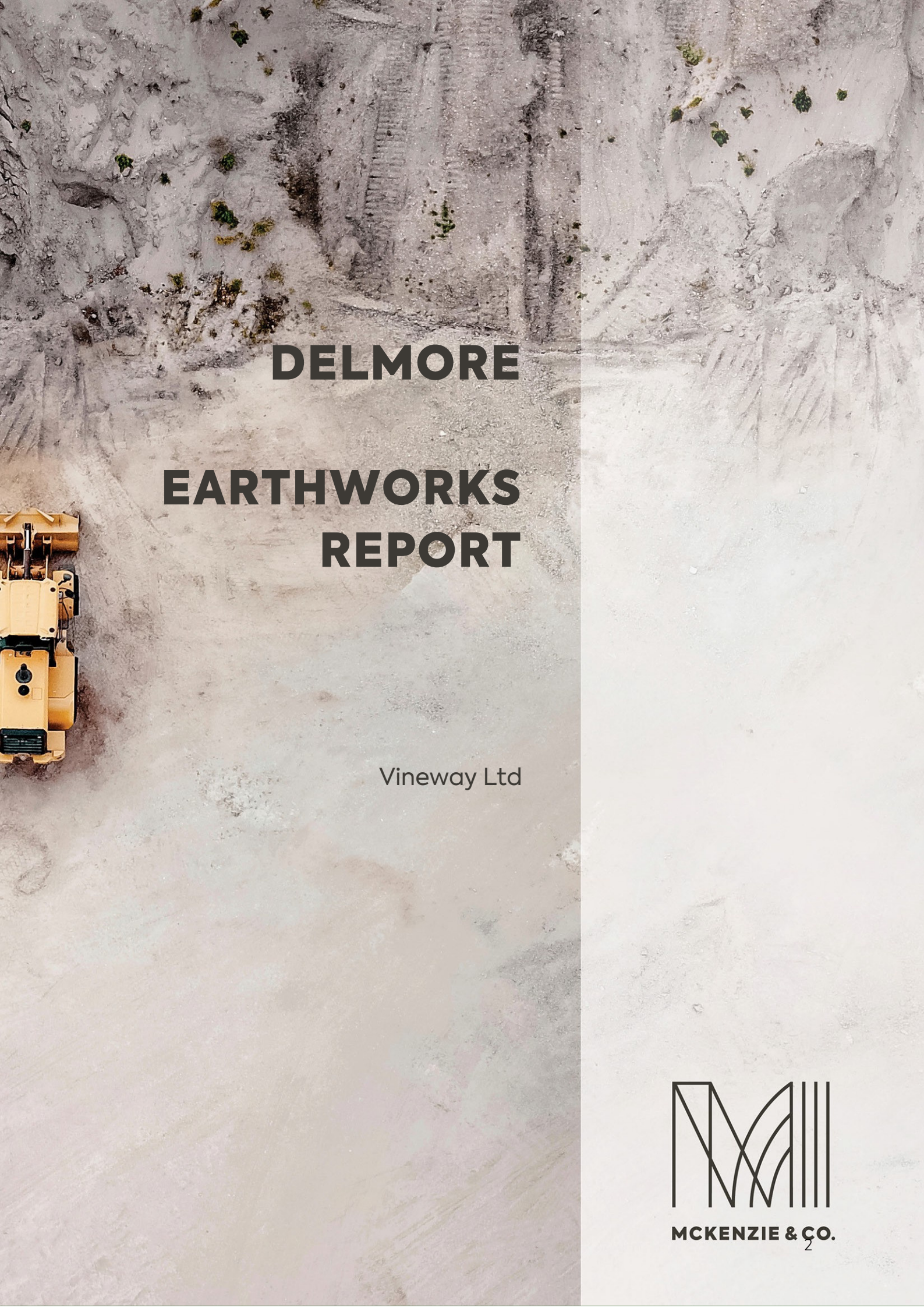

DELMORE

EARTHWORKS REPORT

Vineway Ltd

MCKENZIE & CO.

DOCUMENT CONTROL RECORD

PROJECT: Delmore

CLIENT: Vineway Ltd

PROJECT LOCATION: 53A, 53B & 55 Russell Road and 88, 130 & 132 Upper Ōrewa Road

Revision	Date	Originator	Checker	Approver	Description
A	06/12/24	[redacted]	[redacted]		DRAFT
B	17/01/2025	[redacted]	[redacted]		Updated with comments
C	07/02/2025	[redacted]	[redacted]	[redacted]	Resource Consent
D	11/02/2025	[redacted]	[redacted]	[redacted]	Resource Consent

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report provides an analysis of the proposed earthworks to be conducted as part of the Delmore Development to support the consenting process. The primary objective of this report is to address the earthworks required to facilitate the development and sediment controls required to prepare the site for construction, ensuring compliance with relevant environmental and safety regulations.

Specific aspects of the design which are discussed in this report include:

- Site information - details about the project site and constraints, including existing streams, wetlands, and bush covenants.
- Earthworks – the proposed earthworks of the project, including design strategies, cut/fill volumes, areas of impact on environmental protection areas, and stream works.
- Erosion and sediment control – a discussion about managing the expected risks, establishing control measures, monitoring and maintenance, and reporting.
- Sediment control methodology – a discussion about the philosophies to be implemented about sediment control, including minimising disturbance, staging/timing of earthworks, and protecting environmentally sensitive areas.
- Water management controls – management of clean/dirty water, surface stabilisation, order of works, overland flow paths, and catchment specific control detail.

The proposed earthworks are in accordance with Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016. The design has taken into consideration the possible impact of the proposed development and has minimised impacts to the receiving environment using accepted engineering practices.

2. INTRODUCTION

McKenzie & Co. Consultants have been engaged by Vineway Ltd Limited to provide an Earthworks report in support of the proposed 109Ha development located at 53A, 53B & 55 Russell Road and 88, 130 & 132 Upper Ōrewa Road. The proposed development is a residential development for approximately 1250 residential Lots, delivered across two stages.

This report is prepared to support Vineway Ltd's application for approvals under the Fast-track Approvals Act 2024, in particular its approvals for resource consents that would otherwise be sought under the Resource Management Act 1991 for approvals under the Fast-track Approvals Act 2024, in particular its approvals for resource consents that would otherwise be sought under the Resource Management Act 1991, by addressing the earthworks and related erosion and sediment control measures. It is important to note that this report exclusively covers earthworks and erosion & sediment control, while other infrastructure matters, including roading and access, stormwater, flooding, wastewater, water supply, and utility servicing works are addressed in separate infrastructure reports.

3. SITE DESCRIPTION

The proposed development site is situated between Grand Drive and Russell Road, and is legally described as Lot 1 DP 336616, Lot 1 DP 497022 & Lot 2 DP 497022, Lot 2 DP 418770, Lot 1 DP 153477 &

Lot 2 DP 153477, as illustrated in Figure 2 below. The site is zoned as Future Urban and is immediately adjacent to the consented Ara Hills Development. The road network within the Ara Hills Development provides the connection between the proposed development site and the Grand Drive interchange. The general site location is shown below in Figure 1.

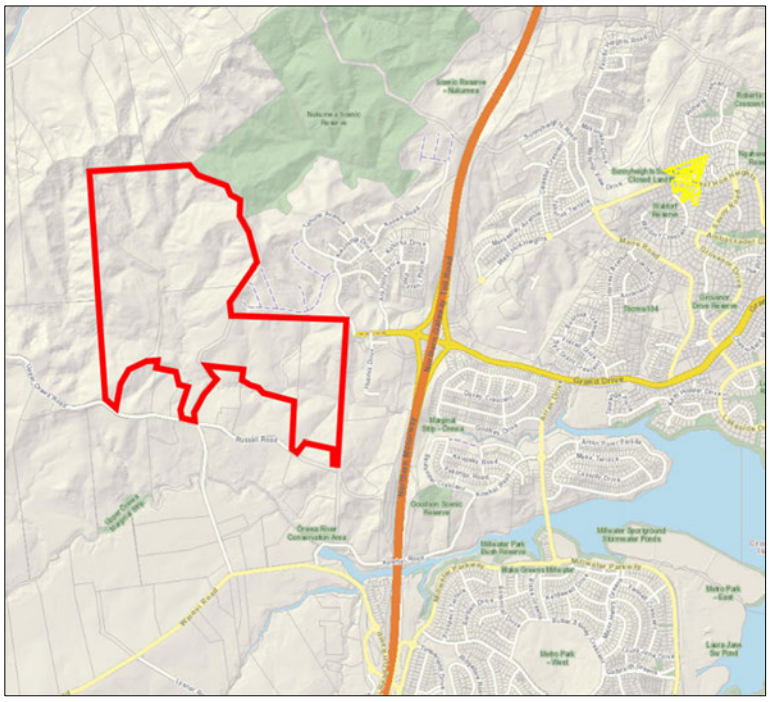

Figure 1 – Project site location

Currently, the site is used for agricultural purposes with livestock roaming across a significant portion of the site.

