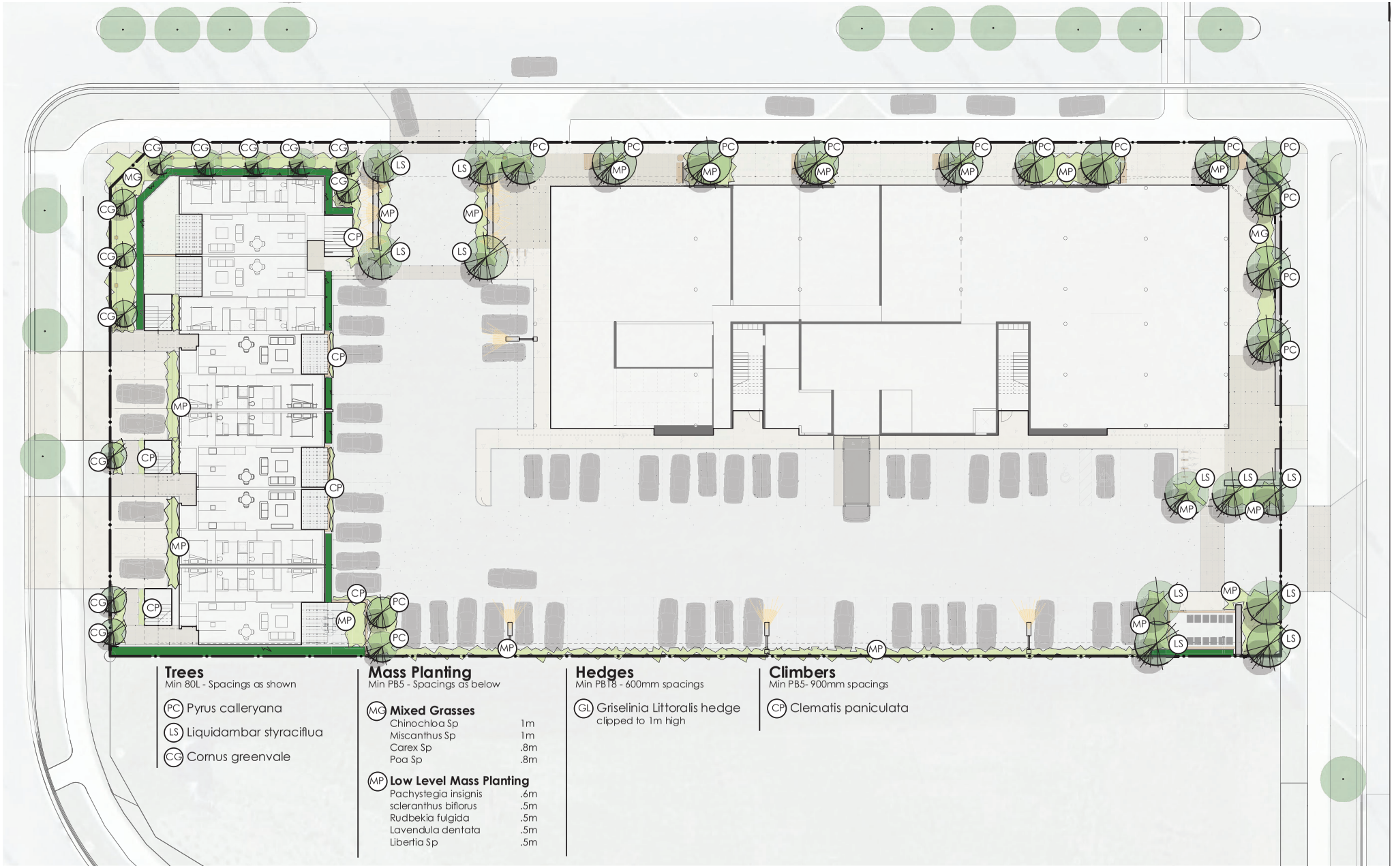

Trees
Min 80L - Spacings as shown

- (PC) Pyrus calleryana
- (LS) Liquidambar styraciflua
- (CG) Cornus greenvale

Mass Planting
Min PB5 - Spacings as below

(MG) **Mixed Grasses**

Chinochloa Sp	1m
Miscanthus Sp	1m
Carex Sp	.8m
Poa Sp	.8m

(MP) **Low Level Mass Planting**

Pachystegia insignis	.6m
scleranthus biflorus	.5m
Rudbekia fulgida	.5m
Lavendula dentata	.5m
Libertia Sp	.5m

Hedges
Min PB18 - 600mm spacings

- (GL) Griselinia Littoralis hedge clipped to 1m high

Climbers
Min PB5- 900mm spacings

- (CP) Clematis paniculata

Northlake Commercial Centre - **Planting plan**

18 February 2021

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NORTHLAKE COMMERCIAL & VISITOR ACCOMODATION DEVELOPMENT

INFRASTRUCTURE REPORT

PROJECT:	Northlake Commercial & Visitor Accommodation Development
CLIENT:	Northlake Investments Limited
OUR REF:	W6204
DATE:	FEB 2021

REVISION / APPROVAL PANEL

Rev:	Date:	Prepared By:	Reviewed By:	Comments:
0	22/02/21	AGT	MJB	Issued for resource consent application

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1. SCOPE

This report covers the availability of the following infrastructure elements and is intended to accompany a resource consent application for a commercial and visitor accommodation development to be located on Lot 1006 DP 515015.

- Earthworks
- Roading
- Stormwater
- Wastewater
- Water Supply – Potable and Firefighting
- Network Utility Services – Electricity and Telecommunications

A separate report covering access and parking provisions has been prepared by Carriageway Consulting and is included with the application at Appendix F.

1.1 Description of Proposed Development

The proposed development can be broken down as follows

- Building 1:
    - 6 retail tenancies of varying size all located on the ground floor
    - 13 visitor accommodation units all located on the first floor. All units have 2 bedrooms and 2 bathrooms except Unit 4 which has 1 bedroom and 1.5 bathrooms.
- Building 2:
    - 12 visitor accommodation units split across the ground and first floors. All units have 2 bedrooms and 2 bathrooms.
- Carparking, loading and vehicle manoeuvring area
- Landscaping and footpaths

2. EXISTING SITE DESCRIPTION

2.1 General

The site of the proposed development is legally described as Lot 1006 DP 515015 which was created as part of Northlake Stage 2 (RM 160509) and titled in 2017. The site has an area of 4580m^2.

The site is located between Cluden Crescent (western boundary), Mt Linton Avenue (eastern boundary) and Northlake Drive (northern boundary) – Refer to Figure 1. To the south of the site is a local purpose reserve (stormwater) that is legally described as Lot 1007 DP 515015 and is vested in the Queenstown Lakes District Council.

The site is currently used as a laydown area for other Northlake related construction activities.

Figure 1: Site location

The site is relatively flat, with a gentle 1% grade from the northwest to southeast corners.

2.2 Existing Services

Multiple connections for stormwater (SW), wastewater (WW) and water supply (WS) were constructed for Lot 1006 as part of the Northlake Stage 2 civil construction works. These are generally located in the northwest and southeast corners of the site. Figure 2 below shows the location of the existing services. This figure is snipped from the as built plan that was supplied to Council at the time of RM 160509 224c application. We have checked the QLDC online services GIS database and confirm that this is consistent with the as built plans with the only exception being that the second set of SW and WW along Northlake Drive are shown as 'pending' on the GIS database. We confirm that these laterals were installed as part of RM160509.

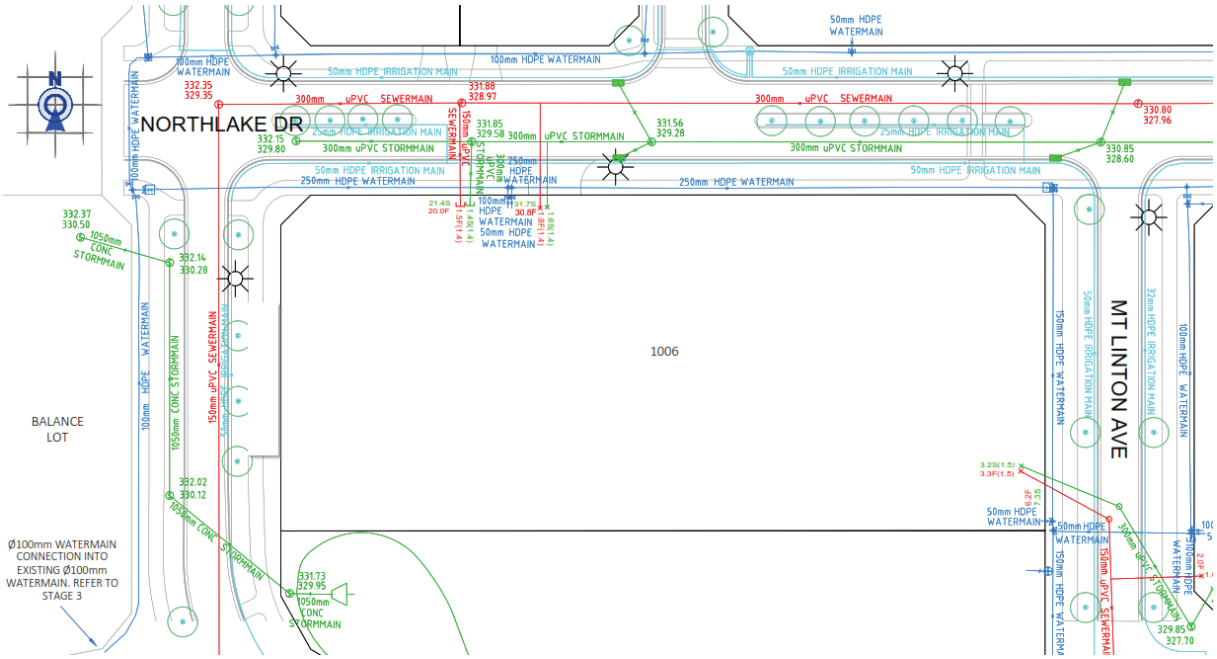

Figure 2: RM160509 as-built for Lot 1006 DP 515015

2.3 Geology and Soil Conditions

B F Witham Ltd have prepared a geotechnical completion report (GCR) for the Northlake Stage 2 subdivision dated 12 October 2017. The following is a summary of key elements from that report that will affect the proposed development.

- Lot 1006 current ground level is the result of earthworks during the construction of this lot consisting of up to 0.5m cut (generally located to the west of the site) and up to 1.0m fill (generally located along the southern boundary of the lot).
- The subgrade over Lot 1006 will achieve a minimum of 200kPa ultimate bearing capacity therefore any foundations requiring an ultimate bearing capacity of greater than 200kPa will require specific engineering design.

3. EARTHWORKS

3.1 Sequencing

The methodology and sequencing of earthworks will ultimately be left up to the appointed contractor, however the following list is the expected sequencing.

- Prepare an Environmental Management Plan (EMP) that includes an Erosion and Sediment Control Plan (ESC) and obtain approval of this from QLDC.
- Instal ESC measures
- Remove any items from site that are remaining from its current use as a site laydown.
- Strip topsoil
- Prepare subgrade ready for building activity to commence
- Construct drainage, water supply, utility services, carparking and footpaths. This is likely to occur in

parallel with the later stages of the building construction.

- Construct landscaping
- Removal of erosion and sediment control measures is likely to be progressive throughout the build phase as certain areas become stabilised and the risk of environmental effects is reduced.

3.2 Proposed Earthworks

Earthworks are required to prepare the site for the proposed construction works. Earthworks will generally only be required over that portion of the site that is currently covered in topsoil which covers a total area of approximately 2475m^2. Refer to Figure 3 below.

Figure 3: Areas requiring topsoil stripping

Once the site is stripped of topsoil, there will only be a minimal amount of grading required to prepare the site subgrade for the building floor slab works. It is proposed that Building 2 will have a stepped floor slab to account for the change in height in the west-east elevation therefore only a nominal volume of earthworks has been shown in the overall earthworks volumes for consent.

The estimated earthworks quantities for the proposed development are shown in Table 1. Given the simplicity of the proposed earthworks a specific set of drawings is not deemed necessary and has therefore not been prepared.

Description	Proposed Volume (m^3)
Strip topsoil	250
Trim subgrade (cut to fill locally)	50
Imported metal products to construct carpark and footpaths pavement	600
Total Earthworks	900

Table 1:Proposed Earthworks Volumes

The quantities presented in Table 1 are based on the following assumptions.

- Existing topsoil depth is approximately 100mm deep. This was the topsoil respread design depth at the time of the underlying works for Lot 1006 DP 515015
- A nominal allowance / estimate or 50m^3 cut to fill within the site to create level subgrade pads for the building foundations
- Carpark and footpath pavements will be on average 300mm thick
- Excavated soils from foundation footings, drainage and utility service trenches were not included in this calculation.

3.3 Earthworks Assessment

The proposed earthworks have been assessed against the site and zone standards for the Northlake Special Zone as outlined below.

Site standards 12.34.4.1.ix	Comments
12.34.4.1.ix.(a).(i) The total volume of earthworks does not exceed 200m3 per site (within a 12-month period). For clarification of "volume", see interpretative diagram 5	Does not comply The proposal will require earthworks for the movement of topsoil, construction of carpark and footpath pavement and the installation of services. The total quantity of earthworks required is estimated to be 900m^3
12.34.4.1.ix.(a).(ii) The maximum area of bare soil exposed from any earthworks where the average depth is greater than 0.5m shall not exceed 400m² in area within that site (within a 12 month period).	Complies The area of topsoil to be stripped is 2475m however the topsoil is only 100mm deep. The remainder of the works required to grade the site in preparation for building construction will only require a depth of 200mm-300mm. Therefore the provisions of this rule will not be exceeded.
12.34.4.1.ix.(a).(iii) Where any earthworks are undertaken within 7m of a Water body the total volume shall not exceed 20m³ (notwithstanding provision 17.2.2).	Complies No proposed earthworks are within 7m of a waterbody
12.34.4.1.ix.(a).(iv) No earthworks shall: a. expose any groundwater aquifer; b. cause artificial drainage of any groundwater aquifer; c. cause temporary ponding of any surface water	Complies a) & b) no earthworks are proposed within a groundwater aquifer c) no surface water ponding is proposed
12.34.4.1.ix.(b).(i) The vertical height of any cut or fill shall not be greater than the distance of the top of the cut or the toe of the fill from the site boundary (see interpretative diagram 6). Except where the cut or fill is retained, in which case it may be located up to the boundary, if less or equal to 0.5m in height.	Complies The proposed works only involve very minor cuts and fills (<400mm). Proximity to boundary rule is not exceeded.

12.34.4.1.ix.(b).(ii) The maximum height of any cut shall not exceed 2.4m.	Complies The maximum height of any cut will be <400mm

Table 2: Earthworks assessment

3.4 Erosion and Sediment Control

An Environmental Management Plan (EMP) that includes an Erosion and Sediment Control Plan (ESC) will be prepared in accordance with the *QLDC Guidelines for Environmental Management Plans (June 2019).* This EMP will be submitted to QLDC for review and acceptance prior to the commencement of any works on the site.

4. ROADING

4.1 Vehicle Crossings

There is one existing vehicle crossing servicing this site which is located on Northlake Drive towards the western side of that road frontage, refer to Figure 4. The existing crossing will need to be removed and a new crossing installed slightly further west towards Cluden Crescent. The proposed new crossing will be designed and constructed in accordance with QLDC LDSCoP Appendix B Drawing B5-19. Specific details relating to this new crossing will be supplied at the time of Engineering Acceptance.

Figure 4: Existing vehicle crossing off Northlake Drive (looking west)

A new vehicle crossing is required in the south east corner of the site off Mt Linton Avenue. This proposed crossing will also be designed and constructed in accordance with QLDC LDSCoP Appendix B Drawing B5-19 and specific details relating to this new crossing will be supplied at the time of Engineering Acceptance.

The access and parking report prepared by Carriageway Consulting discusses the location of these two vehicle crossings and assesses their suitability against the requirements of the District Plan.

4.2 Alterations to Public Roads

4.2.1 Parking Bay off Mt Linton Ave

An existing recessed parking bay located on Mt Linton Avenue will need to be removed to enable the vehicle crossing off this road to be constructed. See Figure 5 and Figure 6. This will reduce on street parking on Mt Linton Ave by 2 car parking spaces.

Figure 5: Proposed vehicle crossing off Mt Linton Ave (looking north) – also showing recessed parking bay to be removed

Figure 6: Existing recessed carpark to be removed. Looking west across Lot 1006.

4.2.2 Modifications to Existing Footpath / Central Island

It is proposed to widen the existing footpath on Northlake Drive, from Mt Linton Ave to Cluden Crescent, from 2.0m to 3.0m. Mt Linton Ave and Cluden Crescent footpaths will remain at 1.5m though the tie-ins to the new 3.0m footpath will need to be reformed. Similarly, the existing pedestrian crossing across Northlake Drive will remain at 1.5m wide. The widened footpath will continue west along Northlake Drive past the Cluden Crescent intersection to a new pedestrian crossing across Northlake Drive. The new 3.0m wide footpath will then link to the existing 3.0m wide footpath within the Northlake recreation reserve (Lot 1000 549205) and through Northlake Stage 15 to Outlet Road. Refer to Figure 7 and Figure 8 for location of footpath to be upgraded.

Additional design detail will be provided at the time of Engineering Acceptance. This detail will include footpath pavement information, location of new drop-down kerbs required and construction detail for new pedestrian crossing across Northlake Drive.

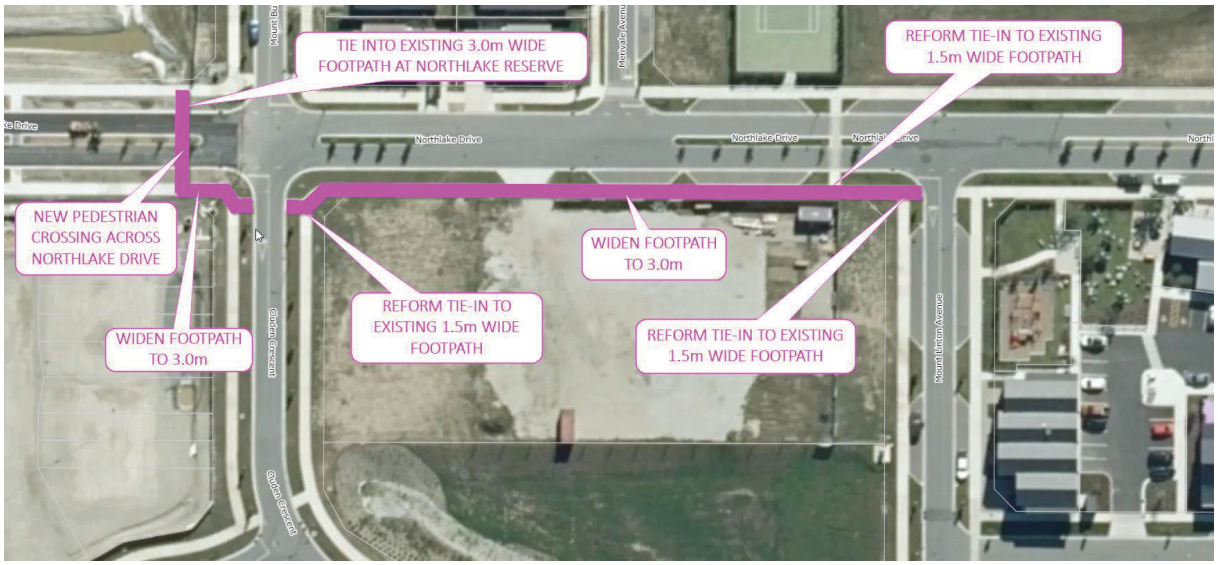

Figure 7: Northlake Drive footpath to be widened

Figure 8: Alignment for 3.0m wide footpath to tie in with Northlake Reserve 3.0m wide footpath

4.3 Proposed Carpark

The proposed carpark is outlined in both the Architectural Drawings (Appendix B to the AEE) and the Access and Parking Assessment (Appendix F to the AEE) therefore no additional detail regarding the geometric design of the carpark is necessary in this report.

Detailed design of the carpark will be supplied to QLDC with the future Engineering Acceptance application. This will include the following details

- Longsection and typical cross sections
- Pavement design information including subgrade design and pavement depths
- Kerb types
- Surfacing detail
- Crossing point construction details.

