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NORTHLAKE INESTMENTS LIMITED
PRIVATE PLAN CHANGE REQUEST
INFRASTRUCTURE REPORT

PROJECT:	Northlake Wanaka, Private Plan Change Request
PRINCIPAL:	Northlake Investments Limited
OUR REF:	W4481-07
DATE:	September 2017

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REVISION / APPROVAL PANEL

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0	11/08/17	PGS	MJB	Issued for client review
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CONTENTS

1. Scope

This report has been prepared to support a private plan change request to adjust the activity area boundaries at Northlake, Wanaka. The private plan change request seeks the adjustment of the activity area boundaries to allow for increased higher density living and the possibility for the development of a retirement village within the Northlake Special Zone while also rationalizing the internal activity area boundaries to more appropriately match the proposed lot and road layout.

This report is to be read in conjunction with the following previous reports;

Report:	Appendix Reference:
Hadley Consultants Ltd: Feasibility of Utility Services and Infrastructure (submitted as part of Plan Change 45)	A
Paterson Pitts Group: Subdivision Stages 1-3 Infrastructure Report	B
Paterson Pitts Group: Subdivision Stages 4-6 Infrastructure Report	C
Paterson Pitts Group: Subdivision Stages 8-9 Infrastructure Report	D
Tonkin & Taylor: Water Modelling 50553.324 (dated 10 February 2016)	E
Watershed Limited – Water Modelling Stages 1-7 (dated 3 June 2017)	F
Watershed Limited – Water Modelling Stages 1-4 (dated 31 August 2017)	G
Rationale: Wastewater Modelling (dated 14 January 2016)	H
Rationale: Wastewater Modelling (dated 1 February 2016)	I

This report covers the availability of the following infrastructure elements and how the amended activity area boundaries and resulting dwelling yields will be suitably serviced within the greater Northlake Special Zone.

- Stormwater
- Wastewater
- Water Supply – Potable and Firefighting
- Network Utility Services (electricity and telecommunications)

2. Resulting Dwelling Yield

Table 2.1 below identifies and compares the residential yield (du's) of that part of the operative Northlake Zone that is owned by Northlake Investments Limited with the proposed plan change alternative yields. It is these yield numbers which have been used to assess the infrastructure needs for the proposed plan change.

Activity Area	Density (Per ha)	Existing Residential Yield +15% (du's) [1]	Proposed Residential Yield +15% (du's) [2]	Difference in Residential Yield (du's)
D1	15	282	366	84
B4 [3] [4]	10	157	157	0
B3	10	134	113	-21
B2	10	88	93	5
C1	4.5	79	74	-5
C2	4.5	37	29	-8
	Total	**777**	**832**	**55**

Table 2.1: Northlake Activity Area Dwelling yields

[1] Existing Residential Yield has been calculated using the Northlake Special Zone Structure Plan as modified by RM160152 (Outline Development Plan decision)

[2] Proposed Residential Yield has been calculated using the areas shown on Baxter Design Group plan 2754-SK02 25 September 2017.

[3] D1 area was adjusted by minus 1.8ha to calculate the Existing Residential Yield for this activity area as per the requirements of District Plan Rule 12.34.6.2 (iii).

[4] D1 area was adjusted by minus 1.416ha to calculate the Proposed Residential Yield in this activity area as per the requirements of District Plan Rule 12.34.6.2 (iii). The adjustment area was reduced as the non-residential area of the Village Centre is now better defined compared to at the time of RM160152

3. Stormwater

The Northlake development proposes to maintain the runoff characteristics of the existing catchment and the proposed adjustments to the activity areas are not going to result in a change to the stormwater catchments. The development will result in an alteration to the existing runoff flow paths and will result in an increase in peak flow runoff once the development is completed and all dwellings are built due to a slight increase in proposed density.

It is proposed to continue to utilise the low impact design approach i.e. swales, detention ponds, soakage along with traditional piped reticulation where required to ensure there is no increase from pre to post development flows leaving the site and to ensure that stormwater quality is maintained prior to subsequent discharge into the Clutha River.

