STORMWATER MANAGEMENT PLAN

DELMORE, ŌREWA

Vineway Ltd

MCKENZIE & CO.

DOCUMENT CONTROL RECORD

PROJECT: DELMORE, ŌREWA

CLIENT: VINEWAY LTD

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

Revision	Date	Originator	Checker	Approver	Description
-	09/12/24	[redacted]			DRAFT
A	17/01/25				DRAFT
B	11/02/2025				DRAFT
C	02/07/2025				DRAFT
D	18/12/2025				DRAFT

Note this SMP will remain draft, until such time as the Delmore Development area is zoned, and which point it is expected that Auckland Council will adopt this SMP as part of the Network Discharge Consent Process.

Contents

1. EXISTING SITE APPRAISAL

1.1 Summary of Data Sources and Dates

The following data sources have been used in preparing this stormwater management plan:

Table 1 - Summary of Data Sources

Existing Site Appraisal Item	Source and Date of Data Used
Topography	LiDAR, Auckland Council, 2016-2018 Mckenzie & Co Topographic Survey, November 2024.
Geotechnical	Riley Geotechnical Report, 2025.
Existing Stormwater Network	Auckland Council Geomaps, 2023
Existing Hydrological Features	Auckland Council Geomaps, 2023 Ōrewa West ICMP 2011 & 2014 Addendum
Stream, River, Coastal Erosion	Auckland Council Geomaps, 2023 Ōrewa West ICMP 2011 & 2014 Addendum
Flooding and Flow paths	Auckland Council Geomaps, 2023 Ōrewa West ICMP 2011 & 2014 Addendum
Coastal Inundation	Auckland Council Geomaps, 2023 Ōrewa West ICMP 2011 & 2014 Addendum
Ecological / Environmental Areas	Auckland Council AUP Maps, 2023
Cultural and Heritage Sites	Auckland Council AUP Maps, 2023
Contaminated Land	Auckland Council Geomaps, 2023
Arboricultural Assessment	Peers Brown Millar Ltd - 2025
Delmore Development Geomorphic Assessment	Morphum Environmental, 2025
Note from Auckland Council Geomaps- Adopting official height standard NZVD2016	From 1 July 2024, Auckland Council adopts the official height standard for New Zealand called Vertical Datum 2016 (NZVD2016). The geographical datasets containing height information (e.g. Contours) will be updated to NZVD2016. From 1 July 2024, the GeoMaps Data Extract Tool will be generating the updated Contours in the new standard NZVD2016.

1.2 Location and General Information

Table 2 – Site Location and General Information

Existing Site Element	
Site Address	53A, 53B & 55 Russell Road, 88, 130 & 132 Upper Ōrewa Rd. Location of the site is shown in Figure 1.
Legal Description	Lot 1 DP 336616 Lot 2 DP 497022 Lot 1 DP 497022 Lot 2 DP 418770 Lot 1 DP 153477 Lot 2 DP 153477
Current Land Use	The site is currently open pasture and is being used for farming. Refer to Figure 2. NZRLI capability is listed as predominantly Arable with moderate to severe limitations (ACGeomaps). It is zoned Future Urban, Refer to Figure 3.
Current Building Coverage	Existing building coverage on the site includes existing dwellings and ancillary buildings and accesses used for farming. Refer to Figure 2.
Historical Land Use	A review of Retrolens historic aerial photographs shows that land has been used for farming (grazing) as far back as 1940.

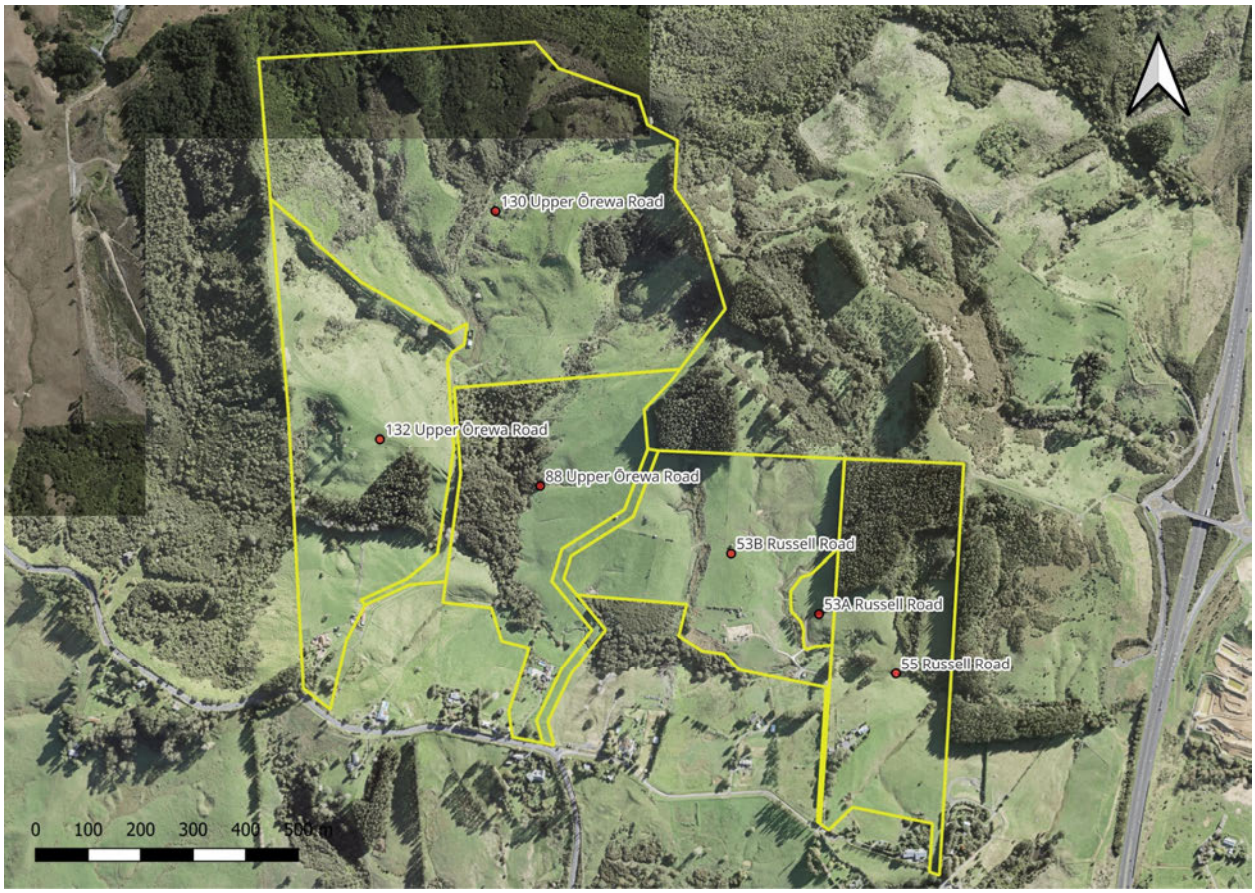

Figure 1 – Site Extent & Properties covered by this SMP

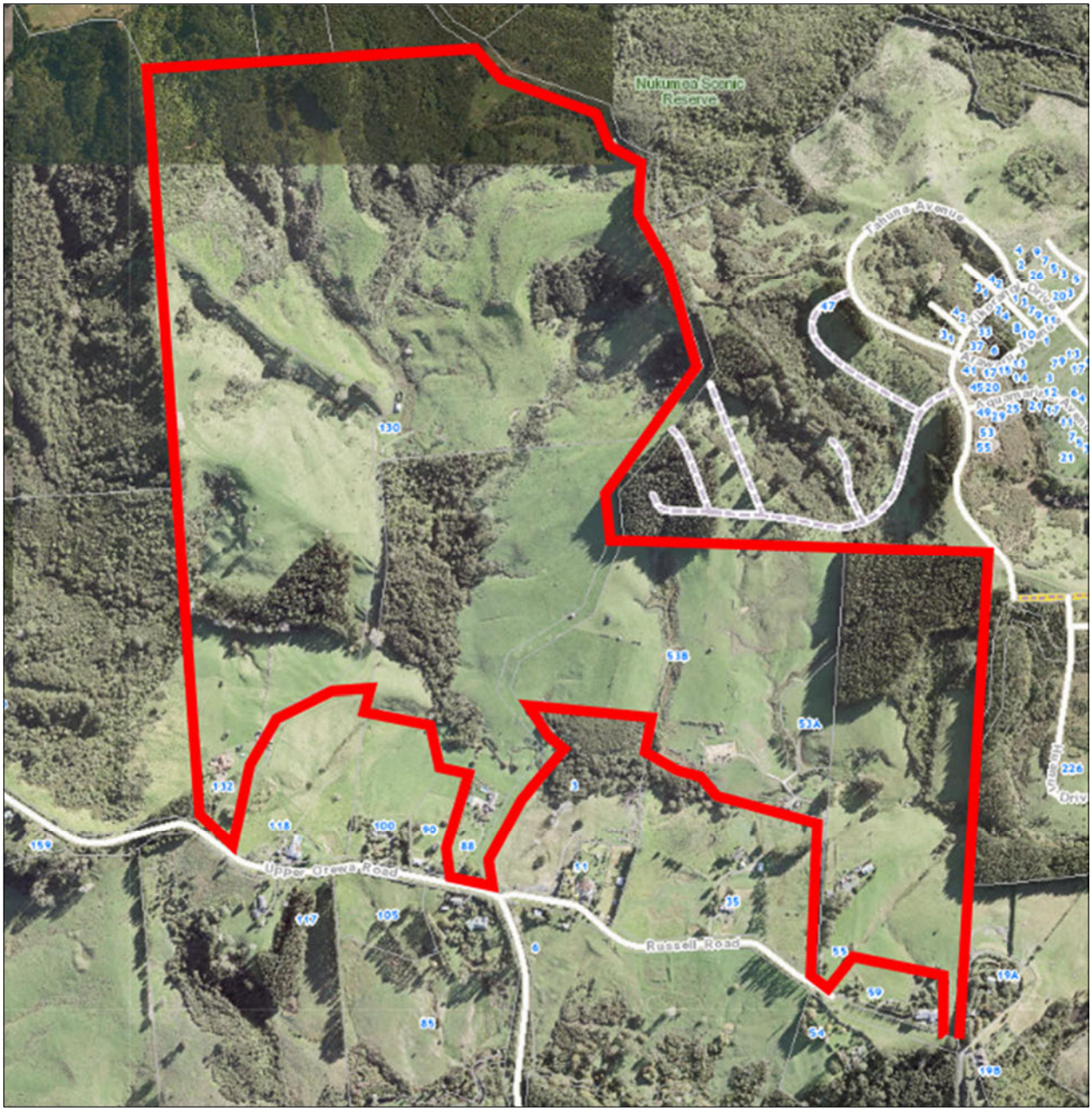

Figure 2 – Current Site Use and Building Coverage (Source – Auckland Council Geomaps)

