

## Memorandum

To: Chris Dawson  
Company: BBO on behalf of Hamilton City Council  
From: James Armitage  
Date: 19 August 2025  
Subject: Hamilton IAF Reservoir - INF - IAF Reservoir Infrastructure Report – Earthworks (Rev 3)

Project No: 148023.33

The purpose of this memo is to describe the impacts of the earthworks for the proposed development located at the IAF Hamilton Reservoir site in Hamilton.

### 1 EARTHWORKS

The earthworks for stage 1 and stage 2 are shown in the attached Appendix A – Civil Drawings. The cut and fill volumes for the earthworks as well as estimated truck movements are shown in Table 1-1 below.

Table 1-1: IAF Reservoir Earthworks

Stage 1 Earthworks		m <sup>3</sup>	Trucks
Cut		13652	1707
Fill		5680	710
Stage 1 Pavements		1349	169
Total		20681	2585
Stage 2 Earthworks		m <sup>3</sup>	Trucks
Cut		7039	880
Fill		6158	770
Stage 2 Pavements		910	114
Total		14107	1763

Note that all truck movements assume a maximum of 8 m<sup>3</sup> per truck, and no bulking factor applied to the volumes, and pavement volumes are based on 200mm of buildup underneath hardstand areas.

Reuse of the soils on site will be confirmed with the final geotechnical design. It is anticipated that a very small portion will be suitable, therefore 100% of the soils as export/import is assessed here.

Stormwater and reticulation design for the site is outside the Holmes scope and provided by others. Assessment of those assets and their impact is by others.

A preliminary erosion and sediment control plan is provided in Appendix B.



A handwritten signature in black ink, which appears to read "James Armitage". The signature is fluid and cursive, with a horizontal line extending from the end.

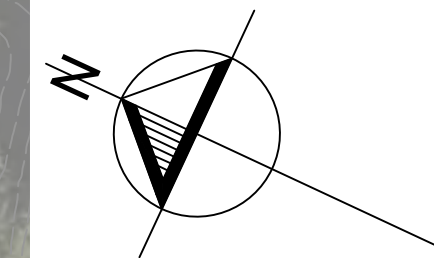
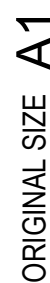
James Armitage  
TECHNICAL DIRECTOR  
Holmes NZ LP

# Appendix A


## Civil Earthworks Design Drawings (100% Preliminary Design Stage)







notes:

1. Refer to drawing C00-01 for project notes.
2.  This drawing set contains colour.  
All reproduction to be in colour.

legend:

- Legend:**
- — — — — Contours major (existing)
  - - - - - Contours minor (existing)
  - . — Site boundary (existing)
  - ▭ Building footprint (proposed)
  - — ○ — ○ — Designation boundary (proposed)

All dimensions to be verified on site before making any shop drawings or commencing any work

The copyright of this drawing remains with Holmes NZ LP

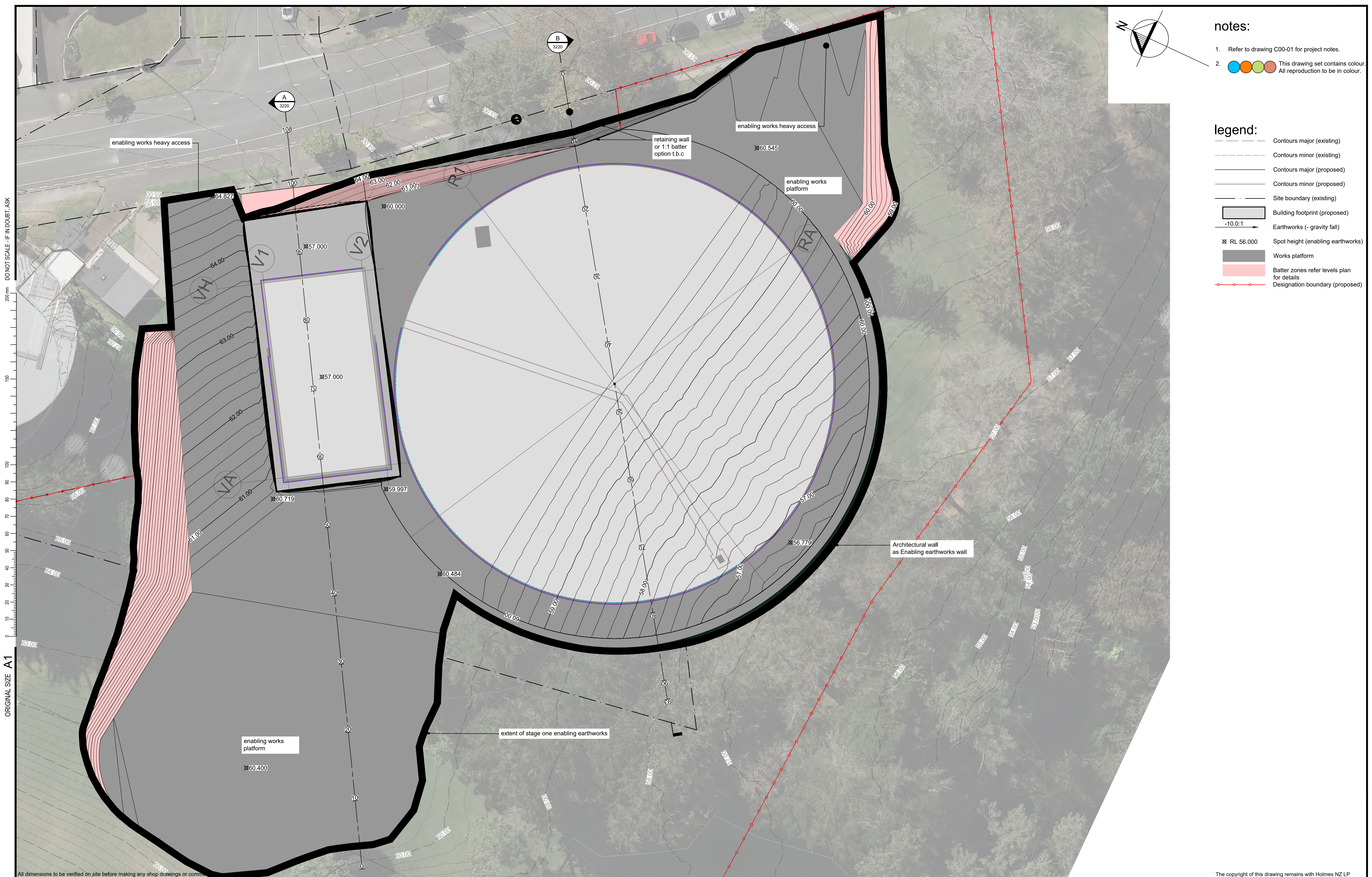
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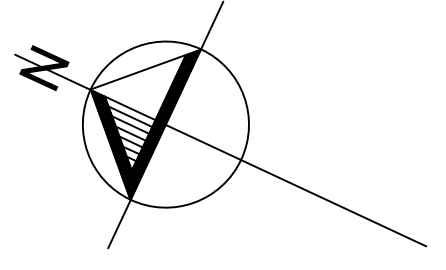