It is proposed that all car parking design details will conform to the requirements of the QLDC LDSCoP.

5. STORMWATER

5.1 Existing Reticulation

Lot 1006 falls within Northlake stormwater Catchment A (Catchment A). Catchment A has been reported on extensively throughout the consents and EA phases of Northlake Stages 1-10 & 12 and the Village Centre lots, which includes Lot 1006, therefore runoff from Lot 1006 has already been allowed for. The reporting and design details for Catchment A have been approved by QLDC and all core infrastructure approved to date has been constructed.

Lot 1006 has been provided with the following existing stormwater connections

- Ø300mm uPVC mains connection off MH ID 306877 in Northlake Drive
- Ø150mm uPVC lateral connection off SW Line ID 305051 in Northlake Drive
- Ø150mm uPVC lateral connection off MH ID 306844 in Mt Linton Ave

Refer to both Figure 2 and the QLDC GIS database for further details.

5.2 Basis of Existing Calculations

The original stormwater calculations and report prepared by Riley Consultants for Northlake Catchment A show that an average impervious area of 65% was allowed for in the area referred to as *Development Area – D* (refer to Page 11 / Table 3 and Page 14 / Figure 7 of the Riley's report which is included as Appendix A of this infrastructure report). The pervious / impervious areas for the proposed development are as follows.

- Pervious area (%) 10%
- Impervious area (%) 90%

When considered in isolation, the proposed impervious area is more than originally anticipated, however Figure 7 of the Riley's report shows that existing Lot 1007 DP 515015 is also part of *Development Area D*. This lot, a local purpose reserve, can be considered to have a pervious area of close to 100% so that when we consider Lots 1006 and Lot 1007 together, the combined pervious / impervious areas are now within the parameters of the original calculations as shown below.

- Pervious area (%) 55%
- Impervious area (%) 45%

Detailed design of the internal SW reticulation for Lot 1006 will need to consider how best to utilise the existing SW connections with particular attention given to the capacity of the existing pipe infrastructure within Northlake Drive and Mt Linton Ave.

5.3 Proposed Internal Stormwater Reticulation

Stormwater from the roof of proposed buildings 1 & 2 and all carparking and hard stand areas will be discharged into the piped drainage reticulation constructed as part of the underlying subdivision works.

Detailed design showing the proposed stormwater network will supplied to QLDC with the future Engineering Acceptance application. It is proposed that all elements of the stormwater design will conform to the requirements of the QLDC LDSCoP.

5.4 Secondary Overland Flow Paths

Existing secondary overland flow paths for the area surrounding the site are shown on Figure 9 as black arrows. The existing overland flow from the undeveloped lot are shown in the same Figure 9 as green arrows.

Figure 9: Existing stormwater secondary overland flow paths

The detailed design of the proposed footpaths, carparks and other hardstand areas as well as landscaping areas will maintain the existing secondary overland flow path.

6. Wastewater

6.1 Existing Reticulation

Existing wastewater mains infrastructure surrounding the site is as follows

- Ø150mm uPVC main (ID 304944) in Cluden Crescent

- Ø300mm uPVC main (ID 304931) in Northlake Drive
- Ø150mm uPVC main (ID 300052) in Mt Linton Ave

Lot 1006 has been provided with the following existing wastewater connections

- Ø150mm uPVC lateral connection off MH ID 305239 in Northlake Drive
- Ø150mm uPVC lateral connection off WW Line ID 304931 in Northlake Drive
- Ø150mm uPVC lateral connection off MH ID 305256 in Mt Linton Ave

Refer to both Figure 2 and the QLDC GIS database for further details.

The Northlake wastewater network has been designed to service the entire Northlake Investments Limited land holding which includes the Village Centre lots i.e. Lot 1006 DP 515015.

6.2 Wastewater Demand

Wastewater demand calculations for the proposed development show that the estimated predicted peak flow is 0.6L/s.

This calculation assumes

- heavy industrial water usage of 1.3 litres/second/hectare as outlined in the QLDC LDSCoP Table 5.1.
- Conservatively uses the area of the lot rather than just the building footprint.

7. WATER SUPPLY

7.1 Existing Reticulation

Existing water supply mains infrastructure surrounding the site is as follows

- Ø250mm ID HDPE main (ID 304781) located on the south side of Northlake Drive
- Ø150mm ID HDPE main (ID 304780) located on the west side of Mt Linton Ave

Lot 1006 has been provided with the following existing water supply connections

- Ø100mm lateral connection off Northlake Drive Ø250mm ID HDPE main. This lateral has an existing gate valve.
- Ø50mm lateral connection off Northlake Drive Ø250mm ID HDPE main. This lateral has an existing gate valve.
- Ø50mm lateral connection off Mt Linton Ave Ø150mm ID HDPE main. This lateral has an existing gate valve.

Refer to both Figure 2 and the QLDC GIS database for further details.

7.2 Firefighting

Existing fire hydrants are located at the northwest and northeast corners of the site on the Ø250mm ID HDPE main in Northlake drive.

An additional hydrant is located on Obelisk Street, near the Cluden Crescent / Obelisk Street intersection, which is 75m from Building 2.

The ground floor retail area of Building 1 will be fitted with sprinklers therefore the water supply classification per PAS4509:2008 will be FW2 for this component.

The visitor accommodation units are not proposed to be fitted with sprinklers therefore Building 2 (both floors) and the first floor of Building 1 will be classified as FHC1 (0-199m^2) and therefore FW3. Table 2 in PAS4509:2008 states that for a FW3 fire water classification, the required flow within a distance of 135m is 25L/s with an additional 25L/s within a distance of 270m. The hydrants along Northlake Drive identified above were not tested at the time of the underlying subdivision however the next 4 hydrants along Northlake Drive were tested as part of the Northlake Drive construction. A copy of these results is attached at Appendix D. These results show that FW2 fire fighting supply is available and they suggest that FW3 is also achieved though this will be confirmed as part of the detailed design phase for this project.

8. UTILITY SERVICES

8.1 Electricity

A suitable electrical connection is available to Lot 1006 for the proposed development. Refer to Appendix B for the PowerNet supply confirmation letter.

8.2 Telecommunications

A suitable telecommunications connection is available to Lot 1006 for the proposed development. Refer to Appendix C for the Chorus supply confirmation letter.

9. CONCLUSION

Based on our knowledge of this site as well as an assessment of the existing infrastructure we conclude that the proposed development at Lot 1006 DP 515015 can be adequately serviced in accordance with Council's standards.

Alex Todd
Principal, MS+SNZ
Paterson Pitts Limited Partnership

APPENDIX A: Riley Consultants - Northlake Stormwater Report

RILEY CONSULTANTS

NORTHLAKE STORMWATER OVERVIEW REPORT

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NORTHLAKE STORMWATER OVERVIEW REPORT

Report prepared for: Northlake Investments Ltd

Report prepared by: Mike Heiler, Senior Engineer, Central Otago

.....

Report reviewed by: Steven James, Director, CPEng

.....

Report reference: 150693-C

Date: 8 April 2016

Copies to: Northlake Investments Ltd Electronic copy

Riley Consultants Ltd 1 copy

Issue:	Details:	Date:
1.0	Northlake Stormwater Overview Report	8 April 2016

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NORTHLAKE STORMWATER OVERVIEW REPORT

1.0 Introduction

This briefing document has been prepared by Riley Consultants Ltd (RILEY) at the request of Northlake Investments Ltd. It presents an outline of the stormwater management philosophy for the area covered by the Northlake Outline Development Plan (ODP) as well as a summary of the methodology applied for the design to date.

This report is intended to provide an overview of the design to date. Revisions to the design are anticipated based on further refinement of the subdivision layout.

2.0 Scope of Works

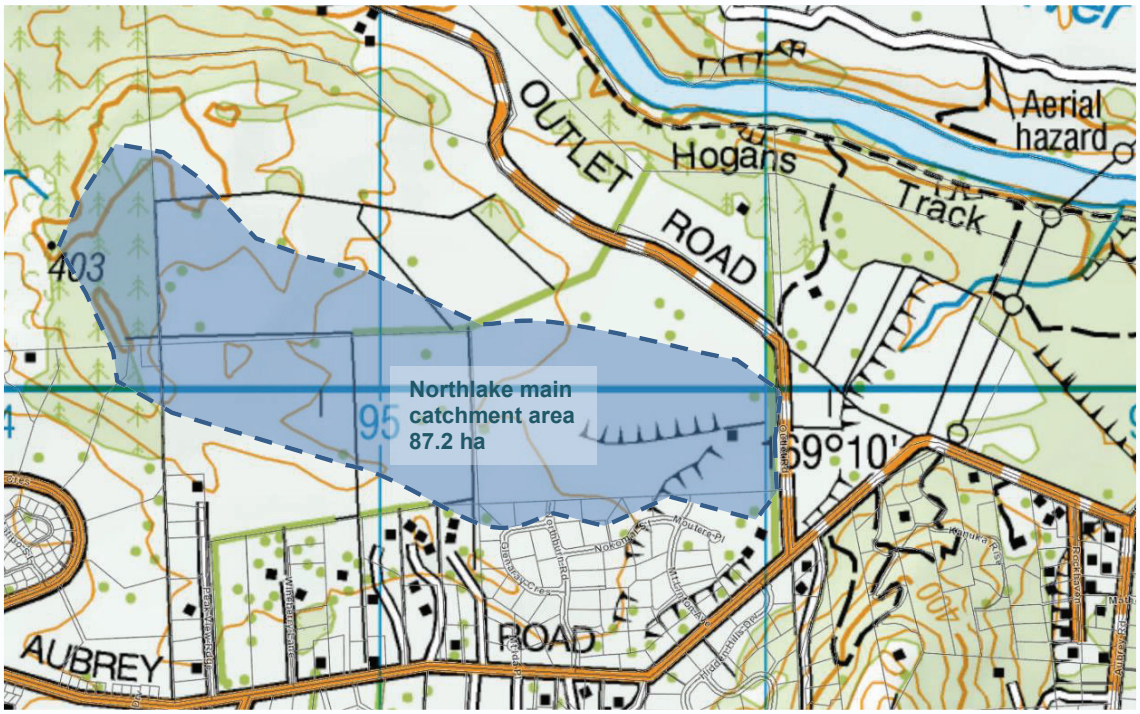
As part of this assessment, RILEY has undertaken the following tasks:

1. Undertaken site visits to gain an understanding of the site and upstream catchments.
2. Assessed all available Queenstown Lakes District Council (QLDC) and development design data with respect to design standards for the development.
3. Identified existing catchment flowpaths in relation to the ODP development.
4. Completed a hydrological and hydraulic assessment of the stormwater design for the subdivision to quantify peak design storm flows and volumes. This has been undertaken for the fully developed catchment that contributes flows through the ODP area. Two methods of hydrological analysis have been applied as outlined in this report.
5. Undertaken various revisions to hydraulic design of the stormwater structures as the development layout has been modified and updated.
6. Worked collaboratively with Paterson Pitts Group during the development of the Stage 1 to 7 Master Plan layout to ensure stormwater requirements can be met.
7. Attended workshops with Northlake Investments Ltd, Baxter Design Group, and Paterson Pitts Group to discuss options for stormwater management, including:
    a. Use of roadways as overland flowpaths.
    b. Discussion of attenuation requirements.
    c. Discussion of stormwater quality requirements.
    d. Discussion and agreement on the potential to modify the development layout to better incorporate stormwater management options.

3.0 Catchment Description

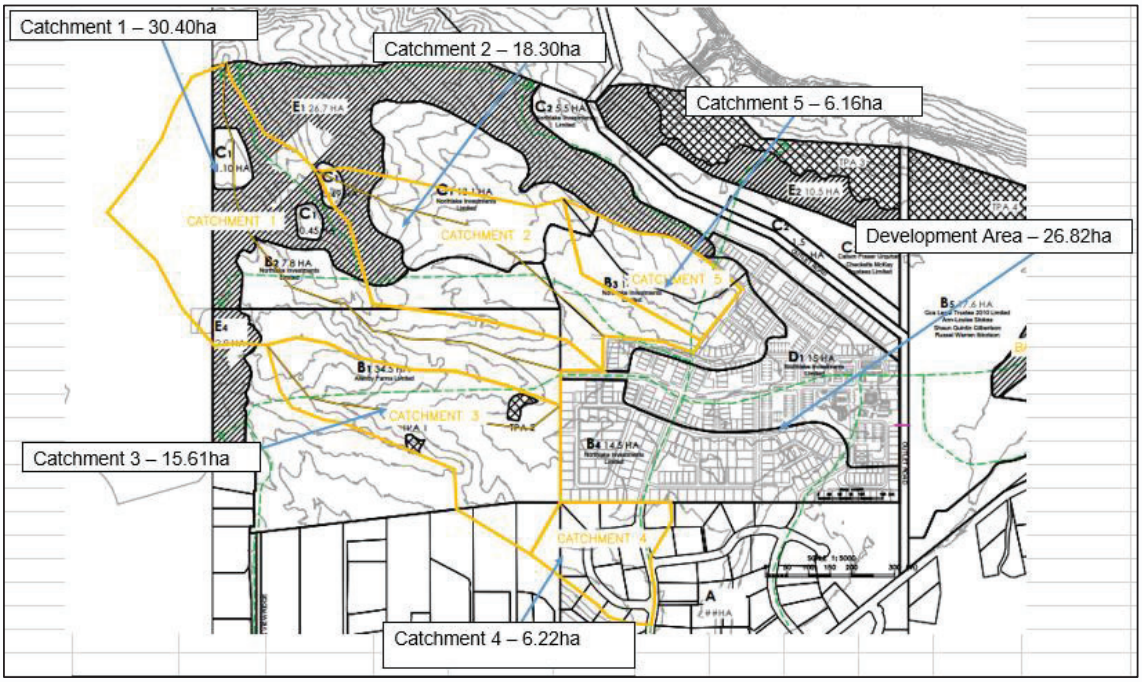
The main catchment at Northlake runs west to east and covers an area of approximately 87 hectares, as shown in Figure 1. The catchment drain forms a wide ephemeral overland flow channel through the centre of the development area. The discharge point from the development is across Outlet Road approximately 330m north of the Aubrey Road intersection. To the east of Outlet Road the channel enters a more deeply incised and steep gully draining to the north-east to the Clutha River.

Figure 1: Northlake main catchment extents



The catchment upstream of the ODP area has been split into various sub-catchments based on existing flowpaths, as shown in Figure 2.

Figure 2: Contributing catchments upstream of ODP area



4.0 Stormwater Design Requirements

At the time of this report, Northlake development is in the ODP process. As such, no land use or discharge resource consents have been applied for. Set out below are various matters relating to stormwater design requirements.

4.1 QLDC Land Development and Subdivision Code of Practice

Currently, subdivision engineering design is required to be in accordance with QLDC Land Development and Subdivision Code of Practice. This document generally references requirements of New Zealand Standard NZS 4404:2010 Land Development and Subdivision Infrastructure, with a number of amendments.

Provided below is a summary of requirements in the Code of Practice that are relevant to stormwater engineering design for Northlake.

The QLDC Code of Practice specifies the following design storm standard for subdivision development:

> *4.3.5 Design criteria*
> *Discharge to an existing network from a primary system shall be at a rate (litres per second) no greater than would have occurred for the undeveloped catchment during a 60 minute 5 year storm.*
>
> *4.3.5.1 Design Storms*
> *All Primary Systems shall, as a minimum, cater for the worst case 1 in 20 year return period (5% AEP) storm with no surface flooding.*
>
> *Where no secondary flowpath is available the worst case 1 in 100 year return period (1% AEP) storm shall be catered for with no surface flooding.*

The QLDC Code of Practise makes the following comment with regard to Low Impact Design (LID).

> *4.3.7.1 Low impact design stormwater system*
>
> *The Council's preferred method of stormwater control is a low impact design solution. The designer shall gain written approval from the Council's Asset Performance Team that the proposed maintenance requirements are acceptable prior to submitting a design for acceptance.*
>
> *Low impact design is a type of stormwater system that aims to minimise environmental impacts by:*
>
> *(a) Reducing peak flow discharges by flow attenuation;*
> *(b) Eliminating or reducing discharges by infiltration or soakage;*
> *(c) Improving water quality by filtration;*
> *(d) Installing detention devices for beneficial reuse.*

4.2 Proposed Provisions – Plan Change 45 (Northlake Special Zone)

As part of the Northlake Special Zone formed under Plan Change 45, provision for stormwater management was made under Objective 6, as follows:

> *Objective 6 – Infrastructure 6.4. To utilise, where practical, low impact design solutions that minimise adverse environmental effects resulting from stormwater runoff*

Also, under Assessment Matters in the Plan Change 45 provisions, the following comment is made.

> *12.X.7.2 Assessment Matters*
> *In considering whether or not to grant consent or impose conditions, the Council shall have regard to, but shall not be limited by, the following assessment matters:*
>
> *(f) In regard to approaches to stormwater disposal*
> *(i) Whether, where practical, low impact design solutions are employed.*
> *(ii) Whether, where possible, safe and practical proposals to integrate stormwater management facilities into an attractive public realm and/or conservation corridors are proposed.*

4.3 Otago Regional Council Regional Plan - Water

As final discharge is currently proposed to be to the Clutha River, appropriate discharge quality standards for the Clutha River will be conditions of consent by Otago Regional Council (ORC).

Planning Rules and Regulations Rule 12.B.1.8 (May 2014) of the Regional Plan: Water for Otago states that the discharge of drainage water to water from any drain is a permitted activity so long as certain conditions are met. The conditions of particular relevance to the discharge of stormwater from the proposed new roads and residential lots are as follows:

> *Rule 12.B.1.8*
> *The discharge of stormwater from a reticulated stormwater system to water, or onto or into land in circumstances where it may enter water, is a permitted activity, providing:*
> *(a) Where the system is lawfully installed, or extended, after 28 February 1998:*
> *(i) The discharge is not to any Regionally Significant Wetland; and*
> *(ii) Provision is made for the interception and removal of any contaminant which would give rise to the effects identified in Condition (d) of this rule; and*
> *(b) The discharge does not contain any human sewage; and*
> *(c) The discharge does not cause flooding of any other person's property, erosion, land instability, sedimentation or property damage; and*
> *(d) The stormwater discharged, after reasonable mixing, does not give rise to all or any of the following effects in the receiving water:*
> *(i) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or*
> *(ii) Any conspicuous change in the colour or visual clarity; or*
> *(iii) Any emission of objectionable odour; or*

(iv) The rendering of fresh water unsuitable for consumption by farm animals; or

(v) Any significant adverse effects on aquatic life.

4.4 Low Impact Design

As stated above, Northlake is currently in an ODP process and so no stormwater related resource consents have been issued for the development. Council has stated a preference for LID for the development through the Plan Change 45 process.

NZS4404:2010 defines LID as aiming to use natural processes such as vegetation and soil media to provide stormwater management solutions as well as adding value to urban environments.

The main principles of LID are reducing stormwater generation by reducing impervious areas, minimising site disturbance, avoiding discharge of contaminants, managing stormwater as close to the point of origin as possible to minimise collection and conveyance. Stormwater quality and quantity control are the key outcomes from good LID practise.

The general principle in stormwater treatment is to treat the 'first-flush" run-off (that part of the storm that has the highest levels of contaminants). Removal of sediment from the 'first-flush' event will remove many of the contaminants of concern, including; particulate trace metals, particulate nutrients, oil and grease on sediments, and bacteria on sediments.

It is noted that ORC made a submission to Plan Change 45 recommending that water quality should meet or exceed pre-development levels and this has informed the design philosophy.

Stormwater quantity control is achieved by detaining and attenuating stormwater before it leaves the development. QLDC provides specific requirement for stormwater control for discharges to its existing public system. However, discharge from the development will ultimately flow through Department of Conservation land to the Clutha River. Therefore, the ORC Regional Plan – Water is the appropriate document to assess the activity. In particular Rule 12.B.1.8 (c) specifies a permitted activity where the discharge does not cause flooding of any other person's property, erosion, land instability, sedimentation or property damage.

For the development to meet the permitted activity threshold, stormwater will need to be managed to demonstrate that property flooding and land instability will not result. Stormwater quantity control is the most common way of achieving this.