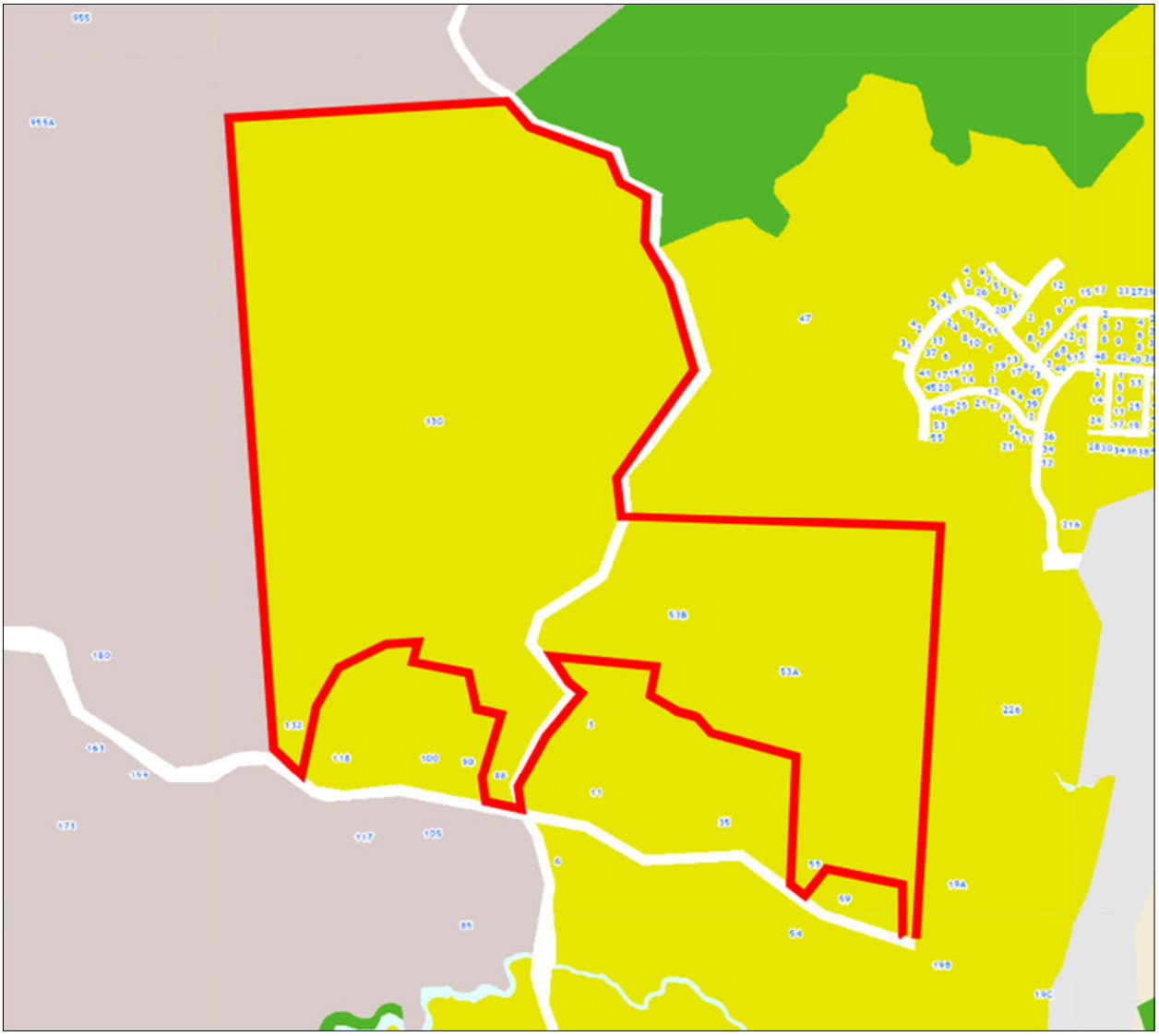

Figure 3 - Existing Land Use – Future Urban (Source - Auckland Council Geomaps)

1.3 Topography

The site is generally characterised by is well defined gullies, with an undulating series of steep sided hills with gullies which drain to well-defined streams.

The contour of the site generally grades down towards the East.

Heights range from 95m RL to 10m RL. Ground slopes range from 1V:2H in the hillsides to slopes less than 5% at the lower gully areas. A major OLFP runs West to East through the southern part of the site.

Refer to Figure 4 for site topography plan and Figure 5 for the existing site slopes.

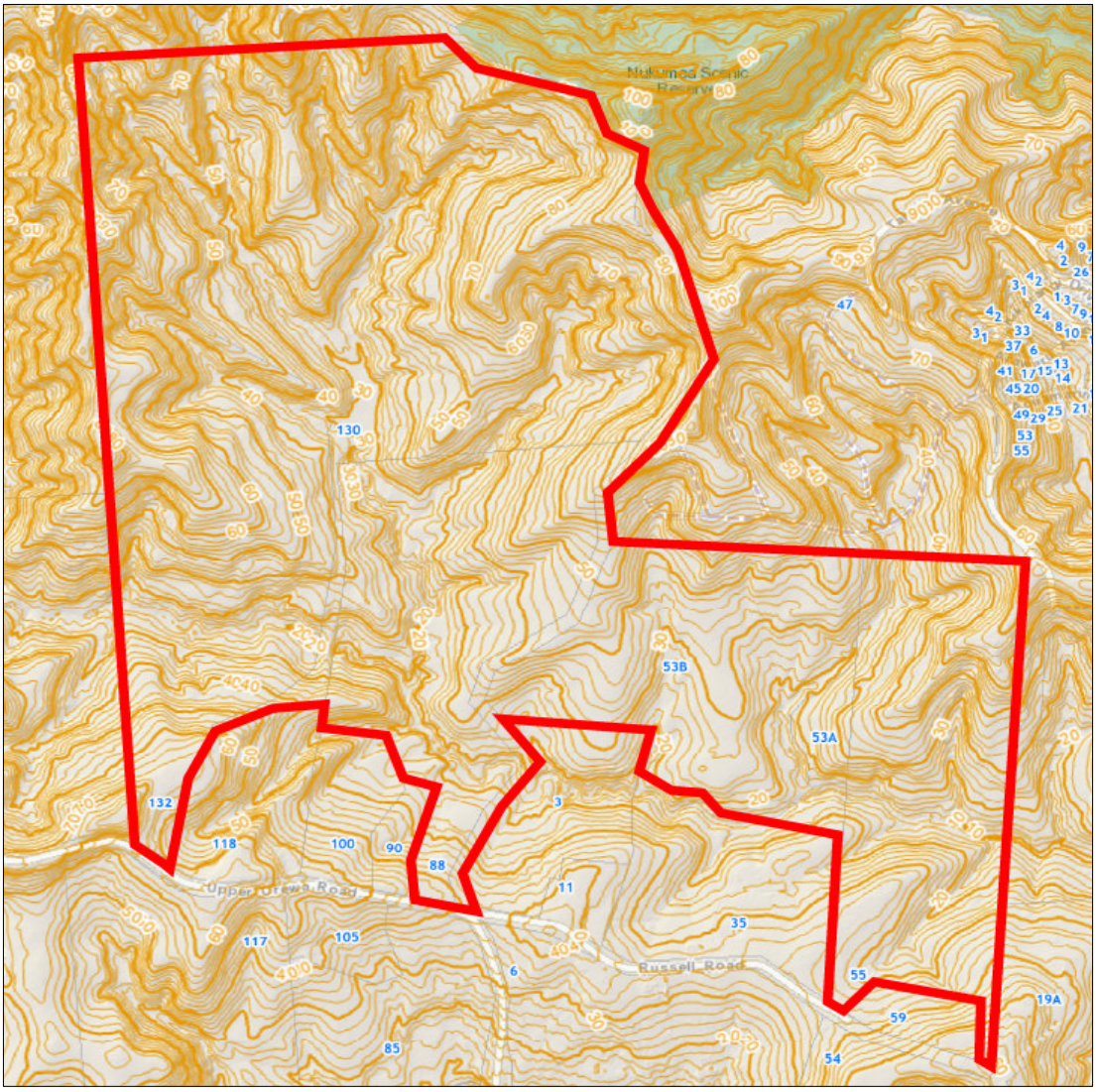

Figure 4 – Site Topography (Source – Auckland Council Geomaps)

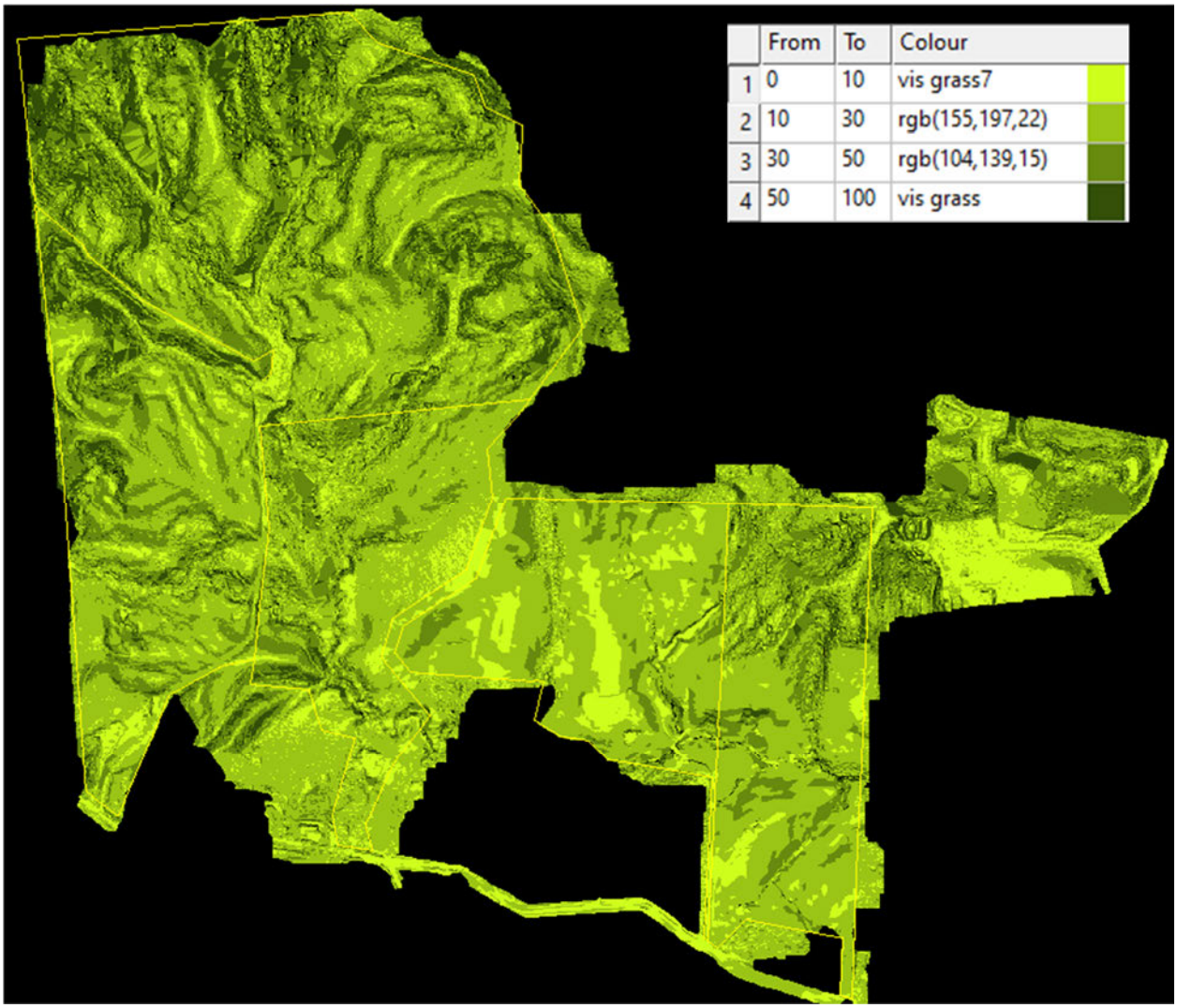

Figure 5 -Site Ground Slopes

1.4 Geotechnical

A geotechnical assessment for the site has been completed by Riley Consultants Ltd. The investigation confirms that the site is underlain by multiple geological units, each with differing engineering and hydrological characteristics that influence stormwater design and management.

