

## STORMWATER ASSESSMENT REPORT

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<b>Project Name:</b>	Orawaahi – A Complete Community Project ('the Project')
<b>Client:</b>	Knight Investments Limited
<b>CP Project No:</b>	2296-01
<b>CP Document No:</b>	2296-01-ER01-stormwaterassessment-aja-rfs-20251029
<b>Date of Issue:</b>	29 October 2025
<b>Originator:</b>	Anthea Abbott – Senior Civil Engineer
<b>Reviewer:</b>	Ryan Pitkethley – Director

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### 1. Introduction & Project Description

This report has been prepared in relation to a fast-track referral application by Knight Investments for the proposed *Orawaahi - A Complete Community Project* ('the Project').

The Project Area is legally described as Lot 3 DP 337204 and Lot 1 DP 337204, known as 156 Clarks Beach Road and the adjacent lot which has no street address.

In addition, works are proposed on:

1. 115 Clarks Beach Road (Lot 1020 DP 578599, Lot 1012 DP 573987, Lot 1018 DP 573987, Lot 1001 DP 560664, Lot 1003 DP 560664, Lot 801 DP 526153, Lot 200 DP 567326, 9/14 SH Lot 300 DP 526153, 4/23 SH Lot 100 DP 560664), for works associated with required infrastructure/roading upgrades.
2. Lot 4 DP 116708 held as Local Purpose Reserve (Esplanade), located at the southern edge of the site, adjacent to the Coastal Marine Area ("CMA").
3. A portion of land which is vested as legal road, as per GeoMaps (but unformed), which is located between the subject site and the CMA.
4. Clarks Beach Road.

The Project is a masterplanned sustainable extension to the existing Clarks Beach coastal community that enables multigenerational living, local employment and community services. The Project will be integrated with the fast growing Clarks Beach community, and will provide a logical extension to it.

The Project seeks to establish:

1. Residential lots to accommodate approximately 700-800 dwellings;
2. A retirement village of approximately 220 units/villas;
3. A neighbourhood centre (likely to include supermarket, retail, a community hub, commercial offices, food and beverage premises, childcare and/or fitness/wellness facilities)
4. A service / light industrial area (likely to include workshops, storage and warehouse facilities, associated retail and business premises);
5. A multi-functional green / blue network across the site's stream and wetland features, with enhancements of the coastal edge. This will include neighbourhood parks, recreational walkways, and pedestrian/cycle connections throughout the site.

This assessment report examines existing site conditions, identifies likely stormwater mitigation solutions, and assesses (at a high level) compliance with local and national regulations. The report provides an analysis of hydrological factors and strategies to address known and anticipated flood risks and environmental impacts, ensuring resilient infrastructure and development, noting that a more detailed analysis will be provided with any substantive application for consent.

## 2. Site Description

The Project site is located at Clarks Beach Road, Clarks Beach in Southwest Auckland. The site is 75.13ha of predominantly vacant paddocks with two rural lifestyle dwellings.

Figure 1: Site Location



To the north, the site is bordered by Clarks Beach Road and an ongoing residential development comprising approximately 650 lots. To the east and west, the site is bordered by rural lifestyle properties and along the southern boundary, the Taihiki River, which flows into Manukau Harbour. Clarks Beach Road runs along the northern boundary of the site and is the sole road access to Clarks Beach and Waiau Beach. Access to the site is off Clarks Beach Road.