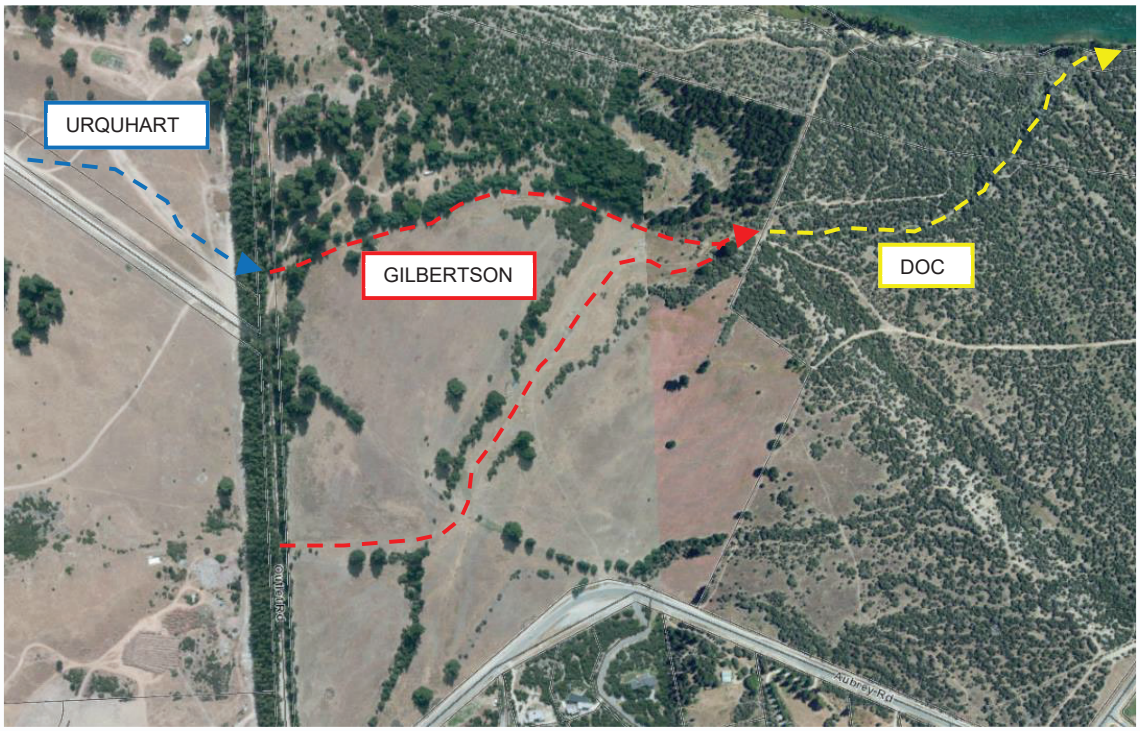
ORC made a submission to Plan Change 45 recommending that peak flows be limited to pre-development levels for the 1% Annual Exceedance Probability (AEP) storm event.

5.0 Stormwater Design Philosophy

5.1 Overview

The ultimate receiving water body is the Clutha River and flooding effects in the river due to increase in flows from the developed area will be insignificant. However, the discharge will pass through Gilbertson's and Urquhart's land as well as Department of Conservation Reserve land, as shown in Figure 3.

Figure 3: Drainage paths downstream of ODP area



The implications of these drainage paths are as follows:

- Northlake Investments Ltd and Allenby Farms hold an easement to discharge flows across Gilberston's land with the following relevant condition:

  a. *In carrying out development, Northlake and Allenby must use reasonable endeavours to maximise on-site discharge of stormwater, minimise increase in stormwater discharge across Land C and avoid the ultimate disposal of stormwater on Land C. In order to achieve this, Northlake is to use "Low Impact Design" methods as recommended and/or approved by QLDC.*

- The gully through the DOC reserve is subject to significant erosion and increase in flows through the gully may exacerbate the erosion of the channel.
- No stormwater easement is in place to discharge flows through Urquhart's land.

As such, the design philosophy adopted for the ODP design to date has been to achieve the following objectives:

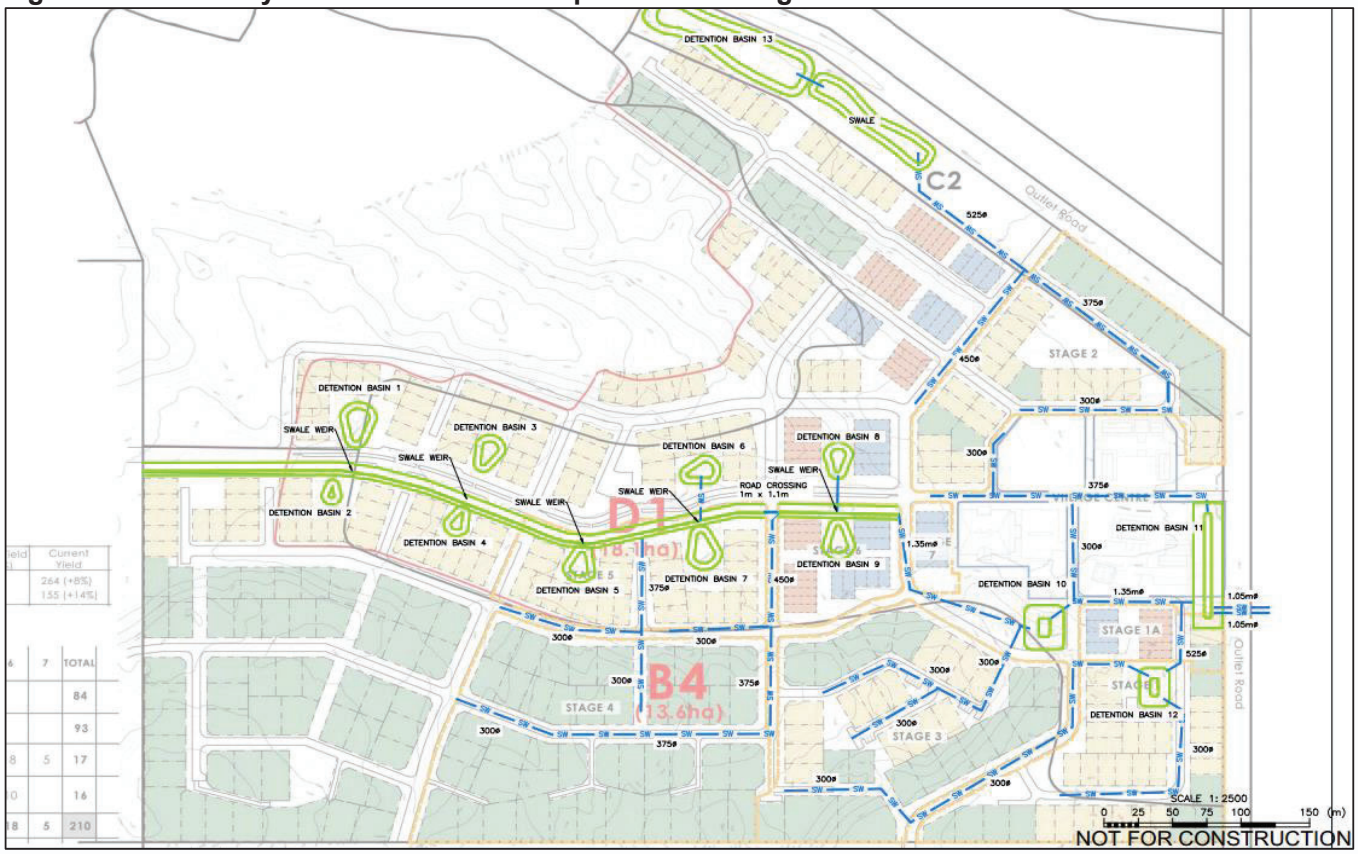
1. Limiting peak flow rates from the ODP area to be equal or less than the pre-development flows for storm events up to the 1 in 100-year storm event.
2. Providing first flush treatment of flows, as far as is practical, to improve stormwater quality.
3. Taking into account 1. and 2. above, minimising the capital and operational cost of stormwater infrastructure for the development.

5.2 Stormwater Management Components

The principles of Low Impact Stormwater Design have been a key feature that has been incorporated into the stormwater management solution to achieve the objectives outlined in Section 5.1.

Figure 4 provides a plan showing the various Stormwater components for Stages 1 to 7 of the ODP development.

Figure 4: General layout of stormwater components for Stages 1 to 7



5.2.1 Stormwater Attenuation

Stormwater attenuation (limiting flows to pre-development levels) will be achieved by the use of on-line and off-line dry detention basins as well as storage within a swale along the southern side of Northlake Drive. On-line basins are systems in which all runoff is directed to the basin. Off-line systems are designed so that only a portion of the runoff (overflow) is directed to the basin.

The 1.5m average depth swale will run along the southern side of Northlake Drive to a point west of the Village Centre precinct. This swale will provide soakage disposal as well as being the primary conduit of the major area of the Northlake development and the catchments upstream of the ODP area, and will flow from west to east. Flows from Stages 4, 5 and 6, as well as future ODP area stages in the western end of the development, will discharge into this swale.

Piped reticulation from side catchments in the development will discharge into the swale. The swale will include five in-line weirs that are spaced along the length of this feature. These weirs will act as flow restrictions to maximise the use of storage in the swale and provide for stormwater to be diverted from the main stem of the swale into the adjoining pocket parks/ detention and soakage areas around which clusters of Northlake Lots are situated. These stormwater detention areas provide a dual function of stormwater detention/soakage and open space and recreation pocket parks for the adjoining residences. These pocket parks will be set finished ground level of 0.5m above the invert of the swale to ensure that frequent storm events do not inundate the parks.

All the bases of the basins will be constructed to provide a positive gravity drainage to ensure that the basins drain quickly and efficiently, without ponding, back into the stormwater conveyance system as the storm passes. In addition, the off-line basins will remain dry for all events up to the 2-year ARI storm. This will prevent any potential for heavy soils or bogginess in the parks and, will have better drainage characteristics than parks without positive gravity drainage incorporated (for example, Domini Park, Wanaka, which exhibits frequent bogginess).

Those areas that cannot, for reasons of topography, discharge into the Northlake Drive swale will utilise dry detention basins in their local catchments to provide stormwater attenuation.

Table 1 provides a summary of the dry detention basins and the areas served.

Table 1: Dry detention basins

Basin Name	Location	Online / Offline	Area Served
Detention Basin 1	Northlake Drive north side	Offline	Future ODP west
Detention Basin 2	Northlake Drive south side	Offline	Future ODP west
Detention Basin 3	Northlake Drive north side	Offline	Future ODP west
Detention Basin 4	Northlake Drive south side	Offline	Future ODP west
Detention Basin 5	Northlake Drive south side	Offline	Stage 5 and ODP west
Detention Basin 6	Northlake Drive north side	Offline	Stages 4 and 5 and ODP west
Detention Basin 7	Northlake Drive south side	Offline	Stages 4 and 5 and ODP west
Detention Basin 8	Northlake Drive north side	Offline	Stages 4 and 5 and ODP west
Detention Basin 9	Northlake Drive south side	Offline	Stages 4, 5 and 6 and ODP west
Detention Basin 10	Major recreation reserve	Online	Stages 3, 4, 5 and 6 and ODP west
Detention Basin 11	Commercial area by Outlet Rd	Online	All Stages and ODP west
Detention Basin 12	Stage 1 reserve	Online	Stage 1
Detention Basin 13	C2 area to north	Online	Stage 2 and ODP north west

Due to space constraints within the development, any development upstream of the current ODP area will be required to attenuate its own flows. Therefore, for the purpose of design, it is assumed that pre-development upstream catchment flows will be conveyed through the ODP area.

5.2.2 Stormwater Treatment

Stormwater treatment is required to meet ORCs point of discharge water quality criteria (Regional Plan Rule 12.B.1.8) to be a permitted activity, namely:

> *(d) The stormwater discharged, after reasonable mixing, does not give rise to all or any of the following effects in the receiving water:*
>
> *i. The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or*
>
> *ii. Any conspicuous change in the colour or visual clarity; or*
>
> *iii. Any emission of objectionable odour; or*
>
> *iv. The rendering of fresh water unsuitable for consumption by farm animals; or*
>
> v. *Any significant adverse effects on aquatic life.*

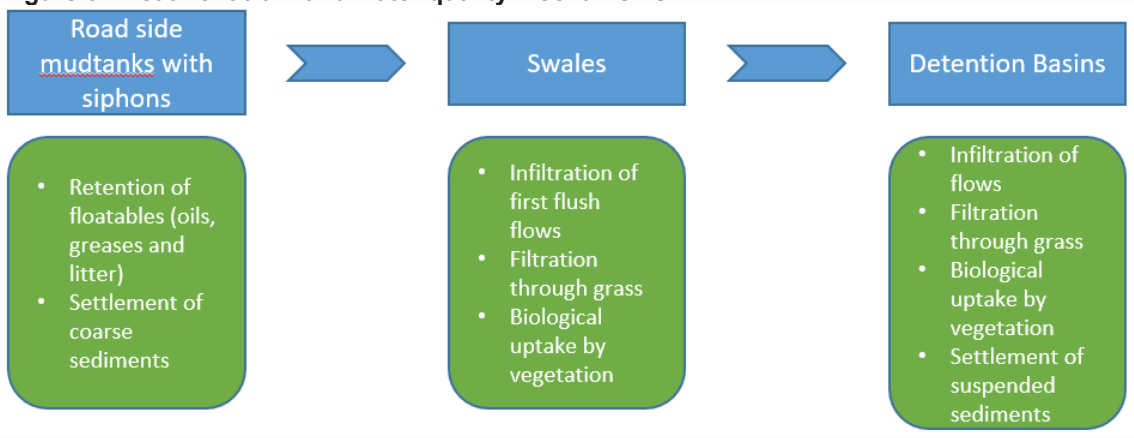
Due to the large receiving water body of the Clutha River and significant dilutive effect, it is considered that the treatment method provided will be more than sufficient to meet this permitted activity rule.

Stormwater treatment will be provided within the Northlake Drive swale, and the on-line detention basins (Detention Basins, 10, 11, 12 and 13). The off-line basins are not suitable for treatment as they do not capture the first flush event. The mechanisms for treatment will be through ground infiltration and bioretention and filtration of sediments within the grass swale base and the on-line infiltration ponds. The pond and swale invert have been designed to be mowable and hence grass cover will provide filtration of sediment. The bottom weirs in the swale are set 100mm above the swale invert to ensure first flush velocities in the swale are low, maximising filtration performance.

Coarse sediment will be retained within sumps in the roadside mudtanks. It is recommended that inverted siphons be installed in the mudtanks to collect floatables (oil, grease and litter).

Figure 5 provides a schematic of the treatment train to be adopted for the development.

Figure 5: Treatment train and water quality mechanisms



5.2.3 Stormwater Collection and Conveyance

Stormwater collection and conveyance will be by traditional piped reticulation in the road reserve. Due to the relatively high density of development, each lot will be connected via a stormwater lateral to the pipe reticulation. Road run-off will be collected via kerbside mudtanks and pipe laterals.

The Northlake Drive swale will also serve to convey development flows from part of the ODP area and upstream catchment as well as provide attenuation and treatment functions (refer to sections above).

Table 2 below provides an initial assessment of the quantities of stormwater collection and conveyance structures required for Stages 1 to 7. These quantities and sizes will be revised through the subdivision design process and may change due to the bulk earthworks design for the development.

Table 2: Stages 1 to 7 stormwater collection and conveyance components

Component	Quantity
300mm dia SN8 uPVC pipe	1,460m
375mm dia RCRRJ pipe	850m
450mm dia RCRRJ pipe	330m
525mm dia RCRRJ pipe	180m
1050mm dia RCRRJ pipe	235m
Northlake Drive swale	340m
Outlet Road culvert	25m
150mm dia pipe laterals with connections to lots	No. 220
Mudtanks and pipe laterals	No. 65
1050 mm dia manholes	No. 34
1800 mm dia manholes	No. 7

6.0 Design Summary

6.1 Design Storm Hydrology

Hydrological analyses have been undertaken to assess the storm peak flows for the development. Hydrological modelling was undertaken using HEC-HMS software package.

Peak flows and storm volumes have been assessed based on the US Natural Resources Conservation Service (formally SCS) hydrological method using the following parameters:

- Pervious area curve number: 61
- Impervious area curve number: 98
- Initial abstraction: 5mm

Curve number values for pervious area is based on Group B Hydrological Soil Classification and Table 2-2a, Runoff curve numbers for urban areas (SCS, 1986).

The development form of the contributing main catchment has been divided into totally impervious areas (road), partially impervious areas (residential properties), and pervious areas (reserve area) to provide a percentage impervious for each development area.

Percentage impervious areas for each of the development areas were calculated based on the permissible residential density in Plan Change 45 as shown in Table 3.

Table 3: Percentage impervious area for contributing catchments

Post-development					
Catchment	**Area, ha**	**% Impervious**	**Length, m**	**Slope**	**ToC, min**
1	30.40	0	1215	0.045	30.5
2	19.34	0	851	0.042	24.6
3	15.61	0	762	0.034	24.3
4	6.22	25			10
Development Area B	14.94	50			10
Development Area D	11.88	65			10
Total	**98.39**				

Design rainfall depths have been taken from NIWA's High Intensity Rainfall Design System (HIRDS V3) as summarised in Table 4 below.

Table 4: Design storm rainfall depths

Rainfall depths (mm)											
		Duration									
ARI (y)	**aep**	**10m**	**20m**	**30m**	**60m**	**2h**	**6h**	**12h**	**24h**	**48h**	**72h**
1.58	0.633	2.8	4.2	5.2	7.8	11.7	22.2	33.3	50	60.7	68
2	0.5	3.1	4.6	5.7	8.5	12.7	24	35.7	53.2	64.6	72.4
5	0.2	4	6	7.6	11.3	16.5	30.2	44.1	64.5	78.4	87.8
10	0.1	4.9	7.2	9.1	13.6	19.6	35.1	50.7	73.3	89	99.8
20	0.05	5.8	8.6	10.9	16.2	23.1	40.6	58	82.9	100.6	112.7
30	0.033	6.4	9.5	12	17.9	25.4	44.2	62.7	88.9	108	121
40	0.025	6.9	10.2	12.9	19.2	27.1	46.9	66.2	93.4	113.5	127.1
50	0.02	7.3	10.8	13.7	20.3	28.6	49.1	69	97.1	117.9	132.1
60	0.017	7.6	11.3	14.3	21.3	29.8	50.9	71.4	100.2	121.6	136.3
80	0.012	8.2	12.2	15.3	22.8	31.8	54	75.4	105.3	127.8	143.2
100	0.01	8.6	12.9	16.2	24.1	33.5	56.5	78.6	109.4	132.8	148.7
WQ (1/3 2 YR)	0.2	1.0	1.5	1.9	2.8	4.2	8.0	11.9	17.7	21.5	24.1

To assess peak flow rates and volumes for a variety of storm durations, two methods of developing the design storm hyetograph (rainfall over time) have been applied, namely:

1. Chicago type nested storm incorporating the various duration rainfall depths in Table 4. This allows short duration high intensity events to be modelled concurrently with longer duration, lower intensity events that have higher total storm volumes.
2. Christchurch method storm with triangular shape and the peak storm intensity being two times the average storm intensity.

The design storm hyetographs for the 1% AEP event are shown in Figure 6, below.

Also included in Figure 6 are the large March 1999 and December 1995 storm events recorded at the Wanaka Airport CWS rain station. These storms included peak recorded rainfalls for various storm durations as shown in Table 5.