2 Site Geology

Based on the 1:250,000 GNS Online Geological Map and Riley's site-specific interpretation, the following geological units are present:

- Northland Allochthon (Hukerenui Mudstone) – present across the central and eastern portions of the site, including the central area of 53B Russell Road.
- East Coast Bays Formation (ECBF) – underlying the majority of the site.
- Pakiri Formation (PF) – present in the northern portion of the site.

The Waitemata Group materials (ECBF and PF) comprise sedimentary sequences of alternating sandstone and mudstone. ECBF is characterised by variable volcanic content and interbedded volcaniclastic grit, with the regional bedding dip inferred to be approximately 30° toward the north-west. The Pakiri Formation consists of thick-bedded, volcanic-rich, graded sandstone and siltstone.

The Northland Allochthon (NA) materials (Hukerenui Mudstone) overlie the younger Waitemata Group sediments. These NA deposits are typically highly sheared mudstones, often red, green, or grey in colour, and are known for their sensitivity to moisture and reduced strength behaviour when saturated.

In addition, Tauranga Group Alluvium is mapped to the immediate south of the site and is likely present within gully inverts and waterway areas. These deposits generally comprise silts and sands, with the potential for localised peat lenses. While typically pre-consolidated, they may include areas of very soft ground requiring engineering consideration.

3 Stormwater Management Implications

Key geotechnical recommendations applicable to the Stormwater Management Plan are summarised from Section 5.8 of the geotechnical report:

- All stormwater discharges must be fully collected and conveyed via piped systems to suitable outfall locations, such as gully bases, constructed ponds, or natural creeks. This approach ensures that stormwater does not infiltrate into sensitive ground materials or flow uncontrolled across slopes that may be prone to instability.
- Stormwater soakage or infiltration into Northland Allochthon soils is not recommended. The report identifies that increased moisture content within NA materials has the potential to adversely affect the underlying rock mass and local slope stability. Avoiding infiltration is therefore a critical design consideration for NDC compliance and long-term resilience.

These recommendations directly influence the stormwater network design, ensuring that runoff

is managed in a manner that avoids saturation of unstable materials, prevents localised erosion, and maintains the stability of cuts, fills, and natural slopes.

Figure 6 of the geotechnical report presents the GNS geological map for the broader area, illustrating the distribution of the Northland Allochthon, East Coast Bays Formation, and Pakiri Formation across the site. This information provides geospatial context for the stormwater management constraints described above.

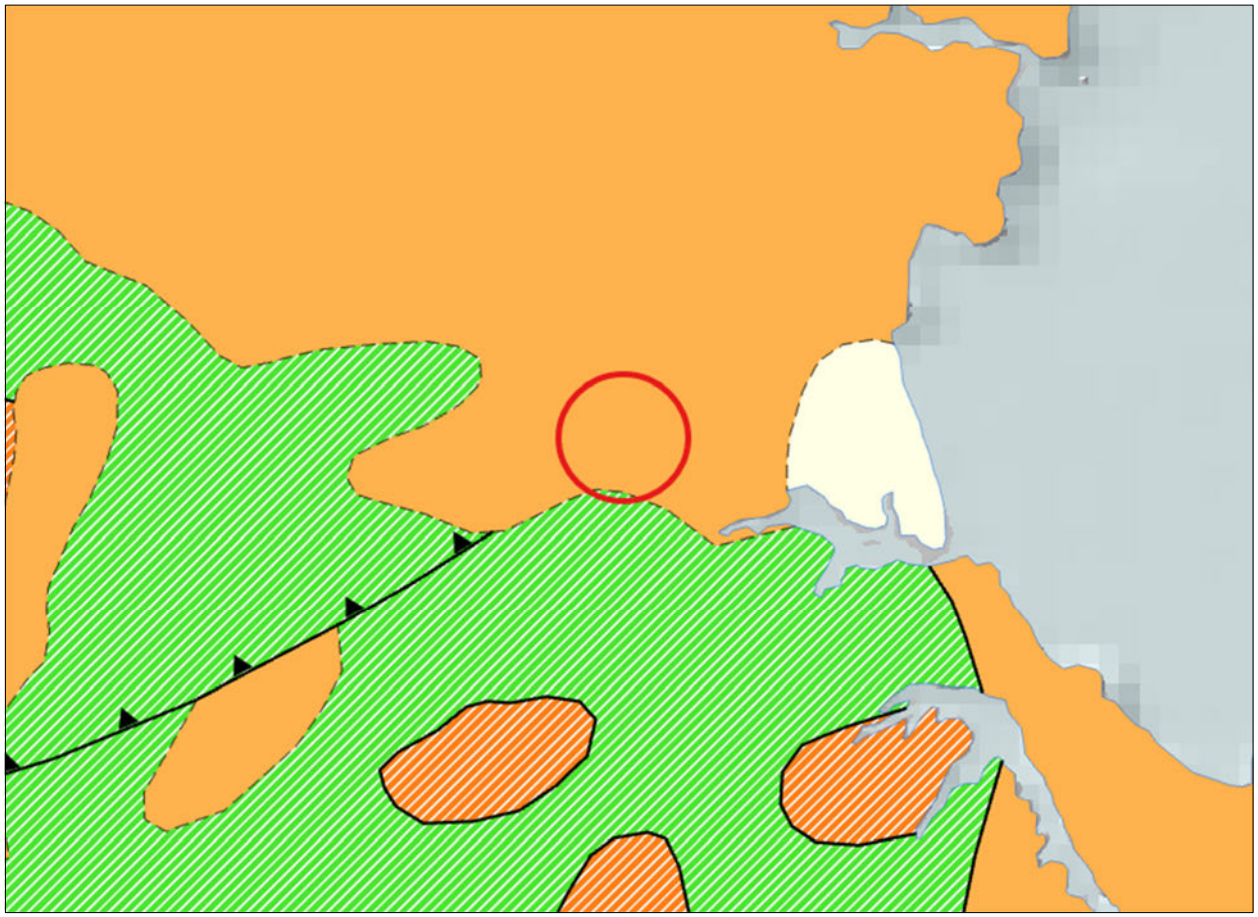

Figure 6 - GNS map of area

3.1 Existing Drainage Features and Stormwater Infrastructure

Auckland Council Geomaps (layer "Rivers and permanent streams") shows modelled overland flowpaths and streams inside the site boundaries (Refer Figure 7). All watercourses within the site have also been classified and mapped by Viridis Consultants[1], according to the definitions within the AUP-OP as either permanent, intermittent, ephemeral, or artificial drains.

No public stormwater infrastructure is contained within the site, however some private farm culverts crossing the streams in several locations are present. Several natural inland wetlands have also been documented. The stormwater within the site discharges to the existing streams and exits the subject site in the easterly direction.

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[1] Delmore Fast Track Application – Ecology Report – Viridis 2025

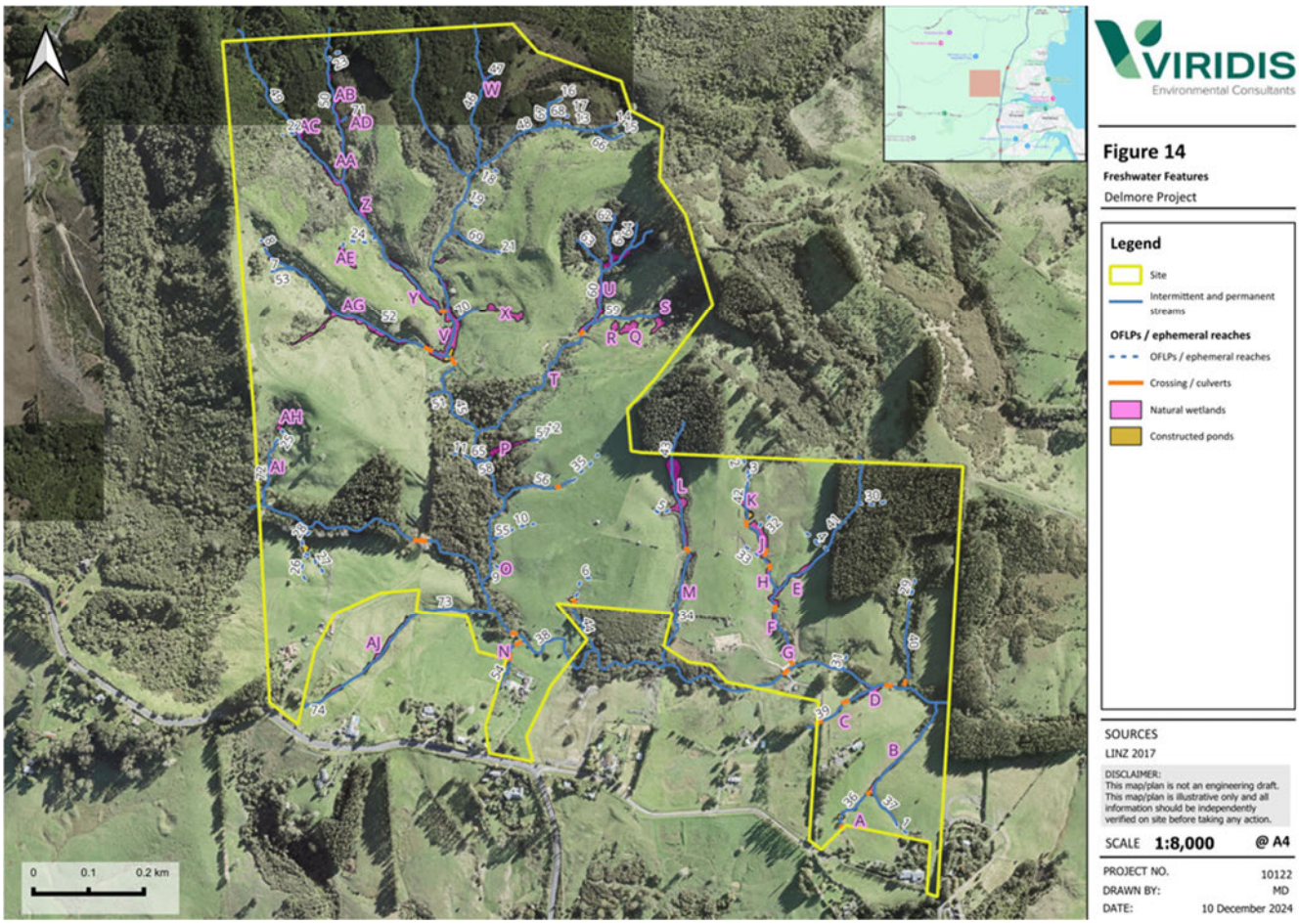


Figure 7 – Watercourses and natural wetlands mapped by Viridis

The site sits within a contributing catchment size of 266.86 ha (Refer Figure 8) (measured using the Digital Elevation Model 1m grid). Note the contributing catchment size is stated as 275 ha in the Ōrewa West ICMP 2011.

The contributing catchment is comprised of five subcatchments (refer Appendix # for catchment plan 470).