ORIGINAL SIZE A1  
200 mm  
DO NOT SCALE - IF IN DOUBT, ASK

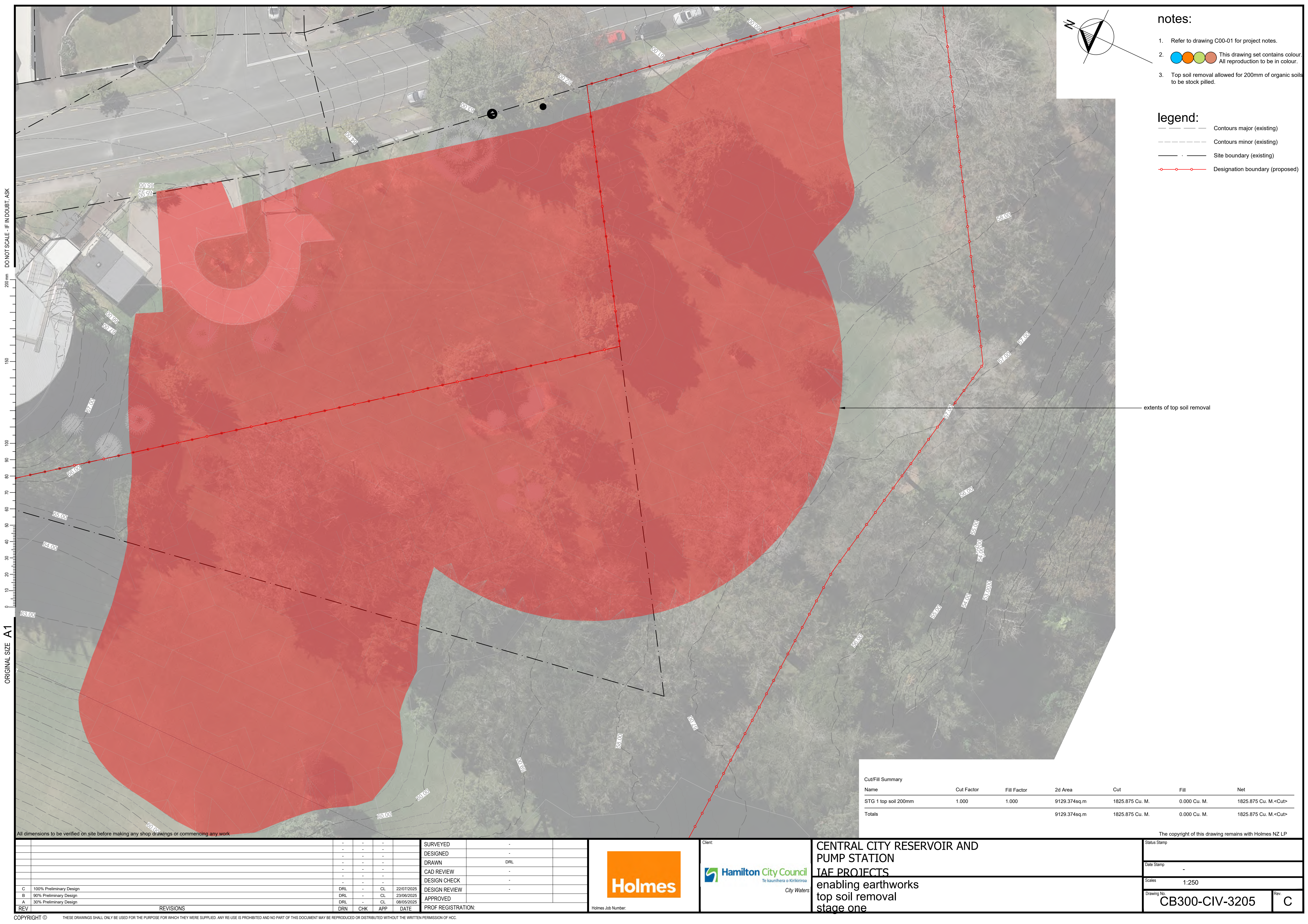


- notes:
1. Refer to drawing C00-01 for project notes.
  2. This drawing set contains colour. All reproduction to be in colour.

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Site boundary (existing)
  - Building footprint (proposed)
  - Earthworks (- gravity fall)
  - Spot height (enabling earthworks)
  - Works platform
  - Batter zones refer levels plan for details
  - Designation boundary (proposed)

All dimensions to be verified on site before making any shop drawings or construction.			The copyright of this drawing remains with Holmes NZ LP		
			SURVEYED		-
			DESIGNED		-
			DRAWN		DRL
			CAD REVIEW		-
			DESIGN CHECK		-
			DESIGN REVIEW		-
			APPROVED		-
			PROF REGISTRATION:		-
			Holmes Job Number:		
			Client:		
			Hamilton City Council		
			Te Kaunihera o Kiriitiroa		
			City Waters		
			CENTRAL CITY RESERVOIR AND PUMP STATION		
			IAE PROJECTS		
			enabling earthworks contours and grading plan stage one		
			Status Stamp		
			Date Stamp		-
			Scales		1:250
			Drawing No.		CB300-CIV-3204
			Rev.		C





- notes:
- Refer to drawing C00-01 for project notes.
  - This drawing set contains colour. All reproduction to be in colour.
  - Top soil removal allowed for 200mm of organic soils to be stock piled.

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Site boundary (existing)
  - Designation boundary (proposed)

Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
STG 1 top soil 200mm	1.000	1.000	9129.374sq.m	1825.875 Cu. M.	0.000 Cu. M.	1825.875 Cu. M.<Cut>
Totals			9129.374sq.m	1825.875 Cu. M.	0.000 Cu. M.	1825.875 Cu. M.<Cut>

REV	REVISIONS	DRN	CHK	APP	DATE
C	100% Preliminary Design	DRL	-	CL	22/07/2025
B	90% Preliminary Design	DRL	-	CL	23/06/2025
A	30% Preliminary Design	DRL	-	CL	08/05/2025

SURVEYED	-
DESIGNED	-
DRAWN	DRL
CAD REVIEW	-
DESIGN CHECK	-
DESIGN REVIEW	-
APPROVED	-
PROF REGISTRATION:	

Client:

Hamilton City Council

Te Kaunihera o Kiriikiriroa

City Waters

CENTRAL CITY RESERVOIR AND PUMP STATION

IAE PROJECTS

enabling earthworks

top soil removal

stage one

Status Stamp

Date Stamp

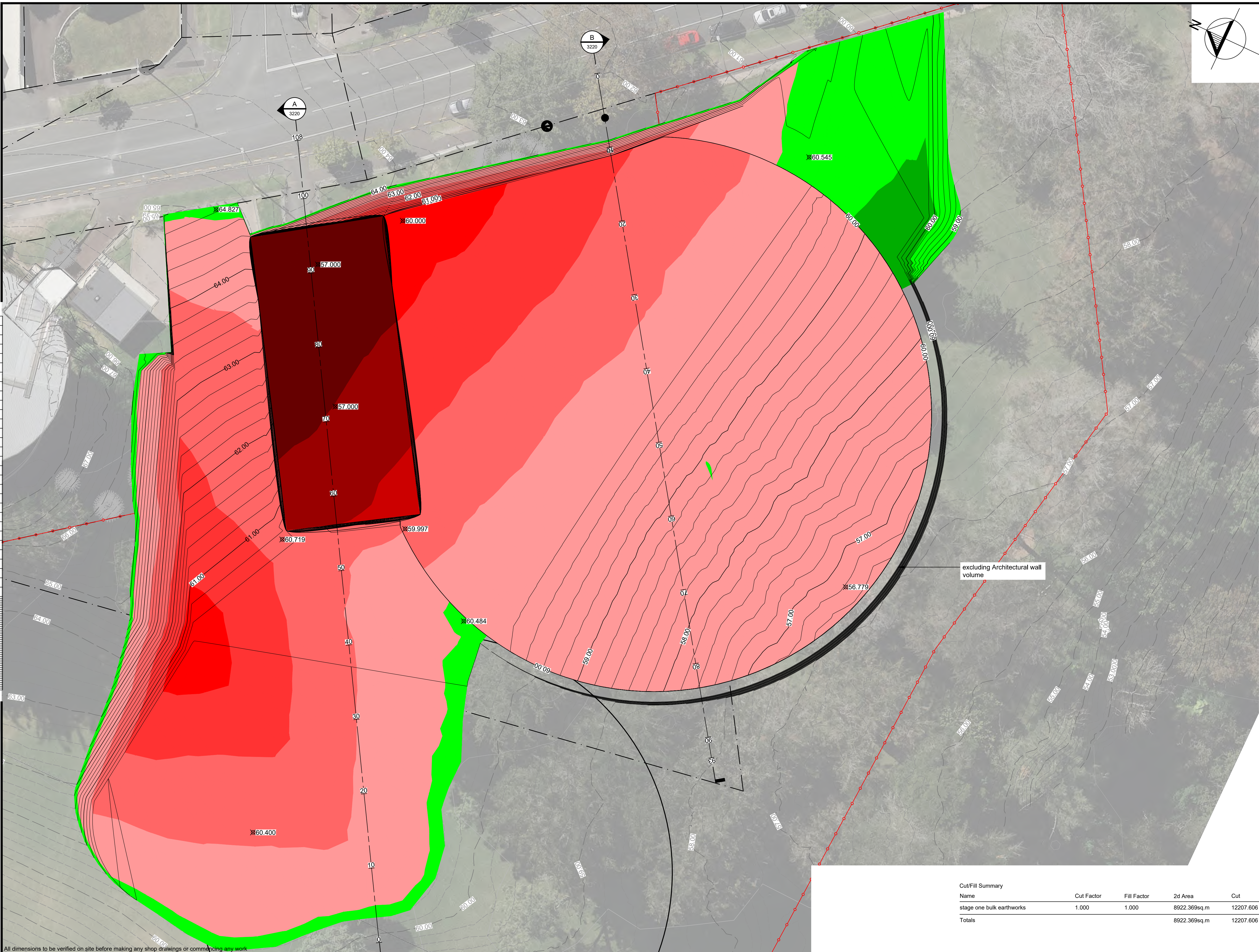
Scale: 1:250

Drawing No. CB300-CIV-3205

Rev. C



ORIGINAL SIZE A1  
200 mm  
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- notes:
1. Refer to drawing C00-01 for project notes.
  2. This drawing set contains colour. All reproduction to be in colour.
  3. Earthworks volumes are based of EG vs design levels to allow construction of the site after bulk earthworks.
    - 3.1. not including top soil stripping or stock pile location / volume.
    - 3.2. not including breakdown of engineered fill volumes.
    - 3.3. not including final levels layout as per landscape design and surface buildsups.