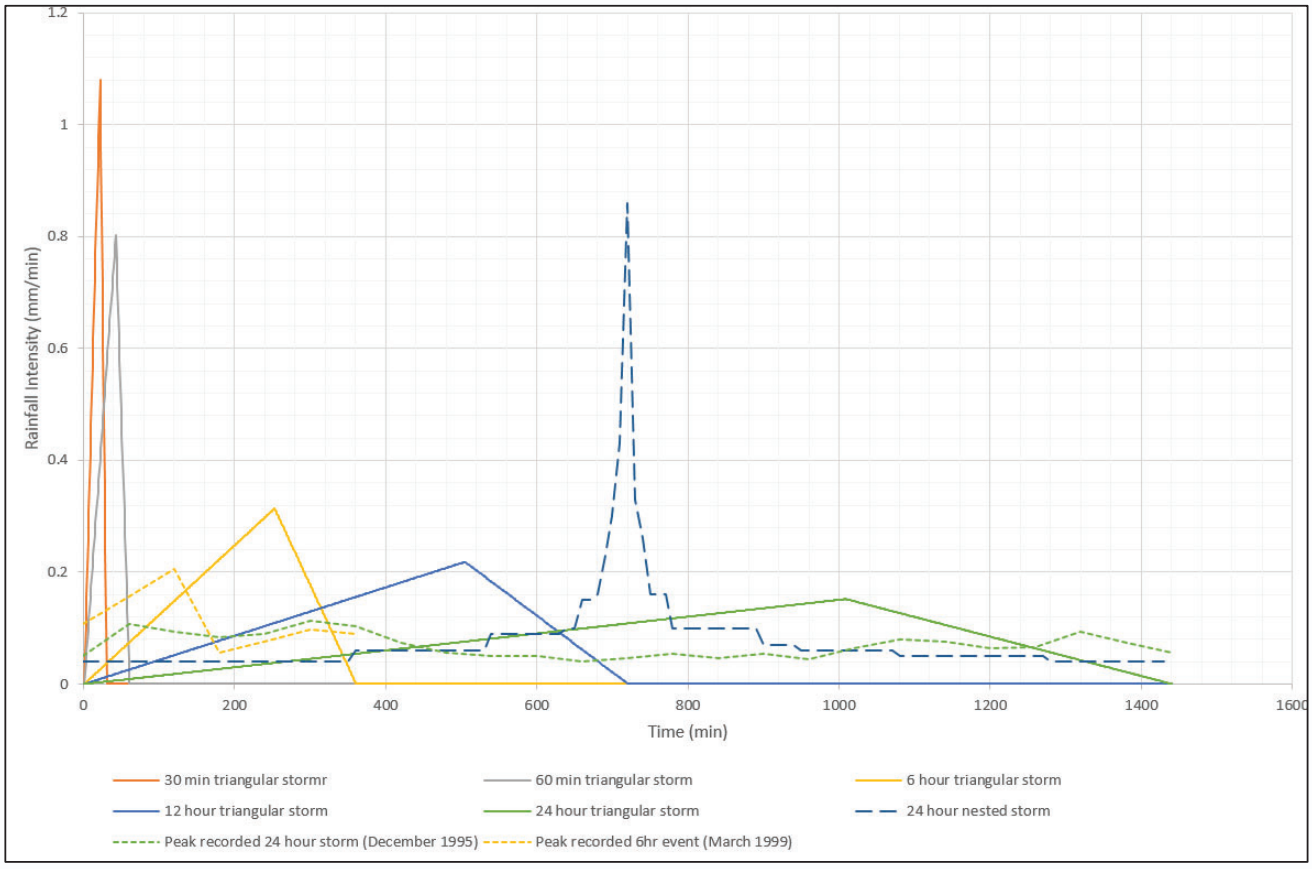
Table 5: Maximum recorded storms at Wanaka Airport CWS

Storm Duration	Recorded Rainfall Depth	Estimated Annual Recurrence Interval	Event
Peak 24 hour	100.6	60 year	December 1995
Peak 12 hour	62	30 year	March 1999
Peak 6 hour	42	25 year	March 1999
Peak 2 hour	21.8	15 year	March 1999
Peak 1 hour	12.4	7 year	March 1999

As shown in Figure 6, the storm hyetographs match the shape of the generated triangular storm much more closely than the nested storm, although with lower peaks. As such, the triangular generated hyetograph has been adopted for design.

The 6 hour duration storm using the triangular method was determined to have the peak pre-development flows and this duration has been adopted for design.

Figure 6: 1% AEP storm hyetograph



Based on this analysis the 1% AEP and 50% AEP peak storm flows and total storm volumes using both the triangular and nested storm profiles are summarised in Table 6 for both the pre-development and post-development (without attenuation) scenarios.

Table 6: Pre and post-development flows

Method	Return Period	Pre-development m^3/s	Post-development m^3/s
Triangular storm	2-year	0.3	0.6
	100-year	1.6	2.2
Nested storm	2-year	0.9	1.4
	100-year	4.2	5.3

As shown above, there is a significant difference in peak flows for the two methodologies. This is primarily due to the assumption of a much lower peak intensity for the triangular method for the longer duration storms. The nested storm method provides a high peak intensity occurring on an already saturated catchment, where loss to infiltration is reduced. This is not considered to be a realistic scenario based on the assessment of the Wanaka Airport CWS rain gauge.

Notwithstanding this, the total volume of storm run-off is similar using both methods for the same duration and, therefore, both methods require similar detention basin volumes to achieve attenuation to their respective pre-development flows when applying different weir configurations to achieve the carrying capacity of the system.

Sensitivity analyses have also been undertaken to confirm that the critical (worst case) hydrological parameters have been modelled. This has been done by running a range of design storm durations and initial abstraction values in the model.

6.2 Hydraulic Modelling Methodology

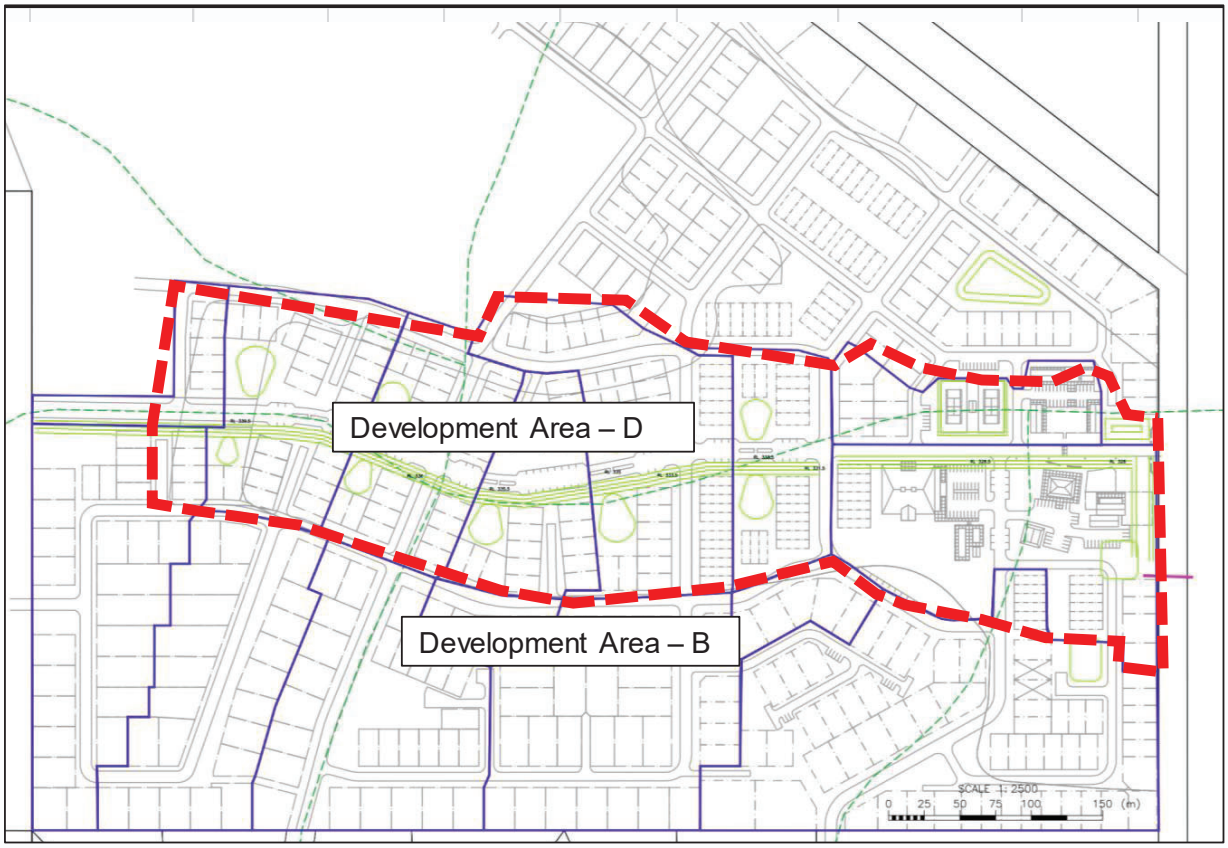
Hydraulic design to assess stormwater attenuation and conveyance of the main swale and detention basins has been undertaken using SWMM model software developed by US Environmental Protection Agency.

The SWMM model provides a dynamic (time based) hydraulic assessment of the main attenuation structures. This has allowed sizing of the detention basins, swale and instream weirs to ensure attenuation of the 100-year storm event is achieved.

6.2.1 Northlake Drive Swale

Runoff hydrographs for upstream Catchments 1to 4 for the 2-year and 100-year storms were created in HEC-HMS and were used as inputs into the SWMM model. The development area catchments were split based on local road run-off and location of the pipe reticulations as shown in Figure 7 (in blue) with inflows into the model at these points.

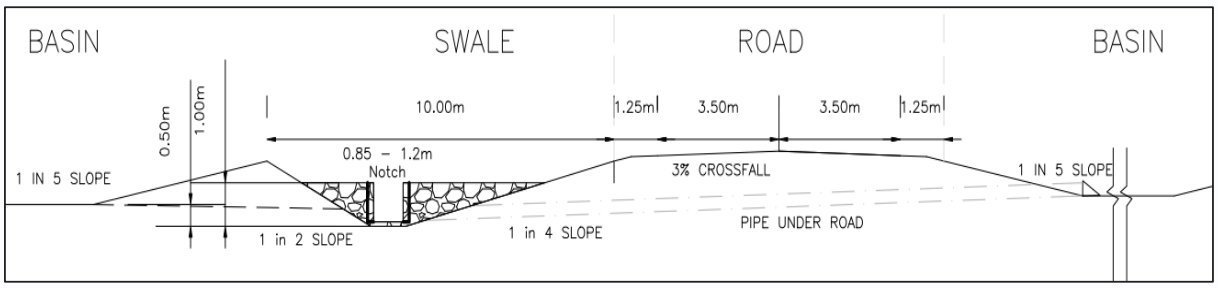
Figure 7: ODP sub-catchment model set-up



A cross section of the proposed Northlake Drive swale is shown in Figure 8. The swale is 1.5m deep with a 1m base width. Side slopes are 1V to 4H and 1V to 2H on opposite sides of the swale. A series of weirs are used along the swale length to attenuate flows and utilise storage within the swale as well as to direct flow into the storage basins as the water level rises in the channel.

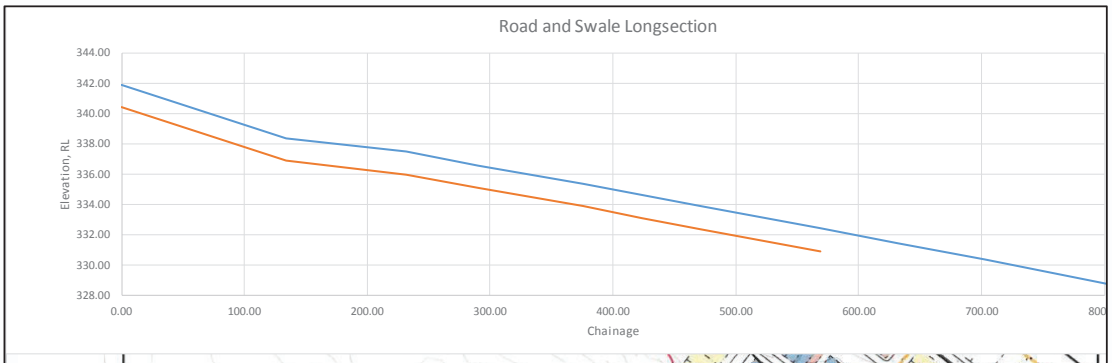
The notch weirs are set 0.1m above the swale base and are typically between 0.85m and 1.2m in width. The weirs are 1m in height from the swale base (i.e. the top of the weir is 0.5m below the top of the swale).

Figure 8: Typical Northlake Drive cross section with weir



The swale longitudinal gradient varies between 0.9% and 2.65% with an average gradient of 1.4%. The swale long section is shown in Figure 9.

Figure 9: Typical Northlake Drive long section



Road			Swale				
Chainage	RL	Slope	Chainage	Road, RL	Depth	Swale, RL	Slope
0.00	341.93		0.00	341.93	1.5	340.43	
134.00	338.38	2.65%	134.00	338.38	1.5	336.88	2.65%
232.00	337.51	0.89%	232.00	337.51	1.5	336.01	0.89%
290.50	336.58	1.59%	290.50	336.58	1.5	335.08	1.59%
376.00	335.38	1.40%	333.00	335.98	1.5	334.48	1.40%
471.00	333.90	1.56%	376.00	335.38	1.5	333.88	1.40%
569.00	332.43	1.50%	423.50	334.64	1.5	333.14	1.48%
632.00	331.47	1.52%	471.00	333.90	1.5	332.40	1.56%
703.00	330.41	1.49%	569.00	332.43	1.5	330.93	1.50%
802.00	328.78	1.65%					

6.2.2 Detention Basins

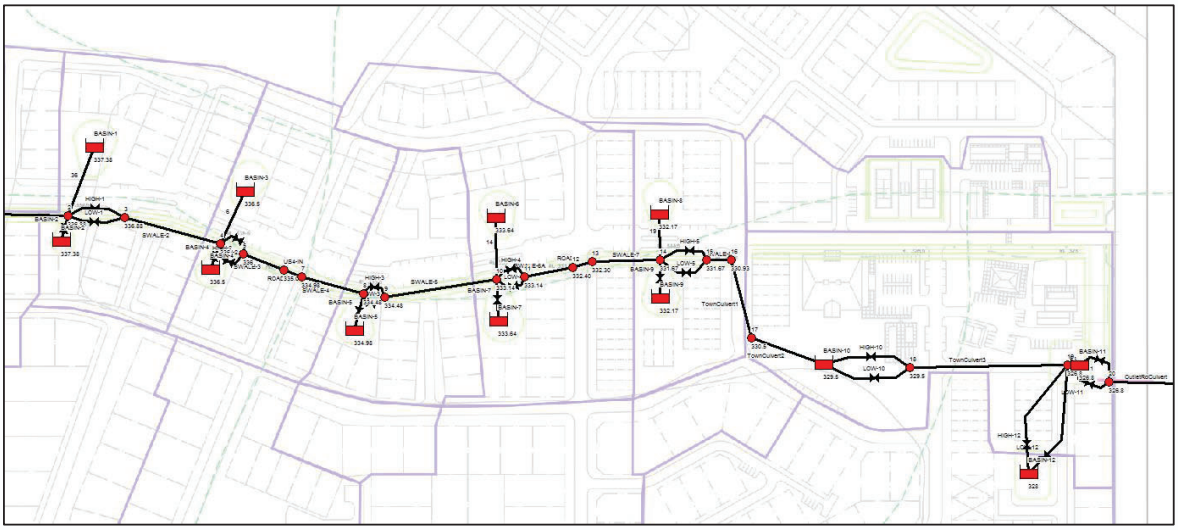
The dry detention basins have been modelled along either side of the main swale. The basins have been designed based on the available space with 1 in 5 side slopes to a maximum depth of 0.5m. The inverts of the basins are typically 0.5m above the corresponding swale invert.

Basins along the northern side of the swale will be connected by pipe underneath the road and basins along the southern side will connect directly to the swale via side weir overflows. The basins are designed such that they will not fill with water for the 2-year return period rainfall event and below.

The downstream basins (Basins 10 and 11), immediately upstream of the culvert beneath Outlet Road and in the major recreation reserve, have been modelled as up to 2m in depth with 1 in 4 side slopes. The outlet is a 0.75mØ orifice with an overtopping outlet (such as a large diameter manhole), also to be provided.

Figure 10 provides a screenshot of the built model in plan showing the locations of the nodes, junctions, and reaches incorporated into the model.

Figure 10: Screenshot of SWMM model



6.3 Model Results

The hydrological and hydraulic analyses have been undertaken to ensure that peak water levels for the various design events are contained within the stormwater structures and that stormwater attenuation is achieved for the 100-year event.

Figure 11 shows the locations and plan extents of the detention basins and swales. Tables 7 and 8 below provide a summary of peak depths and storages within the detention basins and swale for the 100-year and 2-year storm events.

Figure 11: Detention basin layout

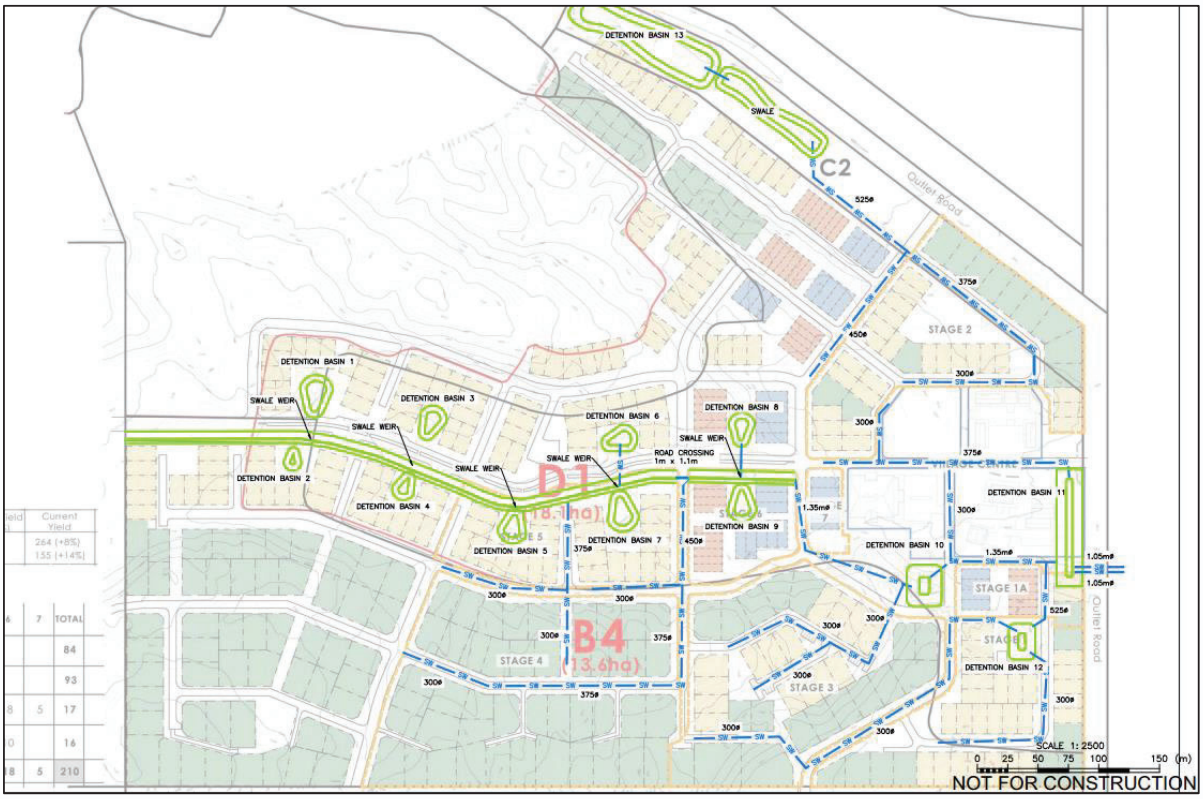


Table 7: Triangular Storm – six hour duration peak water depths and storage

Structure	Peak depth m		Peak Storage m^3	Outlet Control
	2-year	100-year	100-year	
Basin 1	0.0	0.48	182	0.85m swale weir
Basin 2	0.0	0.48	31	0.85m swale weir
Basin 3	0.0	0.47	110	0.90m swale weir
Basin 4	0.0	0.47	62	0.90m swale weir
Basin 5	0.0	0.48	116	1.10m swale weir
Basin 6	0.0	0.49	119	1.10m swale weir
Basin 7	0.0	0.48	165	1.10m swale weir
Basin 8	0.0	0.48	99	1.20m swale weir
Basin 9	0.0	0.48	129	1.20m swale weir
Basin 10	0.55	1.84	922	0.75mØ orifice
Basin 11	0.59	1.86	2191	0.75mØ orifice
Basin 12	0.23	0.88	176	0.175mØ orifice

Table 8: Nested Storm – 24 hour duration peak water depths and storage

Structure	Peak depth, m		Peak Storage m^3	Outlet Control
	2 year	100 year	100 year	
Basin 1	0.0	0.52	204	1.20m swale lower weir, 6m upper weir
Basin 2	0.0	0.52	36	1.20m swale lower weir, 6m upper weir
Basin 3	0.0	0.52	123	1.20m swale lower weir, 6m upper weir
Basin 4	0.0	0.52	71	1.20m swale lower weir, 6m upper weir
Basin 5	0.0	0.37	83	1.20m swale lower weir, 7m upper weir
Basin 6	0.0	0.37	85	1.20m swale lower weir, 7m upper weir
Basin 7	0.0	0.37	118	1.20m swale lower weir, 7m upper weir
Basin 8	0.0	0.63	143	1.20m swale lower weir, 7m upper weir
Basin 9	0.0	0.64	187	1.20m swale lower weir, 7m upper weir
Basin 10	0.77	1.51	653	0.75mØ orifice, 1050Ø riser
Basin 11	0.79	1.58	1,676	0.75mØ orifice, 1050Ø riser
Basin 12	0.35	1.10	255	0.175mØ orifice

As shown, peak attenuation storage requirements are similar for both the triangular and the nested design storms. For both storms, the off-line Northlake Drive detention basins remain dry during the 2-year return period storm and have in the order of 0.4m to 0.6m maximum water depth in the 100-year return period storm. The Northlake Drive swale conveys the 100-year storm without surcharge. For both the Northlake Drive swale and the detention basins, a minimum freeboard of 0.5m is provided to the road level and edge of lots in the 100-year return period storm.