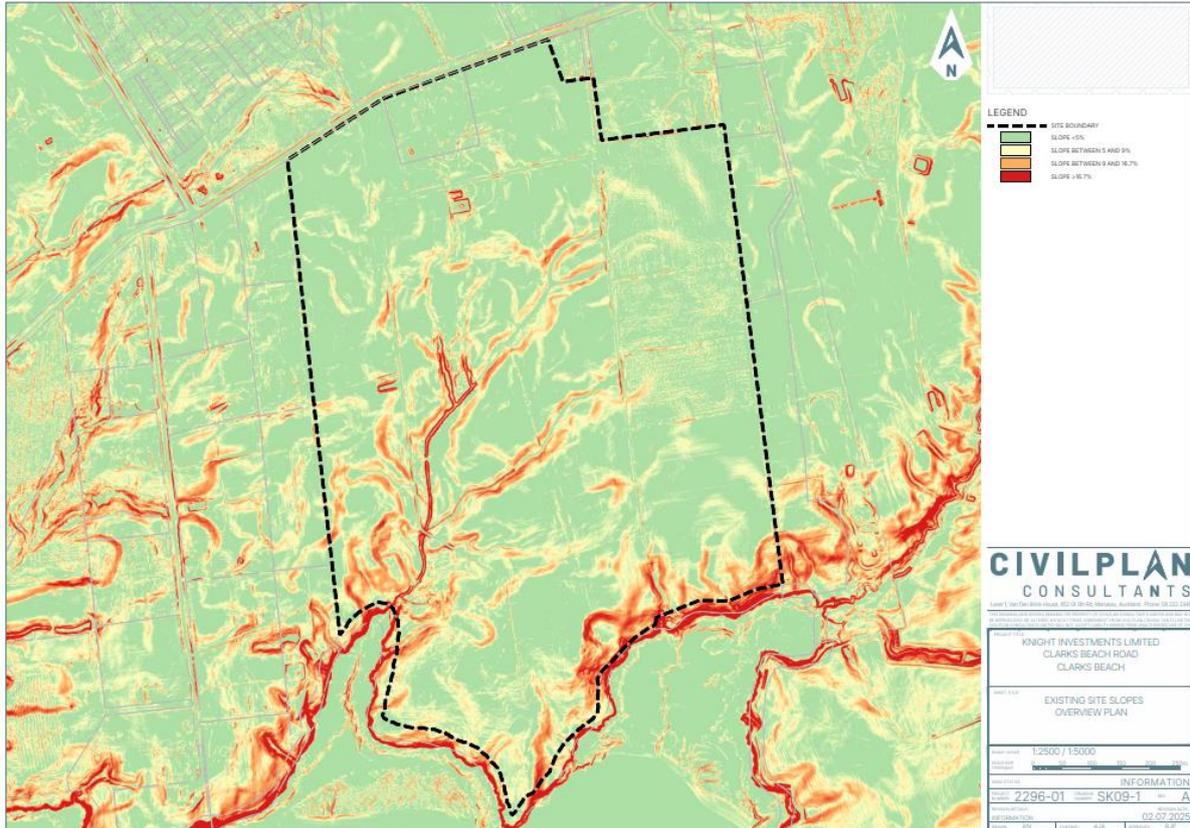
Table 1: Existing Site Details

Site address	156 and NULL Clarks Beach Road, Clarks Beach
Legal description	Lots 1 and 3 DP 337204
Area	75.13Ha
Current Land Use	Pasture
Current impervious coverage	1.2ha
Historical Land Use	Pasture

## 2.1. Topography

The site generally falls from a maximum RL of 27m to the central stream and coastline to the south. The minimum RL within the site is RL 7m. Beyond the site to the south, the coastline is bordered typically by cliffs up to 7m in height. The central stream runs in a northeast to southwest direction discharging into the Taihiki River to the south. The central stream has side slopes of roughly 1 in 3. Existing site slopes are shown below.

Figure 2 – Slope Map



## 2.2. Geotechnical

Geotechnical investigations will be carried out at the substantive application stage. It is anticipated, based on available information to date and our own experience, that the site will comprise natural Auckland Volcanic Field ash soils overlying weaker alluvial soils of the Puketoka Formation, part of the Tauranga group.

Until further geotechnical assessment is undertaken and based on these soil types, we have assumed that in-ground stormwater soakage is not feasible for the site and runoff from all impervious surfaces should be collected by a reticulated network.

Geotechnical assessment undertaken for the site to the north (which is under development) determined that the rate of infiltration was between 0.0005 – 0.002 mm/hr. This rate of infiltration is classified as practically impermeable and hence retention via infiltration may not be practicable if similar features exist on the site.