The site contains a pine tree plantation, and three covenanted bush areas. The pine tree stand will be removed for development. The covenanted bush areas are proposed to remain, however some small areas are required to be removed to enable critical infrastructure. This is covered in more detail in Section 4.3.

Existing dwellings, farm access tracks, and some farm sheds are located in the southern portion of the site and will be removed prior to development.

All the properties included in this proposal is contained within one watershed catchment, which generally drains towards the East, and into the Ōrewa upper estuary. Numerous sub catchments drain into a main stream that runs down the middle of the site.

The site is bounded by a Significant Ecological Area identified in the Auckland Unitary Plan to the northwest which also extends slightly into the site.

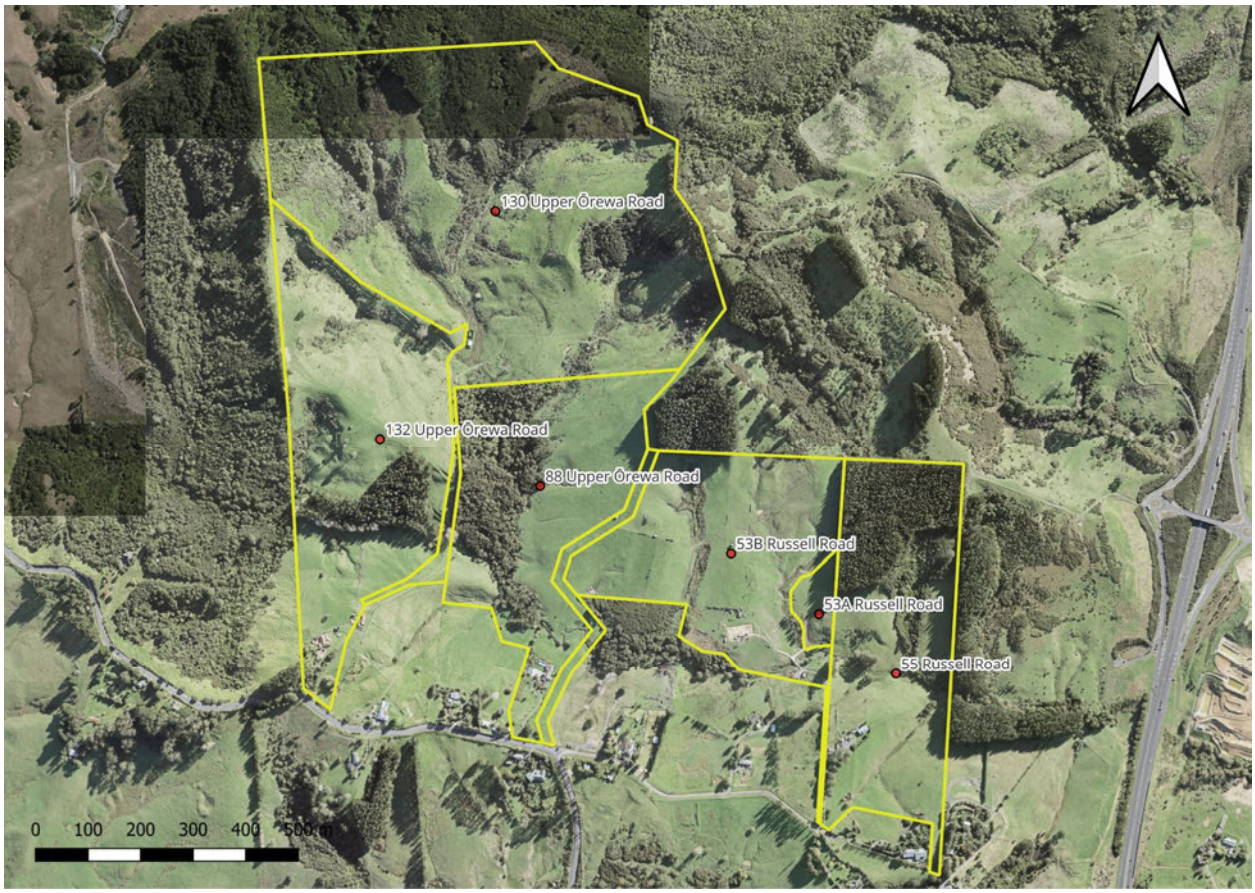

Figure 2 - Properties included in proposal

4. SITE CONSTRAINTS

4.1. STREAMS

Ephemeral and intermittent streams are present on the site and have been mapped by Viridis[1] Consultants. These are shown in Figure 3. A 20m wide riparian margin has been identified along the length of the streams, that are proposed to be planted with appropriate species. Earthworks will extend into this margin to facilitate the formation of batters, however these batters will be topped with 300mm minimum topsoil to facilitate landscaping. This is discussed in more detail in Section 5.2.

[1] Viridis 2024.

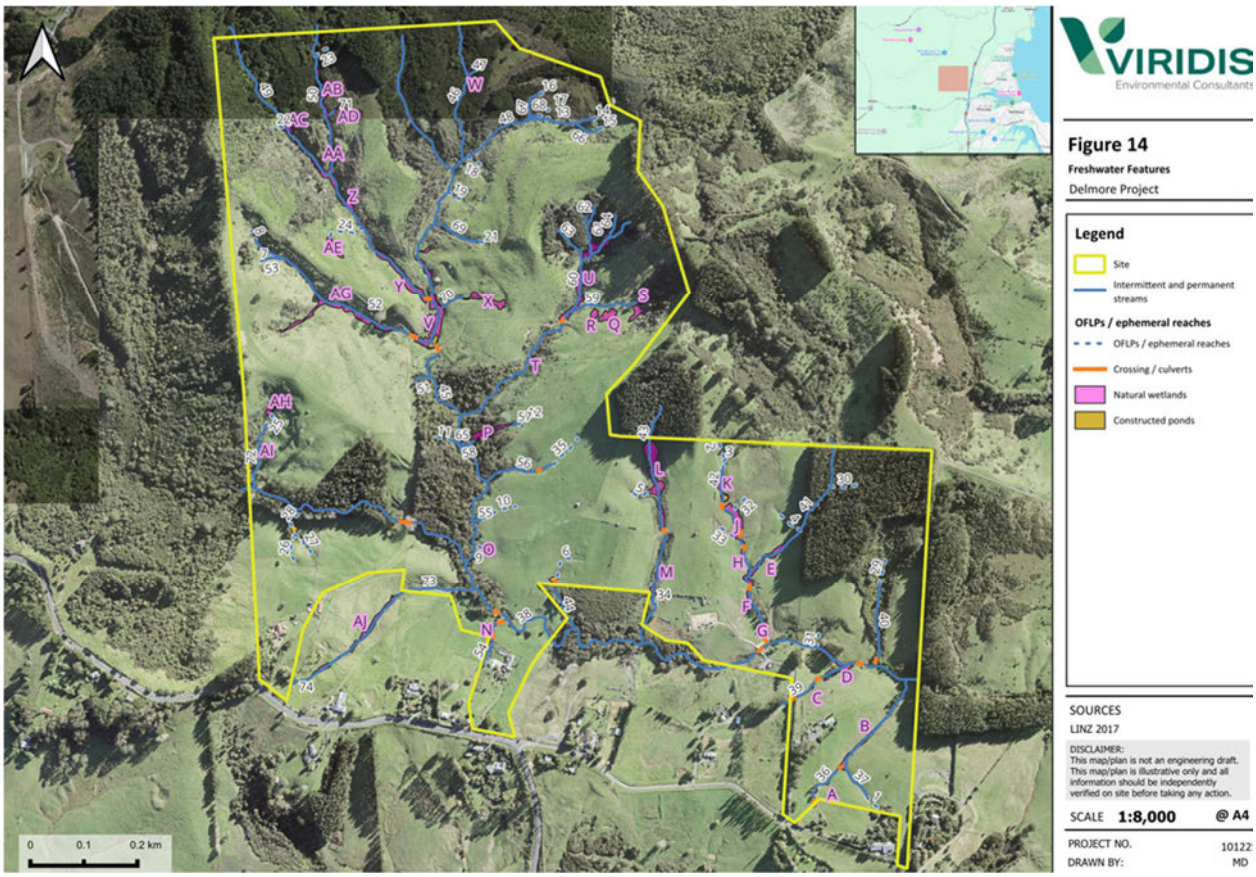

Figure 3 -Mapped Streams & Wetlands

4.2. WETLANDS

The site contains numerous natural wetlands, which have been identified and mapped by Viridis Consultants also shown in Figure 3. Earthworks adjacent to these wetlands have remained outside of the 10m wetland margin where possible. Some natural wetlands are located within the proposed road alignments. This is only the case in locations where re-aligning the roads is not possible to avoid the natural wetland. This is discussed in further detail within Section 5.5 below.