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Site boundary (existing)
  - 10.0:1 Earthworks (- gravity fall)
  - ⌘ RL 56.000 Spot height (enabling earthworks)
  - ○ ○ ○ Designation boundary (proposed)

Surface Analysis: Elevation Ranges			
Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-7.641	-6.000
2		-6.000	-5.000
3		-5.000	-4.000
4		-4.000	-3.000
5		-3.000	-2.000
6		-2.000	-1.000
7		-1.000	0.000
8		0.000	1.000
9		1.000	2.000

Cut/Fill Summary					
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill
stage one bulk earthworks	1.000	1.000	8922.369sq.m	12207.606 Cu. M.	381.259 Cu. M.
Totals			8922.369sq.m	12207.606 Cu. M.	381.259 Cu. M.

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REV	REVISIONS	DRN	CHK	APP	DATE
C	100% Preliminary Design	DRL	-	CL	22/07/2025
B	90% Preliminary Design	DRL	-	CL	23/06/2025
A	30% Preliminary Design	DRL	-	CL	08/05/2025

SURVEYED	-
DESIGNED	-
DRAWN	DRL
CAD REVIEW	-
DESIGN CHECK	-
DESIGN REVIEW	-
APPROVED	-
PROF REGISTRATION:	-

Holmes

Holmes Job Number:

Client:

Hamilton City Council

Te Kaunihera o Kiriakiroa

City Waters

CENTRAL CITY RESERVOIR AND PUMP STATION

IAE PROJECTS

enabling earthworks cut fill and volumes plan stage one

Status Stamp

Date Stamp

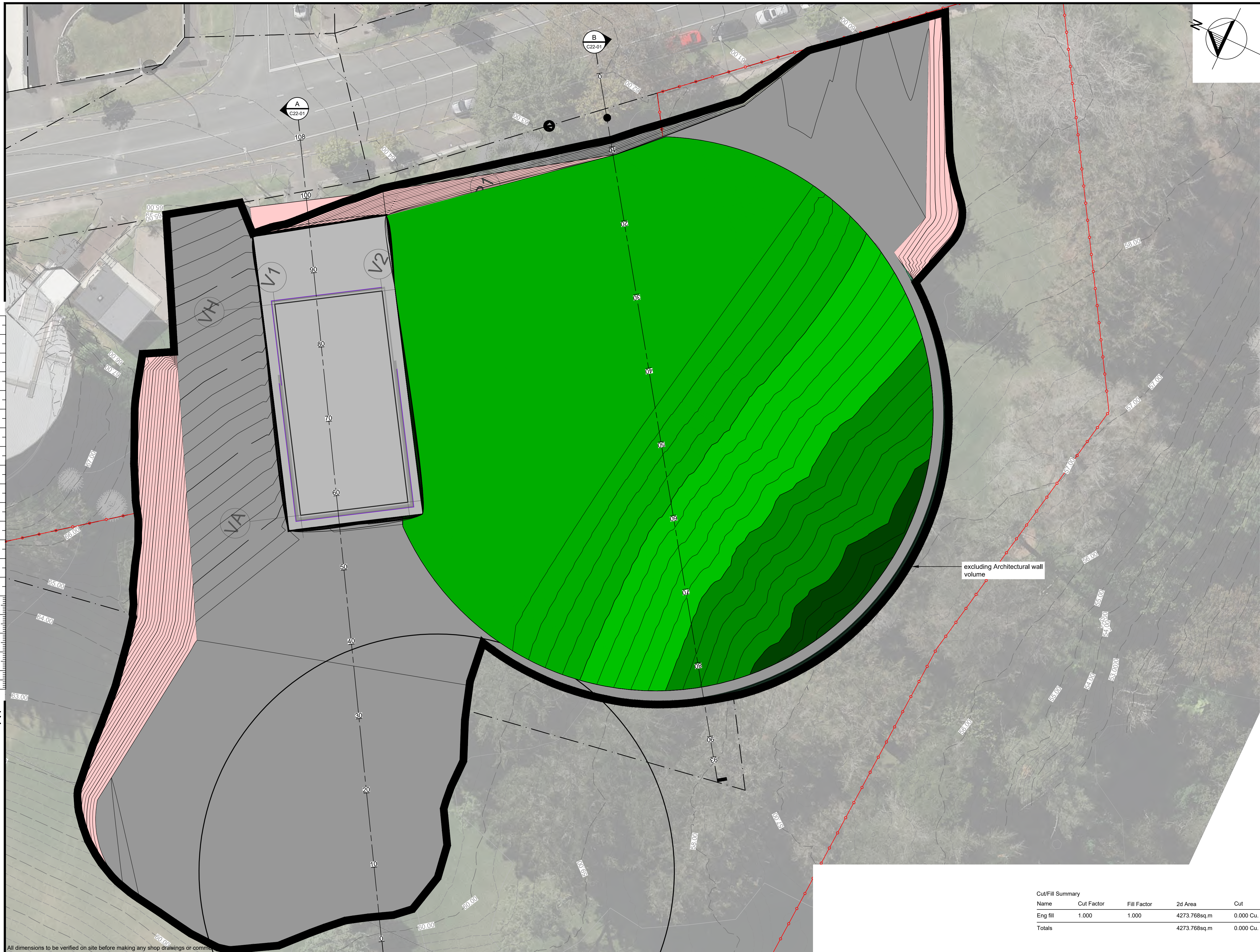
Scales 1:250

Drawing No. CB300-CIV-3206

Rev. C



ORIGINAL SIZE A1  
200 mm  
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    - 3.1. not including top soil stripping or stock pile location / volume.
    - 3.2. not including breakdown of engineered fill volumes.
    - 3.3. not including final levels layout as per landscape design and surface buildsups.

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Site boundary (existing)
  - Designation boundary (proposed)

Surface Analysis: Elevation Ranges			
Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		0.000	0.500
2		0.500	1.500
3		1.500	2.500
4		2.500	3.500
5		3.500	4.250

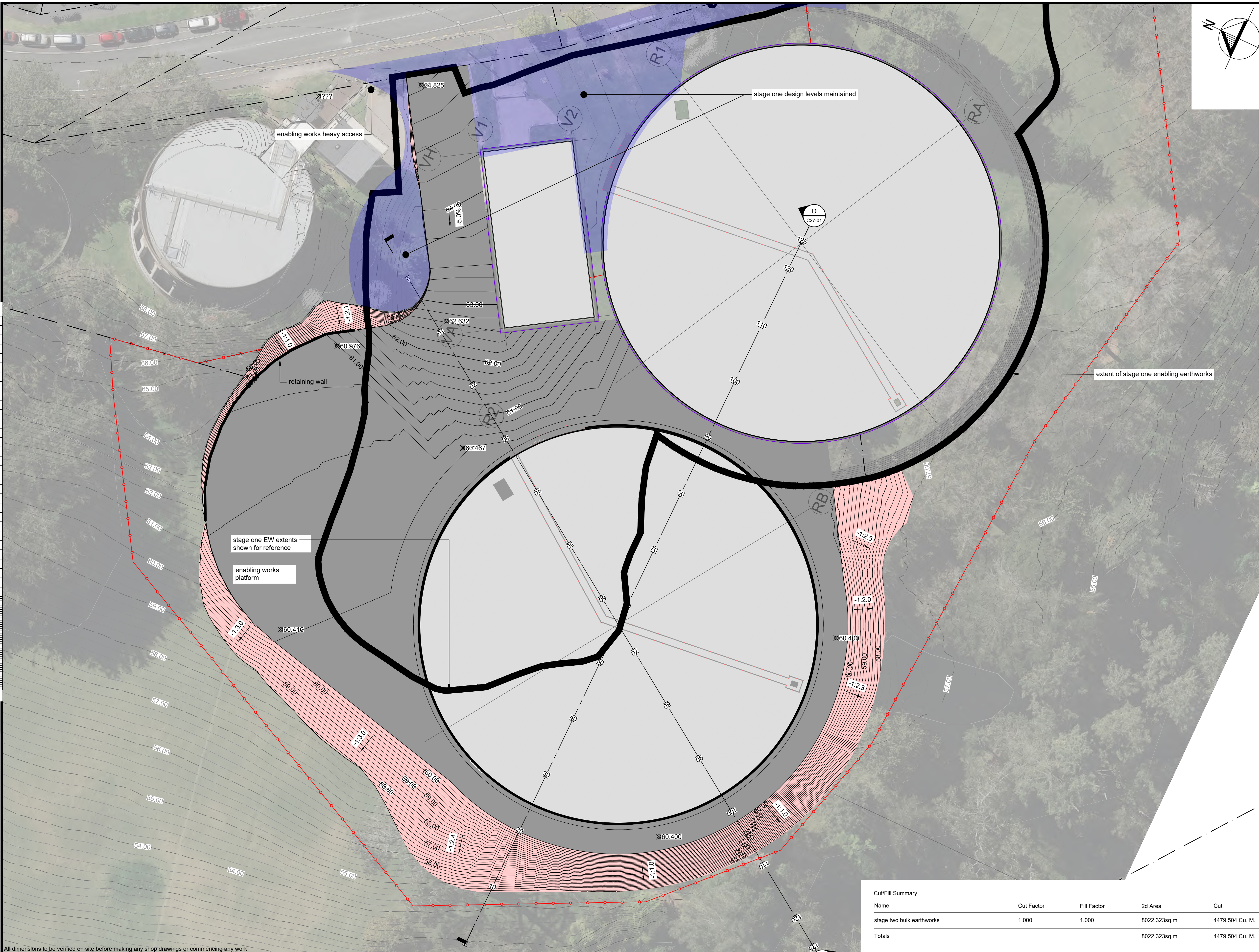
Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Eng fill	1.000	1.000	4273.768sq.m	0.000 Cu. M.	5680.523 Cu. M.	5680.523 Cu. M.<Fill>
Totals			4273.768sq.m	0.000 Cu. M.	5680.523 Cu. M.	5680.523 Cu. M.<Fill>