## 2.3. Existing Drainage Features and Stormwater Infrastructure

There is no existing stormwater drainage as the site is predominantly vacant paddocks. Two existing farm culverts provide farm access over the permanent stream.

## 2.4. Receiving Environment

The site primarily drains to the permanent stream that falls in a northeast to southwest direction, and the Taihiki River along the southern boundary. The site is located near the mouth of the Taihiki River which at this location is a wide silty estuary within the tidal lands of the Manukau Harbour. The Taihiki River originates north of Patumahoe and flows in a northeasterly direction, prior to joining the Waiuku River which discharges into the Manukau Harbour. Like the Waiuku River, a significant portion of the Taihiki's course consists of a broad, silty estuarine environment, highly influenced by tidal effects. The total stream catchment is roughly 60.74ha. A further 14.93ha of the site falls to the southern coastal boundary.

## 2.5. Flooding and Flowpaths

Existing overland flow paths on the site are shown below.

The GIS floodplains for this site are from the Auckland Council Rural Rapid Flood Model Report dated May 2023. This 2D model assessed a 1% AEP storm event with a climate change factor of 3.8°C and used land use values based on the maximum allowable imperviousness anticipated by the development for hydraulic modelling purposes by Healthy Waters.

Figure 3 – Overland Flow Paths (Source Auckland Council GIS)



Figure 4 – Floodplains (Source Auckland Council GIS)



## 2.6. Ecology

Ecological Solutions Ltd has been engaged to define wetlands and streams within the project site. This work was carried out in April 2025 and is shown below in Figure 5. A permanent stream flows in a south-west direction discharging to the Taihiki River estuary at the south-western corner of the site. Wetlands were identified primarily along the tributaries of the main stream channel.

Figure 5 – Ecology (Source Ecological Solutions Ltd May 2025)



## 2.7. Coastal Inundation

Except for an area of low-lying land near the stream interface with the harbour, the lowest levels of the proposed development site are RL 7. This is well above expected coastal inundation levels and hence coastal inundation is not likely to be an issue for this site. Refer to the assessment by LDE in respect of coastal hazards.

### 3. Development Summary and Planning Context

Regulatory requirements are outlined in Table 2 below. The Planning Memorandum prepared by Tollemache Consultants will address resource consent triggers.

Additionally, low flows into the remaining intermittent stream should also be maintained.

**Table 2: Summary of design requirements**

Requirement	Relevant regulatory / design to follow
Unitary Plan – SMAF hydrology mitigation	The site is not in a SMAF area. However, stormwater runoff from an impervious areas discharged to a stream environment shall be managed by a stormwater management device to meet the hydrology mitigation requirements specified for SMAF 1.
High Contaminant Generating Areas	The development may contain high contaminant generating carparks (being those servicing more than 30 carparks) or high use roads (this also includes Clarks Beach Road).
Natural Hazards	Building platforms are to be located outside floodplains and with minimum freeboards as per SWCOP.  Earthworks in 1% AEP floodplain are not to exacerbate flooding of upstream or downstream sites, not to reduce conveyance capacity, and will remedy or mitigate flood hazards where practicable.  Maintain the capacity of overland flow paths.
Auckland Unitary Plan Precinct	N.A.
Existing Catchment Management Plan	N.A.
Auckland Council Regionwide Network Discharge Consent	N.A.  This site is outside the Network Discharge Consent areas and hence approval to discharge will be sought as part of the substantive application.
Auckland Council Stormwater Code of Practice	All design to allow for climate change.  Pipe network to have capacity for 10 year storm.  Overland flow paths to have capacity for 100 year storm.  Overland flows to comply with Austroads safety requirements.  Stormwater management devices to be designed in accordance with GD01.

### 3.1. Impervious Surfaces

Impervious areas expected within the development are outlined in Table 3 below.

**Table 3: Impervious Coverage Ratios**

	Percentage Impervious
Residential/Retirement	70% (per lot) – roofs, driveways, paved areas.
Light Commercial	90% (per lot) – roofs, carparks, driveways, paved areas.
Retail	90% (per lot) – roofs, carparks, driveways, paved areas.
Roads	70% (each road) – carriageway seal, footpaths, vehicle crossings, paved areas.