The Northlake site can be split into two catchments. It is proposed to discharge both catchments to the current discharge locations at the site boundary i.e. post development flow paths will closely align with the pre-

development flow paths. To successfully undertake this, a stormwater system that aims to minimise the environmental impact by reducing peak flow through attenuation, reducing discharge by infiltration and soakage, improving water quality by filtration and the use of detention devices has been adopted.

4. Wastewater

4.1 Wastewater Demand

Table 4.1 below shows the theoretical wastewater generation flow rates (l/day) for the Northlake Development using the existing and proposed residential lot yields.

Scenario	Wastewater Demand (litres/day/du) [1]	Dwelling No.	Total (litres/day)
Existing Residential Yield	750	777	582,750
Proposed Residential Yield	750	832	624,000

Table 4.1: Wastewater Total Litres Per Day

[1] *The wastewater demand calculation in Table 4.1 above is based on QLDC LDSCoP Section 5.3.5.1(a) parameters i.e. average dry weather flow (ADWF) of 250 litres per person per day and 3 people per dwelling. No peaking factor has been applied to this number.*

The QLDC LDSCoP Section 5.3.5.1(a) identifies the following peaking factors to be applied to the wastewater daily demands indicated in Table 4.1

- Dry weather diurnal peaking factor of 2.5
- Dilution/infiltration factor of 2 for wet weather

Applying these peaking factors results in the peak flow estimation as shown in Table 4.2 below.

Scenario	Peak Hour Flow (litres per second)
Existing 777 dwelling equivalents	33.72
Proposed 832 dwelling equivalents	36.11

Table 4.2: Wastewater Peak Hour Flow

4.2 Council Reticulation

As part of the construction of Stages 1-3 of the Northlake development a Ø300mm main was extended up Outlet Road to the entrance to the Northlake development at Northlake Drive. This main was installed with the capacity to reticulate the entire Northlake development west of Outlet Road including other areas of the Northlake Special Zone located upstream of this main (Allenby Farms Limited).

The proposed adjustment to the activity areas within the Northlake development result in an increase in potential dwelling yield of 55 units, however as shown in the Table 4.3 below the existing 300mm main still has the capacity to service the catchment.

Outlet Road Foul Sewer Main Ø300mm Peak Flow	
	Theoretical Peak Hour Flow (l/s)
Northlake Investments Limited (proposed 832 dwellings)	36.11 l/s
Upstream Catchment 420 additional dwellings [1]	18.23 l/s
Total	**54.34 l/s**
300mm Outlet Road main capacity (litres per second)	58.5 l/s
Residual Capacity	**4.16l/s**

Table 4.3: Outlet Road 300mmØ main capacity.

[1] *Upstream catchment numbers based on density yields +15% for neighbouring B1 (Allenby Farms Limited) and C3 (Urquhart)*

4.3 Internal Reticulation

The site has a general slope to the east from its high point at the western boundary bordering Sticky Forest. The majority of the site will be able to be drained using standard trunk and lateral gravity pipes to connect into the existing 300mm main in Outlet Road.

A small area of the proposed D1 and C2 on the north-eastern boundary of the site will require the construction of a pump station or a low-pressure reticulation to convey waste water up to the existing reticulation. That pump station will be necessary regardless of the proposed plan change.

5. Water Supply

5.1 Water Demand

Table 5.1 below shows the theoretical water supply demand (l/day) for the Northlake Development using the existing and proposed residential lot yields.

Scenario	Potable Demand (litres/day/du) [1]	Dwelling No.	Total (litres/day)
Existing Yield	2100	777	1,631,700
Proposed Yield	2100	832	1,747,200

Table 5.1: Water Supply Total Litres Per Day.