Basins 10, 11 and 12 are in-line and, therefore, pass the full development catchment flows. Basins 10 and 11 in particular (major recreation reserve and commercial area adjacent to Outlet Road) provide a relatively significant storage volume in both the 2-year and 100-year events. Therefore, the landscape design will need to allow for frequent inundation of a portion of these during storm events (as opposed to the off-line basins which remain dry in the 2-year event.

Table 9 provides a summary of attenuation achieved based on current modelling.

Table 9: Stormwater attenuation for the 2 year and 100 year events

		Pre-development Outflow m^3/s (target outflow)	Post-development Inflows m^3/s (non-attenuated outflow)	Post-development Outflows m^3/s (modelled outflow)
Triangular Storm	2-year	0.31	0.59	0.30
	100-year	1.63	2.15	1.49
Nested Storm	2-year	0.86	1.39	0.82
	100-year	4.25	5.38	3.47

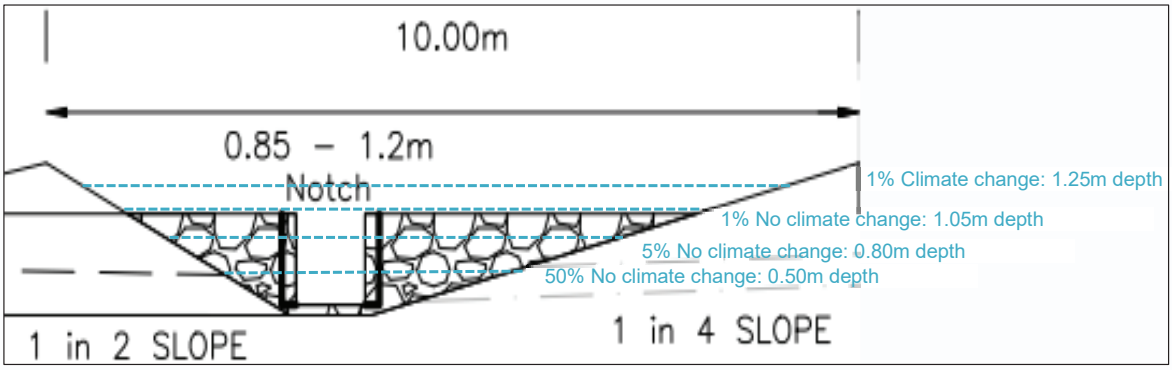
As shown, the target attenuation of the 2-year and 100-year events is achieved when applying both the nested storm and the triangular storm to the assessment.

Climate change has been considered in design to assess conveyance capacity through the stormwater network. The climate change figures show a peak flow increase of approximately 28% when applying the triangular storm event, as follows:

- 2-year post development inflow: 0.76 m^3/s.
- 100-year post development inflow: 2.75 m^3/s.

These revised peak flows are well contained within the stormwater system as shown in Figure 12 below. Figure 12 shows typical water depths in the Northlake Drive swale for the various design events. As shown, the swale conveys the full 1% AEP storm event with 250mm freeboard to the edge of road level.

Figure 12: Peak water levels in Northlake Drive swale



7.0 Conclusion

This document presents an outline of the stormwater management philosophy for the area covered by the Northlake ODP as well as a summary of the methodology applied for the design.

The following conclusions have been made:

- Council has stated a preference for LID for the development. NZS4404:2010 defines LID as aiming to use natural processes such as vegetation and soil media to provide stormwater management solutions as well as adding value to urban environments.
- No water quality standards have yet been set for the development, it is noted that ORC made a submission to Plan Change 45 recommending that water quality should meet or exceed pre-development levels.
- No water quantity standards have yet been set for the development, however ORC made a submission to Plan Change 45 recommending that peak flows be limited to pre-development levels for the 1% AEP storm event.
- The ultimate discharge point from the development is to the Clutha River and flooding effects in the river due to increase in flows from the developed area will be insignificant. However, as is the existing situation, the discharge will pass through Gilbertson's and Urquhart's land as well as Department of Conservation reserve land.
- The design philosophy adopted for the ODP design to date has been to achieve the following objectives:
    1. Limiting peak flow rates from the ODP area to be equal or less than the pre-development flows for storm events up to the 1 in 100-year storm event.
    2. Providing first flush treatment of flows, as far as is practical, to improve stormwater quality.
    3. Taking into account 1. and 2. above, minimising the capital and operational costs of stormwater infrastructure for the development.
- Stormwater attenuation (limiting flows to pre-development levels) will be achieved by the use of on-line and off-line dry detention basins as well as storage within a swale along the southern side of Northlake Drive
- Stormwater treatment will be provided within the Northlake Drive swale, and the on-line detention basins. The mechanisms for treatment will be through ground infiltration and bioretention and filtration of sediments within the grass swale base and the on-line infiltration ponds.

- Stormwater collection will be by traditional piped reticulation in the side catchment road reserves. Due to the relatively high density of development, each lot will be connected via a stormwater lateral to the pipe reticulation.
- Hydrological modelling was undertaken using HEC-HMS software package. Hydraulic design to assess stormwater attenuation and conveyance of the main swale and detention basins has been undertaken using SWMM model software.
- To assess peak flow rates and volumes for a variety of storm durations, two methods of developing the design storm hyetograph have been applied (rainfall over time) (nested and Triangular methods).
- There is a significant difference in peak flows for the two methodologies. This is primarily due to the assumption of a much lower peak intensity for the triangular event for the longer duration storms. However, the total volume of storm run-off is similar using both methods for the same duration and, therefore, similar detention basin volumes are required using either method.
- The hydrological and hydraulic analyses have been undertaken to ensure that peak water levels for the various design events are contained within the stormwater structures and that stormwater attenuation is achieved for the 100-year ARI event.
- Peak attenuation storage requirements are similar for both the triangular and the nested design storms. For both storms, the offline Northlake Drive detention basins remain dry during the 2-year ARI return period storm and have in the order of 0.4m to 0.6m maximum water depth in the 100-year ARI return period storm.
- Basins 10 and 11 (major recreation reserve and commercial area adjacent to Outlet Road) provide a relatively significant storage volume in both the 2-year and 100-year ARI events. Therefore, the landscape design will take into account use of a portion of these areas for this purpose during storm events (as opposed to the off-line basins which remain dry in the 2-year ARI event.
- The target attenuation of the 2-year and 100-year ARI events is achieved when applying both the nested storm and the triangular storm to the assessment.
- For both the Northlake Drive swale and the detentions basins, a minimum freeboard of 0.5m is provided to the road level and edge of lots in the 100-year return period storm.
- Climate change has been considered in design to assess conveyance capacity through the stormwater network. The climate change figures show a peak flow increase of approximately 28% when applying the triangular storm event. These revised peak flows are well contained within the stormwater system.

8.0 Limitation

This report has been prepared solely for the benefit of Northlake Investments Ltd as our client with respect to the brief and Queenstown Lakes District Council to inform the design. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

APPENDIX B: PowerNet - Supply Confirmation Letter

251 Racecourse Road, PO Box 1642,
Invercargill 9840, New Zealand
P: 03 211 1899
F: 03 211 1880
E: enquiries@powernet.co.nz

15TH February 2021

Northlake Investments Ltd
C/o Winton
Level 4, 10 Viaduct Harbour Avenue
Auckland 1010
PO Box 105526, Auckland 1143

C/o Alex Todd
Paterson Pitts Group - Wanaka

Dear Alex

Northlake Drive Provision of Supply Letter for Lot 1006 DP 515015

Please accept this letter as notification that there is a satisfactory High/Low voltage network in place to provide electricity for Lot 1006/DP515015

Further parts of the network will be installed as the development proceeds and will meet the Powernet Design Standards.

As part of the development once complete PowerNet on behalf of Electricity Southland Limited will accept the ownership and all further fault restoration and maintenance obligations for all network installed within the road reserve.

Yours faithfully

Tony Rooke
Senior Project Manager
137 Glenda Drive, Queenstown, PO Box: 1642, Invercargill 9840, New Zealand
Phone: +64 3 211 1899, Mobile: +64 27 256 3814
www.powernet.co.nz

APPENDIX C: Chorus - Supply Confirmation Letter

APPENDIX D: Aon – Northlake Drive Hydrant Testing Results

Aon New Zealand

Aon Inspection Services
Aon New Zealand
PO Box 1484
Dunedin 9054

Telephone: 03 477 6649
Facsimile: 03 474 0596
Email: tony.carline@aon.com

27 May 2019

Patterson Pitts Group

ATTENTION: Kerran Greave

Dear Sir

Re: Northlake Subdivision – Fire Hydrant Flow Testing

On the 15 May 2019 flow testing of the fire hydrants within the above subdivision was undertaken.

Flows were taken from a single fire hydrant outlet, utilising a Giddons Flow Meter. Flows were taken to prove a FW2 water supply, and to prove the maximum flow achievable from the single fire hydrant. The residual pressure was taken from a separate hydrant.

The following results, as referenced to the attached 3 drawings, were achieved:

Hydrant 1 Flow (l/sec)	Residual Pressure (kPa) at Hydrant 4
0	440
42 l/sec	300

Hydrant 2 Flow (l/sec)	Residual Pressure (kPa) at Hydrant 4
0	440
42 l/sec	300

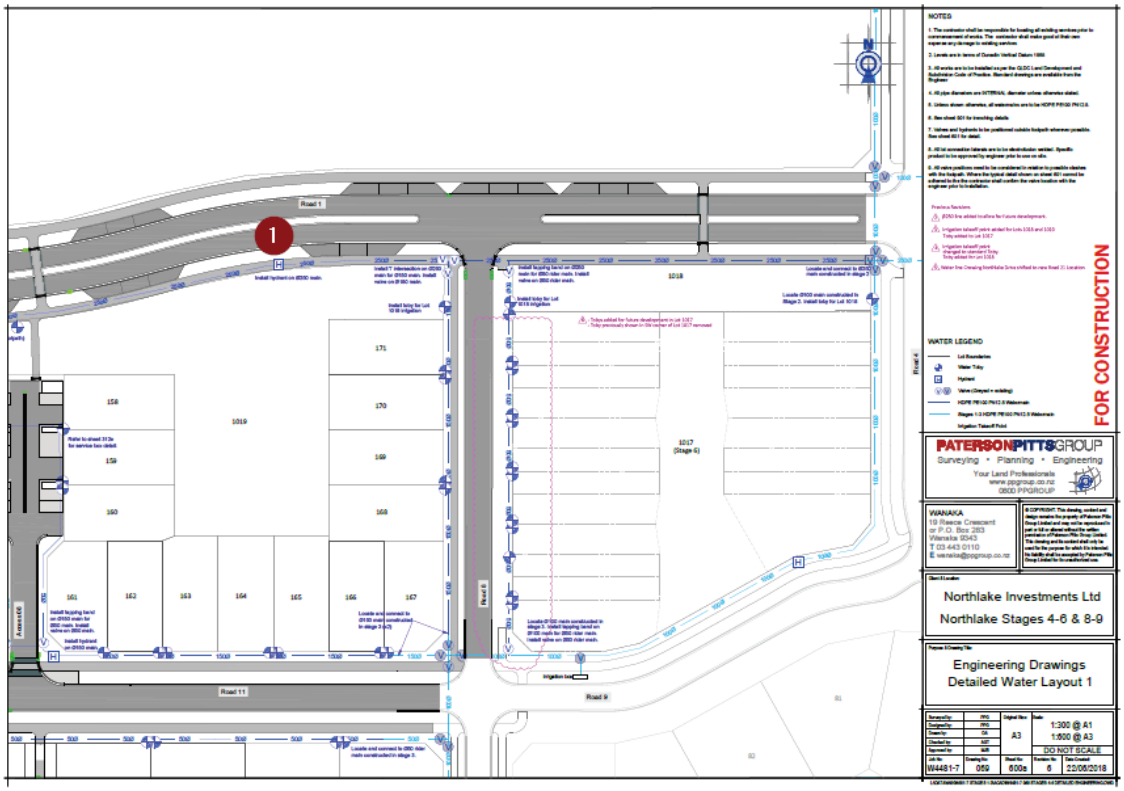
Hydrant 3 Flow (l/sec)	Residual Pressure (kPa) at Hydrant 4
0	440
42 l/sec	300

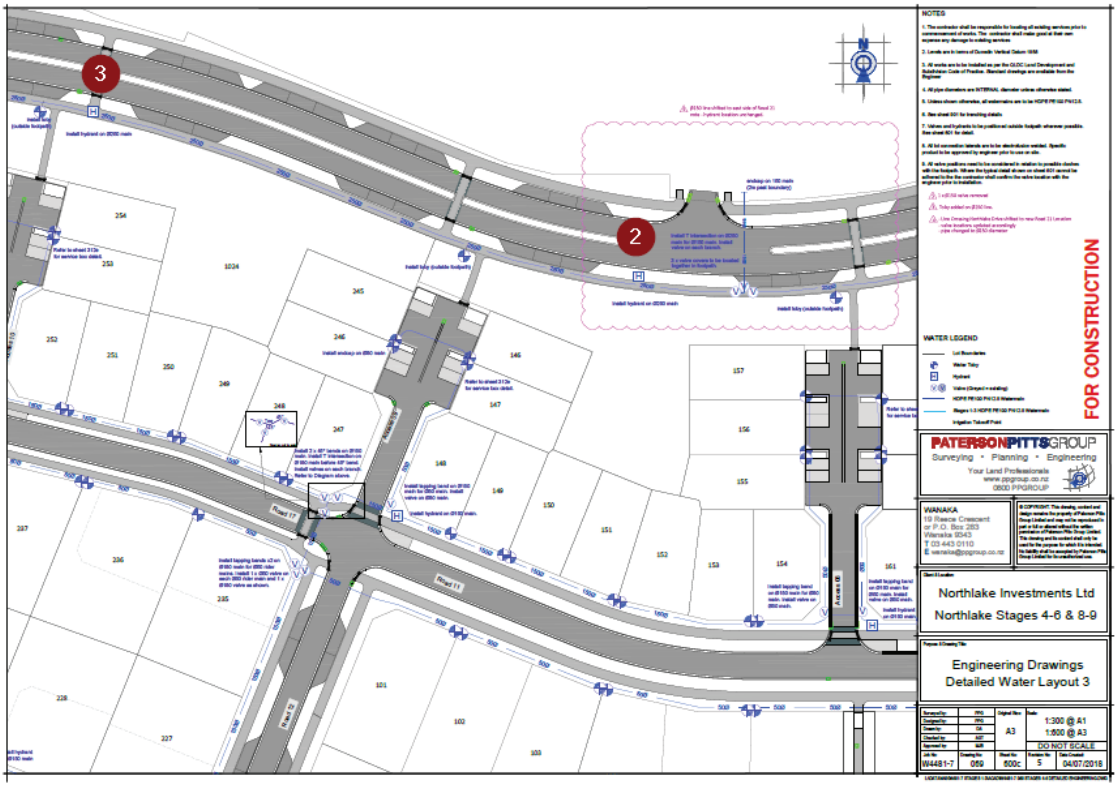
Hydrant 4 Flow (l/sec)	Residual Pressure (kPa) at Hydrant 3
0	440
42 l/sec	300

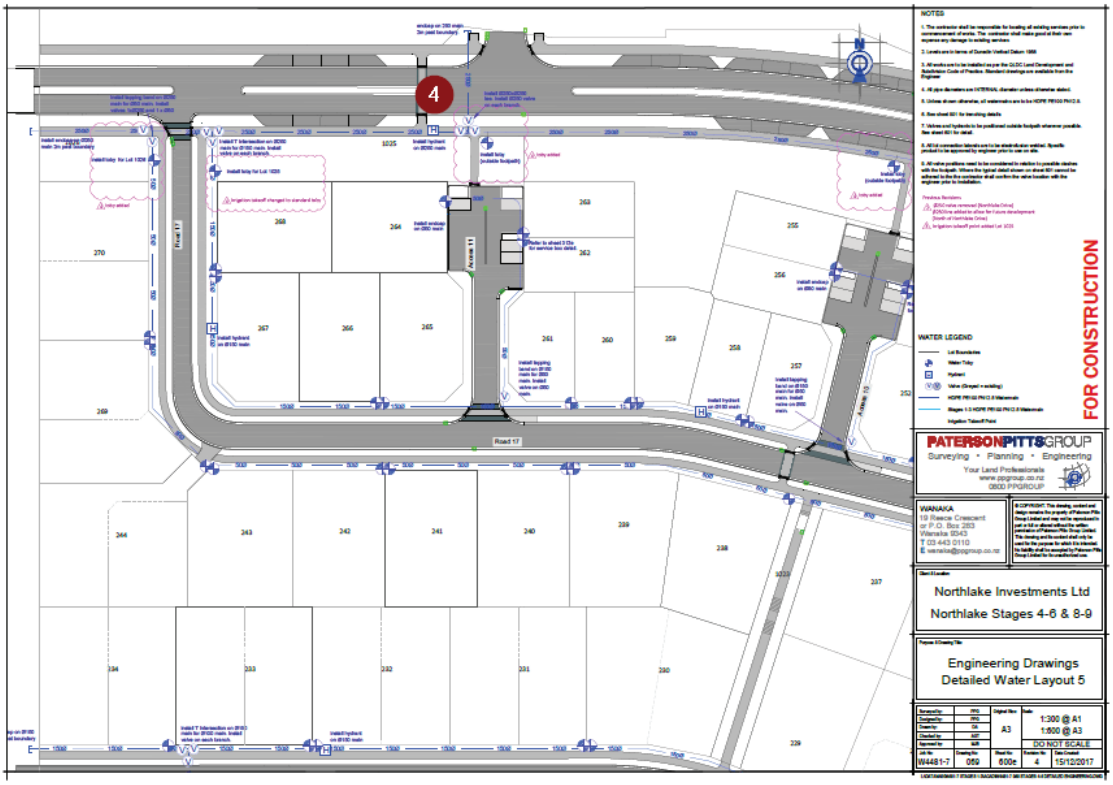
Should you require any further information, please do not hesitate to contact myself.

Yours faithfully

T D Carline
Fire Systems Inspector
IANZ authorised signatory







CCL Ref: 14204-230221-palmer

23 February 2021

CARRIAGEWAY CONSULTING
A. PO Box 29623, Christchurch, 8540
P. 03 377 7010
E. office@carriageway.co.nz

Simon Palmer
Northlake Investments Limited

By e-mail only: simon.palmer@winton.nz

Dear Simon

Northlake: Proposed Commercial and Visitor Accommodation Development (Lot 1006)
Updated Parking and Access Assessment

Further to our recent e-mails, we understand that consents are to be sought for a mixed commercial and visitor accommodation development at Lot 1006 in Northlake. Our review of the site is based on the drawing received by e-mail on 18 February 2021 (Three Sixty Architecture drawing, dated 17 February 2021) and as requested, our assessment is carried out against the operative District Plan.

Background

Lot 1006 is shown below.