### 3.2. Runoff Curve Numbers

Existing soils are made up of ash deposits (clays, silts, tuff). The following curve number (CN) values are proposed for this site. These will be confirmed after completion of geotechnical investigations:

**Table 4: Runoff Curve Numbers and Initial Abstraction**

Cover Type	CN	Initial Abstraction
Pre-Development Pervious (Pasture)	61	5.0
Post-development Pervious (Lots and Roads)	74	5.0
Pre and Post-Development Impervious (Roads/Roof/Paving)	98	0

### 3.3. Rainfall Data

The following tables summarise the 24hr rain depths to be used at this site, which are based on TP108 rainfall charts for the site location and TR2013/035 Figure 14 for the 95<sup>th</sup> percentile depth. The climate change increases outlined in the SWCoP v4 have then been applied to account for a 3.8°C (for 1% AEP events) or 2.1°C (for all other rainfall events) increase in temperature.

A retention depth of 5.0mm is used and the detention depth has been calculated as the difference between the pre-development and post-development runoff volumes from the 95<sup>th</sup> percentile, 24hr rainfall event minus the retention volume for all impervious areas.

24hr DESIGN STORMS	Retention	95th Percentile	50% AEP+ 15.1%CC	10% AEP+17.0%CC
ARI (yr)			<b>2yr+CC</b>	<b>10yr+CC</b>
Design Rainfall (mm)	<b>5.0</b>	<b>32.0</b>	<b>73.0</b>	<b>121.0</b>
Design Rainfall + CC (mm)			<b>84.0</b>	<b>141.6</b>

#### SMAF RETENTION AND DETENTION VOLUME CALCULATION (ARC TP 108)



Figure 14. 95<sup>th</sup> percentile 24 hr rainfall depth (mm)

#### RETENTION DEPTH

95th Percentile Depth	<b>32</b>	mm
Retention (volume reduction) depth	<b>5</b>	mm

from TR2013035 map

#### DETENTION DESIGN DEPTH

$$= \text{Post Dev Runoff Depth} - \text{Pre Dev Runoff Depth} - \text{Retention Depth}$$

	Impervious Surfaces	
	Pre Development	Post Development
P24 (rainfall depth) (mm)	32	32
CN	<b>74</b>	98
Ia	5	0
$S = ((1000/CN) - 10) * 25.4 =$	89.2	5.2
$Q24 = (P24 - Ia)^2 / (P24 - Ia + S) =$	6.3	27.5
$Vd = Q24_{post} - Q24_{pre}$	<b>21.3</b>	mm
Detention (temporary storage) depth	<b>16.3</b>	mm

## 4. Stormwater Management

As the site falls outside the Regionwide NDC, a comprehensive stormwater approach will be applied. At a high level this will include:

- best practice stormwater treatment devices;
- hydrology mitigation i.e. 5mm retention and extended detention for the 95 percentile storm runoff; and
- allowance for climate change to accordance with the Auckland Council Stormwater Code of Practice.

### 4.1. Proposed Stormwater Management

#### Catchments

Pre- development stormwater catchment plan is provided in Appendix 1.

At present the site falls into six separate stormwater catchments as follows:

**Table 5: Pre-Development Catchments**

	Pre-Development Area	Catchment Discharge
Catchment 1	60.74 ha	Stream
Catchment 2	14.93 Ha	Coastal
Catchment 3	1.72 Ha	Wetland
Catchment 4	12.89 Ha	Stream
Catchment 5	19.91 Ha	Stream
Catchment 6	39.81 Ha	Stream

During the substantive design phase, earthworks will be designed to provide for the proposed development. As a result, the post-development catchments may differ slightly to the pre-development catchments. The catchments will be designed to ensure that:

- retained wetlands are not water shorted; and
- there are no adverse effects on downstream properties by ensuring that 1% AEP flows do not exacerbate any downstream flooding.

## Treatment

The stormwater concept for this referral application stage includes communal raingardens, which will provide stormwater quality treatment (90<sup>th</sup> percentile storm), and extended detention (95<sup>th</sup> percentile storm) where required for the impervious road reserve areas.