4.3. BUSH AREAS SUBJECT TO CONSENT NOTICE

The site contains three bush areas subject to consent notices issued under s 221 of the Resource Management Act 1991. Clearance of some of the vegetation in these areas is required for culvert and infrastructure crossings. Any clearing within these areas are shown in the clearing plans (2200 series drawings). Earthworks up to the consent notice area boundary are required, however where possible these areas are avoided.

5. EARTHWORKS

5.1. GEOTECHNICAL APPRAISAL REPORT

A geotechnical appraisal report for the site has been prepared by Riley Consultants[2].

[2] Riley 2024

The report concluded that the study area is suitable for comprehensive development.

The matters contained in the geotechnical assessment will be addressed through the construction works. All geotechnical related construction works shall be undertaken in accordance with the recommendations in the geotechnical report, and under the supervision of geotechnical engineer.

A geotechnical completion report will be prepared at the completion of all civil works pertaining to this earthwork's application by a suitably qualified Geotechnical Engineer.

5.2. PROPOSED EARTHWORKS

The proposed earthworks for this application include general bulk earthworks for establishing roads, treatment ponds, and building platforms.

To minimize the extent of earthworks as far as practicable, the design approach incorporates the following measures:

Road Geometries Aligned with Existing Landforms: Road geometries have been carefully designed to align with the existing landform wherever feasible. This reduces the need for excessive cutting or filling while maintaining the necessary maximum grades for safe and functional roading.

Cut/Fill Balancing: Within the proposed two stages of development (or substages), efforts have been made to achieve a cut/fill balance. This minimizes the need to transport materials across the site, thereby reducing construction movements and associated environmental and logistical impacts.

Lot Formation: Flat building lots have been formed to accommodate future development needs while minimizing the impact on surrounding topography.

Re-profiling and Material Relocation: The design focuses on re-profiling the existing ground primarily along the spines of the proposed sub-catchments. The cut material from these areas will be relocated for engineered filling along the periphery of stream zones, minimizing waste and optimizing resource use.

Stream-Adjoining Batters: The final earthworks design incorporates steeper batters adjacent to stream areas to reduce the overall footprint of the works while maintaining stable and sustainable site conditions.

By implementing these design strategies, the extent of earthworks has been minimized to the greatest extent practicable, balancing environmental, functional, and construction considerations. The detailed earthworks extent is illustrated in Figure 4 and Figure 5.

The earthworks balance has been achieved by the following actions:

Bulk Cut – Fill

The amount of bulk cut material taken and final shaping from the site has been informed by the

amount of fill material needed (including compaction factors) to fill along the stream banks to facilitate flat lot platforms.

The earthworks' philosophy within the fill areas is to undertake reshaping to maintain flat lots and increase the developable lot areas.

Topsoil Strip and Respread Philosophy

As identified by Riley Consultants, the average topsoil depth across the site is approximately 200mm. The topsoil strip and respread philosophy is to minimise topsoil removal off site after the respreading process is complete, and to place topsoil in thicker layers in landscaping areas to facilitate revegetation. Topsoil respread depths are proposed to be varied based on proposed land use at various locations within the site to maximise topsoil respread volumes on site.

A summary of the earthworks is included in Table 1 below.

Table 1: Earthworks

Area	Unit	Stage 1	Stage 2AB	Stage 2CDE	Site Wide	Assumptions
Earthworks area	m^2	240,000	155,000	189,000	584,000	
Net Cut Volume	m^3	436,000	356,000	480,000	1,272,000	Finish surface to existing topo level
Topsoil Strip Volume	m^3	48,000	31,000	37,800	116,800	Assumed 200mm deep topsoil across earthworks area
Maximum Cut Depth	m				15	
Net Fill Volume	m^3	290,000	283,000	380,000	953,000	Finish surface to existing topo level
Topsoil Respread Volume	m^3	48,000	31,000	37,800	116,800	Assumed 200mm deep across earthworks area
Maximum Fill depth	m				15	
Clay Deficit/(surplus)	m^3	146,000 excess cut	73,000 excess cut	100,000 excess cut	319,000 excess cut	Bulk volume, no compaction accounted for
Topsoil Deficit/(surplus)	m^3	0	0	0	0	There are a number of locations throughout site for excess topsoil to be disposed safely if required
Total Earthworks Volume (Cut + Fill)	m^3	726,000	639,000	860,000	2,225,000	

5.3. STREAM RECLAMATION

The design has been developed to ensure that there is no stream removal, thus there are no permanent streams being reclaimed as part of earthworks operations in any stage of the project.

5.4. STREAM MARGINS

Some filling is required in stream margins, to form the batters. The margins have been defined as a 20m from the stream bank.

The total earthworks area and volumes are shown below in Table 2.

Table 2: Stream margin encroachment areas / volumes

	Area (m^2)	Volume (m^3)
Stage 1	32,079	92,438
Stage 2	43,012	146,025

5.5. WORKS WITHIN WETLAND EXTENT

The below table show the extent of works that will occur within wetlands as part of the earthworks operation.

Table 3: Works within wetland extent

Wetland	Reason	Temp works (m^2)	Overall reduction (m^2)	Alternatives considered
B	Construction of culvert crossing 1, in Stage 1	45	0	Realignment of the road was considered, however as the natural wetland extends the full length of the gully, this does not result in avoiding the wetland. A bridge structure was considered, however was decided against as a box culvert can span the full wetland width, be embedded into the stream bed, and reinstated to pre-development conditions. The road batter has been steepened to vertical walls to minimise the length of encroachment into the wetland. Whilst there is an existing culvert crossing located further south, it is not practicable to

				use this as there are two culverts located at the confluence of two streams, however due to the confluence, two wetlands would be affected instead of only one. It is more practical to construct a new culvert at the proposed location and to return the existing culvert crossings further south to a natural flow state rather than extend the culverts.
G	Construction of culvert crossing 5 in Stage 1	172	0	Realignment of the road was considered, however the existing wetland has formed upstream of an existing farm culvert. A different alignment would require the full removal of the existing culvert, resulting in the wetland potentially being drained and drying out. The road needed to be located as low in the catchment as possible to provide sufficient space for the wastewater system to meet minimum pipe grade requirements outlined in the Auckland Wastewater Code of Practice. By aligning the road at the bottom of the catchment it allows significant areas of reinstatement and replanting of uninterrupted wetland upstream.
L	Construction of culvert crossing 7 in Stage 1	295	236	Realignment of the road is not possible, as it is contained within the NOR boundary. A bridge was considered, however it would need to span approximately 30m and as such was considered not financially viable. The cost of such a structure is expected to be in excess of $10M. The road batter has been steepened to near vertical earth reinforced walls to minimise the length of encroachment into the wetland.
V	Construction of culvert crossing 9 in Stage 2	158	41	Realigning this road was considered, however the road is constrained for several reasons. There is an existing bush covenant to the south and there are two raingardens proposed at the low point of the catchment between the

				road and the covenant to meet the stormwater treatment requirements outlined in the Auckland Stormwater Code of Practice. Moving the road further north would require the removal of a greater area of wetland. A different alignment would also require the full removal of an existing farm culvert, potentially resulting in the wetland being drained and drying out, losing the whole wetland area. As the proposed road is located at the same place as the existing farm culvert, the invert of the proposed culvert is raised to maintain the current standing water level in the wetland.
AG	Construction of culvert crossing 10 in Stage 2	139	0	Realignment of the road was considered, however as the natural wetland extends the full length of the gully, this does not result in avoiding the wetland. The narrowest point of the wetland was chosen as the crossing point. A bridge was considered however a culvert was the best solution for this as it results in faster construction method and enables the wetland to be reinstated within the structure sooner for re-establishment. There is no practicable alternative location as the wetland extends the full length of the gully. Whilst an alternative alignment along the western boundary and looping at the top was considered, this was rejected as a result of the potential adverse effects on the SEA to the west and to the north. In addition, this part of the site contains challenging topography resulting in significant additional earthworks and risks of instability.