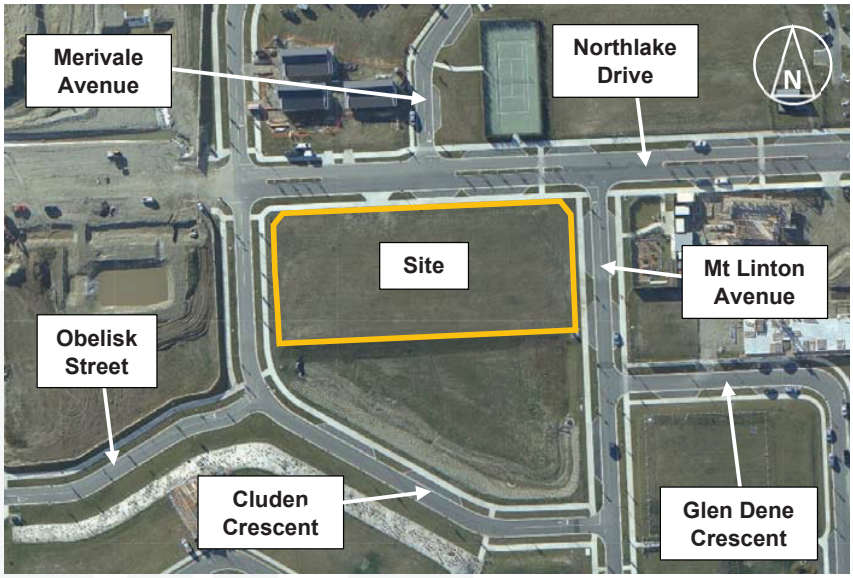


Figure 1: Lot 1006 and Environs

The plans show that there are six retail tenancies proposed for the northern / northeastern parts of the site with Tenancy 1 being the largest (532sqm GFA) and the remaining five tenancies having a total area of 519sqm GFA.

Above the retail tenancies are 13 visitor accommodation units. A further 12 units are proposed along the western edge of the site (6 units at the ground floor and 6 units at the first floor). Each of the units has two bedrooms. We understand that the units will be self-contained and therefore will be 'unit type' under the District Plan.

Accesses are proposed onto Northlake Drive and Mt Linton Avenue to serve a central communal parking area. Several of the visitor accommodation units also have direct access onto Cluden Crescent. Each of the frontage roads is a Local Road under the District Plan.

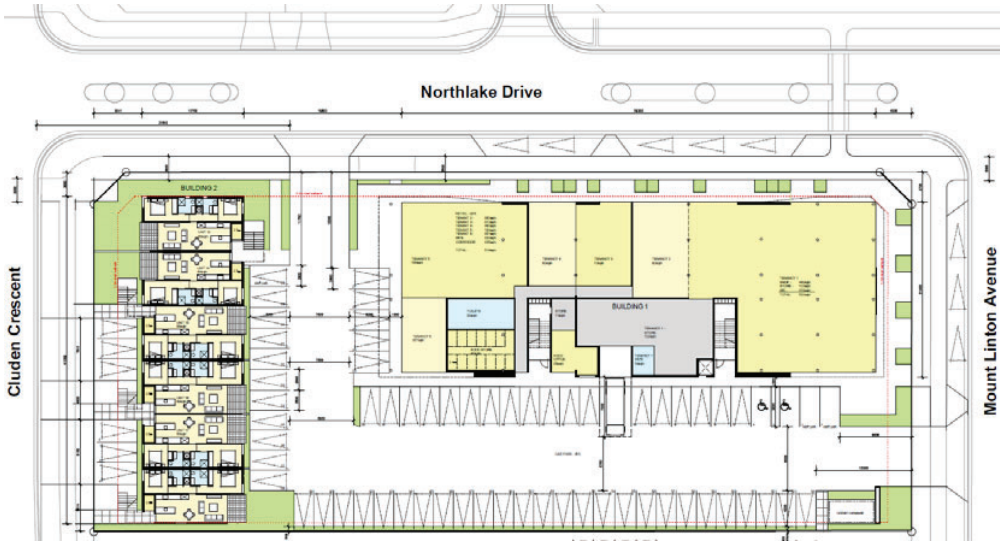


Figure 2: Proposed Development (Extract from Three Sixty Architecture Drawing)

District Plan (Operative Version) Part 14.2.4.1: Parking and Loading

Site Standard 14.2.4.1i: Minimum Parking Space Numbers

Under the operative District Plan, commercial activities require 1 car parking space per 25sqm GFA. With 1,051sqm GFA provided, this means that 42.04 spaces are required.

Under the District Plan, the visitor accommodation units require the following:

- 1 space per unit for the first 15 units, then 0.5 spaces per unit thereafter, plus
- 1 space per 10 units for staff

Under this calculation, this would require 20 spaces for visitors plus 2.5 spaces for staff. We understand however that the applicant wishes to provide one car parking space per unit, making 25 spaces in total.

Overall then, the requirement (and provision of spaces) is:

- 20 spaces required for visitor accommodation but 25 spaces are proposed;
- 2.5 spaces required for staff; and
- 42.04 spaces required for the commercial activity.

Therefore this permutation requires 65 spaces but 70 spaces are proposed.

The plans show that 64 spaces are proposed within the main car parking area, with a further 6 spaces located towards the west and accessed directly from Cluden Crescent. Under this scenario then, 70 spaces are provided, meeting District Plan requirements.

If the visitor accommodation is managed centrally, then it would be considered as one tenancy of 25 units meaning that under the District Plan there is a requirement for 1 coach parking space. However the small scale of the proposed development means that it is unlikely that considerable

numbers of coach parties would stay within the visitor accommodation, as (in our experience) coach parties do not stay at small visitor accommodation complexes as there are insufficient numbers of units available for all travellers.

However, in the event that a coach was to be present, we consider that it would be possible to repurpose a number of car parking spaces in order to allow for a coach. An example of this (at the Chateau Marlborough hotel) is shown below.

Photograph 1: Example of Coach Parked within a Hotel Car Park

We estimate that up to 8 adjacent car parking spaces would be required for this arrangement.

If guests were to arrive by coach then they would evidently not arrive by car. Tour coaches typically accommodate around 50 passengers, and therefore if a tour coach was present, car parking demand would reduce by more than 8 spaces. This then means that the car parking spaces needed for the coach to park would be vacant.

In order for this arrangement to be workable, car parking spaces would need to be allocated to specific units/guests on arrival. This is possible in this case due to the allocation of one parking space to each unit. Thus when a coach was due to arrive, the staff would simply manage the parking to ensure that 8 adjacent spaces were all unoccupied. This can be done simply by numbering the spaces and advising guests on arrival that they are to park in a specific space only.

We also stress that coach parties do not arrive speculatively at visitor accommodation but rather, they are booked well in advance (in order to ensure that sufficient rooms are available). The car parking can therefore easily be managed in the manner described above, because the arrival of a coach will be well known and planned.

In the event that the visitor accommodation is not managed centrally, then each unit will be individually let. Coach parties are extremely unlikely to arrive when units are managed in this way, because such parties stay where there are sufficient units for all travellers, and therefore not in locations where only one or two units are available.

In summary then, we consider that:

- 42 spaces in the central car park should be reserved for the commercial activities, meeting District Plan requirements;

- This then leaves 28 spaces for the visitor accommodation (6 served from Cluden Crescent and 22 within the central car park). This exceeds the Distrct Plan requirements, and achieves the applicant's aim of having 1 space per unit (plus 3 spaces for staff required under the District Plan); and
- At times when a coach is expected, 8 of the spaces in the central parking area should be coned off for the coach and therefore there would be 11 spaces available for car drivers. This is fewer than the District Plan requires but as set out above, the presence of a coach means guest car parking demand will be greatly reduced. In our view there will therefore be no overspill parking at this time due to the shortfall.

Site Standard 14.2.4.1iv: Location and Availability of Parking Spaces

The layout indicates that each space will be unobstructed and can be accessed independently, and none are located within an access or other area used for other purposes. All parking spaces are located on the development site itself.

Staff car parking is required to be specifically marked under this Site Standard. Three spaces are required and three are marked (Spaces 1, 2 and 28).

Site Standard 14.2.4.1v: Size of Parking Spaces

The plans show that all spaces in the central parking area have the following dimensions:

- Spaces 1 and 2 (staff spaces): 2.5m wide, 5.0m long, aisle of 8.0m;
- Spaces 3 and 4 (mobility spaces): 2.5m wide with shared 1.1m width between them, 5.0m long, aisle of 8.0m;
- Spaces 5 to 22, and 34 to 53, and 56 to 64: 2.5m wide, 5.0m long, aisle of 8.0m;
- Spaces 23 to 27, and 29 to 33: 2.6m wide, 5.0m long, aisle of 7.5m;
- Space 28 (staff space): 2.6m wide, 5.0m long, aisle of 7.5m;
- Spaces 54 and 55: 2.7m wide, 5.0m long, aisle of 8.0m.

The dimensions for the standard car parking spaces all meet the requirements for Class 1 and Class 2 users respectively. We highlight that the spaces for Class 1 users are slightly larger than the dimensions required under the District Plan, but this is discussed further below.

Two spaces (54 and 55) have a constrained aisle at times when service vehicles are present, and the aisle width reduces to 6.7m. However in such cases, the width of the parking space (2.7m) is ample for the remaining aisle width.

The mobility spaces share an area between them. While this is not anticipated under the District Plan, the layout is in accordance with Standard NZS4121:2001 ('Design for Access and Mobility: Buildings and Associated Facilities') which enables the width to be shared in this manner.

The six spaces at the western edge of the site are each 5.0m long, 2.6m wide and have an aisle (created by Cluden Crescent itself) in excess of 7.0m, meeting requirements.

Site Standard 14.2.4.1vi: Parking Area and Access Design

Each of the accesses leading into the central car park is shown at 7.5m wide, which is ample to allow for two-way traffic flow. Separate pedestrian routes are shown to access each of the six tenancies from Northlake Drive.

Site Standard 14.2.4.1vii: Gradient of Car Parks

The site is relatively flat and so there will be no difficulties in achieving the maximum gradient of 1 in 20.

Site Standard 14.2.4.1viii: Car Spaces for People with Disabilities

With 70 car parking spaces provided within the site, the District Plan requires 2 spaces to be provided for the mobility impaired, and 2 spaces are shown on the drawings.

Site Standard 14.2.4.1ix: Reverse Manoeuvring

In view of the number of spaces served by the central parking area, it is not permitted for any vehicle to have to reverse onto the frontage roads. However, this car park provides a through route and therefore there are no reasons why by a vehicle would need to be reversed in such a manner.

Cluden Crescent is a Local Road, and since only six parking spaces gain direct access, reversing from these spaces is permitted.

Further, under this Rule, no more than one reverse movement is to be carried out by a vehicle or entering a "*required*" parking space. From previous commissions, we are aware that this is applied by the Council as meaning that a vehicle entering a parking space and then exiting again can undertake no more than one reverse movement in total (rather than one reverse movement upon entry plus one reverse movement on exit). As set out above, each of the parking spaces achieves (or exceeds) the District Plan requirements for dimensions and therefore each can be accessed with just one reverse movement.

Site Standard 14.2.4.1x: Residential Parking Spaces

Residential units are not proposed in this case.

Site Standard 14.2.4.1xi: Queuing

The main car park provides 64 parking spaces. We anticipate that because Northlake Drive forms the main access route through the site, the vehicle crossing onto it will be the more heavily used. However, this will still result in both accesses serving between 21 and 50 spaces, meaning that 12m queuing space is required at each.

At the access onto Northlake Drive, the queuing space provided is 11.7m, meaning that there is a 0.3m shortfall. The access onto Mt Linton Avenue has queuing space of 9.0m, meaning that there is a 3.0m shortfall.

In both cases, the shortfall arises due to the presence of parking spaces that are reserved for staff only. Staff are unlikely to be entering or exiting the site at times when the activities within the site generate their maximum number of arrivals, meaning that it is very unlikely that a vehicle entering the site will encounter another vehicle that is moving to or from those spaces. We also note that the dimensions of the staff spaces are slightly larger than required under the District Plan, meaning that drivers will be more easily able to enter and exit the spaces, and therefore minimise the time spent when the manoeuvring vehicle presents an obstruction. Finally the shortfall at the more heavily used access at Northlake Drive is small (0.3m) and in practice is unlikely to be noticeable.

On this basis, we do not consider that the limited queuing space will give rise to any adverse effects.

No queuing space is required at the six parking spaces accessed directly from Cluden Crescent.

Site Standard 14.2.4.1xiii: Loading Areas

No loading facilities are required for this land use zoning or activity under the District Plan. However, a loading space has been provided in view of the commercial activity, with the space being 10m long and 4.0m wide, exceeding the District Plan requirements.

We have evaluated the swept path of an 8m truck entering and exiting the loading space, as shown below. In this following Figures, the thicker cyan line is the area occupied by the vehicle bodywork and the thinner red line is a clearance of 0.5m around the vehicle.

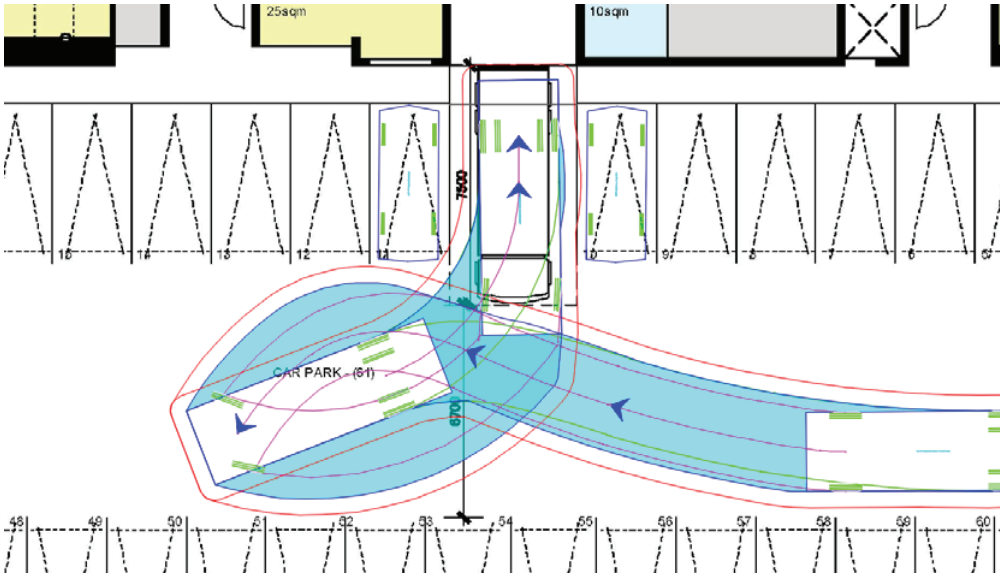


Figure 3: 8m Truck Entering Loading Bay

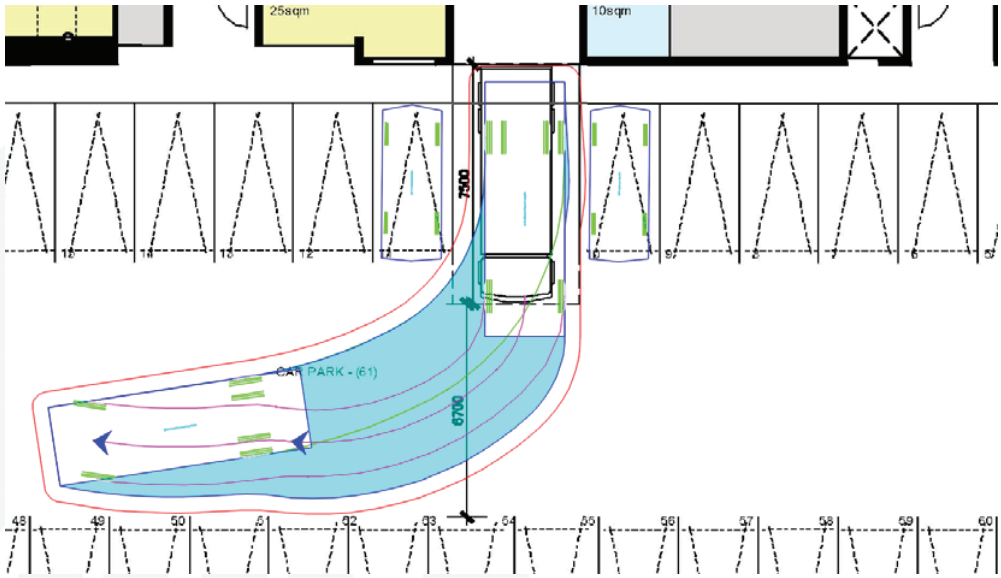


Figure 4: 8m Truck Exiting Loading Bay

It can be seen that the vehicle can enter and exit the loading bay without difficulty.

One particular aspect of the loading arrangement is that the vehicle will be required to reverse within a public car park rather than in (say) a service yard, and there is therefore an elevated potential for conflict with other users. To avoid this, we recommend that service vehicles are only permitted to be present at off-peak times, and that all reversing movements are carried out under the guidance of a spotter (also known as a dogsman or banksman) who is able to ensure that the reverse movement is carried out without risk to others.

Site Standard 14.2.4.1xiv: Surface of Parking and Loading Areas

There are no reasons why the parking spaces cannot be marked and the area sealed.

Site Standard 14.2.4.1xvii: Illumination

As the parking area serves non-residential development, it is required to be illuminated. There are no reasons why this cannot be achieved.

District Plan (Operative Version) Part 14.2.4.2: Access

Site Standard 14.2.4.2i: Length of Vehicle Crossings

The length of the vehicle crossings serving the main car park at the property boundary is 7.5m, with the vehicle crossings serving the westernmost visitor accommodation units being 7.8m wide. These are all within the range of 4m to 9m expected.

Site Standard 14.2.4.2ii: Design of Vehicle Crossings

Under this Site Standard accesses must cross the property boundary at approximately 90 degrees and can intersect the carriageway at between 45 to 90 degrees. This is achieved.

Site Standard 14.2.4.2iii: Maximum Gradient for Vehicle Access

From our observations, the site is relatively flat and so there should be no difficulties in achieving the maximum gradient of 1 in 6, nor the required breakover angles.

Site Standard 14.2.4.2iv: Minimum Sight Distances from Vehicle Access

All roads adjacent to the site are subject to a speed limit of 40km/h. This District Plan does not contemplate speeds of this scale, but extrapolating from the values within Table 3 of the Plan indicates that for non-residential development, sight distances of 57m would be appropriate. These are achieved along the major roads at the site accesses.

The sight distances are reduced to less than 57m when considering the presence of intersections near to the site accesses. However in each case, vehicles that have turned at the intersection will have either had to stop for opposing vehicles or will have slowed down in order to safely negotiate the intersection geometry. In these cases, we consider that the sight distances provided are appropriate for the prevailing vehicle speeds.

Site Standard 14.2.4.2v: Maximum Number of Vehicle Crossings

The site has one access onto Northlake Drive and Mt Linton Avenue, as permitted. There are two vehicle crossings proposed onto Cluden Crescent, but as this is a Local Road and the site has frontage of more than 18m, this is also permitted.

Site Standard 14.2.4.1vi: Distances of Vehicle Crossings from Intersections

The vehicle crossing onto Mt Linton Avenue is 41m from the Northlake Drive / Mt Linton Avenue intersection, with the vehicle crossing onto Northlake Drive being 35m from the Northlake Drive / Merivale Avenue intersection. These exceeds the required separation distance.

This access is also 25m from the Mt Linton Avenue / Glen Dene Crescent intersection, meeting requirements.

The northernmost vehicle crossing onto Cluden Crescent is 27m from the Northlake Drive / Cluden Crescent intersection. This exceeds the required separation distance.

The southernmost vehicle crossing onto Cluden Crescent is 25m from the Cluden Crescent / Obelisk Street intersection. This meets the required separation distance.

The vehicle crossing onto Northlake Drive is 22m from the Northlake Drive / Merivale Avenue intersection. This required separation distance in this case is 25m, and so there is a 3m shortfall. However the minor approach to the intersection is on the opposite side to the access, meaning that drivers will not be confused about where the vehicle is turning. The speed limit of 40km/h also creates additional time for drivers to see and react to vehicles manoeuvring ahead of them. We consider that these matters mitigate the slight shortfall.