The raingardens shall be designed in accordance with GD01 to treat the 90<sup>th</sup> percentile water quality storm. Stormwater devices and sizing calculations shall be provided as part of the substantive application.

Treatment of all neighbourhood centre and light industrial impervious areas will be via water quality devices designed in accordance with GD01 for the relevant contaminants (except where roof water is captured for re-use, the roof water will not be required to be treated). These are likely to be devices contained within each lot such as stormfilters, raingardens, SW360 cartridge filters (or similar type underground devices) and underground vaults (or similar).

## Industrial or Trade Activities

The proposed activities to locate in the neighbourhood centre and light industrial areas may contain activities which are listed as low, moderate or high risk "industrial or trade activities". The substantive application will address which activities are specifically provided for and their associated gross floor areas. Each activity will be assessed for its compliance as either a low, moderate or high risk activity which appropriate stormwater management controls/devices proposed for each activity (eg. 360 cartridge filters or similar type underground devices etc).

## Hydrology Mitigation

Generally, hydrology mitigation for catchments draining to the stream/wetlands will require 5mm retention and extended detention (95<sup>th</sup> percentile storm) to be provided.

Retention and extended detention for road reserves will be provided at end-of-pipe by way of communal raingarden devices. On individual lots; this will typically be achieved by way of tanks (above or below ground) for roof runoff. Should rainwater tanks be used for water supply to the residential lots, then detention volumes and drawdown orifices shall be included in the rainwater tanks.

The retention and extended detention devices will discharge via a piped outlet to streams or wetlands to ensure water flows are maintained to pre-development levels. In storms larger than the 95<sup>th</sup> percentile (extended detention) event, a secondary outlet will engage, discharging to the stream or wetland. In the case of raingardens, this reduces the velocities through the raingarden in large storm events and allows for two smaller outfall structures to be utilised rather than a single outfall catering for the full flow.

Low flows to the remaining wetlands will be maintained in some cases by discharge from a separate "clean water" pipe which drains from lot connections only.

## Coastal Catchment

Along the southern border of the site, the land drains via a series of concentrated and sheet flows to the coast. The coastal environment is an estuarine ecosystem and parts of the estuary near the site are identified as SA1.2 mangrove forest and scrub occurring in areas of frequent tidal inundation with abundant silt deposition, particularly near stream and river mouths. To protect these ecological systems, stormwater discharges will be treated and managed to minimise sedimentation rates.

## Stormwater Reticulation

The stormwater design will comprise catchpits and a pipe network draining to the proposed raingardens, which will provide retention, extended detention, as required, and treatment. The pipe network will be designed to accommodate the 10 year storm plus climate change.

All lots will be provided with individual lot connections to either the piped network which discharges into the proposed raingardens or clean water will be discharged directly to wetlands to ensure minimum flows are maintained to the wetlands.

## Overland Flow Paths

The secondary stormwater network will be designed to manage overland flows from the site and upstream catchment for the 1% AEP rain event including for the potential effects of climate change.

In general, overland flow paths will be within the road reserve areas and be designed for safe conveyance of overland flows with minimal risk to road users and the local community. Final details will be provided as part of the substantive consenting process.

In accordance with the Auckland Council Stormwater Code of Practice, the overland flow paths shall be designed to contain the 100 year storm peak flow within the proposed road reserves and the drainage reserve wherever practicable. If required, overland flow paths designed to cater for the 100 year storm peak flow within private properties greater than 0.4ha shall be protected by way of registered easement. The majority of overland flows will flow to the central stream. For the remaining 100 year overland flows from the southern catchment, discharge locations shall be managed to match existing discharge locations.

## Floodplain Management / Water Quantity

The Auckland Council GIS shows some areas of flooding within the site that are principally minor low-lying areas prone to water accumulation with limited permeability of existing soil leading to slow water absorption. Refer to Figure 4 – Floodplains (Source Auckland Council GIS) on page 6 of this report.

The stormwater catchments will be designed at the substantive application stage to ensure that there are no adverse effects to downstream properties in terms of flooding in 1% AEP events as well as ensuring that downstream ecological features are not impacted by water shorting.