5.6. WETLAND SETBACK AREA

The below table shows the extent of earthworks within the 10m wetland setback area.

Table 4: Wetland setback area encroachment areas / volumes

Stage	Area (m^2)	Volume (m^3)
1	3938	15,712
2	2765	8849

5.7. SEDIMENT CONTROL PROTECTION AREA

The below table shows the extent of earthworks within the sediment control protection area (50m setback from stream).

Table 5: Earthworks within sediment control protection area

Stage	Area (m^2)	Volume (m^3)
1	130,803	314,548
2	177,208	638,767

5.8. STREAM WORKS AND TEMPORARY STREAM CROSSING

Earthworks will avoid works within streams, where possible. Earthworks within streams will be only for the following purposes –

1. Removal of existing farm access culverts, to reinstate and daylight the stream
2. Installation of culverts to facilitate road crossings
3. Installation of riprap from drainage network and culverts.

A number of existing culverts may be retained during construction to facilitate stream crossing until permanent culverts are constructed. These would be strengthened to care for construction loads to ensure the culverts do not fail.

The proposed culverts are proposed to support the road network stream crossings, are to be box culverts embedded into the underlying stream subgrade by 25% of the height of the culvert, to enable a natural stream bed to be re-constructed within the culvert, with addition of riprap. The location of the natural stream bed within the culvert will align with the existing location where possible. It is expected this riprap will eventually be filled with sediment with a stream bed naturally forming through the culvert base. This will minimize the ecological impact of proposed development on the stream. Stream crossings have been designed with Viridis Consultants.

Temporary stream crossings may be provided as part of haul roads to transport cut material between earthworks areas for filling. Details on the construction of any crossings will be provided by the earthwork's contractor to Council for approval prior to commencement of works. The

existing or currently proposed new culverts will also be used as construction accesses during construction. New culverts are designed to meet permitted activity requirements in the NESFW, except for culvert crossings 7, 9, and 10. These exceptions are addressed in the stormwater infrastructure report.

5.9. 10 DEGREE SLOPE

The area of earthworks across the project with slope above and below 10 degrees is shown in the table below.

Table 6 - Area of earthworks with varied slopes

	Slope above 10 degrees	Slope below 10 degrees
Area of earthworks	19.1ha	39.9ha

5.10. 1% AEP FLOODPLAIN

The total volume of earthworks within the 1% AEP floodplain is shown in the table below. Note this is the taken from existing surface, to design surface. The volume of displaced water within the flood plain is not included in the below.

Table 7 - Volume of earthworks within 1% AEP floodplain

	Cut	Fill	Total
Volume of earthworks (m^3)	4647	64,534	39181

5.11. STAGE 1 CONTOUR PLAN

Refer to plans 3725-1-2000 to 2007 for final contours.

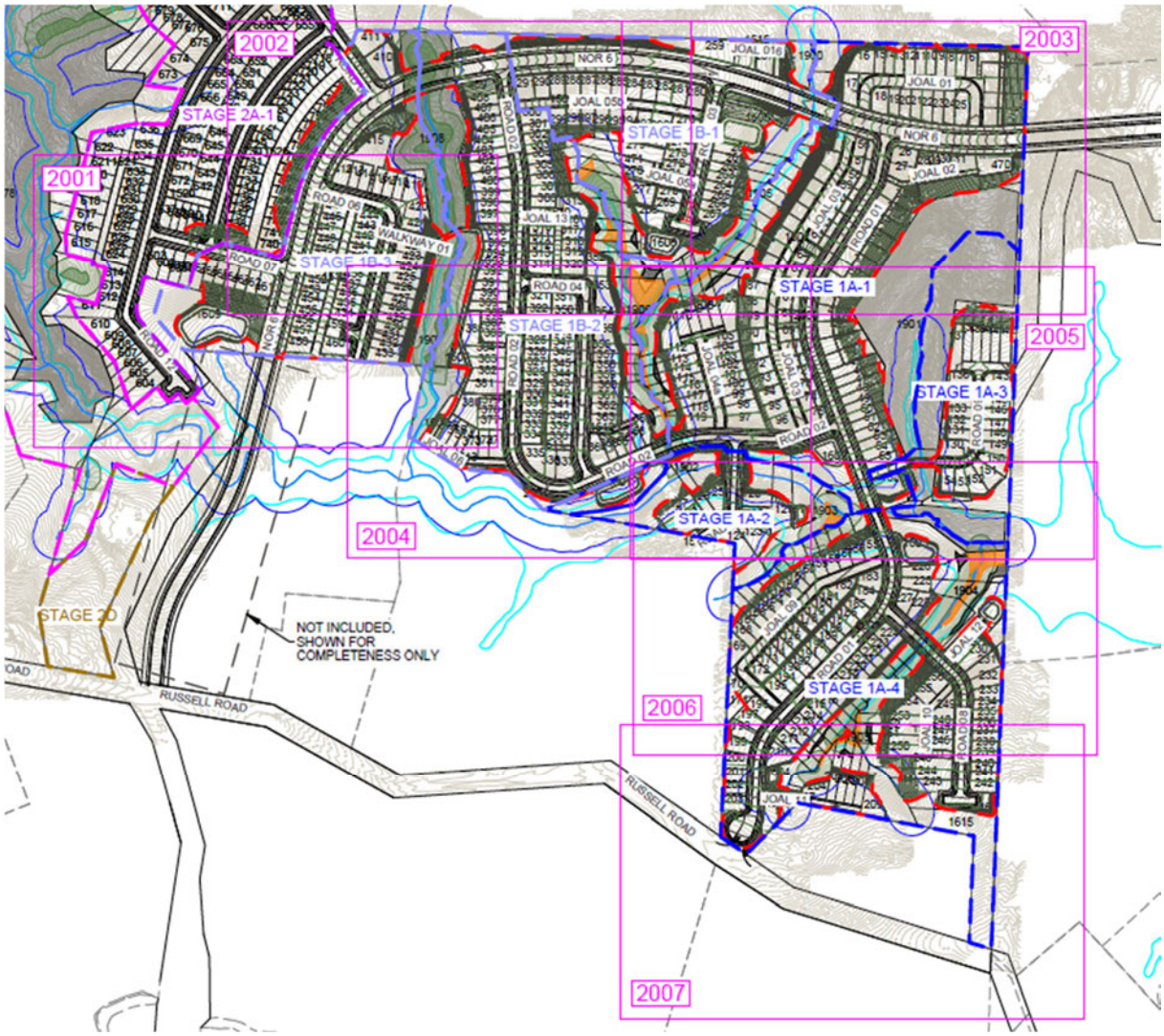

Figure 4 - Stage 1 Earthworks contour plan

5.12. STAGE 2 A, B, C, D & E CONTOUR PLAN

Refer to plans 3725-2AB-2000 to 2005 & 3725-2CDE-2000-2005 for final contours.