Summary of District Plan Compliance

On the basis of our analysis, we consider that the proposed layout has non-compliances with the following Site Standards of the operative District Plan:

- Site Standard 14.2.4.1i: Minimum Parking Space Numbers
    - A coach park is required but not provided. However the site is designed in such a manner that if a coach party was to be present, then 8 of the parking spaces could be reserved for the coach (noting that the car parking spaces would be unused because guests would be travelling by coach).
- Site Standard 14.2.4.1v: Size of Parking Spaces
    - The mobility spaces share additional width, but this arrangement is permitted under Standard NZS4121:2001.
- Site Standard 14.2.4.1xi: Queuing
    - There is a shortfall of 0.3m in the queuing space at the Northlake Drive access and 3m at the Mt Linton Avenue intersection. However the closest spaces are reserved for staff only who are unlikely to be entering or exiting the site at peak times, and the dimensions of these staff spaces are slightly larger than required under the District Plan to expedite quick manoeuvring.
- Site Standard 14.2.4.2iv: Minimum Sight Distances from Vehicle Access
    - There are shortfalls in the sight distances if measured in the direction of the nearby intersections, but the sight distance provided will be appropriate for the prevailing vehicle speeds
- Site Standard 14.2.4.1vi: Distances of Vehicle Crossings from Intersections
    - There is a shortfall of 3m in the separation distance between the vehicle crossing to Northlake Drive and the Northlake Drive / Merivale Avenue intersection, but the low speed limit creates additional time for drivers to see and react to vehicles manoeuvring ahead of them and the minor approach of the intersection is on the opposite side to the access, meaning that drivers will not be confused about where the vehicle is turning.

We have also recommended that trucks only enter (reverse) into the loading bay under the control of a spotter, and at off-peak times, to avoid conflict with members of the public using the car park.

Overall, and subject to the above comments, we consider that these non-compliances will not give rise to any adverse effects that are more than minor.

We trust that this is of assistance but please do not hesitate to contact me if you require anything further or clarification of any issues.

Kind regards
Carriageway Consulting Limited

Andy Carr
Traffic Engineer | Director

Mobile: 027 561 1967 Email: andy.carr@carriageway.co.nz

Northlake Commercial and Visitor Accommodation Development

Urban Design Statement

FEBRUARY 2021

INTRODUCTION

This Urban Design Statement has been prepared by Three Sixty Architecture. It has been commissioned by Northlake Investments Ltd. The purpose of this Statement is to support the Resource Consent application for the proposed **Northlake Commercial and Visitor Accommodation Development**. It is to be read in conjunction with the Architectural drawings.

SITE LOCATION

Legal Description: Lot 1006, DP515015

Planning Zone: Northlake Special Zone, Activity Area D1

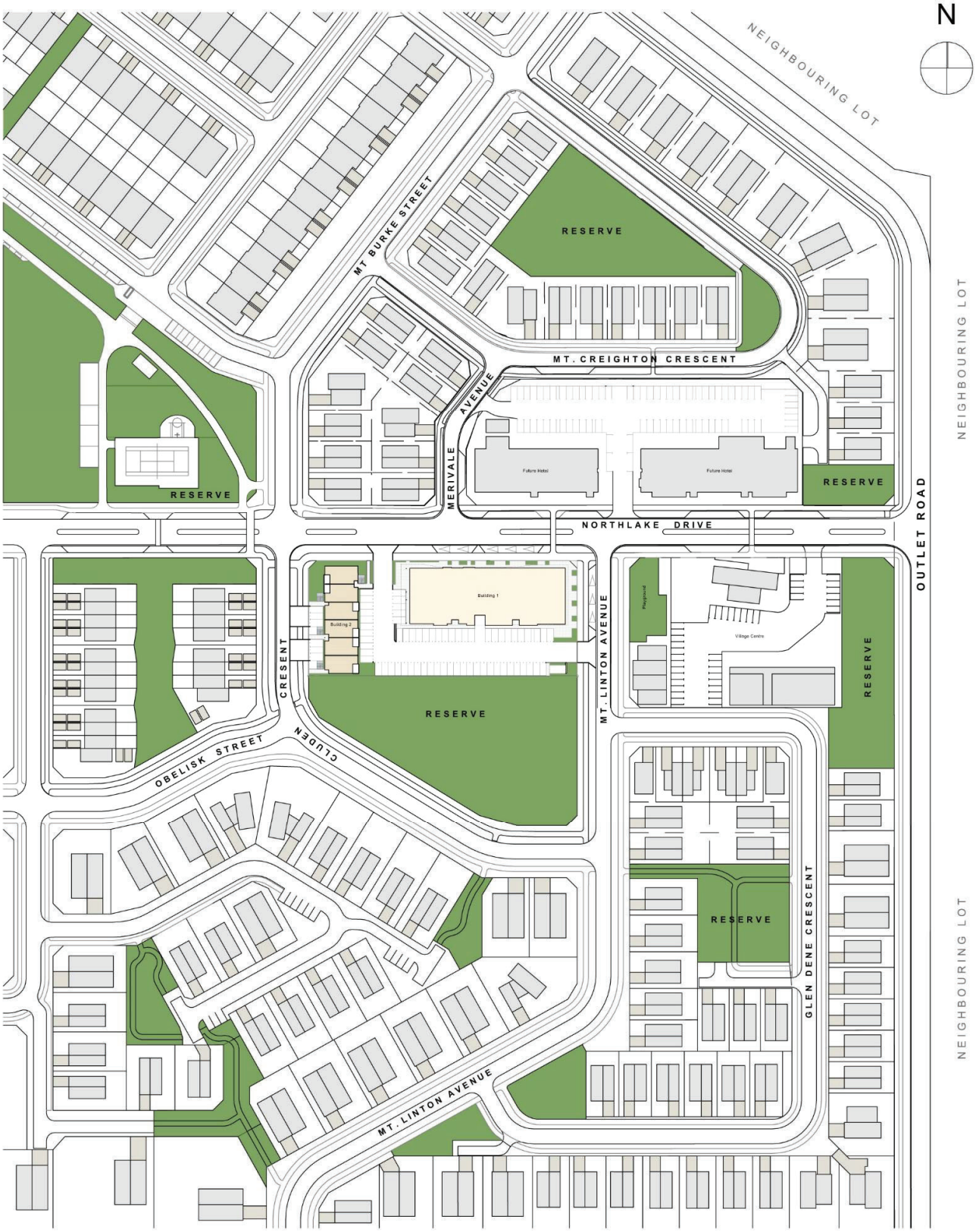
BACKGROUND

Three Sixty Architecture are the architects for many of the residential dwellings within Northlake and both residential and commercial developments in the wider Wanaka area.

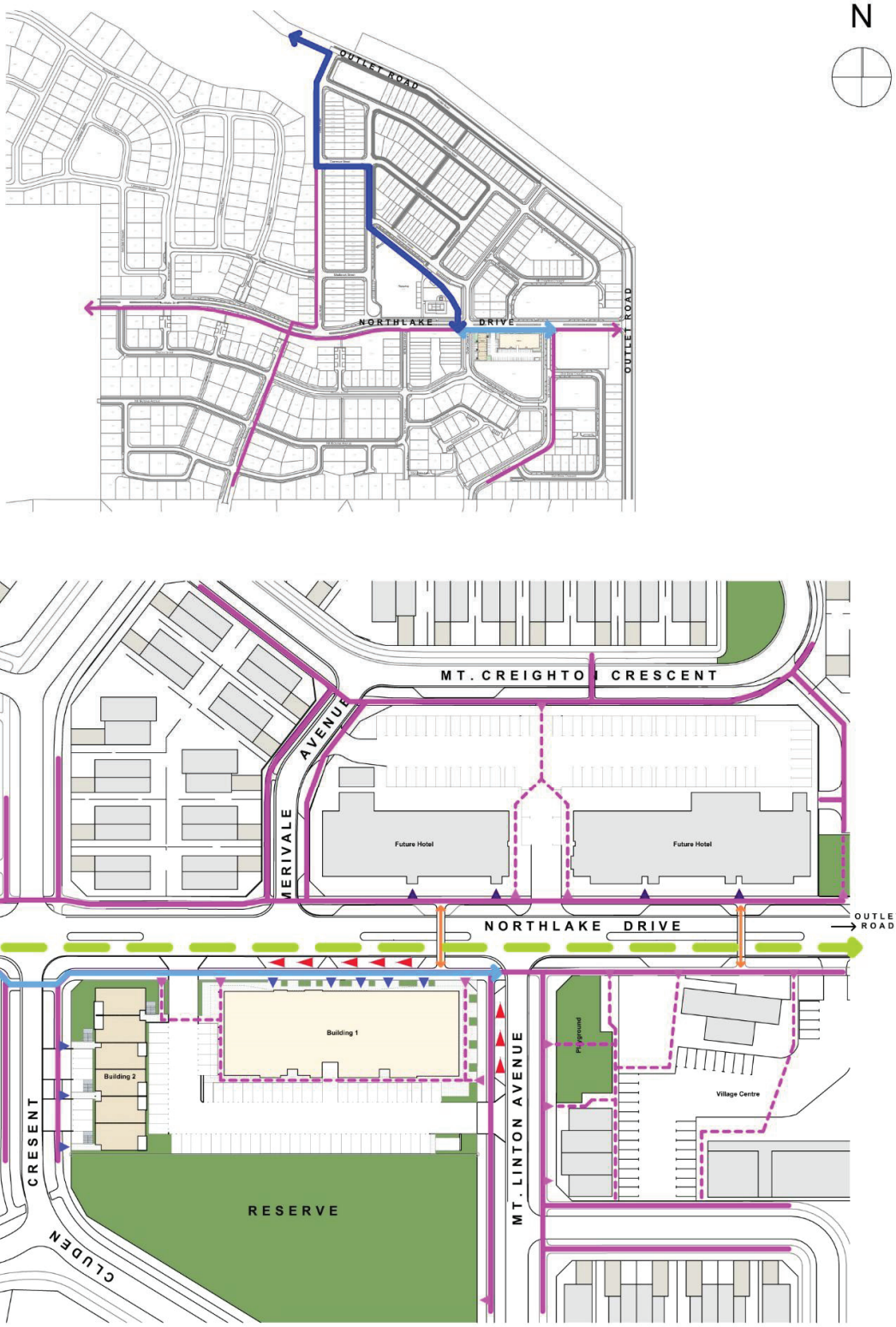
Three Sixty Architecture were commissioned in 2020 to be the architects for the proposed Northlake commercial development. A pre-application meeting was held on, 11th December 2020. Matters that were raised in respect of urban design at the pre-application meeting by Wendy Baker have been incorporated and addressed in this urban design statement.

Three
Sixty
Architecture

Urban design & masterplan drawings.



Future Composite Plan – Figure 1



Pedestrian Network - Figure 2

Assessment Criteria - Northlake Special Zone

Restricted Discretionary Activity - Buildings for Visitor Accommodation, Commercial, Retail and Community Activities and Retirement Villages within Area D1 (Rule 12.34.2.3.iv)

The Urban Design Statement follows the format of the Northlake Special Zone Assessment Criteria as set out in Ref 12.34.5.2.v. Each of the Assessment Criteria are indicated below in italics and a response and commentary follows for each section.

a) Whether the design of the building(s), open spaces, car parking, access, and landscaping successfully mitigates the adverse effects on adjoining properties in terms of:

i. Noise, vibration and lighting from vehicles

Car parking for the development is located to the south of the buildings adjacent to the stormwater reserve which provides a buffer to the residential housing further south. The two-storey visitor accommodation (VA) building which houses 12 VA units conceals the carparking area from the residential dwellings to the west on the other side of Cluden Crescent. The parking is setback from both Northlake Drive and Mount Linton Avenue with a landscaped buffer. This buffer is approx. 12m deep which serves as a queuing space and a visual screen to the houses on the north side of Northlake Drive.

The combination of building location, setbacks from the boundary, and the landscape buffering around the car park edges collectively work well to alleviate any potential concerns of noise, vibration and lighting from vehicles to the neighbouring residential properties.

ii. Protecting privacy for residential neighbours

The site, Lot 1006 is an island site, bordered by roads and the reserve ie. Northlake Drive, Mount Linton Ave and Cluden Crescent. Therefore, this site has no residential neighbours as all residential neighbours are across streets in all cases.

Notwithstanding this, there are several factors that protect privacy for the houses across this street condition.

Firstly, the houses located on Northlake Drive have their vehicle access points, garages and entries to the street facing the development. They typically have their living areas and private outdoor spaces facing to the north, west and east. Therefore, privacy for the houses is very unlikely to be affected.

Secondly, the terrace houses located on Cluden Cresent which also has vehicle access points, s and entries to the street facing the development. The West elevation of building 2 has been designed to smaller windows, and entry points to reduce the overlooking. Balconies are predominately located on the east façade, with the exception of the corner facing VA units.

b) Whether buildings, taking account of their proposed location, function and visibility, will make an attractive contribution to the streetscape or landscape.

The development has been broken into two separate buildings.

Building 1 – Retail at ground level and VA to the first floor. This building has been located along the length of Northlake drive and Mount Linton Avenue, with a setback approx. 3.7m to the north and 4.4m to the east. The building addresses the street edges and the existing village hub to the east, with retail tenancies that have been located to address these street frontages at ground level, creating an interactive and positive contribution to the streetscape.

Building 2 – Twelve VA units, six at ground level and six at first floor level. This building has been located along the length of Cluden Crescent, with the main façade being setback approx. 6.0m from Cluden Crescent, and three staircases abutting the 3.0m setback. To the north face the building abuts the min council required 3.0m setback.

The upper roof forms of both buildings have been articulated by the introduction of lower link roofs which create a broken roof form, which reduces the buildings in overall scale to smaller single gable forms.

Changes in façade material, window treatment and rhythm, break the scale of the building. In essence the buildings read as collection of linked gable buildings. This helps the large scale buildings to be more sympathetic to its residential neighbours in scale, yet at the same time, creating intensity at the focal point of the Northlake village hub.

c) Whether the design, colour and choice of building materials will contribute to a coherent theme for the street and neighbourhood, in general accordance with the architectural style shown in the following images.

The architectural style and form of the development takes its cues from historical buildings often found in the Central Otago landscape. This fits with the general spirit and style of the sketch images provided in the Northlake Special Zone section of the district plan. Refer Figure 3.

The proposed built form, colours and material palette are considered appropriate for the site providing a high degree of variation, modulation and suitable material use. The development is 'broken up' into smaller buildings as opposed to one large larger building. Overall, the design is considered a campus style development unified through a consistent material and colour use but with sufficient variation to avoid a lack of legibility.

The overall forms of the development read conceptually as linked gables stacked along the street edge. The use of partially rendered brick creates mass, deep reveals and a sense of gravity.

The scale of the building is in contrast to the scale of the predominantly one storey houses but does not dominate due to the close proximity other larger buildings. These being the 2-storey terrace housing on Cluden Cresent, the 2-storey commercial buildings in the village hub and 2-storey housing within stage 3, these buildings are similar in height and mass. The articulation of the following elements further integrates the commercial development into the context; overall form through roof variation, inclusion of balconies overlooking the streetscape, variety of cladding materials, extruded window surrounds, characteristic gable roof and setbacks.

QLDC District Plan Northlake Special Zone 'Architectural Style' Excerpt

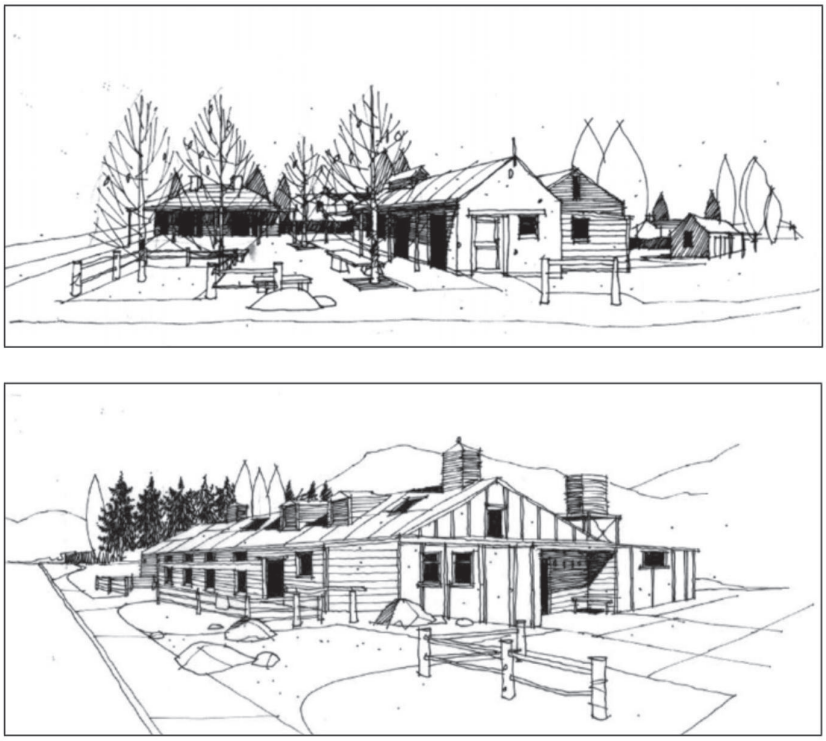


Figure 3.

d) Whether the buildings would be attractive when viewed from elevated locations inhabited or frequented by people.

There are very few elevated locations in the immediate context to the site. However, it could be seen from Mount Iron, the two storey houses in stage 3 and future hotel to the north within the Northlake development which will be of larger scale. From these locations and distance, the roof form and character would be an important consideration. As it is designed, the roof is broken into smaller gable forms linked together and would be read as a series of smaller buildings which would tie into the single storey smaller dwellings it sits amongst, if viewed from an elevated point.

e) Whether the building is setback from the road or not and the extent to which it is set back.

The building itself is set back from Northlake Drive and complies with the District Plan Site Standards, i.e. a 3.0 metre setback from roads. This setback area has been landscaped both with soft and hard surfaces to further enhance the streetscape and allowing the footpath on Northlake Drive to be increased in width to 3.0 metre .

f) Whether any area set aside for the storage of waste is adequately sized and designed to enable the separation, storage and collection of recyclable waste.

Storage and collection of recycling and waste has been located in the south-east corner of the car park adjacent the reserve space, away from Northlake Drive. Refer architectural drawings.

g) The extent to which the outside storage of any goods, materials or equipment (including vehicles associated with the activity parked on the site overnight) would have an adverse effect on the residential amenity of neighbours or the streetscape.

Careful consideration has been given to the location of outside storage, car parking and servicing to screen to ensure that is setback from the residential amenity of the neighbours and the streetscape is protected. The car parking is located to the rear of the buildings away, therefore limiting effects overnight, the reserve also increases this buffer to the neighbours.

h) Whether any landscaping associated with buildings, for the purposes of mitigation or beautification, would:

i. Result in adverse effects on neighbouring properties;

ii. Be practical to maintain.

The soft and hard landscaping treatments enhance the proposal and give clear legibility to the development site and precinct. These are easily accessible to maintain and is consistent with the standard of landscaping in the commercial blocks.

i) Whether sufficient car and cycle parking is available or proposed either on site or through shared or common area.

Sufficient cycle parking has been provided in the form of a on-site cycle parking area. Refer Architectural plans.

Refer to Carriageway Consulting report for detailed assessment relating to parking and access.

j) Whether car parking is appropriately located and designed.

Car parking has been located to south side of the site behind the buildings away from the Northlake Drive frontage. Legible entranceways are located on both Northlake Drive and Mount Linton Avenue.

Refer to Carriageway Consulting report for detailed assessment relating to parking and access.

Existing on street parking located outside the site on the north and east faces may be adjusted to 15-minute short term parks to allow for short visits to the retail spaces along the street frontages.

See figure 2 and 4

k) Whether the building contributes to the creation of an active street frontage.