During the substantive design phase, ecological and geological assessment of the streams will be undertaken to determine whether attenuation of the increased peak flows and velocities will be needed to mitigate erosion impacts within the stream. As the soils in the area are cohesive and allow for minimal infiltration, and the gradient of the stream is gradual, it is likely that attenuation of the full post development flows will not be required. This will be confirmed during the substantive design phase. Should it be determined that the increased flows will degrade the stream, then attenuation

can be provided via detention basins. Energy dissipation at outlets and riparian planting of the stream will be provided.

All proposed habitable floor levels shall be located outside of 1% AEP flood extents.

## Device Selection

The following table outlines acceptable stormwater management devices that may be incorporated into the final design. Stormwater devices will be designed in accordance with GD01.

**Table 6: Stormwater Mitigation Devices**

	Purpose	Suitability
Rainwater Tanks	Retention / Extended Detention	Private lots within all catchments.
Cartridge Filters	Treatment	Private lots within all catchments.
Permeable Pavements	Retention / Extended Detention	Residential areas with space constraints within all catchments.
Rain Gardens / Bioretention Devices	Treatment/Retention/Extended Detention	All catchments
Swales / Vegetated Channels	Treatment	All catchments
Constructed Wetlands	Attenuation/Treatment/Retention/Extended Detention	All catchments
Detention Basins	Attenuation - Temporarily store runoff to reduce peak flow	All catchments
Energy Dissipation Structures	To reduce velocities at outfalls and therefor prevent erosion	All discharges to streams, wetlands or coast.
Outfall Relocation	Move discharge point to more resilient location to prevent erosion	Coastal catchments

The substantive application will address device selection.

## Ownership

As the site falls outside the Regionwide NDC, some of the stormwater management devices may not vest in Auckland Council. The concept has endeavoured to ensure compliance with the relevant engineering standards should they be accepted and vesting be achieved in the future, however should vesting not occur, all devices will remain in private ownership (with communal devices managed by a Residents Association or similar).

## 5. Pre-application meeting

A pre-application meeting was held on 28 July with Auckland Council. The matters largely raised related to lists of likely resource consent triggers (which is not a matter addressed by this stormwater memorandum). The other matters were agreed to be those which would require further detail as part of the substantive application and include

- Provision of an ecological report to address catchment and hydrology changes,
- Specific detail of stormwater devices
- Further detail on earthworks and effects on floodplains