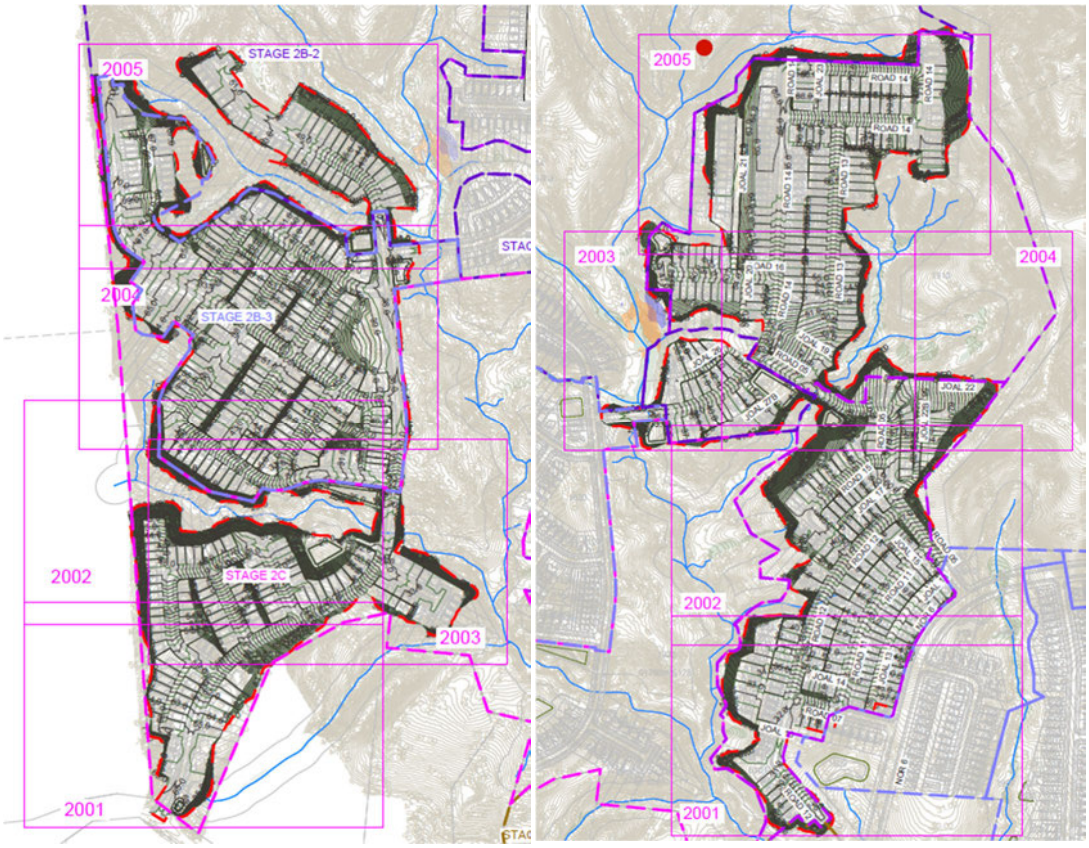

Figure 5 - Stage 2 Earthworks Contour plan

6. EROSION AND SEDIMENT CONTROL

There are several key elements to the erosion and sediment control methodology as stipulated in GD-005. These include identifying the erosion and sediment risks, establishing control measures, monitoring and maintenance, and reporting.

The first step is to identify the erosion and sediment risks associated with the earthwork's activities. This includes assessing –

- the nature of the site (refer Section 3 above),
- the soil types (refer Section 5 above and the geotechnical report),
- the topography, (refer Section 3 above),
- proximity to waterways, refer to Figure 3

Based on the factors identified above, the following control measures can be established to manage the risks:

- Employ sediment retention devices
    - A detailed description of the devices proposed for this site given its specific features are outlined within Section 8.6.
- Engage a contractor with proven experience with E&S control practices.
- Adjust the ESC Plan as needed. Work with Auckland Council to approve the final ESC plan.
    - It is anticipated that regular site visits, weekly contractor meetings, and meetings with the council officers will ensure that the measures planned on site are robust, and up to date with the works program.
- Assess and adjust the ESC measures
    - In conjunction with the controls above, ESC measures need to be inspected, monitored and maintained. E&S control will be an item on the contractors weekly site meeting agenda for discussion. Weather patterns will also be monitored during the earthworks period, and any urgent preparations will be implemented prior to incoming inclement weather.

7. SEDIMENT CONTROL METHODOLOGY

The Erosion and Sediment Control methodology per GD-005 is discussed below.

7.1. NON-STRUCTURAL APPROACHES

The following principles have been considered with respect to the site, in the preparation of this report and plans.

- Minimise disturbance – only the areas necessary to be earth worked to support the land use application, are proposed. The proposed earthworks utilise the existing contour as far as practical, and the cut/fill areas are planned to occur as close as possible to transport material the shortest distance possible. The earthworks are anticipated to occur during the earthworks season only, unless the consent holder applies for approval from Council to undertake certain earthworks outside the earthworks season and approval is given.
- Stage construction – The proposal has been split into different sub-catchments, in accordance with the stages proposed. Refer to section 8.6 for catchment details. Some catchments will take longer to complete the enabling works, and as such, these are separated out where possible to enable areas to be stabilised earlier.
- Protect slopes – The exiting topography of the site has extensive slopes. It is expected that the perimeter of earth-worked areas where batters tie into existing slopes and stream edges will require stabilization measures beyond simple vegetative covers such as topsoiling and seeding. In these areas additional stabilization methods will be implemented as necessary under the direction of the geotechnical engineer and in

compliance with GD05 standards. Wherever possible, disturbance to existing slopes will be minimised to reduce the risk of instability. Clean water runoff from above the site will be carefully managed and diverted away from exposed slopes to prevent erosion. The Erosion and Sediment Control Plan (ESC Plan) will clearly delineate slopes, limits of disturbance, and areas requiring specific protection to ensure effective implementation of slope protection measures throughout the site.

- Protect Watercourses – All watercourses are shown on the ESC plans, series 2300 plans. The plans show that streams and wetlands will be protected through the water management controls.

- Rapidly stabilise exposed areas – Vegetation, mulch, grassing, or other stabilizing techniques will be used to progressively stabilize the disturbed soils after each stage of earthworks and at certain milestones during each stage. Milestones at which point these stabilizing techniques will be used will be specified in the ESC Plan. They are typically points like completion of topsoiling on lots and berms.

- Timing of Earthworks – Works are proposed to be substantially undertaken between October and April. Where earthworks outside of this period are required, this will be provisional on gaining winter works approval from Auckland Council.

8. WATER MANAGEMENT CONTROLS

Clean water and dirty water diversion bunds will be installed as per the 2300 series plans.

Clean water from outside of the site will be excluded from the earthworks area by clean water diversion bunds to ensure water remains outside of the earthworks area.

Dirty water diversion bunds will be sized to convey flows from the 5% AEP storm event with a freeboard of 300mm and will be established prior to earthworks commencing.

Regular monitoring of the bunds will be undertaken to identify any areas of actual/potential erosion.

A standard 4m x 10m x 150mm thick stabilised entrance will be maintained for the duration of the works to the earthworking areas.

Where required, upgrading of the existing farm tracks, or construction of new stabilised haul roads (100mm of GAP65 on a layer of geofabric) is also proposed between the stabilised entrance and the earthworking areas.

8.1. SOIL AND SURFACE STABILISATION

All areas will be topsoiled and grassed after bulk earthworks operations to ensure that sediment cannot be easily mobilised, and minimise erosion.

Future lot and berm areas will be progressively topsoiled, and grass seeded as they are

completed.

Future road areas will be left with a v-channel cut 200mm above finished levels to protect the future subgrade. The area can be stabilised with straw mulch (or a shallow layer of aggregate where inspects show channels form/erosion occurring) until road construction commences.

Straw mulching will be utilised as short/medium term. E.g. for stabilisation of partially complete earthworks over the winter period.

Future building sites, where pre-loading is required, will be left stabilised with topsoil and grass, for future removal.

Stream works surfaces may be left with erosion matting, where required.

8.2. SEDIMENT CONTROL

It is proposed to divide the site into the sub-catchments as outlined in Section 8.6 below.

Each sub-catchment is proposed to be served by a single SRP. Any areas where grades do not enable flows into the SRP, can be treated with a silt fence. All SRPs have been modelled in 12d, to ensure they can be discharged properly.

All treatment devices will be flocculent treated. Calculations will be provided within a Flocculation Management Plan prepared prior to the pre-start meeting.

Earthworks areas shall be enclosed by a silt fence prior to commencing work.

8.3. ORDER OF WORKS

Works are proposed to be undertaken, generally, in the following order:

1. Pre-start meeting held with Auckland Council, the Contractor and Consultant to confirm the ESC Plan as proposed, the consent conditions and identify any areas for improvements and agreement to commence works.

2. Stabilised entranceway is established for machinery entry and exit the site, including a haul road into the northern part of the site.

3. Super silt fences constructed on the stream boundary.

4. Site perimeter clean water and dirty water diversion bunds are constructed.

5. New SRPs are constructed as required for their respective catchment areas.

6. As-builts of the physical erosion and sediment controls and forwarded to Auckland Council for approval.

7. Once approved, topsoil from the site will be stripped and stockpiled for future re-spreading.

8. Cut to fill operations will commence.

9. As finished levels are achieved the site will be progressively stabilised. Straw mulching may be applied as a short/medium term measure.