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ORIGINAL SIZE A1  
200 mm  
150  
100  
90  
80  
70  
60  
50  
40  
30  
20  
10  
0



- notes:
1. Refer to drawing C00-01 for project notes.
  2. This drawing set contains colour. All reproduction to be in colour.
  3. Earthworks volumes are based of EG vs design levels to allow construction of the site after bulk earthworks.
    - 3.1. not including top soil striping or stock pile location / volume.
    - 3.2. not including breakdown of engineered fill volumes.
    - 3.3. not including final levels layout as per landscape design and surface buildups.
    - 3.4. existing contours are including stage one design

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Site boundary (existing)
  - Building footprint (proposed)
  - Earthworks (- gravity fall)
  - Spot height (enabling earthworks)
  - Designation boundary (proposed)
  - Works platform
  - Batter zones refer levels plan for details

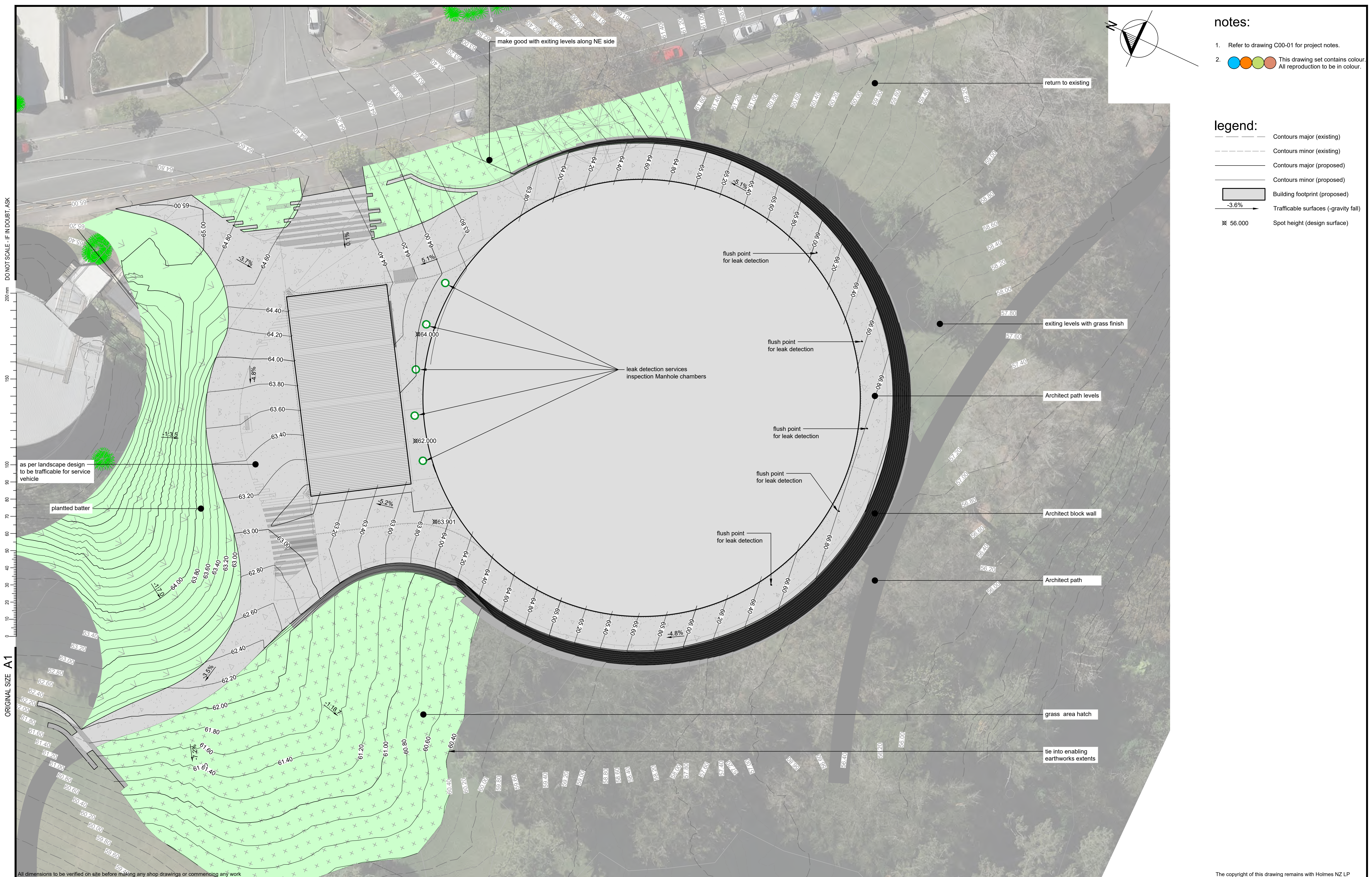
Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
stage two bulk earthworks	1.000	1.000	8022.323sq.m	4479.504 Cu. M.	6077.943 Cu. M.	1598.439 Cu. M.<Fill>
Totals			8022.323sq.m	4479.504 Cu. M.	6077.943 Cu. M.	1598.439 Cu. M.<Fill>

All dimensions to be verified on site before making any shop drawings or commencing any work				The copyright of this drawing remains with Holmes NZ LP			
				Status Stamp			
				Date Stamp			
				Scales 1:300			
				Drawing No. CB300-CIV-3210			
				Rev. C			









- notes:
1. Refer to drawing C00-01 for project notes.
  2. This drawing set contains colour. All reproduction to be in colour.

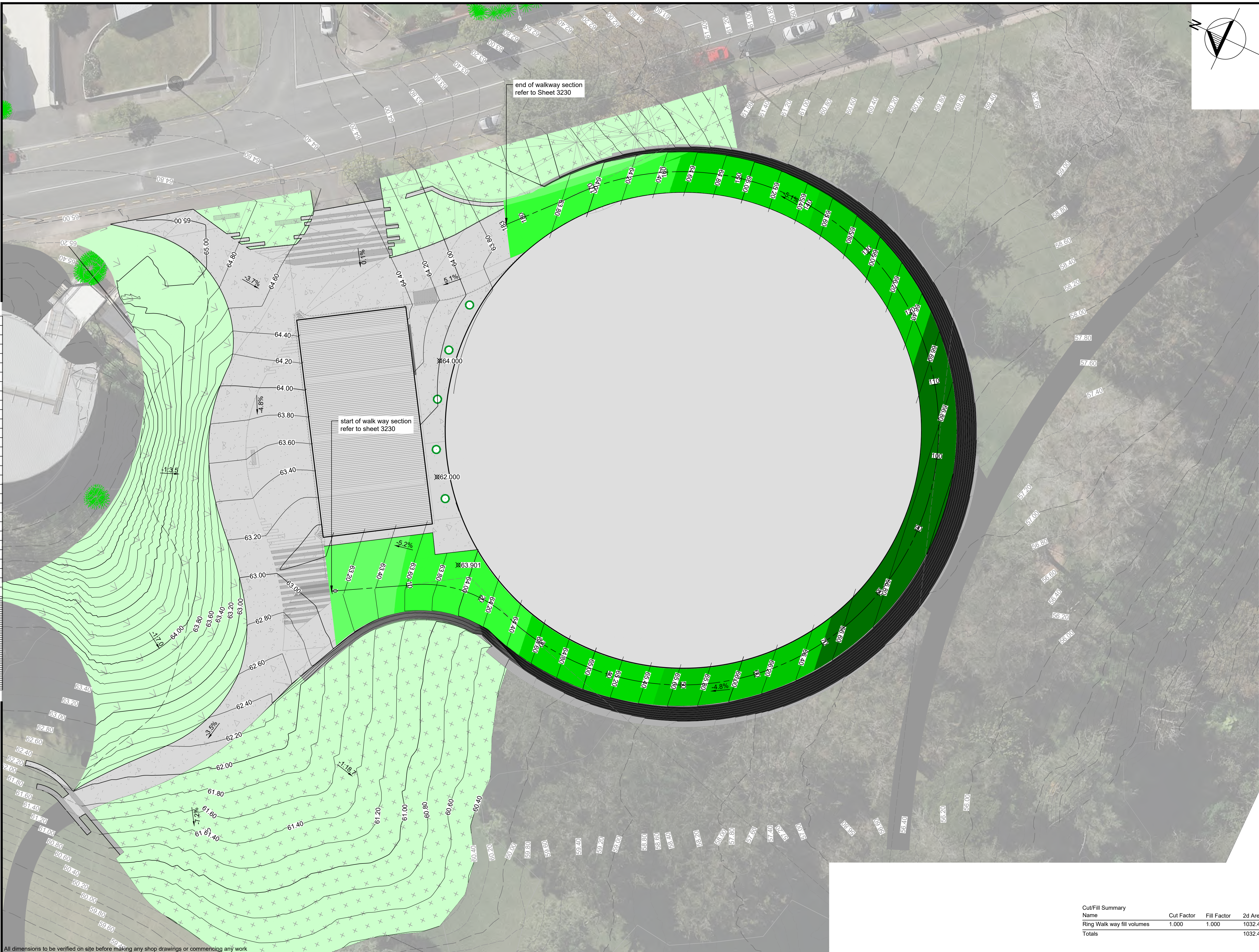
- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Building footprint (proposed)
  - Trafficable surfaces (-gravity fall)
  - Spot height (design surface)