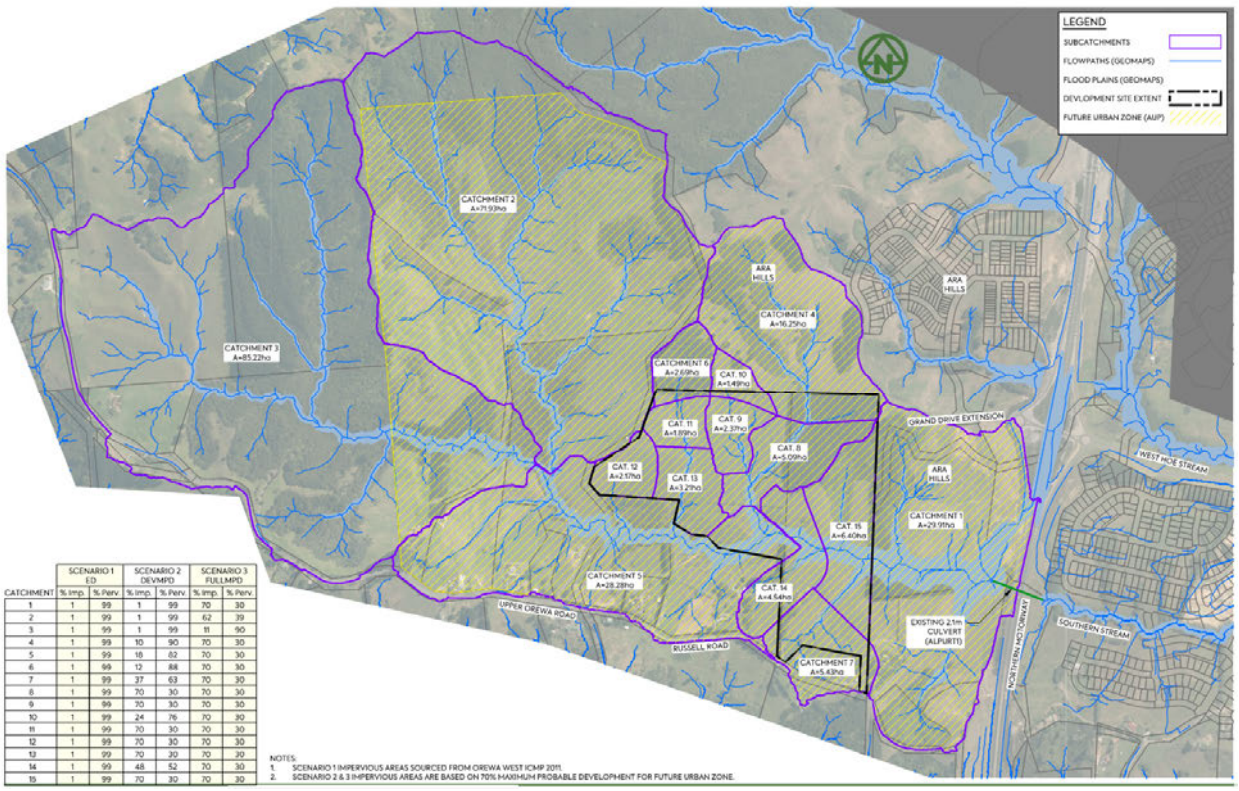
Two large subcatchments (catchment 2 and 3), 157ha located west/Northwest of the development site feed into Streams 31 & 38through the subject site.

The remaining catchments within northern portion of the subject site (catchments 8, 9, 11 12, part-of 6, 10, 14 and 15) drain south toward the main overland flow path running through the site, then discharges to the "main overland flow path" flowing in the easterly direction.

The site's southern boundary straddles several catchments and is bounded by Upper Ōrewa Road/Russel Road. Catchments 5, 7 and part of catchment 14 drain toward the "main overland flow path" which discharges to the east through the subject site.

The existing catchment is predominantly rural, with land cover largely comprising pasture, interspersed with occasional farm houses and small outbuildings. As outlined in the Arboricultural Assessment (Appendix 18 to the AEE), three areas of covenanted native bush are present along parts of the stream network, providing localised natural shading, bank stability, and interception of overland flow. The report also identifies a pine plantation in the northeastern portion of the

site, which currently influences hydrological responses through increased canopy interception relative to surrounding pasture. The drainage system across the catchment consists primarily of natural stream channels and informal overland flow paths, with minimal formal stormwater infrastructure due to the low degree of existing development. Collectively, these features define a catchment with a largely natural hydrological regime and varied vegetation cover across sub-catchments.



CATCHMENT	SCENARIO 1 ED		SCENARIO 2 DEVMPD		SCENARIO 3 FULLMPD	
	% Imp.	% Perv.	% Imp.	% Perv.	% Imp.	% Perv.
1	1	99	1	99	70	30
2	1	99	1	99	62	39
3	1	99	1	99	11	90
4	1	99	10	90	70	30
5	1	99	18	82	70	30
6	1	99	12	88	70	30
7	1	99	37	63	70	30
8	1	99	70	30	70	30
9	1	99	70	30	70	30
10	1	99	24	76	70	30
11	1	99	70	30	70	30
12	1	99	70	30	70	30
13	1	99	70	30	70	30
14	1	99	48	52	70	30
15	1	99	70	30	70	30

Figure 8 – Sub-catchment arrangement

3.2 Receiving Environment

Freshwater flow from the site flows in an easterly direction and eventually discharges under the northern motorway through a 2.1m diameter culvert, and out to the upper reaches of the Ōrewa Estuary. Refer Figure 9.

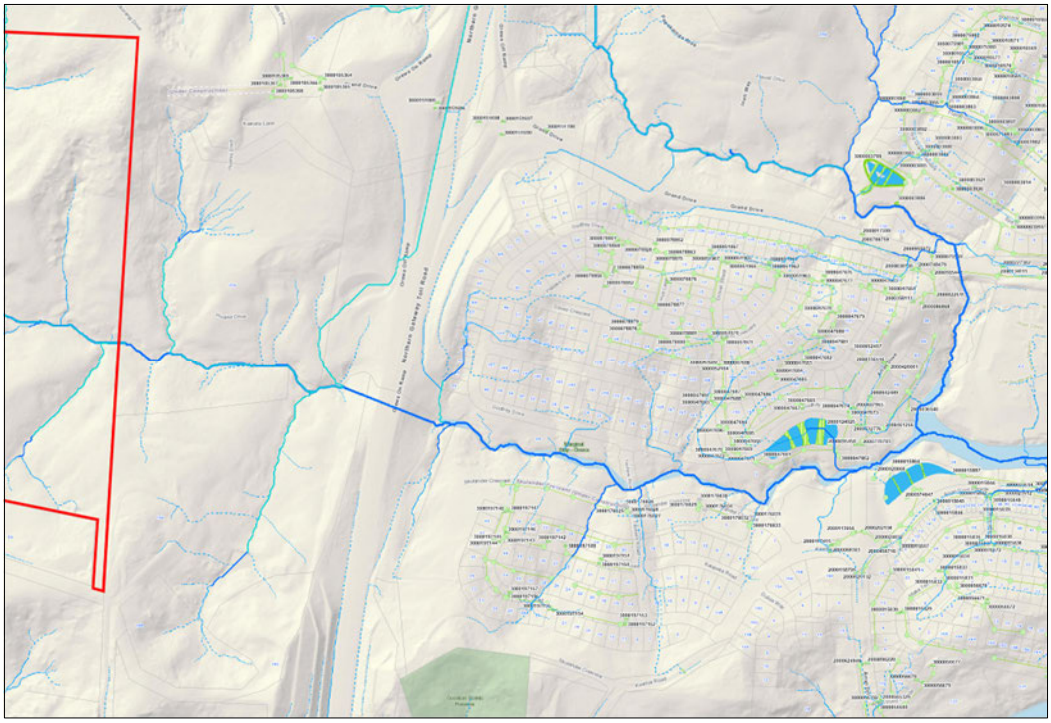


Figure 9 - Receiving environment. Eastern boundary of Delmore site outlined in red.

3.3 Existing Public Stormwater Infrastructure

Based on a review of Auckland Council GIS, there is no existing public stormwater infrastructure within the site.

3.4 Existing Hydrological Features

The streams and natural wetlands, are the main hydrological features with the SMP area.

3.5 Flooding and Flow paths

Auckland Council GIS shows the overland flow paths in the site, and a flood plain. Flood inundation is generally contained within the lower lying gulley features and natural inland wetlands across the site. This shows that all streams within the site act as well-defined overland flow paths, which drain all water in a flood event to the bottom of the catchment, where the water backs up against the motorway embankment, before discharging through a culvert to the coast.

The SMP area extent defined in in Figure 1 discharges to a single culvert which discharges under the Northern Motorway which creates a flood plain within the culvert site. This flood plain is controlled by the headwater above the 2.1m diameter pipe.

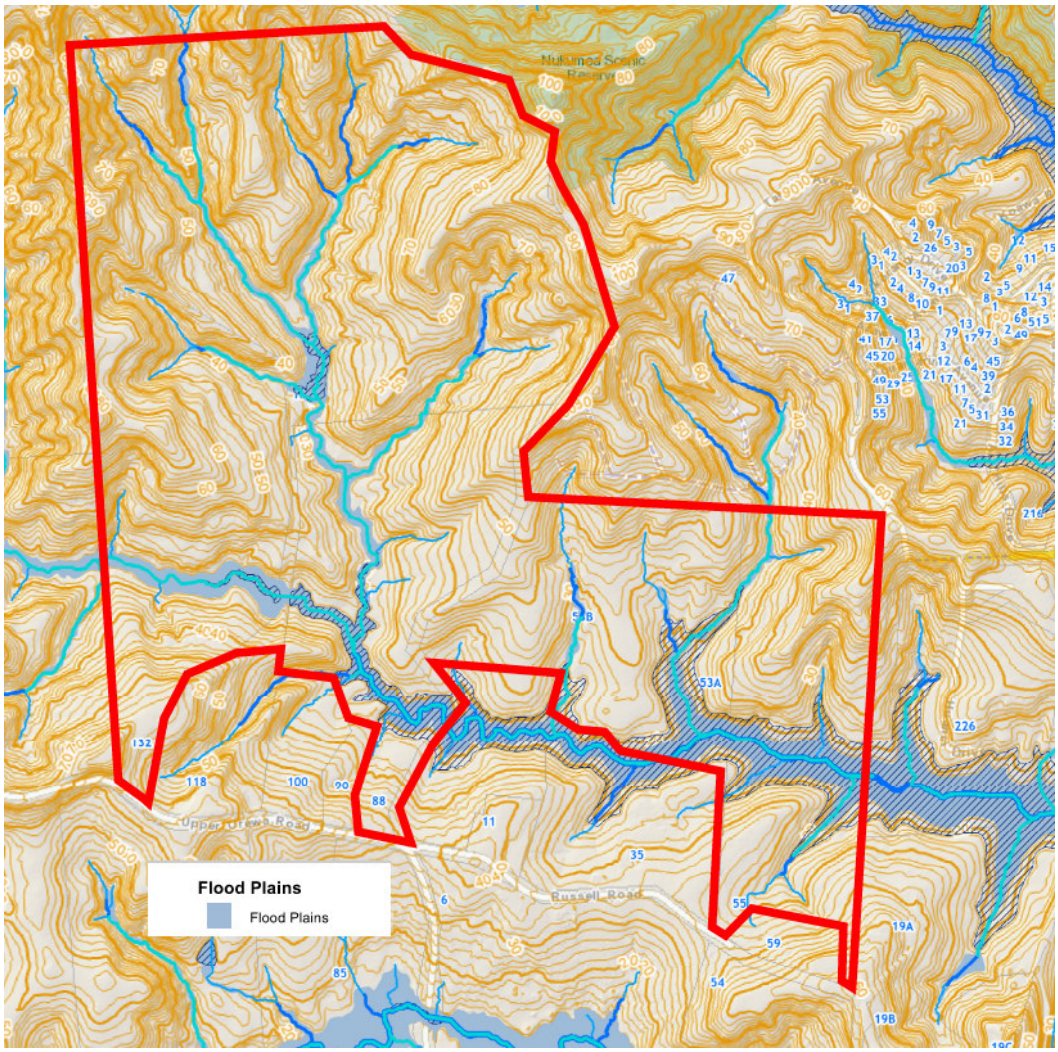


Figure 10– Indicative Overland Flow Paths and Flood Plains - Auckland Council Geomaps

A Flooding Assessment Report has been produced by McKenzie and Co to be read in conjunction with this SMP. This report predicts flood depths for post development scenarios and states what anticipated effects the proposed development will have on the upstream and downstream neighbouring properties.