10. Removal of ESC controls will only be undertaken upon agreement from the Auckland Council monitoring officer.

8.4. INSPECTIONS AND MAINTENANCE

1. Once the ESC controls have been established and approved, daily inspections will be undertaken to assess their performance and areas for potential improvement.

2. ESC will form part of weekly contractor/consultant meetings to assess performance and areas for improvement.

3. Auckland Councils monitoring officer will also undertake routine monitoring of the site.

4. On completion of the earthworks, a final inspection will be held with an Auckland Council Natural Resources field officer, the contractor, client, and consultant to confirm that all works were carried out in accordance with the consent conditions and GD005 guidelines.

8.5. OVERLAND FLOW PATHS

Overland flow paths will be required to be protected and maintained during construction. Where velocities are calculated to be greater than 2m/s, the surface shall be stabilised with cloth and riprap protection.

OLFP matters for the completed design surface, have been addressed in the stormwater report.

8.6. CATCHMENTS

The earthworks cover a working area of approximately 109Ha hectares. The site can be divided into a number of sub-catchment areas, depending on typology, the nature of the works, and the timing of the works. These catchment areas are shown on drawings 2300-2307.

For Stage 1, the sub-catchments are:

- Pond Catchment 1 – (16,900 m^2) which flows into Sediment Retention Pond 1 (SRP#1). This is less than the 5ha maximum for SRP.

- Pond Catchment 2 – (26,600 m^2) flows into Sediment Retention Pond #2 (SRP#2). This is less than the 5ha maximum for SRP.

- Pond Catchment 3 – (11,100 m^2) flows into Sediment Retention Pond #3 (SRP#3). This is less than the 5ha maximum for SRP.

- Pond Catchment 4 – (21,400 m^2) flows into Sediment Retention Pond #3 (SRP#4). This is less than the 5ha maximum for SRP.

- Pond Catchment 5 – (36,400 m^2) flows into Sediment Retention Pond #3 (SRP#5). This is less than the 5ha maximum for SRP.
- Pond Catchment 6 – (23,300 m^2) flows into Sediment Retention Pond #3 (SRP#6). This is less than the 5ha maximum for SRP.
- Pond Catchment 7 – (21,700 m^2) flows into Sediment Retention Pond #3 (SRP#7). This is less than the 5ha maximum for SRP.
- Pond Catchment 8 – (23,700 m^2) flows into Sediment Retention Pond #3 (SRP#8). This is less than the 5ha maximum for SRP.
- Pond Catchment 9 – (15,200 m^2) flows into Sediment Retention Pond #3 (SRP#9). This is less than the 5ha maximum for SRP.
- Pond Catchment 10 – (22,500 m^2) flows into Sediment Retention Pond #3 (SRP#10). This is less than the 5ha maximum for SRP.
- Super silt fence catchments are all less than the 0.5ha maximum for super silt fence.

For Stage 2AB, the sub catchments are:

- Pond Catchment 1 – (37,500 m^2) which flows into Sediment Retention Control Pond 1 (SRP#1). This is less than the 5ha maximum for SRP.
- Pond Catchment 2 – (23,600 m^2) which flows into Sediment Retention Control Pond 2 (SRP#2). This is less than the 5ha maximum for SRP.
- Pond Catchment 3 - (10,300 m^2) which flows into Sediment Retention Control Pond 3 (SRP#3). This is less than the 5ha maximum for SRP.
- Pond Catchment 4 - (26,700 m^2) which flows into Sediment Retention Control Pond 4 (SRP#4). This is less than the 5ha maximum for SRP.
- Pond Catchment 5 - (14,600 m^2) which flows into Sediment Retention Control Pond 5 (SRP#5). This is less than the 5ha maximum for SRP.
- Pond Catchment 6 - (41,000 m^2) which flows into Sediment Retention Control Pond 6 (SRP#6). This is less than the 5ha maximum for SRP.
- Super silt fence catchments are all less than the 0.5ha maximum for super silt fence.

For Stage 2CDE, the sub catchments are:

- Pond Catchment 1 – (9,900 m^2) which flows into Sediment Retention Control Pond 1 (SRP#1). This is less than the 5ha maximum for SRP.
- Pond Catchment 2 – (21,600 m^2) which flows into Sediment Retention Control Pond 2

(SRP#2). This is less than the 5ha maximum for SRP.

- Pond Catchment 3 – (17,200 m^2) which flows into Sediment Retention Control Pond 3 (SRP#3). This is less than the 5ha maximum for SRP.
- Pond Catchment 4 – (7,300 m^2) which flows into Sediment Retention Control Pond 4 (SRP#4). This is less than the 5ha maximum for SRP.
- Pond Catchment 5 – (13,800 m^2) which flows into Sediment Retention Control Pond 5 (SRP#5). This is less than the 5ha maximum for SRP.
- Pond Catchment 6 – (24,700 m^2) which flows into Sediment Retention Control Pond 6 (SRP#6). This is less than the 5ha maximum for SRP.
- Pond Catchment 7 – (45,800 m^2) which flows into Sediment Retention Control Pond 7 (SRP#7). This is less than the 5ha maximum for SRP.
- Pond Catchment 8 – (16,300 m^2) which flows into Sediment Retention Control Pond 8 (SRP#8). This is less than the 5ha maximum for SRP.
- Pond Catchment 9 – (20,900 m^2) which flows into Sediment Retention Control Pond 9 (SRP#9). This is less than the 5ha maximum for SRP.
- Super silt fence catchments are all less than the 0.5ha maximum for super silt fence.

All sediment retention ponds have been placed outside of the extent of wetland and stream margin areas (as shown on drawings 2300-2307). Earth diversion bunds will divert flows to proposed super silt fences, where SRPs cannot cater for flows.

To control erosion and sediment, the typical sediment and erosion control measures stipulated in the Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region - Guideline Document 2016-005 (GD005) will be put in place.

9. CONCLUSION

The proposed earthworks for this proposal, has been designed to facilitate the required infrastructure necessary for use and enjoyment of the development, and are in accordance with Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016.

The design has taken into consideration the possible impact of the proposed development and has minimised impacts to the receiving environment using accepted engineering practices.

APPENDIX A
ENGINEERING PLANS

BOUND SEPARATELY

APPENDIX B
GEOTECHNICAL INTERPRETIVE REPORT

SEE APPENDIX TO THE AEE

APPENDIX C
SEDIMENT RETENTION POND CALCULATIONS

MCKENZIE & CO.