ORIGINAL SIZE A1  
200 mm  
150  
100  
90  
80  
70  
60  
50  
40  
30  
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All dimensions to be verified on site before making any shop drawings or commencing any work				The copyright of this drawing remains with Holmes NZ LP			
				SURVEYED		-	
				DESIGNED		-	
				DRAWN		DRL	
				CAD REVIEW		-	
				DESIGN CHECK		-	
				DESIGN REVIEW		-	
				APPROVED			
				PROF REGISTRATION:			



ORIGINAL SIZE A1  
200 mm  
150  
100  
90  
80  
70  
60  
50  
40  
30  
20  
10  
0



- notes:
- Refer to drawing C00-01 for project notes.
  - This drawing set contains colour. All reproduction to be in colour.
  - Ramp volumes are based on final levels vs earthworks enabling design including Eng fill

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Contours major (proposed)
  - Contours minor (proposed)
  - Building footprint (proposed)
  - Trafficable surfaces (-gravity fall)
  - Spot height (design surface)

Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Ring Walk way fill volumes	1.000	1.000	1032.404sq.m	0.000 Cu. M.	4730.808 Cu. M.	4730.808 Cu. M.<Fill>
Totals			1032.404sq.m	0.000 Cu. M.	4730.808 Cu. M.	4730.808 Cu. M.<Fill>

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REV	REVISIONS	DRN	CHK	APP	DATE
C	100% Preliminary Design	DRL	-	CIL	22/07/2025
B	90% Preliminary Design	DRL	-	CL	23/06/2025
A	30% Preliminary Design	DRL	-	CL	08/05/2025

SURVEYED	-	
DESIGNED	-	
DRAWN	DRL	
CAD REVIEW	-	
DESIGN CHECK	-	
DESIGN REVIEW	-	
APPROVED	-	
PROF REGISTRATION:		

Holmes

Holmes Job Number: 148023.33

Client:

Hamilton City Council  
Te Kaunihera o Kiriitiroa  
City Waters

INFRASTRUCTURE  
ACCELERATION FUND RESERVOIR  
AND PUMP STATION  
fill volume walk way

Status Stamp

Date Stamp

Scales 1:250

Drawing No. CB300-CIV-3216

Rev. C



DO NOT SCALE - IF IN DOUBT, ASK

200 mm

150

100

90

80

70

60

50

40

30

20

10

0

0

10

20

30

40

50

60

70

80

90

100

110

120

130

140

150

160

170

180

190

200

210

ORIGINAL SIZE A1

H scale 1:200  
V scale 1:200

h.a.d. (m) 52.5

existing levels	59.808	61.233	61.451	61.605	61.727	61.868	62.516	63.164	64.142	64.245	64.443	64.390
design levels		60.400	60.400	60.400	60.437	60.555	57.000	57.000	57.000	57.000		
cut / fill depth		-0.833	-1.051	-1.205	-1.290	-1.312	-5.516	-6.164	-7.142	-7.245		

A - cross section

H scale 1:200  
V scale 1:200

h.a.d. (m) 55.0

existing levels	62.041	62.407	62.019	61.229	60.767	60.046	59.561	59.240	58.853	58.274	58.068
design levels		61.497	59.946	59.884	59.822	59.519	58.898	58.251	57.737		
cut / fill depth		-0.910	-2.073	-1.345	-0.945	-0.527	-0.663	-0.989	-1.116		

B - cross section

notes:

- Refer to drawing C00-01 for project notes.
- This drawing set contains colour. All reproduction to be in colour.

legend:

- Cut
- Fill
- Subsoil drain (proposed)

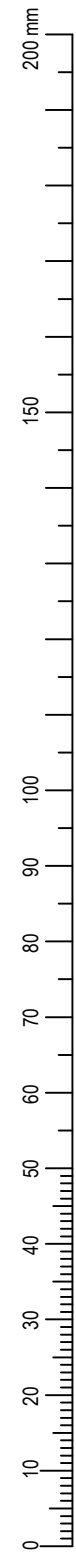
Cut/Fill Summary						
Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
stage one bulk earthworks	1.000	1.000	8922.369sq.m	12207.606 Cu. M.	381.259 Cu. M.	11826.347 Cu. M.<Cut>
STG 1 top soil 200mm	1.000	1.000	9129.374sq.m	1625.875 Cu. M.	0.000 Cu. M.	1625.875 Cu. M.<Cut>
Eng fill	1.000	1.000	4273.768sq.m	0.000 Cu. M.	5680.523 Cu. M.	5680.523 Cu. M.<Fill>
Totals			22325.511sq.m	14033.481 Cu. M.	6061.782 Cu. M.	7971.698 Cu. M.<Cut>

All dimensions to be verified on site before making any shop drawings or commencing any work

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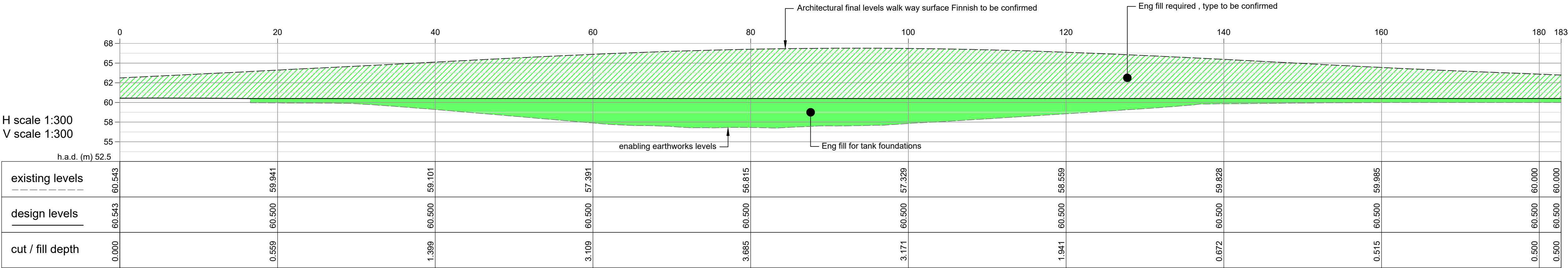
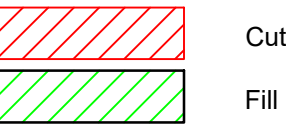


ORIGINAL SIZE A1

notes:

1. Refer to drawing C00-01 for project notes.
2.  This drawing set contains colour.  
All reproduction to be in colour.

legend:



Ramp levels - cross section

All dimensions to be verified on site before making any shop drawings or commencing any work

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B	90% Preliminary Design	DRL	-	CL	23/06/2025
A	30% Preliminary Design	DRL	-	CL	08/05/2025
REV		DRN	CHK	APP	DATE

SURVEYED	-	
DESIGNED	-	
DRAWN	DRL	
CAD REVIEW	-	
DESIGN CHECK	-	
DESIGN REVIEW	-	
APPROVED	-	
PROF REGISTRATION:		

Client:

Te Kaunihera o Kiriakira  
City Waters

INFRASTRUCTURE  
ACCELERATION FUND RESERVOIR  
AND PUMP STATION

section walk way

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Status Stamp	
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Rev.	C

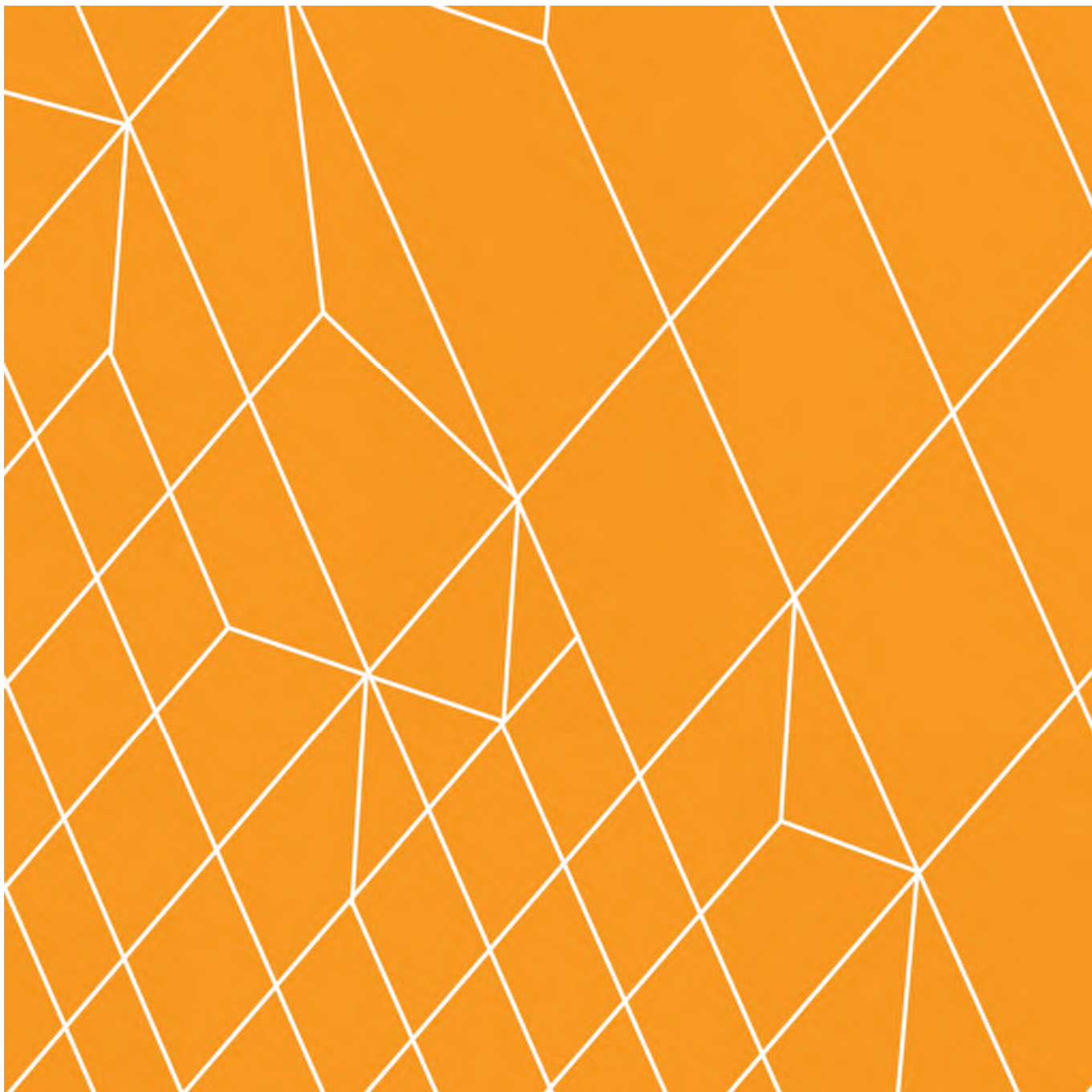


# Appendix B

## Preliminary Erosion and Sediment Control Plan







# **Central City Reservoir and Pump Station IAF Project**

18 Ruakiwi Road  
Hamilton Central

**Erosion & Sediment Control**

**Holmes Consulting**

Revision 3  
19 August 2025  
148023.33



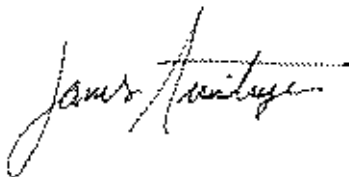
Erosion & Sediment Control

Central City Reservoir and Pump Station  
IAF Project

Prepared For:  
Hamilton City Council

Date: 19 August 2025  
Project No: 148023.33  
Revision No: 3

Prepared By:



James Armitage  
TECHINICAL DIRECTOR

Reviewed By:



Chris Lenssen  
PROJECT DIRECTOR

Holmes NZ LP

Report Issue Register

DATE	REV. NO.	REASON FOR ISSUE
13 June 2025	1	Resource Consent
14 July 2025	2	Resource Consent
19 August 2025	3	Resource Consent



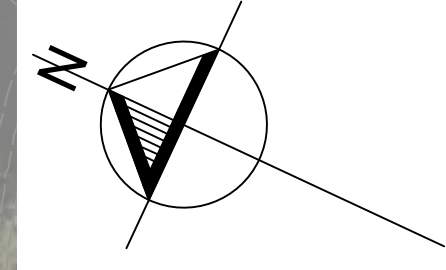
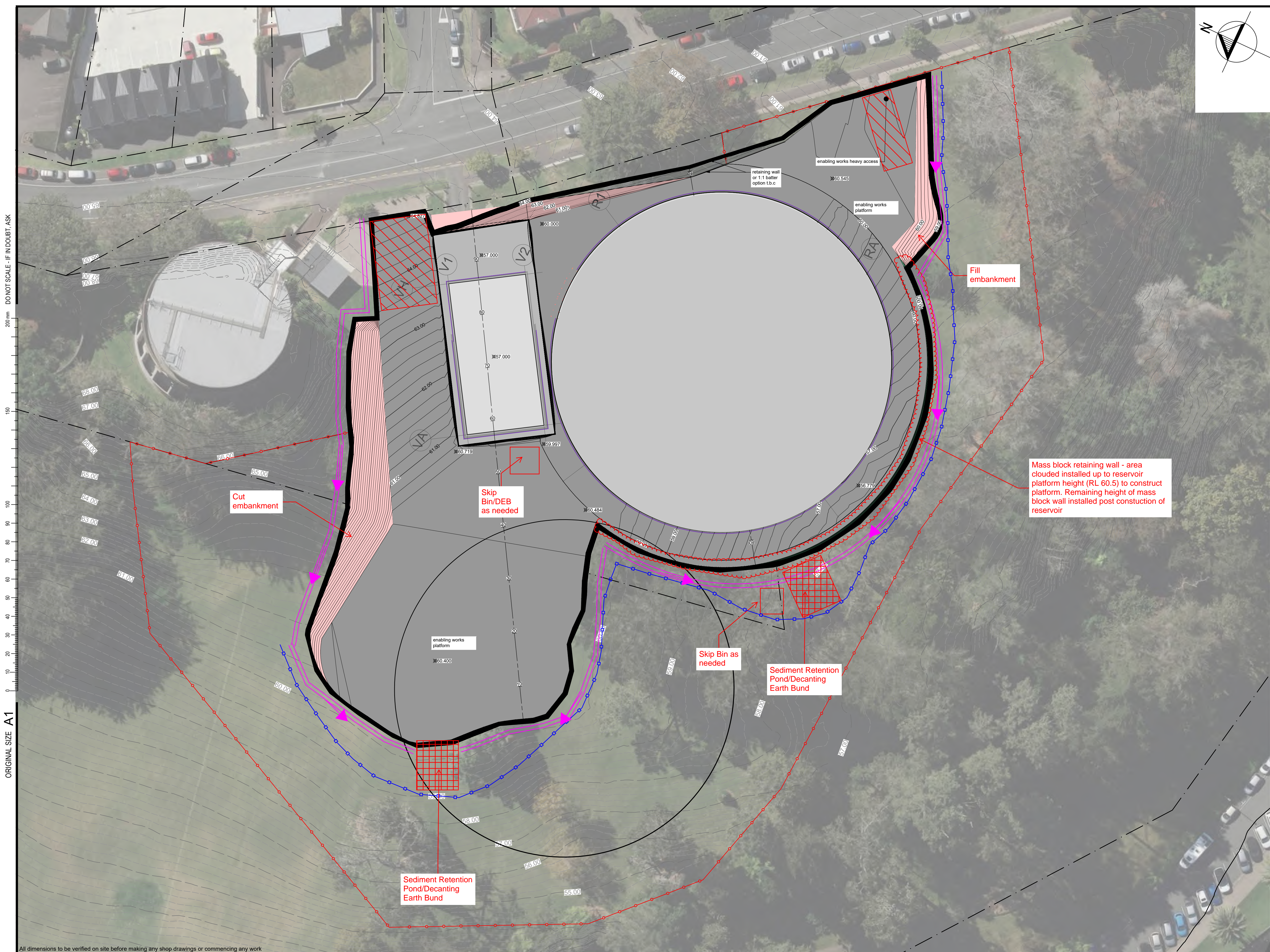
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**APPENDIX A: EROSION & SEDIMENT CONTROL PLANS**





- notes:
1. Refer to drawing C00-01 for project notes.
  2. This drawing set contains colour. All reproduction to be in colour.