3.6 Coastal Inundation

The site's downstream boundary is located within approximately 1100 metres from the tidal effect area and at an elevation difference of 7 metres. A boundary condition for the extreme coastal inundation has been included with the flood model in accordance with Healthy Water' requirements.

3.7 Biodiversity

Viridis[2] have identified various vegetation within the development site, which consists of pine plantation, native dominant vegetation, exotic dominant vegetation, and gorse scrub. These

[2] Viridis Environmental Consultants, 2025

areas are shown below in Figure 11 - Vegetation within the SMP area.

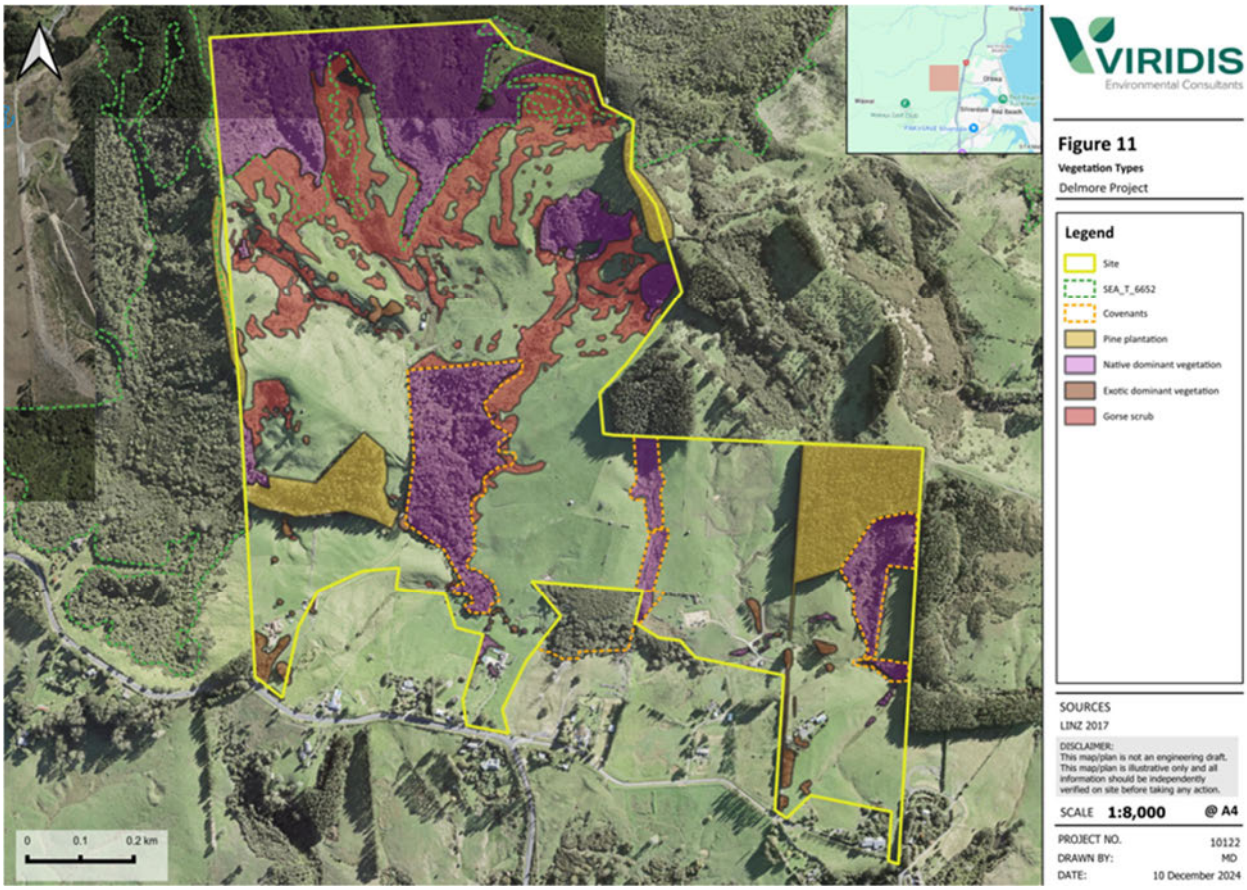


Figure 11 - Vegetation within the SMP area

36 natural inland wetlands were identified within the Site, as shown in Figure 7.

3.8 Cultural and Heritage Sites

An Archaeological assessment has been undertaken for this proposal[3]. The report identifies two archaeological sites recorded in the Project Area. Both sites will be able to be avoided by the proposed development, due to their locations being outside of the development footprint and upstream of the development..

3.9 Contaminated Land

A preliminary ground contamination advice memo[4] has been prepared by Williamson Water & Land Advisory Ltd (WWLA) dated 24th April 2024. Their assessment identified very limited potential for significant ground contamination. There are no confirmed HAIL activities on site. Dwellings and sheds are mostly modern construction (2000s onward) with one single garage having fibre cement cladding.

Regarding soil contamination management WWLA state "Localised soil contamination, which

[3] PROPOSED RESIDENTIAL DELMORE, ŌREWA, AUCKLAND: FAST TRACK ARCHAEOLOGICAL ASSESSMENT, Clough & Associates Ltd, December 2024

[4] Delmore Subdivision – Preliminary ground contamination advice for Fast-track Approval dated 24th April 2024 Ref. WWLA1147

may be present around existing structures, is best dealt with during demolition, for example, by a localised scrape of surficial soils. Such minor works can be dealt with under the demolition approval process and should not trigger the need for ground contamination specific consents. Following demolition and clearance of the existing structures it is expected that earthworks should largely be able to be managed through standard earthworks controls and procedures."

2. DEVELOPMENT SUMMARY AND PLANNING CONTEXT

This section provides a high-level summary of the proposed development, together with the specific planning and regulatory requirements.

2.1 Regulatory and Design Requirements

Based on the review of Auckland Council's regulatory and stormwater guidelines, site-specific stormwater management requirements have been identified. The relevant regulatory guidelines are listed in **Table 3** below, and a summary of the requirements is presented in the sections following.

Table 3 - Summary of Regulatory and Design Requirements

Requirement	Relevant Regulatory / Design to Follow
Stormwater Discharge Consent	Auckland Council Regionwide Stormwater Network discharge consent (NDC) Schedule 4 (Greenfields Development)
SMAF Hydrology mitigation	Not within SMAF overlay
High Contaminant Generating Areas (HCGA)	Auckland Unitary Plan Chapter E9
Natural Hazards	Auckland Unitary Plan Chapter E36
Natural Resources of the Regional Policy Statement	Auckland Unitary Plan Chapter B7
Stormwater Diversion and Discharge	Auckland Unitary Plan Chapter E8
AUP Precinct	Not applicable
Stormwater Management Devices Design	Auckland Council GD01
Application of Principles of Stormwater Management	Auckland Council GD04
Hydrology in the Auckland Region	Guidelines for Stormwater Runoff Modelling in the Auckland Region – Technical Publication 108 (1999). Former Auckland Regional Council.
Stormwater Management Approach	Auckland Unitary Plan stormwater management provisions: technical basis of contaminant and volume management requirements– Technical Report 2013/035 (2013). Auckland Council.
Design and Construction of Stormwater Infrastructure	Auckland Code of Practice: For Land Development and Subdivision (Chapter 4 - Stormwater V4) - NZ Building Code, E1 Surface Water.

Detail on Stormwater Management including WSD, Flood Risk Management, Freeboard allowance etc.	NZS4404 – Land development and Subdivision infrastructure. NZ Building Code, E1 Surface Water. Auckland Code of Practice: For Land Development and Subdivision (Chapter 4 – Stormwater V4) - November (2015). Auckland Council.

2.2 Stormwater Discharge Consent

This SMP relates to Greenfields Development and although it is currently zoned Future Urban, it is anticipated at some point in the future, this land will be re-zoned as residential by Auckland Council, and eventually be adopted under the Auckland Council Regionwide Stormwater Network discharge consent (NDC). Schedule 4 of the NDC outlines the stormwater management factors for Greenfields Developments. Under the NDC the performance requirements below must be achieved.

The stormwater management approach outlined in this SMP meets the NDC requirements.

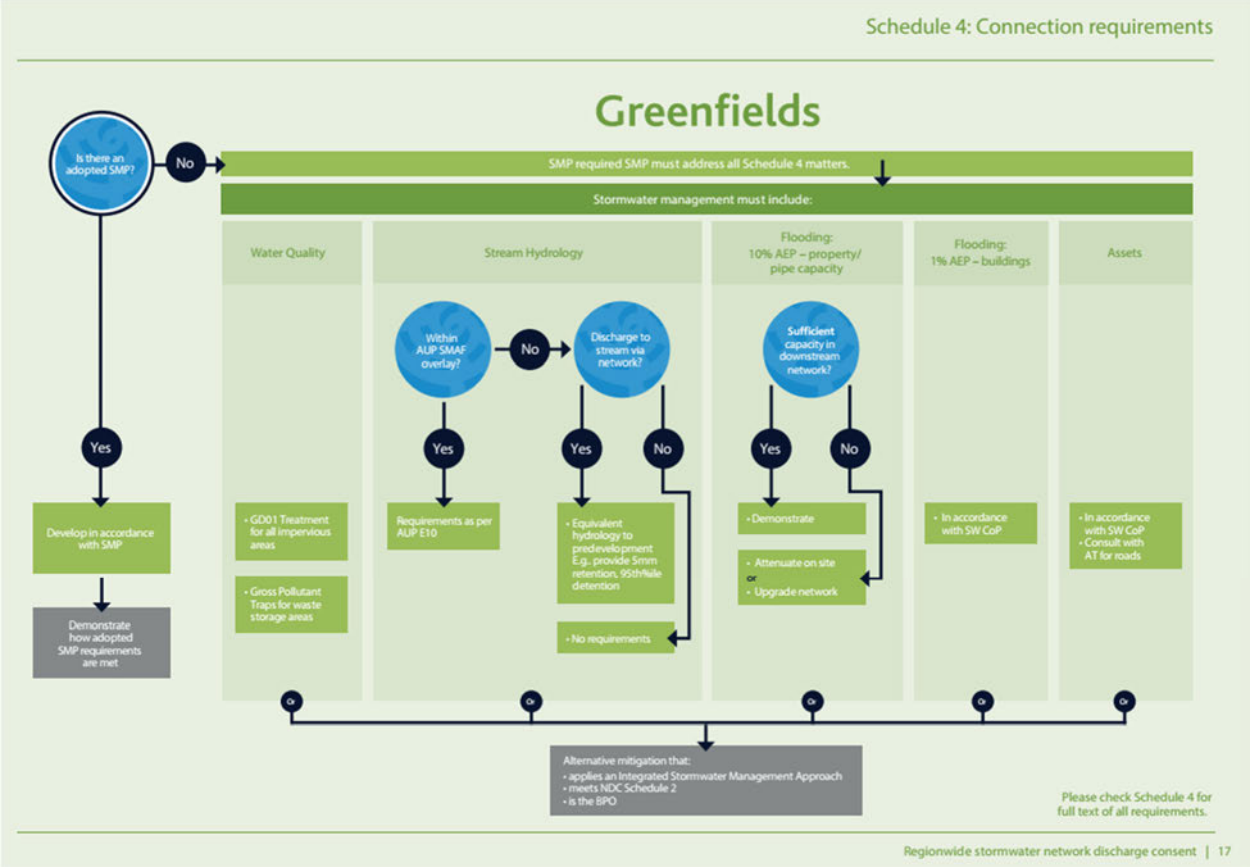


Figure 12 - Regionwide Stormwater Network Discharge Consent Schedule 4 Greenfield connection requirements