SEDIMENT RETENTION POND 1 (SRP 1) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	16,900	sq.m.	
Volume	507	cu.m.	3% of Contributing Catchment
SRP Width	15.00	m	excluding embankment width
SRP Length	43.50	m	excluding embankment width
Bottom Width	7.00	m	
Bottom Length	33.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	12.60	m	
Length at Primary Spillway	40.50	m	
Length to Width ratio	3.21		at Primary Spillway RL
Volume at Primary Spillway	512	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	19.20	m	
Emergency Spillway RL	18.90	m	300mm below Embankment RL
Primary Spillway RL	18.60	m	300mm below Emergency Spillway RL
Dead Storage RL	17.75	m	level at 30% volume of Primary Spillway
Invert level	17.20	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 2 (SRP 2) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	26,600	sq.m.	
Volume	798	cu.m.	3% of Contributing Catchment
SRP Width	18.00	m	excluding embankment width
SRP Length	51.00	m	excluding embankment width
Bottom Width	10.00	m	
Bottom Length	41.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	15.60	m	
Length at Primary Spillway	48.00	m	
Length to Width ratio	3.08		at Primary Spillway RL
Volume at Primary Spillway	802	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	14.70	m	
Emergency Spillway RL	14.40	m	300mm below Embankment RL
Primary Spillway RL	14.10	m	300mm below Emergency Spillway RL
Dead Storage RL	13.22	m	level at 30% volume of Primary Spillway
Invert level	12.70	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	10	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 3 (SRP 3) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	11,100	sq.m.	
Volume	333	cu.m.	3% of Contributing Catchment
SRP Width	13.00	m	excluding embankment width
SRP Length	37.00	m	excluding embankment width
Bottom Width	5.00	m	
Bottom Length	27.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	10.60	m	
Length at Primary Spillway	34.00	m	
Length to Width ratio	3.21		at Primary Spillway RL
Volume at Primary Spillway	338	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	18.50	m	
Emergency Spillway RL	18.20	m	300mm below Embankment RL
Primary Spillway RL	17.90	m	300mm below Emergency Spillway RL
Dead Storage RL	17.08	m	level at 30% volume of Primary Spillway
Invert level	16.50	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 4 (SRP 4) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	21,400	sq.m.	
Volume	642	cu.m.	3% of Contributing Catchment
SRP Width	16.50	m	excluding embankment width
SRP Length	47.00	m	excluding embankment width
Bottom Width	8.50	m	
Bottom Length	37.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.10	m	
Length at Primary Spillway	44.00	m	
Length to Width ratio	3.12		at Primary Spillway RL
Volume at Primary Spillway	645	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	15.50	m	
Emergency Spillway RL	15.20	m	300mm below Embankment RL
Primary Spillway RL	14.90	m	300mm below Emergency Spillway RL
Dead Storage RL	14.03	m	level at 30% volume of Primary Spillway
Invert level	13.50	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 5 (SRP 5) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	36,400	sq.m.	
Volume	1,092	cu.m.	3% of Contributing Catchment
SRP Width	20.50	m	excluding embankment width
SRP Length	57.50	m	excluding embankment width
Bottom Width	12.50	m	
Bottom Length	47.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	18.10	m	
Length at Primary Spillway	54.50	m	
Length to Width ratio	3.01		at Primary Spillway RL
Volume at Primary Spillway	1,097	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	21.50	m	
Emergency Spillway RL	21.20	m	300mm below Embankment RL
Primary Spillway RL	20.90	m	300mm below Emergency Spillway RL
Dead Storage RL	20.00	m	level at 30% volume of Primary Spillway
Invert level	19.50	m	Bottom RL
Number of Decant Arms	3	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	12	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 6 (SRP 6) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	23,300	sq.m.	
Volume	699	cu.m.	3% of Contributing Catchment
SRP Width	17.00	m	excluding embankment width
SRP Length	49.00	m	excluding embankment width
Bottom Width	9.00	m	
Bottom Length	39.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.60	m	
Length at Primary Spillway	46.00	m	
Length to Width ratio	3.15		at Primary Spillway RL
Volume at Primary Spillway	707	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	25.00	m	
Emergency Spillway RL	24.70	m	300mm below Embankment RL
Primary Spillway RL	24.40	m	300mm below Emergency Spillway RL
Dead Storage RL	23.53	m	level at 30% volume of Primary Spillway
Invert level	23.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 7 (SRP 7) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	21,700	sq.m.	
Volume	651	cu.m.	3% of Contributing Catchment
SRP Width	16.50	m	excluding embankment width
SRP Length	47.50	m	excluding embankment width
Bottom Width	8.50	m	
Bottom Length	37.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.10	m	
Length at Primary Spillway	44.50	m	
Length to Width ratio	3.16		at Primary Spillway RL
Volume at Primary Spillway	653	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	16.13	m	
Emergency Spillway RL	15.83	m	300mm below Embankment RL
Primary Spillway RL	15.53	m	300mm below Emergency Spillway RL
Dead Storage RL	14.66	m	level at 30% volume of Primary Spillway
Invert level	14.13	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 8 (SRP 8) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	23,700	sq.m.	
Volume	711	cu.m.	3% of Contributing Catchment
SRP Width	17.00	m	excluding embankment width
SRP Length	49.50	m	excluding embankment width
Bottom Width	9.00	m	
Bottom Length	39.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.60	m	
Length at Primary Spillway	46.50	m	
Length to Width ratio	3.18		at Primary Spillway RL
Volume at Primary Spillway	715	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	19.00	m	
Emergency Spillway RL	18.70	m	300mm below Embankment RL
Primary Spillway RL	18.40	m	300mm below Emergency Spillway RL
Dead Storage RL	17.53	m	level at 30% volume of Primary Spillway
Invert level	17.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 9 (SRP 9) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	15,200	sq.m.	
Volume	456	cu.m.	3% of Contributing Catchment
SRP Width	14.50	m	excluding embankment width
SRP Length	41.50	m	excluding embankment width
Bottom Width	6.50	m	
Bottom Length	31.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	12.10	m	
Length at Primary Spillway	38.50	m	
Length to Width ratio	3.18		at Primary Spillway RL
Volume at Primary Spillway	460	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	26.00	m	
Emergency Spillway RL	25.70	m	300mm below Embankment RL
Primary Spillway RL	25.40	m	300mm below Emergency Spillway RL
Dead Storage RL	24.56	m	level at 30% volume of Primary Spillway
Invert level	24.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 10 (SRP 10) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	22,500	sq.m.	
Volume	675	cu.m.	3% of Contributing Catchment
SRP Width	17.00	m	excluding embankment width
SRP Length	47.50	m	excluding embankment width
Bottom Width	9.00	m	
Bottom Length	37.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.60	m	
Length at Primary Spillway	44.50	m	
Length to Width ratio	3.05		at Primary Spillway RL
Volume at Primary Spillway	682	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	24.00	m	
Emergency Spillway RL	23.70	m	300mm below Embankment RL
Primary Spillway RL	23.40	m	300mm below Emergency Spillway RL
Dead Storage RL	22.53	m	level at 30% volume of Primary Spillway
Invert level	22.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 1 (SRP 1) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	37,500	sq.m.	
Volume	1,125	cu.m.	3% of Contributing Catchment
SRP Width	20.50	m	excluding embankment width
SRP Length	59.00	m	excluding embankment width
Bottom Width	12.50	m	
Bottom Length	49.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	18.10	m	
Length at Primary Spillway	56.00	m	
Length to Width ratio	3.09		at Primary Spillway RL
Volume at Primary Spillway	1,129	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	25.00	m	
Emergency Spillway RL	24.70	m	300mm below Embankment RL
Primary Spillway RL	24.40	m	300mm below Emergency Spillway RL
Dead Storage RL	23.50	m	level at 30% volume of Primary Spillway
Invert level	23.00	m	Bottom RL
Number of Decant Arms	3	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	15	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 2 (SRP 2) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	23,600	sq.m.	
Volume	708	cu.m.	3% of Contributing Catchment
SRP Width	17.00	m	excluding embankment width
SRP Length	49.50	m	excluding embankment width
Bottom Width	9.00	m	
Bottom Length	39.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.60	m	
Length at Primary Spillway	46.50	m	
Length to Width ratio	3.18		at Primary Spillway RL
Volume at Primary Spillway	715	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	39.50	m	
Emergency Spillway RL	39.20	m	300mm below Embankment RL
Primary Spillway RL	38.90	m	300mm below Emergency Spillway RL
Dead Storage RL	38.03	m	level at 30% volume of Primary Spillway
Invert level	37.50	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 3 (SRP 3) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	10,300	sq.m.	
Volume	206	cu.m.	2% of Contributing Catchment
SRP Width	11.00	m	excluding embankment width
SRP Length	31.50	m	excluding embankment width
Bottom Width	3.00	m	
Bottom Length	21.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	8.60	m	
Length at Primary Spillway	28.50	m	
Length to Width ratio	3.31		at Primary Spillway RL
Volume at Primary Spillway	208	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	33.00	m	
Emergency Spillway RL	32.70	m	300mm below Embankment RL
Primary Spillway RL	32.40	m	300mm below Emergency Spillway RL
Dead Storage RL	31.63	m	level at 30% volume of Primary Spillway
Invert level	31.00	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 4 (SRP 4) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	26,700	sq.m.	
Volume	801	cu.m.	3% of Contributing Catchment
SRP Width	18.00	m	excluding embankment width
SRP Length	51.00	m	excluding embankment width
Bottom Width	10.00	m	
Bottom Length	41.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	15.60	m	
Length at Primary Spillway	48.00	m	
Length to Width ratio	3.08		at Primary Spillway RL
Volume at Primary Spillway	802	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	45.50	m	
Emergency Spillway RL	45.20	m	300mm below Embankment RL
Primary Spillway RL	44.90	m	300mm below Emergency Spillway RL
Dead Storage RL	44.02	m	level at 30% volume of Primary Spillway
Invert level	43.50	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	10	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 5 (SRP 5) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	14,600	sq.m.	
Volume	438	cu.m.	3% of Contributing Catchment
SRP Width	14.00	m	excluding embankment width
SRP Length	42.00	m	excluding embankment width
Bottom Width	6.00	m	
Bottom Length	32.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	11.60	m	
Length at Primary Spillway	39.00	m	
Length to Width ratio	3.36		at Primary Spillway RL
Volume at Primary Spillway	442	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	42.50	m	
Emergency Spillway RL	42.20	m	300mm below Embankment RL
Primary Spillway RL	41.90	m	300mm below Emergency Spillway RL
Dead Storage RL	41.06	m	level at 30% volume of Primary Spillway
Invert level	40.50	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 6 (SRP 6) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	41,000	sq.m.	
Volume	1,230	cu.m.	3% of Contributing Catchment
SRP Width	21.00	m	excluding embankment width
SRP Length	62.00	m	excluding embankment width
Bottom Width	13.00	m	
Bottom Length	52.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	18.60	m	
Length at Primary Spillway	59.00	m	
Length to Width ratio	3.17		at Primary Spillway RL
Volume at Primary Spillway	1,232	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	47.00	m	
Emergency Spillway RL	46.70	m	300mm below Embankment RL
Primary Spillway RL	46.40	m	300mm below Emergency Spillway RL
Dead Storage RL	45.50	m	level at 30% volume of Primary Spillway
Invert level	45.00	m	Bottom RL
Number of Decant Arms	3	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	15	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND (SRP) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	9,900	sq.m.	
Volume	297	cu.m.	3% of Contributing Catchment
SRP Width	12.50	m	excluding embankment width
SRP Length	35.50	m	excluding embankment width
Bottom Width	4.50	m	
Bottom Length	25.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	10.10	m	
Length at Primary Spillway	32.50	m	
Length to Width ratio	3.22		at Primary Spillway RL
Volume at Primary Spillway	301	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	56.00	m	
Emergency Spillway RL	55.70	m	300mm below Embankment RL
Primary Spillway RL	55.40	m	300mm below Emergency Spillway RL
Dead Storage RL	54.59	m	level at 30% volume of Primary Spillway
Invert level	54.00	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	3	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 2 (SRP 2) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	21,600	sq.m.	
Volume	648	cu.m.	3% of Contributing Catchment
SRP Width	16.50	m	excluding embankment width
SRP Length	47.50	m	excluding embankment width
Bottom Width	8.50	m	
Bottom Length	37.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.10	m	
Length at Primary Spillway	44.50	m	
Length to Width ratio	3.16		at Primary Spillway RL
Volume at Primary Spillway	653	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	31.00	m	
Emergency Spillway RL	30.70	m	300mm below Embankment RL
Primary Spillway RL	30.40	m	300mm below Emergency Spillway RL
Dead Storage RL	29.53	m	level at 30% volume of Primary Spillway
Invert level	29.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 3 (SRP 3) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	17,200	sq.m.	
Volume	516	cu.m.	3% of Contributing Catchment
SRP Width	15.50	m	excluding embankment width
SRP Length	42.50	m	excluding embankment width
Bottom Width	7.50	m	
Bottom Length	32.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	13.10	m	
Length at Primary Spillway	39.50	m	
Length to Width ratio	3.02		at Primary Spillway RL
Volume at Primary Spillway	524	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	26.00	m	
Emergency Spillway RL	25.70	m	300mm below Embankment RL
Primary Spillway RL	25.40	m	300mm below Emergency Spillway RL
Dead Storage RL	24.55	m	level at 30% volume of Primary Spillway
Invert level	24.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 4 (SRP 4) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	7,300	sq.m.	
Volume	146	cu.m.	2% of Contributing Catchment
SRP Width	10.00	m	excluding embankment width
SRP Length	28.00	m	excluding embankment width
Bottom Width	2.00	m	
Bottom Length	18.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	7.60	m	
Length at Primary Spillway	25.00	m	
Length to Width ratio	3.29		at Primary Spillway RL
Volume at Primary Spillway	149	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	19.00	m	
Emergency Spillway RL	18.70	m	300mm below Embankment RL
Primary Spillway RL	18.40	m	300mm below Emergency Spillway RL
Dead Storage RL	17.68	m	level at 30% volume of Primary Spillway
Invert level	17.00	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	3	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 5 (SRP 5) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	13,799	sq.m.	
Volume	414	cu.m.	3% of Contributing Catchment
SRP Width	14.00	m	excluding embankment width
SRP Length	40.00	m	excluding embankment width
Bottom Width	6.00	m	
Bottom Length	30.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	11.60	m	
Length at Primary Spillway	37.00	m	
Length to Width ratio	3.19		at Primary Spillway RL
Volume at Primary Spillway	417	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	25.00	m	
Emergency Spillway RL	24.70	m	300mm below Embankment RL
Primary Spillway RL	24.40	m	300mm below Emergency Spillway RL
Dead Storage RL	23.56	m	level at 30% volume of Primary Spillway
Invert level	23.00	m	Bottom RL
Number of Decant Arms	1	unit	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 6 (SRP 6) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	24,700	sq.m.	
Volume	741	cu.m.	3% of Contributing Catchment
SRP Width	17.50	m	excluding embankment width
SRP Length	49.50	m	excluding embankment width
Bottom Width	9.50	m	
Bottom Length	39.50	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	15.10	m	
Length at Primary Spillway	46.50	m	
Length to Width ratio	3.08		at Primary Spillway RL
Volume at Primary Spillway	745	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	35.00	m	
Emergency Spillway RL	34.70	m	300mm below Embankment RL
Primary Spillway RL	34.40	m	300mm below Emergency Spillway RL
Dead Storage RL	33.52	m	level at 30% volume of Primary Spillway
Invert level	33.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)		mm Ø	
Outlet Pipe		mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 7 (SRP 7) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	45,800	sq.m.	
Volume	1,374	cu.m.	3% of Contributing Catchment
SRP Width	22.00	m	excluding embankment width
SRP Length	65.00	m	excluding embankment width
Bottom Width	14.00	m	
Bottom Length	55.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	19.60	m	
Length at Primary Spillway	62.00	m	
Length to Width ratio	3.16		at Primary Spillway RL
Volume at Primary Spillway	1,380	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	36.00	m	
Emergency Spillway RL	35.70	m	300mm below Embankment RL
Primary Spillway RL	35.40	m	300mm below Emergency Spillway RL
Dead Storage RL	34.50	m	level at 30% volume of Primary Spillway
Invert level	34.00	m	Bottom RL
Number of Decant Arms	3	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	15	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 8 (SRP 8) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	16,299	sq.m.	
Volume	326	cu.m.	2% of Contributing Catchment
SRP Width	13.00	m	excluding embankment width
SRP Length	36.00	m	excluding embankment width
Bottom Width	5.00	m	
Bottom Length	26.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	10.60	m	
Length at Primary Spillway	33.00	m	
Length to Width ratio	3.11		at Primary Spillway RL
Volume at Primary Spillway	327	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	48.00	m	
Emergency Spillway RL	47.70	m	300mm below Embankment RL
Primary Spillway RL	47.40	m	300mm below Emergency Spillway RL
Dead Storage RL	46.58	m	level at 30% volume of Primary Spillway
Invert level	46.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	6	m	(for 100y ARI event)