- legend:
- Contours major (existing)
  - Contours minor (existing)
  - Site boundary (existing)
  - Building footprint (proposed)
  - Designation boundary (proposed)
  - Construction Entrance
  - Dirty Water Diversion Bund
  - Silt Fence
  - Sediment Retention Pond/DEB
  - Skip Bin

Earthworks Plan Area = 9,176 m<sup>2</sup>

Refer to Civil drawings for cross sections of the site - sheets 3220, 3222, 3230

Refer to Civil drawings for topography and for cut and fill volumes - sheets 3206, 3207, 3210, 3211, 3216

All dimensions to be verified on site before making any shop drawings or commencing any work

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REV	REVISIONS	DRN	CHK	APP	DATE

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DESIGNED	-	
DRAWN	DRL	
CAD REVIEW	-	
DESIGN CHECK	-	
DESIGN REVIEW	-	
APPROVED	-	
PROF REGISTRATION:		



Holmes Job Number: 148023.33


Client:



City Waters

INFRASTRUCTURE  
ACCELERATION FUND RESERVOIR  
AND PUMP STATION

SCALE 1:350



PROJECT: IAF Hamilton Reservoir

JOB NO: 148023.33      DATE: 19/08/2025

CSK: escp-01      REV: 3



## **1 INTRODUCTION**

Holmes NZ LP has been engaged to provide civil engineering design services for the IAF Hamilton Reservoir for Hamilton City Council (HCC). The project involves construction of a new reservoir and pump building located at the intersection of Ruakiwi Road and Clarence Street.

The project will be undertaken in two stages. Stage 1 includes the construction of a 25ML reservoir, a valve chamber and a booster pump station (pump station is located at 139 Clarence St). Stage 2 consists of construction of a second 25ML reservoir, proposed to be constructed in 8-10 years time.

This Erosion and Sediment Control Plan (ESCP) describes measures to minimise sediment loss and erosion control during construction of the proposed development. This ESCP is intended to be a living document. It will be refined and customised as the project develops, to fit with the Contractor's specific construction programme. The Contractor will submit a comprehensive ESCP for approval by the Principal and Council prior to the commencement of works on site.

This ESCP should be read in conjunction with Waikato Regional Council's Erosion & Sediment Control; Guidelines for Soil Disturbing Activities and Holmes NZ drawing CSK escp-01. It has been issued to support a resource consent application.

### **1.1 Limitations**

Findings presented as part of this report are for the sole use of Hamilton City Council in their evaluation of the subject property. The findings are not intended for use by other parties and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

This erosion and sediment control plan covers the construction of the proposed reservoir, building, and site works only. It does not provide guidance for the demolition of any existing buildings.

### **1.2 Project Description**

The IAF Hamilton Reservoir is a new reservoir and pump building to add resilience to the Hamilton water supply.

### **1.3 Site Description**

The subject site for the proposed development is at the intersection of Clarence Street and Ruakiwi Road adjacent to the existing reservoir. The subject site is a mix of impervious cover (roof and hardstand) and park/landscape.

The construction zone for the proposed works is approximately 9,176 m<sup>2</sup>.







### **1.3.2 Contamination Summary**

The geotechnical report identifies that potential contaminated soils (uncontrolled fill) are located near the existing reservoir, and if worked with, should be tested for contamination.

### **1.3.3 Archaeological and Cultural Issues**

In the event that during earthworks on site, any archaeological features, artefacts or human remains are found, the Hamilton City Council's Accidental Discovery Protocol within the District Plan shall be complied with. There are no recorded sites affected by the proposed works.

### **1.4 Erosion and Sediment Control Guidance Document**

The erosion and sediment controls used on this site will meet the requirements of Waikato Regional Council's Erosion & Sediment Control; Guidelines for Soil Disturbing Activities, issued January 2009. The way that these requirements are met is described below.

### **1.5 Receiving Environment**

Construction of the proposed development could deliver sediment-laden runoff into the Council stormwater network and Hamilton Lake if no sediment control devices are put in place.

Hamilton Lake is approximately 130 m downstream overland/in the Council network from the subject site.



## 2 CONSTRUCTION

### 2.1 Project Works

The proposed construction will include the following elements:

- Demolition works to remove existing hardstand
- Earthworks to create a level building platform and working area (cut/fill)
- Construction of the proposed development

### 2.2 Earthworks

Preliminary estimates of the earthwork volumes involved are summarised in Table 2-1 below. These volumes have been modelled as part of the resource consent package for the proposed development. It is anticipated that the cut material will not be suitable for re-use under the reservoir and engineered fill material will need to be brought to site.

	Volume (m <sup>3</sup> )	Area (m <sup>2</sup> )	Maximum Depth (m)
Cut (Stage 1)	13,650		7.6
Fill (Stage 1)	5,680		3.7
Net Total (Stage 1)	7,970	9,176	na
Cut (Stage 2)	7,040		2.0
Fill (Stage 2)	6,150		5.0
Net Total (Stage 2)	890	5,816	na

Table 2-1: Summary of Earthwork Volumes

The site slopes away from Ruakiwi Road. Earthworks are required to prepare the excavation level across the site.

### 2.3 Work Phases

The development is for a single reservoir with a possible second reservoir in the future. Earthworks for the second phase have been included to show indicative future work. The Contractor shall submit a final ESCP based upon their construction methodology and phasing for approval by Council prior to the commencement of any works on site.

#### 2.3.1 Demolition

A demolition contractor has not been engaged therefore the demolition programme of the existing hardstand is not known. Once engaged, the demolition Contractor shall use the appropriate sediment and erosion control methods to ensure any areas of exposed soil are stabilised.

#### 2.3.2 Pre-Construction

Prior to the commencement of works, the Contractor shall produce a comprehensive Erosion and Sediment Control Plan for all phases of their construction methodology. This final ESCP shall be submitted to Council for approval. Time shall be allowed in the construction programme for approval of this ESCP and establishment of the appropriate erosion and sediment controls required for the duration of the



construction programme, prior to the start of works. Construction of the proposed development should not begin until these controls have been approved, established and inspected by council.

### **2.3.3 Excavating to Bottom of Reservoir**

Temporary support will be required to manage the stability of the excavation sides. Any temporary retaining structures shall be designed and documented by a Geotech and Structural Engineer.

### **2.3.4 Construction Order**

The earthworks will be undertaken first to excavate down to the contours shown in Figure 1 above, then fill placed (as shown in green in sections A & B of the appended drawings) to bring the building platform to the base of the reservoir. There will be localised low areas which are identified as requiring either pumping, skip bins, or other diversion techniques to prevent erosion and sediment discharge.

### **2.4 Treatment Requirements**

Sediment-laden stormwater that is collected on site is to be attenuated until a specific minimum treatment standard is achieved. Chemical flocculation (volume and application rates to be designed by contractor) shall only be used if bench testing shows benefits of flocculation. Records shall be kept and made available to Council at any time.

### **2.5 Discharge to HCC Stormwater Network**

Discharge of stormwater during earthworks is limited to 3 L/s per contributing catchment. The Contractor may discharge at a higher rate if they can demonstrate that the treatment requirements have been met and only with prior written approval with Council. This shall be confirmed with the final erosion and sediment control plan.



### 3 FINALISED EROSION & SEDIMENT CONTROL PLAN

This ESCP (refer CSK escp-01) is a preliminary plan, submitted to support the resource consent for the IAF Hamilton Reservoir. A finalised Erosion and Sediment Control Plan will be prepared by the Contractor and submitted to Waikato Regional Council for approval, prior to any works beginning on site. The Contractor will prepare this plan in line with the principles described in Section 3.1 below. Specific erosion and sediment control methods are referenced in Section 3.2 below.

#### 3.1 Principles of Erosion & Sediment Control

##### Cover exposed surfaces

- Minimise the areas of exposed soil at all times. Consider construction phasing to allow the site to be progressively worked on and stabilised in a sequential manner, so that the areas of exposed soil are always as small as possible.
- Always stabilise exposed soil as soon as possible following earthworks. The use of vegetation cover, hay mulching or final hard landscaping should be implemented as soon as practical following completion of the soil disturbing activities and within six to twelve months from the date of disturbance or the next planting season (whichever is sooner).
- Minimise the volume of material stockpiled on site. Locate stockpiles away from overland flow paths and low points where water can pond. Provide bunds around stockpiles. Cover stockpiles during windy conditions or in significant rainfall.

