	Date

Scale
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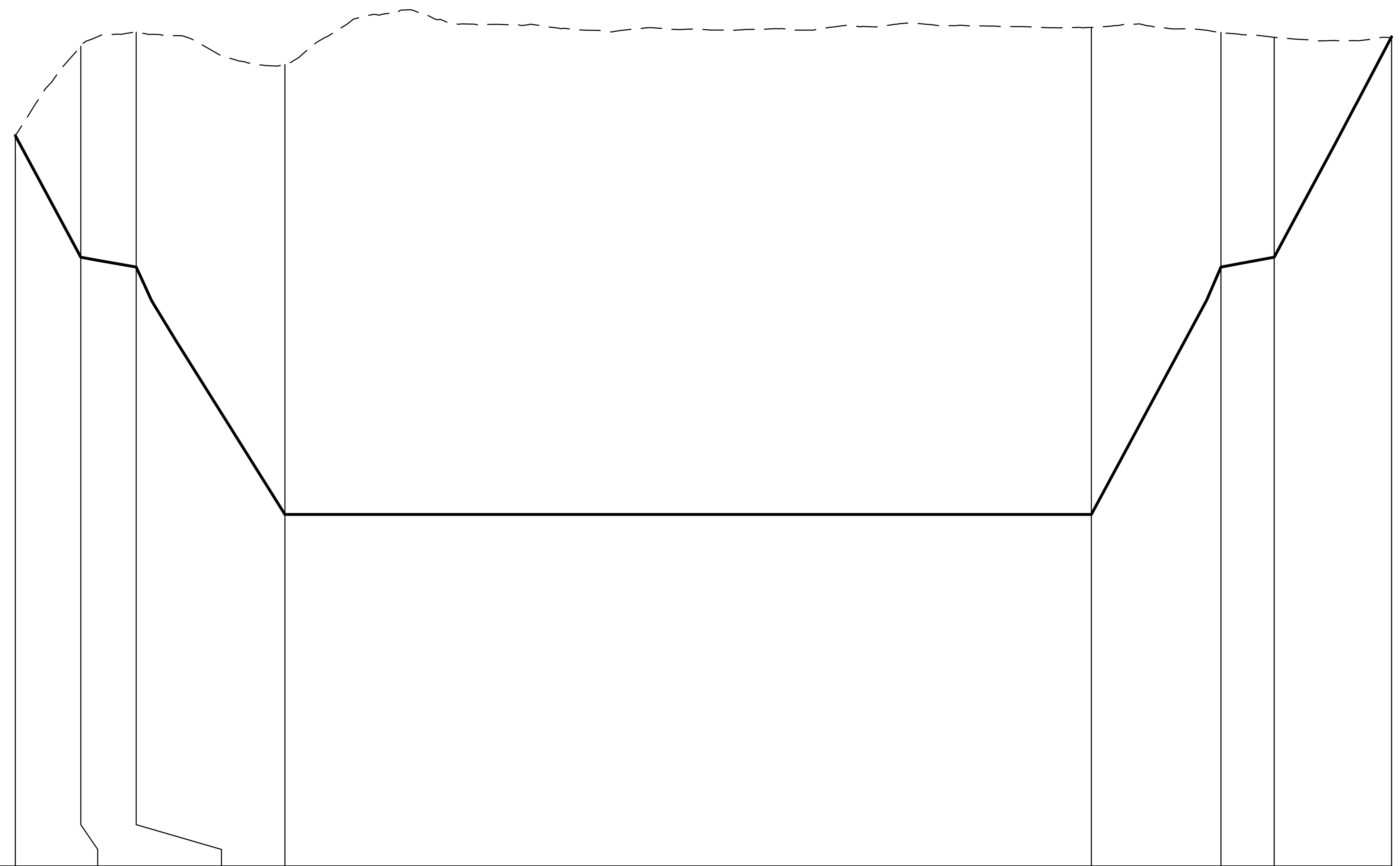
FREEDOM DEVELOPMENT

PRELIMINARY Drg No **321570-000CD602** Rev **-**



HORIZONTAL GEOMETRY

VERTICAL GEOMETRY

DESIGN GRADELINE

DATUM RL 188.5

DESIGN CENTRELINE	192.929	192.191	192.131	190.631	190.631	192.131	192.191	193.528
EXISTING SURFACE	192.928	193.471	193.556	193.360	193.585	193.554	193.524	193.523
CHAINAGE	26.053	30.024	33.386	42.402	91.299	99.153	102.381	109.500

SECTION C-C: RB3

file name 321570-000CD600.dwg layout name CD603 plotted by Carlin Gyorffy
file location R:\321\321570\000\Civil\ACAD plot date 18/04/2024 5:34 PM Sheet 9 of 10 Sheets