The development contributes positively to an active street frontage. The ground level retail activities are purposefully located to activate Northlake Drive and add to the vibrancy of the village hub. Landscaping elements, trees and balconies face Northlake Drive to add interest and provide separation. This is further enhanced by a widening of the Northlake drive footpath to 3.0m along the length of the frontage to facilitate better desire travel lines for pedestrians between the village hub, the reserve to the west of the site and beyond linking Outlet road with the proposed retirement village and finally to the lake. *See figure 2 and 4*

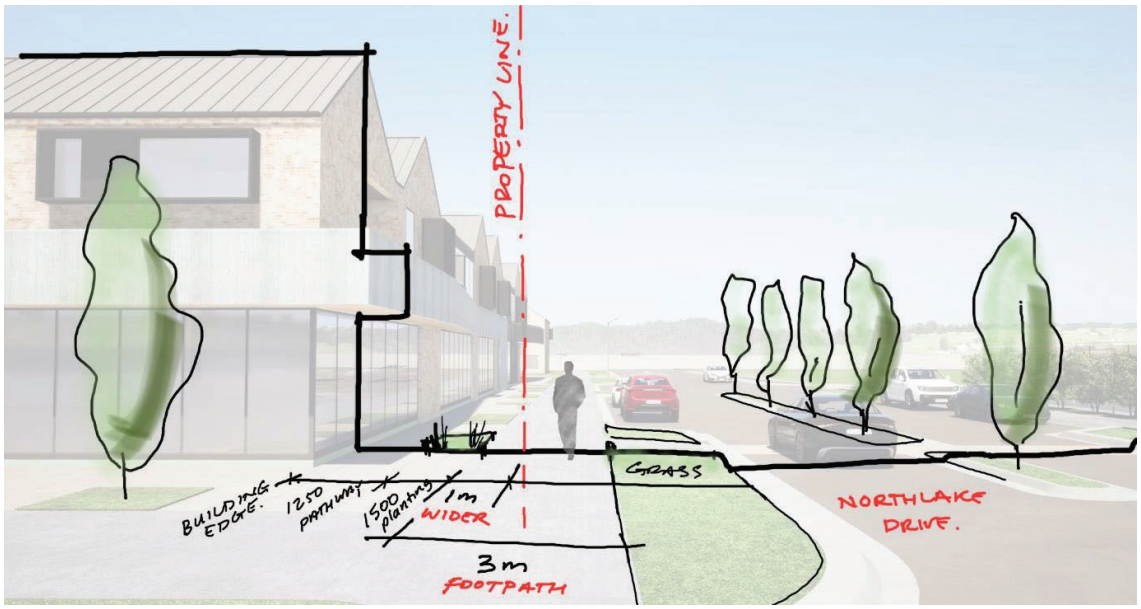


Figure 4

l) Whether, for buildings which adjoin open spaces, an appropriate interface is achieved with that open space that makes the open space feel safe and attractive.

The commercial / retail and possible future outdoor dining areas face onto Northlake Drive and Mount Linton Avenue to the east. Northlake Drive will be activated and be an attractive addition to the village hub area. The combination of these different commercial spaces facing the road will add to the 'eyes on the street' and from a CPTED point of view will make a positive contribution.

The units on all levels facing all directions will assist with a sense of safety to the spaces below. As the site is an island site and surrounded by public streets, reserves and footpaths, there are no back alleyways or areas where the built fabric creates unsafe areas. Notably, the units located in building 2 at the ground floor, on the car park side, have direct access through a patio space. This adds to positive overlooking and surveillance of the car park area.

m) The extent to which any proposed retail activities are limited to small scale retail activities intended to primarily service the local neighbourhood catchment, such as dairies, hairdresser, cafés/restaurants and food takeaway shops.

The development proposal brings with retail, commercial functions that are complementary to the scale and character of the Northlake Development as a whole. The retail activities have been divided into 6 tenancies of varying size to support future occupation of small-scale local service activities.

The proposed retail and commercial uses are sympathetic to the village hub which includes a playground, café and childcare centre directly across the road, and future hotel which form the critical mass of the village hub.

Tenancy 1 is proposed retail offering in the manner of a small supermarket or convenience store which is primarily intended to service the local neighbourhood.

Urban Design Protocol Assessment

Following the Northlake Zone Assessment Criteria a MFE NZ Urban Design Protocol has been included. The NZ Urban Design Protocol sets out the Seven C's as criteria to help guide good urban design outcomes.

Creativity

The mixed development is a welcome addition to the village hub as it brings life and amenity. Being visitor accommodation, and brings retail, commercial and convenience support facilities that would be beneficial to the local residential community.

The cluster of uses and building forms in the village hub, create a focal point for the residential neighbourhood. The proposed mixed-use development brings visitors to the hub which adds a social dynamic to complement local usage and local community patronage.

Connections

The development is located on Northlake Drive, between the existing village hub and other residential / reserve spaces. It is therefore a key linking and connecting element to the Northlake development. It is well connected in terms of vehicular access and is also a primary pedestrian and cycle connection through the zone.

There are pedestrian crossing points across Northlake Drive to the west and east of the site. There are footpaths on all street frontages. A new footpath widening is proposed to the Northlake drive frontage which connects the existing village hub with other areas within Northlake to the west.

Collaboration

Given the proposal is for a single development, collaboration is expressed through the multidisciplinary design team, i.e. architect, urban designer, landscape architect, planner, civil engineer, traffic engineer, structural engineer and client. Additionally, the formation of the village hub activities and uses is a collaborative effort to get the right mix of uses and scale for the new and existing community. This is led by the client, Northlake Investments Ltd.

Custodianship

The proposed development is an extension of the existing village hub which is a collection of local amenities that engender a sense of community that are privately operated yet open out onto semi-public and public outdoor landscape spaces. The proposed development offers increased amenity and a further gathering place for the locals. The proposed development will provide a positive contribution with its location on Northlake Drive.

Character

The use of gable forms and materials reinforces the character of the village hub. The collection/cluster of like-minded buildings at the junction, form a defined low-key focal point for Northlake. The development builds on a palette of textural and heavily mortared brick, timber and metal roofing profiles which have been very successfully employed within the village zone. Combined with the gable roof forms and lower links it has a domestic scale and character.

Choice

These VA units offer choice in terms of visitor accommodation. It adds diversity to the village hub and complements the other hub uses.

Context

The development with its mixed use programme is inherently contextual. It fits nicely into its immediate context of a small village hub, aesthetically and programmatically. It has an architectural dialogue with the rest of the hub, and with neighbouring houses.

Conclusion

In the wider context the proposal satisfies the broader contextual siting issues in that the development is located at the junction of a number of primary connector roads. It sits comfortably in the wider landscape and landform with clear cues to its previous rural architectural imagery.

Within the local context, in terms of a local neighbourhood context it fits with the vernacular cluster of buildings to date within the hub, employing materials and related forms.

Car parking is set away from Northlake Drive, such that the two buildings conceal the car parking from the residential activities. The public retail functions are situated directly on the street edge which activates the frontage and reinforces the hubs presence and amenity.

The public spaces have been well considered with excellent access for all. Desire lines and pathways have been enhanced linking the existing commercial hub with reserves and areas. This is accommodated with increased width to footpaths, enhancements to landscaping and changes to street parking time limits are proposed to allow for site usability.

This design will bring a connected and positive urban outcome to the wider Northlake area and village hub.

Dean Cowell

Registered Architect

NZIA

23.02.2021

Signature Date

Three
Sixty
Architecture

MARSHALL DAY Acoustics

NORTHLAKE WANAKA – LOT 1006
PREDICTED NOISE

Rp 001 20210052 | 17 February 2021

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Cover image

QLDC Quickmaps

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APPENDIX A GLOSSARY OF TERMINOLOGY

1.0 SUMMARY

Marshall Day Acoustics has been engaged to determine the potential site noise emissions from the proposed development of Lot 1006 on Northlake drive, Wanaka, the details of which are provided in the application documentation.

The proposed activities within the site include visitor accommodation, residential apartments and retail activities.

We have recommended noise related consent conditions that should be included in any land use consent, should consent be granted.

If the proposed conditions of consent are complied with then it is our opinion the development can comply with the Queenstown District Lakes Plan noise limits at all properties that have not provided written consent.

Where a technical non-compliance with noise limits occurs, we have concluded the predicted noise will be acceptable.

2.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged to determine the potential site noise emissions from the proposed Northlake Wanaka mixed use development of Lot 1006.

The proposed development consists of two buildings and a carpark and will include a mix of activity types. Building one will include retail and/or offices on the ground floor and apartments on level 1. A second building will consist of two levels of residential in the form of apartment style visitor accommodation.

Given this, the predominant noise sources are expected to be those typical of residential and retail activities, as well as vehicle movements and mechanical plant for heating, cooling and ventilation. Activities and planning matters are discussed in greater detail in the application and associated planning assessment. We have summarised only relevant aspects of this discussion below.

A glossary of acoustical terminology is provided in Appendix A.

Figure 1: Site location

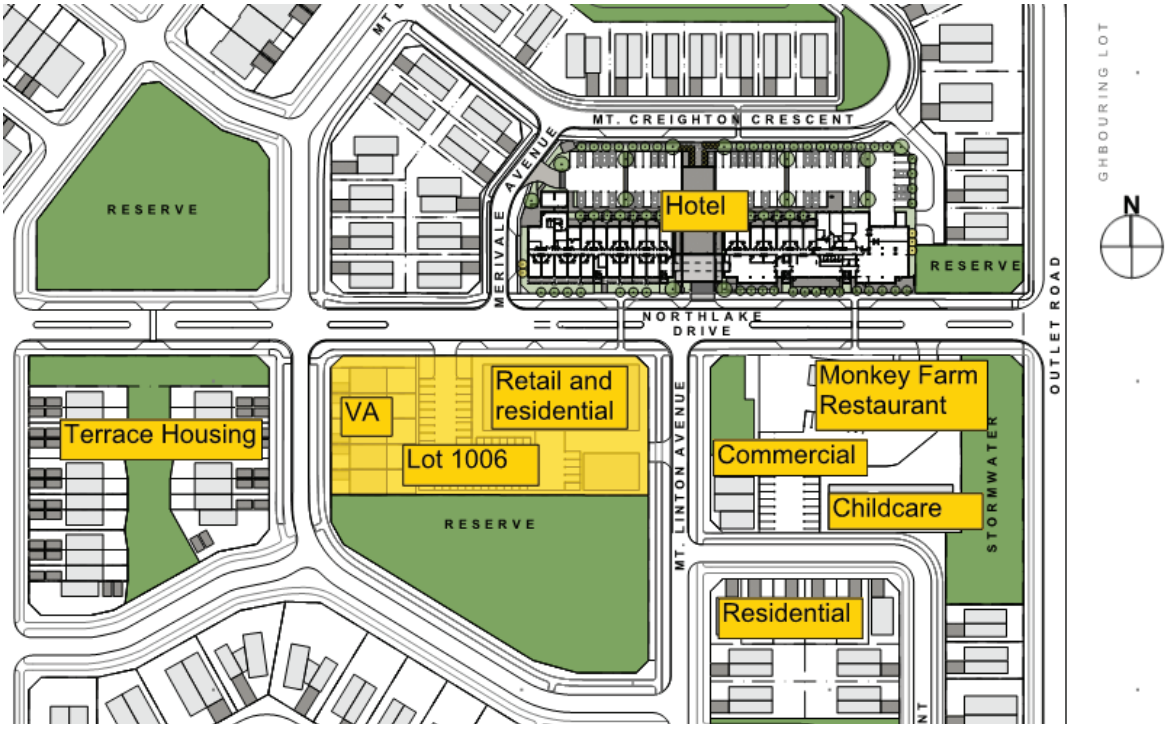

Image: studiopacific architecture

3.0 NOISE LIMITS

The site is located wholly within the Northlake Special Zone (NSZ) in the Queenstown Lakes District Plan (QLDP). The surrounding receiving sites are also within the NSZ.

The QLDP requires compliance with the following noise limits:

NSZ; Section 12.34.4.2 vi

vi. Noise

(a) Sound from non-residential activities measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008 shall not exceed the following noise limits at any point within any other site in this zone:
  (i) Daytime (0800 to 2000 hrs) 50 dB $L_{Aeq(15\ min)}$
  (ii) Night-time (2000 to 0800 hrs) 40 dB $L_{Aeq(15\ min)}$
  (iii) Night-time (2000 to 0800 hrs) 70 dB L_{AFmax}

(b) Sound from non-residential activities which is received in another zone shall comply with the noise limits set in the zone standards for that zone.

(c) The noise limits in (a) and (b) shall not apply to construction sound which shall be assessed in accordance and comply with NZS 6803:1999.

(d) The noise limits in (a) shall not apply to sound associated with airports or windfarms. Sound from these sources shall be assessed in accordance and comply with the relevant New Zealand Standard, either NZS 6805:1992, or NZS 6808:1998. For the avoidance of doubt the reference to airports in this clause does not include helipads other than helipads located within any land designated for Aerodrome Purposes in this Plan.

3.1 Noise Limit Discussion

The wording of the QLDP NSZ noise rules requires the noise limits between all land uses within the NSZ should be the same. There is no differentiation of different land use types - and sensitivity to noise - within the NSZ.

The noise limit values and hours of day/night are conservative for all land uses other than residential. Commercial for instance, would typically be 60dB L_{Aeq} 24 hours per day. The basis for commercial activities being capable of receiving higher noise than residential receivers is that commercial activities are less sensitive to noise than dwellings.

The protection of reserve land used for quiet enjoyment and amenity may be required. In the case of infrastructure stormwater reserve we do not agree that a requirement to meet Plan noise limits is appropriate.

The consequence of a “one size fits all” noise limit based on the most sensitive type of receiver is that any non-residential landuse is almost certainly going to either wholly, or in part, fail to comply and thus trigger need to obtain resource consent.

4.0 NOISE MODEL

In calculating the potential noise levels generated by the various site activities we have calculated this using ISO9613-2 algorithms and included consideration of building forms as well as light downwind conditions. The immediate area around the applications site is essentially flat and we have completed our calculations on that basis.

4.1 Potential receivers of noise

Figure 2 illustrates the potential receivers of noise and Table 1 summarises the property address, zoning and our short reference for each.

Figure 2: Potential receivers of noise

Image: QLDC maps and Three Sixty Architecture

Table 1: potential receivers of noise

MDA reference	Address	Operative District Plan Zone	Use
1	1 Merivale Ave	Northlake Special	Residential
2	2 Mt Bourke St	Northlake Special	Residential
17	17 Cluden Cres	Northlake Special	Residential
19	19 Cluden Cres	Northlake Special	Residential
21	21 Cluden Cres	Northlake Special	Residential
23	23 Cluden Cres	Northlake Special	Residential
25	25 Cluden Cres	Northlake Special	Residential
27	27 Cluden Cres	Northlake Special	Residential
29	29 Cluden Cres	Northlake Special	Residential
9R	9 Rocklands Ct	Northlake Special	Residential
11R	11 Rocklands Ct	Northlake Special	Residential
13R	13 Rocklands Ct	Northlake Special	Residential
15R	15 Rocklands Ct	Northlake Special	Residential
17R	17 Rocklands Ct	Northlake Special	Residential
30	Cluden Cres reserve	Northlake Special	Stormwater reserve
32	62 Mt Linton Ave	Northlake Special	Residential
62	Mt Linton Ave commercial	Northlake Special	Commercial

5.0 PREDICTED NOISE EMISSION SCENARIOS

We have considered the following scenarios occurring simultaneously:

- Retail and office usage
- Visitor Accommodation

  Noise from visitor accommodation is anticipated to be equivalent to residential activity.

  To ensure this is the case the management of the visitor accommodation will need to require clients to agree to good behaviour – including noise – during booking and reiterated by signage in the guest rooms. A site manager will also be available to monitor and deal with any rogue guests (the manager need not be in residence but should be able to respond to issues as they arise).
- Carpark use

  Worst case scenario of each carpark closest to each receiver are occupied and vacated in a one hour period – this is considered to be a worst case scenario, particularly with regard to visitor accommodation.

  No boundary fences have been assumed – should a reduction in noise from carpark activities be required - this could easily be achieved along the reserve boundary.
- Mechanical services

  It is common for the mechanical services equipment to be conditioned with a consent condition requiring specific design to ensure compliance with District Plan noise limits cumulatively with other activities.

5.1 Predicted noise levels

Table 2 summarises the predicted noise level for each operational scenario which are considered low key in terms of the potential noise emisison. The predicted noise levels at each receiver are per activity and not cumulative.

However, it is a simple task to use the predicted noise levels in Table 2 to calculate what may be expected from different scenarios of simultaneous activities. We have provided a comment with regard to potential cumulative noise on the basis of the Table 2 results and also briefly discussed it in Section 5.2.

The predicted noise levels in Table 2 do not have any additional noise mitigation other than what would be anticipated in a base build project. The details of noise mitigation required, for example with mechanical services is typically resolved through conditions of consent targeted at specific matters.

Table 2: Predicted noise levels; no additional mitigation

MDA Ref		Predicted noise level dB, L_{Aeq} for different operational scenarios				
	Address	Retail/office	Carpark - day	Day/night noise limit, dB, L_{Aeq}	Complies ?	Comment
1	1 Merivale Ave	<40	<40	50/40	Yes	-
2	2 Mt Bourke St	<40	<40	50/40	Yes	-
17	17 Cluden Cres	<30	<30	50/40	Yes	-
19	19 Cluden Cres	<30	<30	50/40	Yes	-
21	21 Cluden Cres	<30	<30	50/40	Yes	-
23	23 Cluden Cres	<30	<30	50/40	Yes	-
25	25 Cluden Cres	<30	<30	50/40	Yes	-
27	27 Cluden Cres	<30	<30	50/40	Yes	-
29	29 Cluden Cres	<30	<30	50/40	Yes	-
9R	9 Rocklands Ct	<30	38	50/40	Yes	-
11R	11 Rocklands Ct	<30	38	50/40	Yes	-
13R	13 Rocklands Ct	<30	38	50/40	Yes	-
15R	15 Rocklands Ct	<30	37	50/40	Yes	-
17R	17 Rocklands Ct	<30	37	50/40	Yes	-
30	Cluden Cres reserve	<40	48	-	-	See 5.2.1
32	62 Mt Linton Ave	<40	34	50/40	Yes	-
MLA	Mt Linton Ave commercial	<40	<40	-	-	See 5.2.1

From the predicted noise levels in Table 2 we conclude compliance with day and night-time noise levels at many of the nearest potentially affected properties.

5.2 Discussion

In this section we will discuss the implication of potential non-compliance identified in Table 2 with NSZ noise limits.

5.2.1 Commercial activity receiver

As noted in Section 2.1, the blanket noise limit of 40 dB L_{Aeq} from 8pm to 8am throughout the NSZ, irrespective of the land use, is too simplistic an approach in our view. The consequence of this approach is that anomalies arise such as noise received at commercial activities is required under the QLDP to comply with residential amenity noise levels in order to be considered permitted with respect to noise.

This is a moot point in this case because of the low predicted noise levels received at the commercial site. Nonetheless it is important to acknowledge the recognised difference in sensitivity to noise based on a receivers use.

5.2.2 Reserve adjacent to site

We understand the reserve adjacent to the site is owned by QLDC. In our opinion this reserve land is not considered of such recreational value that it requires protection from noise to an equivalent standard that a dwelling does.

The reserve is understood to be more functional – for stormwater runoff – rather than a recreational space, and as such is not considered special in terms of noise levels that may be received there.

6.0 CONDITIONS OF CONSENT

Should consent be granted, we recommend the following noise related conditions be included:

1. *Noise from the application site shall comply with the following noise limits:*
    - *(a) Sound from non-residential activities measured in accordance with NZS6801:2008 and assessed in accordance with NZS6802:2008 shall not exceed the following noise limits at any of the points marked in Figure 1 below:*
        - *(i) daytime (0800 to 2000 hrs) 50dB $L_{Aeq\ (15\ min)}$*
        - *(ii) night-time (2000 to 0800 hrs) 40dB $L_{Aeq\ (15\ min)}$*
        - *(iii) night-time (2000 to 0800 hrs) 70dB L_{AFmax}*
    - *(b) The noise limits in (a) shall not apply to construction sound which shall be assessed in accordance with NZS6803:1999.*
2. *Prior to commencement of operations, the consent holder shall provide to the Planning Manager a letter from a suitably qualified acoustic consultant that noise from all building services plant on site has been designed to adopt the best practicable options to mitigate and control noise beyond the application site to an appropriate level in addition to meeting the noise limits in 1 above.*
3. *Visitor accommodation management shall highlight to customers - both at time of booking and by way of notices in rooms - that noise during use of the accommodation shall not be unreasonable or excessive and that guest must be mindful of neighbours expectation of peace and quiet.*

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A sound that is unwanted by, or distracting to, the receiver.
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.