##### Control run-on water

- Minimise the amount of sediment-laden water that needs to be treated, by keeping water out of active earthworks areas. Do not allow clean water to enter active working areas; use bunds, lined clean water diversion channels, interception channels or similar to prevent overland runoff from entering these areas. Divert clean flows to a suitable discharge point well away from active earthworks.

##### Separate 'clean' from 'dirty' water

- Use diversion channels and earth bunding for clean water.
- Send all sediment-laden water to treatment (i.e. settling pond or decanting earth bund). This includes dewatering water. Sediment ponds may not be required if areas of exposed earth are limited and progressive stabilisation is employed.

##### Prevent sediment from leaving the site

- Capture and treat all sediment-laden discharges generated on the site. Treatment may be via settling or chemical treatment (choose a method best suited to the soil types on site, space available for treatment, and the expected volume of runoff from the works area).
- Never discharge sediment-laden water off the site. In an emergency, consider sucker trucks or similar to remove sediment-laden water off-site if storage facilities are overwhelmed. Provide adequate emergency storage volume on site (in a pond or similar) for the duration of the works.
- Prevent dust by watering stockpiles as required in dry, windy conditions.

##### Phased Construction

- It is recommended to phase the construction to minimise the areas of exposed soil at any one time. Any areas of earthworks will be appropriately managed in order to minimise the potential for erosion.
- Surfaces are to be stabilised as far as reasonably practical. Where works are not complete, the use of temporary stabilisation is recommended (i.e. surface mulching, geotextiles and erosion control blankets). When works are complete, ensure surfaces are fully stabilised (i.e. asphalt pavement, turfing, hydroseeding etc.).



- Progressive stabilisation should be used when working on large areas of pavement or large building platforms. Use of temporary stabilisation will limit the extent of exposed soil at any one time. Exposed soil should be covered during periods of wet weather and overnight.

### **Pumping Management Plan**

- When dewatering requires the use of a pumping system (ie, if gravity drainage cannot be achieved due to flat site topography), a pumping management plan is to be provided by the Contractor.

### **Maintenance**

- Check erosion & sediment control measures daily and make repairs as necessary. As the works progress, ensure that the erosion & sediment control measures remain appropriate for the works and are in good condition. Check condition of all devices after any rainfall events.
- Check the weather forecast regularly. Before any significant rainfall event, check the site to ensure that it is stabilised as much as possible and that all erosion & sediment control measures are in place and in good condition.

### **Experience**

- A Contractor with extensive experience in setting up, monitoring and maintaining effective erosion and sediment control will help the project progress by identifying ways to protect the receiving environment during construction early on.
- A pre-construction meeting should be set up between the Contractor and Waikato Regional Council (and the ESCP design engineer as required) to discuss the construction staging to ensure the plan set in place will be as effective as possible.

### **Assess and Adjust**

- The Contractor will be responsible for monitoring the erosion and sediment control devices on site. Should any device be identified as performing poorly, measures must be taken to correct this to ensure no sediment-laden runoff leaves the site. As such, this ESCP will be modified as the project progresses and as work moves around the site.

## **3.2 Erosion & Sediment Control Measures**

### **3.2.1 Silt Fence**

Silt fencing will prevent sediment from leaving the site in surface runoff. It is a standard boundary control to be used downstream of other ESC facilities at the perimeter of the project site.

### **3.2.2 Earth Bund (Runoff Diversion Bund)**

Stabilised earth bunds will be used to prevent sediment-laden stormwater from leaving construction areas and direct runoff to ESC facilities for treatment.

### **3.2.3 Stabilised Construction Entrance**

Stabilised construction entrance to consist of 50-75 mm washed aggregate, 150 mm thick (minimum), 4.0 m wide (minimum) and 10 m long (minimum).

A stabilised construction entrance will reduce the amount of sediment leaving site. It also clearly identifies the authorised access points for construction vehicles. Combined with a formal wheel wash facility or shaker ramp, this will prevent sediment being tracked onto the adjacent road ways. The Contractor shall check the vehicle entrance each day, to ensure no sediment is being tracked onto roads. Any sediment shall be cleaned up immediately.



### 3.2.4 Mulch/Geotextiles

If any area of soil is to be left exposed for any long period of time, mulching or geotextiles should be used. This will prevent dust during dry weather or erosion of the soil during periods of wet weather.

### 3.2.5 Stormwater Inlet Protection

All existing stormwater inlets should be protected before any construction begins. As new inlets are installed, the same protection measures should be put in place to ensure sediment-laden runoff cannot enter the council network. Use of sediment socks or gross litter traps are common methods of preventing sediment from entering the network.

Sediment socks are only effective when used as part of a suite of sediment control devices (ie. downstream of earth bunds, silt fences). They should not be used as a primary sediment control device.

### 3.2.6 Dewatering

For small areas of exposed soil, use of a dewatering skip bin may be required to pump water from low points to an area for treatment. The same treatment requirements apply to water from a skip bin prior to discharging from site.

## 3.3 Inspection Frequency

The table below sets out the minimum inspection requirements for the various sediment control devices on-site.

Sediment and Erosion Control Device	Frequency of Inspection
Silt fence	Daily (minimum) + after every rainfall event
Stabilised construction entrance	Daily + after every rainfall event
Earth bunding	Weekly + after every rainfall event
Clean water diversion channels	Weekly + after every rainfall event
Stormwater inlets	Daily + after every rainfall event
Stabilised areas (with hay mulch etc.)	Daily + before/after every rainfall event

Table 3-1: Minimum inspection requirements for devices on-site

## 3.4 Contingency Measures

Weather forecasts will be regularly monitored by the Contractors for the duration of the works. Standard practise is to install a rain gauge on-site. Where practical, emergency measures will be installed at critical locations prior to the occurrence of heavy rainfall and storm events. For example; critical batters on site should be covered with pinned geotextile material and additional riprap placed at discharge points and in diversion channels. This is to reduce the risk of sediment discharge from the site in the event of an extreme storm event. This is particularly crucial on this site, located at the top of a steep embankment. If erosion and sediment control measures are not secured at the top of the embankment, it could lead to significant sediment washout during heavy rainfall.

## 3.5 Emergency Response

The Contractor shall comply with the following procedures in the event of any failure of erosion and sediment device on-site:

1. The Contractor should visit the site to survey the extent of damage.
2. Contact Waikato Regional Council and the Principal to report the failure of the device and what emergency measures are to be taken.



3. As soon as conditions allow safe work, put temporary works in place to minimise further damage to the device and the surrounding environment. Temporary control measures may include:
  - Forming bunds and diversion drains to control runoff;
  - Protect exposed surfaces by using geotextile or hay mulching;
  - Temporary backfill of any voids created by erosion during device failure;
  - Cleaning out downstream channels.
4. As soon as conditions allow, carry out remedial work downstream of the failed device to repair any damage to infrastructure and property. Clean up deposited silt and debris. Reinstall surfaces and structures to their original condition.
5. Review to identify the cause of the device failure. Potential factors may include rainfall event intensity/duration, catchment size, catchment characteristics, the suitability of the device, construction issues (installation practices etc), lack of maintenance and monitoring.
6. Confirm any amendments to the design of the failed device prior to commencing project site works.
7. Re-construct the device in accordance with approved plans and maintain for the remainder of the project work.



## **4 CONTRACTOR INPUT**

The Contractor will assume responsibility for overseeing erosion and sediment control maintenance and monitoring for the duration of the works.

### **4.1 Contractor's Construction Management Plan**

Once a Contractor is appointed, and prior to start of the construction works, a Construction Management Plan (CMP) will be prepared which sets out the details of the proposed construction methodology and measures to be taken to minimise the potential erosion caused by construction.

### **4.2 Final Erosion & Sediment Control Plan**

A final version of the Erosion and Sediment Control Plan (ESCP) shall be produced by the Contractor and will form part of the CMP and be submitted to Waikato Regional Council for approval. The Contractor's emergency shut-down procedure in the event of forecast heavy rainfall or spill shall be part of this documentation. Any conditions provided as part of the Resource Consent will be incorporated into the final ESCP.

### **4.3 Finalised Pumping Methodology Plan**

If stormwater or dewatering water requires pumping during the construction works, the Contractor shall be responsible for producing a finalised pumping methodology plan. The Contractor shall submit this for approval from Waikato Regional Council prior to any works commencing on site.

### **4.4 Chemical treatment Management Plan**

The Contractor shall be responsible for producing and submitting a CTMP for approval from Waikato Regional Council prior to any works commencing on site.