MCKENZIE & CO.

SEDIMENT RETENTION POND 9 (SRP 9) CALCULATION OUTPUT

Description	Value		Note
Contributing Catchment	20,900	sq.m.	
Volume	627	cu.m.	3% of Contributing Catchment
SRP Width	16.50	m	excluding embankment width
SRP Length	46.00	m	excluding embankment width
Bottom Width	8.50	m	
Bottom Length	36.00	m	
Depth	2.00	m	Top of SRP (Embankment level) to bottom
Width at Primary Spillway	14.10	m	
Length at Primary Spillway	43.00	m	
Length to Width ratio	3.05		at Primary Spillway RL
Volume at Primary Spillway	629	cu.m.	Top of upstand MH to bottom RL
Depth at Primary Spillway	1.40	m	
SRP Embankment RL	34.00	m	
Emergency Spillway RL	33.70	m	300mm below Embankment RL
Primary Spillway RL	33.40	m	300mm below Emergency Spillway RL
Dead Storage RL	32.53	m	level at 30% volume of Primary Spillway
Invert level	32.00	m	Bottom RL
Number of Decant Arms	2	units	
Primary Spillway (upstand MH)	1050	mm Ø	
Outlet Pipe	300	mm Ø	(for 20y ARI event)
Emergency Spillway width	8	m	(for 100y ARI event)