Rev	Amendments	Approved	Date

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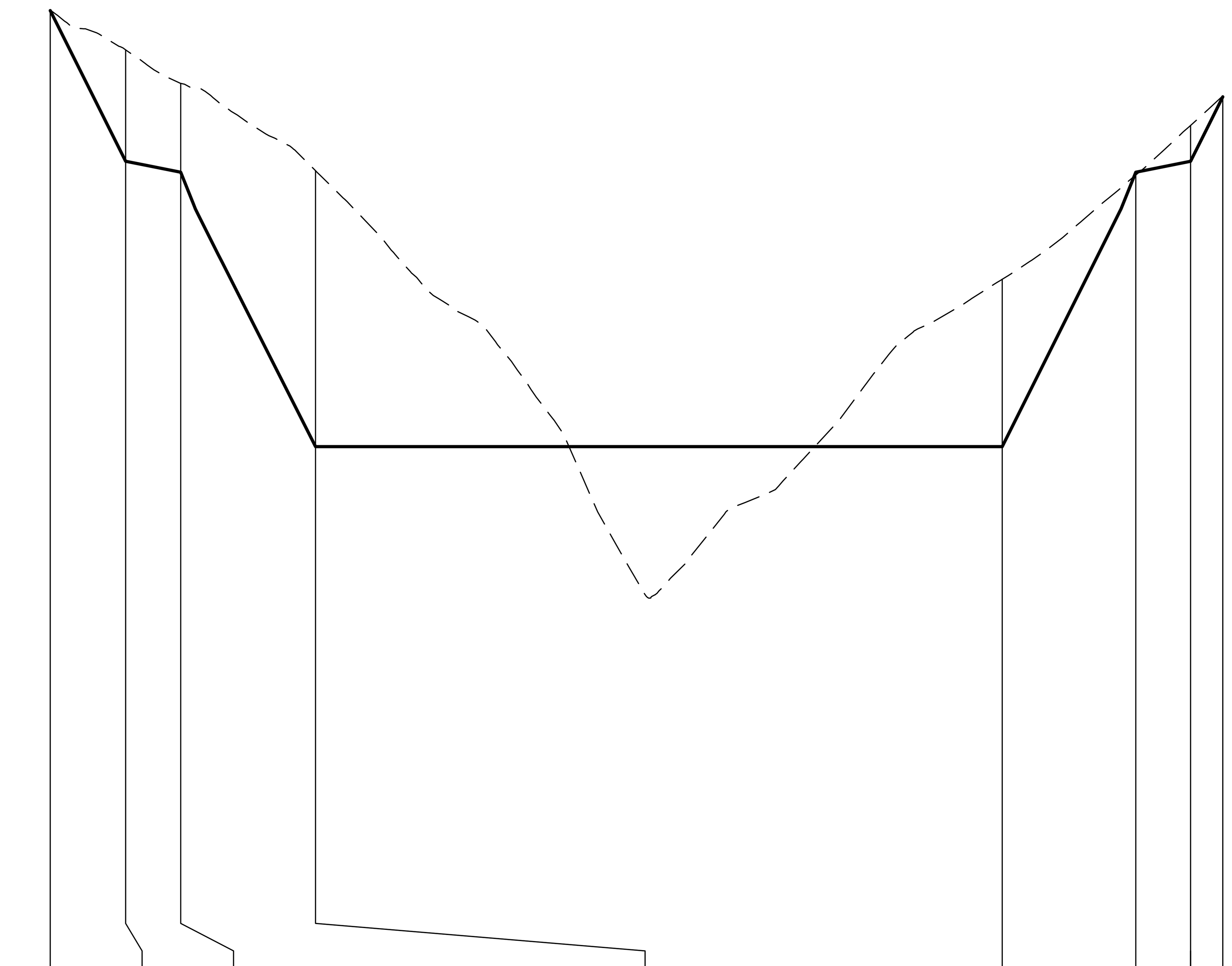
PRELIMINARY

Drg No **321570-000CD603** Rev **-**



HORIZONTAL GEOMETRY

VERTICAL GEOMETRY

DESIGN GRADELINE

DATUM RL 198.5

DESIGN CENTRELINE	203.740	202.917	202.857	201.357	201.357	202.857	202.917	203.269
EXISTING SURFACE	203.743	203.526	203.342	202.865	202.271	202.842	203.112	203.275
CHAINAGE	11.143	15.270	18.276	25.648	63.194	70.493	73.493	75.255

SECTION D-D: RB4

Rev	Amendments	Approved	Date

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DRAINAGE
DRAINAGE MISCELLANEOUS - SHEET 5
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FREEDOM DEVELOPMENT

PRELIMINARY Drg No **321570-000CD604** Rev **-**

file name 321570-000CD600.dwg layout name CD604 plotted by Carlin Gyorffy
file location R:\32\321570\000\Civil\ACAD plot date 18/04/2024 5:34 PM Sheet 10 of 10 Sheets