## 6. Conclusion

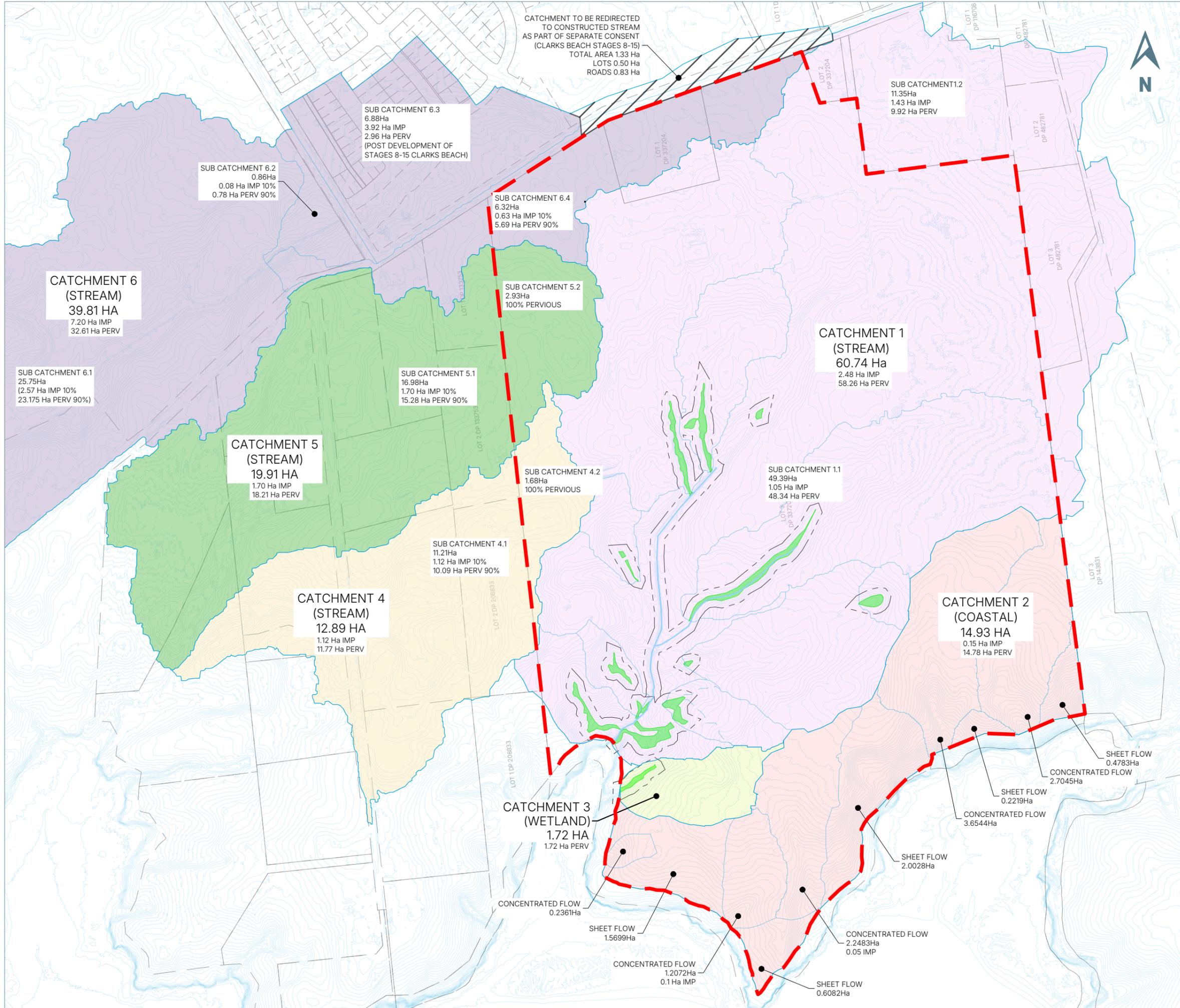
The proposed development site is situated outside the Auckland Council Network Discharge coverage, and there is no existing Stormwater Management Plan (SMP) established for this catchment.

As part of the substantive application a comprehensive stormwater management plan will be developed. It is expected that the stormwater management plan will broadly incorporate stormwater management principles for the proposed development which will:

- Provide best-practice stormwater quality treatment for the 90th percentile storm.
- Providing retention of a minimum of 5mm runoff depth for all impervious areas discharging to streams.
- Provide extended detention for the 95th percentile storm with a drain-down period of 24hrs for the difference between the pre-development and post-development runoff volumes minus the retention volume for all impervious areas discharging to streams/wetlands.
- Ensure no adverse impact on downstream catchments or freshwater features from changes to catchments or water quantity.

# APPENDIX 1

## Stormwater Catchment Plan



- LEGEND**
- EXISTING
  - SITE BOUNDARY
  - STORMWATER CATCHMENT BOUNDARIES
  - PERMANENT STREAM
  - 10m OFFSET FROM WETLAND AND PERMANENT STREAMS
  - WETLAND

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PROJECT TITLE:  
**KNIGHT INVESTMENTS LIMITED  
 CLARKS BEACH ROAD  
 CLARKS BEACH**

SHEET TITLE:  
**PRE-DEVELOPMENT  
 STORMWATER CATCHMENT PLAN  
 OVERALL LAYOUT**

SCALE: (A1/A3) 1:2500 / 1:5000  
 SCALE BAR 15000@A3 0 50 100 150 200 250m

ISSUE STATUS: **DRAFT@03.07.2025**

PROJECT NUMBER: **2296-01** DRAWING NUMBER: **SK01-2** REV: **-**

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DRAWN: - CHECKED: - APPROVED: -