The following requirements apply to the site area covered by this SMP –

1. Water Quality – GD01 treatment for all impervious areas
2. Stream Hydrology – Equivalent hydrology to pre-development (5mm retention, 95th percentile detention)
3. Flooding - 10% AEP – Demonstrate sufficient capacity in downstream network
4. Flooding - 1% AEP – No effect on existing downstream building floor levels, achieves SWCoP freeboard requirements.

3. MANA WHENUA: TE AO MAORI AND MATAURANGA

Consultation with Iwi is currently being undertaken and key recommendations will be incorporated into the next issue of this SMP. The recommendations address cultural impacts, land preservation, water quality, and ecological conservation. By incorporating these recommendations, the stormwater management design will promote sustainable practices and cultural stewardship.

4. STAKEHOLDER ENGAGEMENT AND CONSULTATION

The following parties have been consulted during the preparation of the preparation of this SMP;

- Healthy Waters, Advice regarding their flood model characteristics.

5. PROPOSED DEVELOPMENT

5.1 Location and Area

The site for the proposal is located west of Ōrewa township in North Auckland Flat within the Future Urban Zone.

The site is located 370 metres west of State Highway 1 interchange with Grand Drive. Grand Drive is currently being constructed as an extension to serve the Ara Hills development currently under construction. This Grand Drive extension is proposed to continue west through the site and curve southward to end in a connection with Russell Road/Upper Ōrewa Road intersection. This is the main access into the site.

5.2 Purpose of the Development

The proposal is to develop the site into residential living. The current indicative masterplan is shown in Figure 13 below. The masterplan retains the current watercourses and does not alter the current flow path locations through the site. Residential areas will be located outside the flood plains. Roading layout is sympathetic to the current topology and maintains the watercourses. Several road crossings over the watercourses are required to facilitate the roading network. It is anticipated these road crossings will consist of box culverts to facilitate construction. Further information pertaining to the culverts and crossings is contained within the Earthworks & ESC Report.

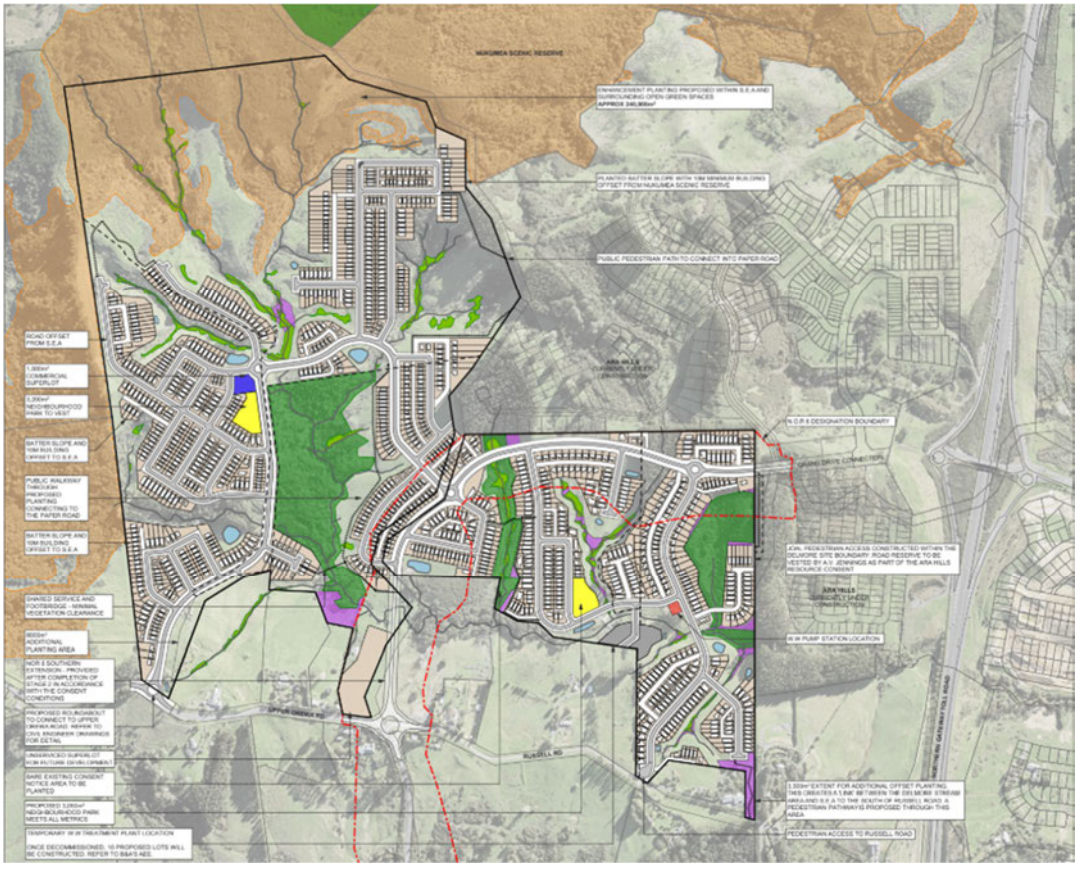


Figure 13 Indicative proposed Development Masterplan (Source: Vineway Ltd)

5.3 Earthworks

The site will be contoured to provide access and building platforms. Generally, the roads follow ridgelines, which will require these to be cut down and filled along the sides, with batters down to the streams to form building platforms. The extent of earthworks and the earthworks philosophy need to be carefully considered, planned and carried out for this development site due to the nature and value of the existing watercourses. It is expected earthworks will not be undertaken in the watercourses themselves. However some road crossings of the streams are proposed and these crossings will be in the form of box culverts. These will require some embankment earthworks to be carried out each side of the proposed culvert.

The alignment of flow paths will be retained however some minor adjustments could provide improved positive outcomes after consultation and with agreement of related stakeholders. Such adjustments could require minor earthworks in the watercourse bed and would be very carefully planned and managed during the design and works phases with monitoring during and after completion for adverse environmental effects. E.g. any sediment migration, erosion. Any improvement works would be incorporated into the proposed planting/riparian improvement plan.

6. STORMWATER MANAGEMENT

6.1 Principles of Stormwater Management

6.1.1 Original Principles

This section outlines the stormwater management approach for the post-development outcome for the site. It aligns with the provisions of the AUP, and the objectives set out in schedule 4 of the NDC from greenfield developments. The purpose of this approach is to promote sustainable stormwater management and land development on the site. Additionally, it aims to safeguard, restore, and improve the receiving environment, such as watercourses.

The following standards and guidelines were adopted for the stormwater management approach:

- Auckland Unitary Plan Operative in Part
- Auckland Council Ōrewa West Integrated Catchment Management Plan February 2010
- Auckland Council Catchment Management Plan Update, Ōrewa West Catchment January 2014
- Stormwater Management Devices in the Auckland Region, Guideline Document 2017/001 (GD01) Dec 2017 Incorporating Amendment 2.
- Water Sensitive Design for Stormwater, March 2015, Guideline Document 2015/004 (GD04).
- The Auckland Council Code of Practice for Land Development and Subdivision, Stormwater (SWCoP v4).
- Guidelines for Stormwater Runoff Modelling in the Auckland Region, ARC Technical Publication No. 108 (ARC TP108), 1999.
- Network Discharge Consent (NDC)

The guiding water sensitive design principles as outlined in GD04, have been adopted and incorporated in the stormwater management approach for the development of the site. See key points and guiding principles below. **Table 4** shows the expected outcomes and performance standards consistent with the objectives and policies AUP.

Table 4 - Application of Stormwater Principles

Water Sensitive Design Principles	Applications
Protect and enhance the values and functions of the natural ecosystem	Adoption of the WSD Blue-Green infrastructure, and green corridor network. Riparian stream edge planting, and riprap have been used, to minimise impact of stormwater runoff and overland flow on the receiving downstream environment. Raingarden Bio-retention devices have been

	used for water quality and hydrological mitigation within the site to mitigate effects on receiving environments (streams).
Address stormwater effects as close to the source point as possible	Generation of contaminants will be prevented as far as practicable using low contaminant generating materials. Where contaminants are generated, i.e., roads, infrastructure will be provided to mimic natural physical, biological, and physical treatment processes as close to the source as practicable. Communal devices preferred.
Mimic natural systems and processes for stormwater management	Retain existing overland flow paths and add Riparian stream edge planting & revegetation planting, and riprap to protect the gully networks within the site.

6.1.2 Updated Principles

We envisage no updated principles for stormwater management. The development proposal will adopt the standards and principles in line with the Auckland Council regulatory and New Zealand Building Code requirements as discussed above.

6.2 Stormwater Management approach

6.2.1 General

An evaluation of stormwater management devices appropriate for this site (to produce a Best Practical Option (BPO) Toolbox) was undertaken and is presented in Appendix A.

The stormwater approach for the site, utilises the existing landform and stream network as far as practicable, by mimicking the existing catchments, and providing communal devices in the low points of the catchments. Where lots are directly adjacent to streams, treated stormwater discharges direct to the stream through a T bar energy dissipation device, to maintain stream flows and minimise concentrated flows with high velocities entering the fragile stream network.

On site tanks will be provided for each lot for water quality, retention detention, and optional re-use.

A flow chat is shown below in Figure 14 for the approach to treating all impervious surfaces within the development. Further explanation of each element is shown below.

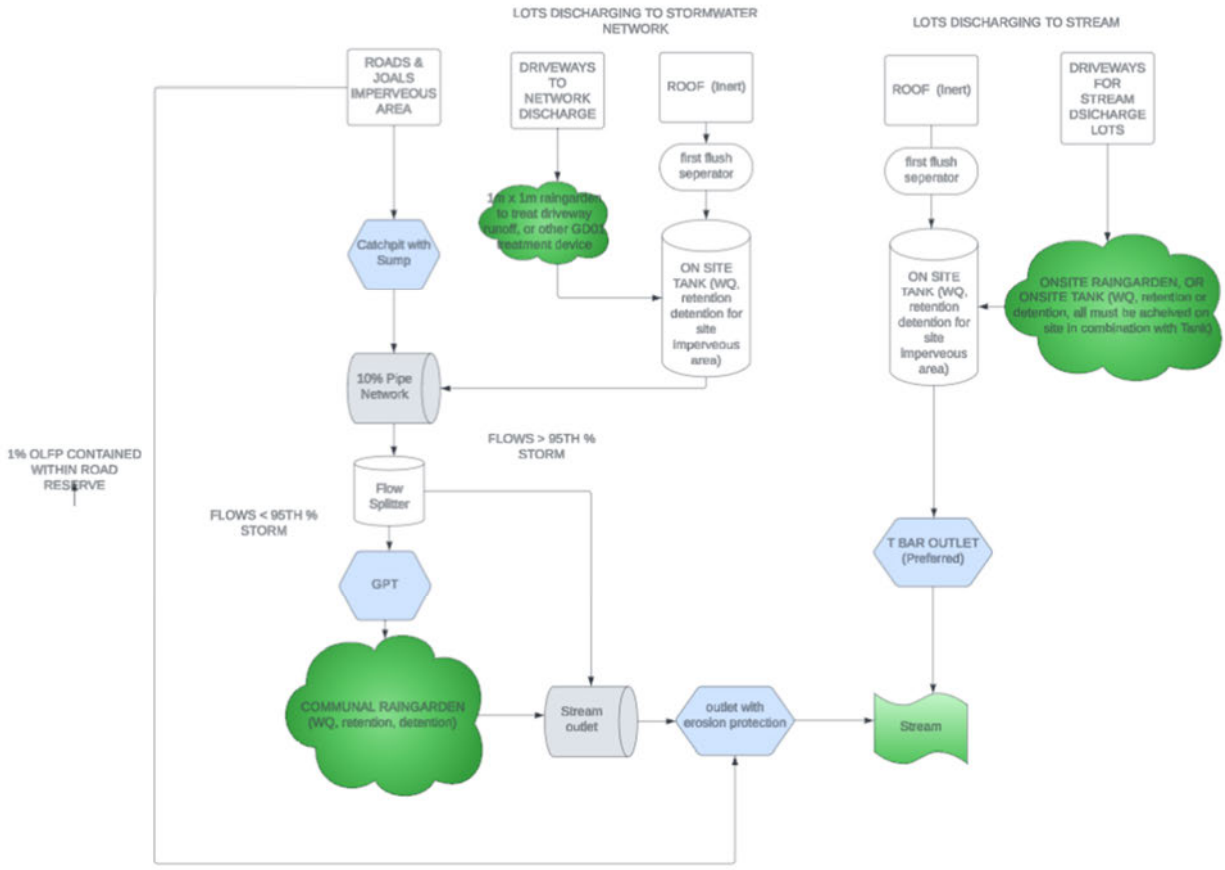


Figure 14 - Treatment Train flow chart for BPO

6.3 Water Quality

Water quality objectives are:

- To provide treatment of all impervious surfaces using a device designed in accordance with GD01 for the appropriate contaminants.
- 75% of total suspended solid to be treated.
- Eliminate and if not possible minimise the generation and discharge of contaminants.
- Design a stormwater management system that provides a high level of water quality to protect the receiving environment.
- Preserve, protect, and enhance streams and floodplains which can also provide amenity and connectivity with communities.
- Provide at-source water quality treatment of runoff for contaminant generating impervious surfaces to target sediments and metals.

Table 5 - Contaminants of Concern, and Quality mitigation BPO for Various Impervious Surfaces

Impervious area	Contaminants of concern	BPO
Roofs,	Copper, Zinc	Lot contaminant generating areas.
Driveways	Sediments, gross pollutants, metals, oils and grease, hydrocarbons, temperature	Catchpit with Sump, on-site Raingarden
Public roads	Sediments, gross pollutants, metals, oils and grease, hydrocarbons, temperature	Catchpit with Sump, Communal Raingarden
Private Joals	Sediments, gross pollutants, metals, oils and grease, hydrocarbons	Catchpit with Sump, Communal Raingarden

6.4 Stream Hydrology

The potential effects from development on stream hydrology will be mitigated through the provision of retention and detention within the private lots, and communal raingardens. These devices collectively moderate changes to runoff volume and peak flows, reducing downstream hydrological impacts.

An assessment of existing wetlands has been undertaken by Viridis consultants, and discharges have been balanced to minimise the effects of changes on hydrology on these wetlands.

A Geomorphic Risk Assessment (Appendix 21) has been undertaken by Morphum Consultants to evaluate the susceptibility of each stream reach to erosion, instability, and geomorphic change under post-development flow conditions. The assessment identified reaches with elevated risk due to existing channel form, gradient, confinement, and sediment characteristics. Recommended mitigation measures include:

- Moderating peak flow frequencies;
- Dispersing discharge to avoid concentrated erosive forces;
- Ensuring outlet structures are designed to minimise bed and bank disturbance.

The proposed stormwater management approach, including distributing offset retention/detention to streams and low-energy flow dispersion directly responds to these findings and is expected to maintain or improve overall channel stability.

Where practicable, individual lot discharges will be directed along the stream banks rather than concentrated at the catchment low point. Flow will be discharged through a T-bar arrangement to diffuse runoff and minimise localised erosion. All outlets will be designed in accordance with Auckland Council Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices TR2013/18, HEC-14, or equivalent engineering guidance. Communal raingardens designed to GD01 requirements will provide the water quality mitigation, retention

and detention requirements suitable for the development proposal for the runoff from the road reserve network, and the JOALs. Raingarden locations are shown on appended drawing 3725-400.

The Raingardens meet the required minimum water quality treatment described in section 6.2.1 above.

6.5 Flooding 10% AEP Event (Network Capacity)

A new pipe network will be provided within the SMP area, sized for the 10% AEP event, in accordance with SWCOP.

Attenuation of the 10% AEP event is not required as there are no downstream constraints or flood risk in the 10% AEP event. Flood modelling has been undertaken by Mckenzie & Co[5] for the 10% AEP event with Climate change and Maximum Probable Development, for the pre and post development scenarios. This shows that there is no increased flood risk upstream or downstream from the development, in this event.

Outlets will be in accordance with Auckland Council Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices TR2013/18, HEC-14 or other equivalent guidelines.

6.6 Flooding 1% AEP Event (Habitable Floors)

Attenuation of storms up to the 1% AEP is not included in this SMP as the Ōrewa West ICMP[6] states *"As there are no downstream flooding issues, attenuation of 2-, 10- and 100-year ARI flows is not proposed."* Flooding is discussed further in the following sections 6.5 and 6.6.

Assessment of 1%AEP flooding is provided in the attached McKenzie and Co. Flood Assessment Report.19A Kowhai Road is located downstream of the site and has a single dwelling at a floor level of approximately RL 50m, which is 30m higher than the MPD flood level.

A development directly east of the site is Ara Hills Stage 2. A review of proposed design contours on the Engineering Plan Approval drawings for Ara Hills reveal the design surface level at the lower dwelling lots is RL 26m. It is not clear if this is to Auckland Datum 1946 or NZVD 2016 (a difference of approximately 300mm exists between these datums). The AC Rapid Flood Model flood level at this location is 17.77m RL (1946 datum). This is a vertical height difference of approximately 8.2m. At this level difference it can be considered the Delmore development to which this SMP relates will not affect the existing downstream dwelling lots located in Ara Hills Stage 2.

An existing pump station within the Ara Hills development is currently at risk of inundation during the 1% AEP flood event when 3.8-degree climate change conditions are applied. Under existing conditions, the pump station's floor level is low enough that flooding would occur in such an event. However, the proposed development results in a reduction of the 1% AEP flood and therefore does not increase flood risk to this asset.

Based on the ICMP recommendations, and the recent Mckenzie & Co Flood assessment, based

[5] McKenzie & Co Flood Report 2025

[6] Ōrewa West ICMP 2011, section 7.2.2, page 50

on 3.8 Degree climate change, and MPD within the catchment, there is no downstream flood risk from the development on habitable dwellings. In fact, the Delmore development will reduce the downstream flood extents in some locations during the 1% AEP event.

Attenuation of the 1% AEP event is proposed through the throttling of flows that will occur behind the proposed culverts within the development. Flow throttling will be contained within the riparian margins and will not produce any on-site flooding effects on any activities sensitive to natural hazards.

6.7 Overland Flowpath and Floodplain Management

All residential building platforms are set outside of streams and overland flow paths. The Maximum Probable Development flood extent using post-development impervious coverage and 3.8° for climate change is shown on drawing 3725-4930 appended.

As the residential development is predominantly situated on ridges, most overland flowpaths are constrained to the existing stream network, and therefore do not affect the development. Where minor OFLPs do enter the site, these entry points are to be retained. OLDPs are to be contained within the road reserves and JOAL boundaries. All OLFPs from the development discharge to the stream network.

Lots are to maintain an appropriate freeboard above the OLFP's in accordance with Auckland Council SWCoP. Roads are used to convey secondary flow, from where flow is then conveyed to the streams through rip rap lined channels or other appropriate energy dissipating devices.

All lots are located well above the flood plain at the bottom of the catchment. For lots along the edge of the flood plain, a minimum finished floor level will be noted on titles by way of consent notice.

Outlets will be in accordance with Auckland Council Hydraulic Energy Management: Inlet and Outlet Design for Treatment should be Devices TR2013/18, HEC-14 or other equivalent guidelines.

6.8 Development Staging

The development is to be delivered in two stages, and 14 sub-stages, and each stage can be serviced with its own stormwater management device independently.

6.9 Hydraulic Connectivity

Hydraulic connectivity mimics current natural physical pathways. Primary runoff from roofs and paving discharges to the pipe network which enter the Raingardens. Secondary flows runoff to the roads. There are no significant alterations to the natural flow paths. There are no disconnected impervious surfaces proposed.

6.10 Asset Ownership

The Communal raingardens will be vested in Auckland Council at time of compliance, as "Land in lieu of Reserve – for Drainage Purposes", as shown on the Scheme Plans (Appendix 10).

The pipe network is to be vested to Auckland Council.

On site rainwater tanks and T-bar discharges, will be owned and maintained by the private Lot

owners.

6.11 Ongoing Maintenance Requirements

Vested assets will be maintained by Auckland Council. An operations and maintenance plan for each communal device will be provided at time of compliance.

The rainwater tanks are to be maintained by the owner. Consent notices can be put in place to ensure obligation of ongoing maintenance is ensured.

6.12 Implementation of Stormwater Network

Public stormwater network will be constructed and vested at each stage of development.

6.13 Dependencies

No stormwater infrastructure is proposed outside of the development site.

6.14 Risks

Potential risks to the stormwater management are listed below in **Table 6**. Mitigation and management options will be included also after further information is received.

Adjustment in location of the proposed large raingardens is expected to mitigate some of the risks identified.

Table 6 - Risk Register

Proposed Risk to Stormwater Management	Mitigation / Management	Further mitigation/ management to be used	When do risks need to be addressed	What is the Resultant level of Risk?
Infiltration ability	Use 2mm/day for design purposes	Testing at devices locations	Detailed Design	Low
Slope Stability	Geotechnical assessment		Resource Consent and Detailed Design phase	Moderate Moderate
High Groundwater levels	Geotechnical assessment (boreholes)		Resource Consent and Detailed Design phase	Low Low
Expansive soils	Geotechnical Assessment		Building Consent phase	Low

Erosion prone soils	Geotechnical Assessment	Resource Consent and Detailed Design phase	Moderate
Presence of fauna in close by watercourse	Ecology Assessment	Resource Consent phase	Low
Presence of natural wetlands, etc close to site	Environmental Assessment	Resource Consent phase	Moderate
Mana Whenua	Cultural Impact Assessment, consultation.	Resource Consent phase	Low

7. DEPARTURES FROM REGULATORY OR DESIGN CODES

The stormwater management approach for development meets the minimum regulatory or design codes standards and is considered the BPO approach. No departures are proposed.

8. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

This Stormwater Management Plan has been prepared to meet the requirements of Auckland Council's Regional Network Discharge Consent to enable stormwater discharges from an approximately 1213 residential dwelling development (and associated infrastructure) at the site. The supporting flood assessment is contained in a separate report. The management approach set out in this SMP is summarised below. -

Roads & JOALs

Requirements

- WQ treatment for all impervious areas
- Retention/detention for impervious areas

Proposed BPO

- Catchpits with Sumps
- Pipes for 10% conveyance
- Communal Raingardens for WQ and retention/detention. Where not possible due to topographic constraints, manage on site manage via private on-lot stormwater reuse tanks.
- Road OLFP for conveyance of 1% AEP with 3.8 degree climate change

Lots

Requirements

- WQ treatment for all impervious areas
- Retention/detention for impervious area

Proposed BPO

- Low contaminant generating surfaces
- First Flush diversion devices
- Rainwater Tanks
- On-site Raingarden/ GD01 compliant device to treat driveway runoff, for all lots.
- T-bar discharge to streams where practical (Preferred), Pipes for 10% conveyance to public system where not possible, due to increased flows to wetlands or very steep

batters.

- Avoid the Floodplain, maintain freeboard above 1% AEP levels.

APPENDIX A – STORMWATER MANAGEMENT TOOLBOX ASSESSMENT

Hydrologic Requirements

The site is not located in a SMAF 1 or SMAF 2 area, as shown below in Figure 15.

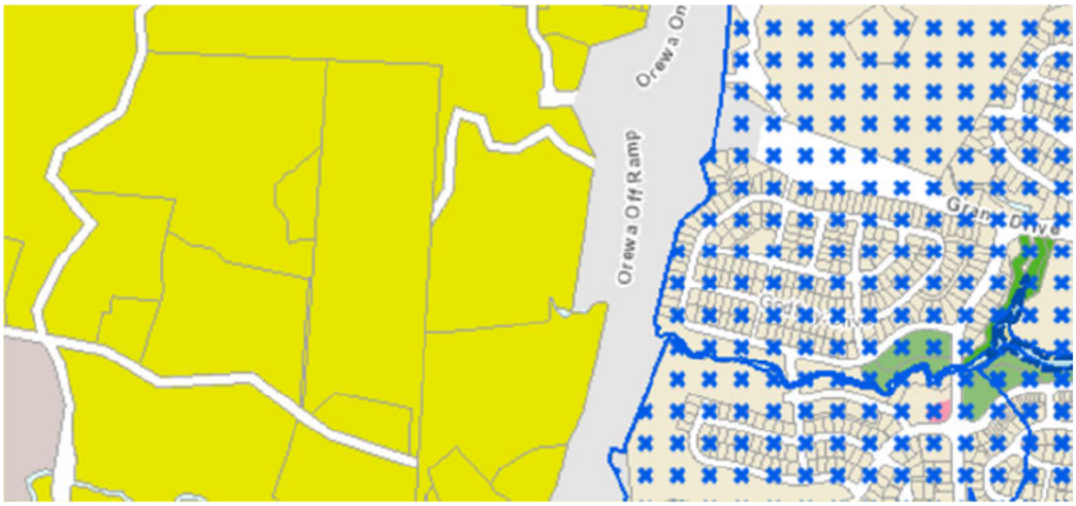


Figure 15 - Development site is outside SMAF area

As the proposed impervious area is greater than 1000m^2 the Unitary Plan states that the discharge off of the impervious area should be managed by a stormwater management device that:

- Reduces contaminants from the impervious area: and
- Provides retention (volume reduction) of a minimum of 5mm runoff depth off impervious areas and provide detention (temporary storage) with a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes of the 95th percentile, 24 hour rainfall event (minus the retention volume off of impervious areas).

From GD01 Table 10 (Figure 16 below) the hydrologic mitigation requirements and the devices selected are highlighted in green boxes.

Table 10: Mitigation needed to support Auckland Unitary Plan requirements

Mitigation requirement (Auckland Unitary Plan)	Stormwater management requirement and aim	Devices providing this mitigation
Stormwater management - flow: SMAF 1 and 2: • Provide retention (volume reduction) of at least 5 mm runoff depth.	Retention: • To protect streams and recharge groundwater.	Rainwater tanks (with reuse) Bioretention devices (unlined) • Living roofs • Pervious paving (unlined) • Infiltration devices.
Stormwater management - flow: • SMAF 1: Provide detention and a drain-down period of 24 hours for the difference between the pre- and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5 mm retention • SMAF 2: Provide detention and a drain-down period of 24-hours for the difference between the pre- and post-development runoff volumes from the 90th percentile, 24-hour rainfall event minus the 5 mm retention.	Detention: • To protect streams.	• Pervious pavements Bioretention devices • Wetlands • Ponds (dry and wet) • Rainwater tanks.
Stormwater diversion and discharge: • Provide detention of 10% AEP • Provide detention of 1% AEP.	Detention: • To manage and mitigate flood effects and flood risks, including effects on buildings and property.	• Rainwater tanks (no reuse) • Ponds • Wetlands.
Stormwater management – quality: Provide treatment of the water quality flow or volume.	Water quality mitigation: • To protect water quality.	Bioretention devices • Swales • Wetlands • Ponds (where specific design is agreed with Auckland Council).

Figure 16 - Mitigations requirements from GD01 Table 10

Hydrologic calculation requirements are proposed in green boxes from GD01 Table 11 (Figure 17 below).

Table 11: Suggested hydrological calculations

Hydrological calculation	Regulatory reference (Auckland Unitary Plan)	Mitigation aim	Preferred method	Calculation requirement	Wetlands	Ponds	Bioretention	Swales	Infiltration devices	Pervious paving	Living roofs	Rainwater tanks
Water quality flow (WQF)	E8 and E9	Water quality effects	Rational method	10 mm/hour			X[a]	X				
Water quality volume (WQV)	E8 and E9	Water quality effects	TP108[8]	90th percentile equivalent	X	X[b]	X					
Retention	E8 and E10	Effects on streams and aquatic biodiversity	TP108	5 mm runoff depth			X		X	X	X	X[d]
Detention	E8 and E10	Effects on streams and aquatic biodiversity	TP108	95th percentile 90th percentile	X	X	X			X		X
Large storms	E8	Flood effects	TP108	10% AEP	X	X		X[c]				X[f]
Extreme storms	E8	Flood effects	TP108	1% AEP	X[e]	X[e]						

Figure 17 - GD01 Table 11 hydrologic calculations

Due to raingarden bioretention devices satisfying the above criteria for this site, they have been selected as the preferred device. They have been designed to be placed in locations where they can treat catchments, dictated largely by the catchment shape, but also to enable adequate access for maintenance of the Raingarden and outlet structures.

GD01 Figure 6 shows the 95th percentile 24-hour rainfall depth at the development site location as **38mm** which will be used for device sizing.

The site can be split into various catchment categories for determining the Best Practical Option (BPO) for the catchment. Below is a table with the different catchments, and the BPO identified for each, based on the toolbox.

Table 7 – Best practicable option for lots, roads, and joals

Sub catchment	BPO			
	Treatment	Detention/Retention	10% AEP conveyance	Outlet
Lots	Low contaminant generating	Tank	T bar outlet to stream if possible, or public pipe if not.	To existing streams with rip-rap protection

	surfaces First Flush Diversion device Other GD01 compliant devices			
Public Road	Raingarden	Raingarden	Pipe	To existing streams with rip-rap protection
Private Joals	Raingarden, or GD01 compliant devices on site if raingarden is not possible.	Raingarden Onsite tank	Pipe	To existing streams with rip-rap protection

Lots

Lots will be required to be constructed from low contaminant generating materials. Roof runoff will be required to have first flush diversion devices. The residential lots will have private on-lot rain tanks. Driveway surfaces will need to be treated, through a small onsite raingarden or a GD01 complaint device. Tanks will be sized for the retention and detention volume. It is proposed that each lot will have a T-bar discharge, where possible to discharge flows safely to the streams. This is to ensure that base flows in the streams are maintained. Where this is not possible, the lots will discharge into the public pipe network.

Public Roads

Public roads will be vested to Auckland Transport. Due to the steep local road gradients above 8% swales are considered unsuitable. Pervious pavement, tree pits and roadside bioretention devices (Raingardens) are not desired by Auckland Transport due to O & M costs and are not proposed due to steep terrain. Wetlands cannot cater for retention, and are difficult on steep sites such as Delmore due to their large footprint. As such communal raingardens are proposed as the most appropriate device selection, as per Figure 17.

Catchpits collect runoff which is piped to a common public network of trunk mains. The downstream end of the pipe network is directed to the Raingarden. The pipe outlet will have either a standard precast concrete wingwall or a bubble up manhole with scruffy dome for 10% AEP and low outlet pipe for storm flows lower than 10% AEP. Pre-treatment for Gross Pollutants before flow enters the Raingarden is not proposed.

The Raingarden provides retention volume of 5mm and 95th detention volume of post less pre and retention. Discharge is into an adjacent natural gully flow path with rock rip-rap outlet protection. These flow paths discharge to the main overland flow path that runs from west to east through the centre of the development site. An emergency spillway to GD01 standard is provided to the adjacent gully.

Raingardens will be designed to GD01.

Secondary storm flows run down roadways to sag locations. Short sections of new open

conveyance channels could be required to provide the link to the existing gully locations. Velocity reduction measures will be employed e.g. check dams, natural baffles, etc. The shape and visual nature of these would be unobtrusive and marry with the aesthetic characteristics of the landform. Secondary flow paths will not be located on private property where possible.

Nominal locations of proposed Raingardens are shown on drawing 3725-400 (appended). It is desirable to minimise the number of Raingardens, with their placement being logical to the layout of the roading and residential lots above and to the topographical constraints and any nearby flooding effects. A minimal number of raingardens will reduce O & M costs for Auckland Council, so the raingardens are proposed at the base of their catchment. These devices will be in public reserve (recreation/stormwater).

Private Roads

Private JOALs follow the same principles as the public roads. Grading, kerbs, channels and catchpits in the private roads collect surface runoff and discharge to the pipe network. From there the runoff is managed as above for public road runoff. Pervious pavement is not proposed due to the maintenance cost.

Riparian Margin

The riparian margin located at the edges of the main flow path and existing tributary gullies will be enhanced by planting. Extent of planting will be in accordance with recommendations of the watercourse assessment report.

Outlets

Outlets will be in accordance with Auckland Council Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices TR2013/18, HEC-14 or other equivalent guidelines.

Raingarden stability

If the infiltration rate is less than 2mm per day and/or infiltration is found to have an on influence slope stability, then the raingardens may be lined and retention volumes will be added to detention volumes. Should the geotechnical report / monitoring raise this as a specific concern then raingardens may be lined to mitigate these risks in specific locations. This will be undertaken during detailed design.

APPENDIX B – DRAWINGS

Bound Separately