[1] *Potable Demand based on 700 litres/person/day and 3 persons per residential unit.*

The QLDC LDSCoP Section 6.3.5.6 identifies a peaking factor for the 'Rest of District' as being 6.6 however recent modelling by Watershed suggests a peaking factor of 4.6 (peak day factor of 2 and peak hour factor of 2.3) is more appropriate (refer to **Appendix G and Appendix J**)p

The report contained in Appendix G summaries the water supply modelling results indicate that Stages 1-14 (see plan attached the Appendix G report to location of these stages) can be supplied through the proposed reticulation and that this supply will meet the level of service required by QLDC.

Further refinement of the design layout will be required at the time that detailed design is undertaken and Engineering Acceptance is applied for however the attached report confirms there are no fundamental issues with the design.

5.2 Firefighting Supply

In accordance with SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of practice, will require a firefighting water supply classification of FW2 for all residential lots. An FW2 classification requires 12.5l/s of water flow available within a distance of 135 metres and an additional 12.5l/s of water flow available within a distance of 270 metres. Council modelling will be required to ensure FW2 flows can be maintained during Peak hour flows.

We attach for Council's information the recent results provided by the New Zealand Fire Service after flow testing of the fire hydrants in Northlake Stage 1 (refer to Appendix K). Further testing has been completed in Northlake Stages 2 & 3 however the results of this testing has not yet been issued by the NZFS.

6. Network Utility Services (electricity and telecommunications)

The existing network design for electricity and telecommunications has sufficient capacity to service the proposed adjustments to the activity areas and the resulting increase in dwelling yields.

7. Conclusion

The capacity of the existing and proposed three waters infrastructure has been assessed in terms of the amended Structure Plan. No infrastructure constraints have been identified that would result from the proposed changes to the activity areas and therefore the proposal is considered appropriate from an infrastructure point of view.

Stormwater runoff can be satisfactorily reticulated and disposed of using a continuation of the range of low impact design solutions i.e. swales, detention ponds, soakage along with traditional piped reticulation where required to ensure there is no increase from pre to post development flows leaving the site and that discharged stormwater quality is maintained prior to ultimate discharge to the Clutha River.

The proposed change will result in an increase to the expected peak hour flow for wastewater however the existing infrastructure has the capacity to absorb this increase. The majority of the site will be able to be drained via gravity reticulation while a small portion along the low lying north eastern boundary of the site will likely require the construction of a pump station or low-pressure reticulation system to connect back into council reticulation.

Water supply hourly Peak flow will increase slightly as a result of the proposed changes to the activity areas, however, it is anticipated that with planned upgrades that the site can be appropriately serviced.

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CONSULTING CIVIL & STRUCTURAL ENGINEERS

Michaela Ward Meehan

Northlake Plan Change

Feasibility of Utility Services & Infrastructure Report

Michaela Ward Meehan

Northlake Plan Change

Feasibility of Utility Services & Infrastructure Report

March 2013

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Contents

1. Introduction

This report has been prepared to support a private plan change request to re-zone approximately 256 of land in Wanaka from Rural Residential and Rural General to a new zone ("the site"). The site is referred to as "Northlake". The private plan change requestor is Michaela Ward Meehan.

The site is located on the north side of Aubrey Road, Wanaka, with Outlet Road running through the site. The site is contained in five parcels held by four land owners and is currently zoned Rural General and Rural Residential under the Queenstown Lakes District Plan.

The private plan change request seeks the re-zoning of the site to give effect to the community's long term intentions for the land, as described in the Wanaka Structure Plan (2007), by enabling residential development of approximately 1,707 new dwellings.

Michaela Ward Meehan (MWM) has engaged Hadley Consultants Limited (HCL) to investigate and report on the feasibility of providing utility services and the necessary development infrastructure for the development of the subject site at Outlet Road, Wanaka.

This report considers the nature of the proposed development, the site conditions affecting the implementation of the necessary utility services and development infrastructure and describes the proposed implementation of the following elements:

- Water supply reticulation
- Wastewater reticulation
- Stormwater control
- Gas supply

2. Nature of Proposed Development

MWM proposes to develop the existing site adjacent to Outlet Road in Wanaka. The site, located to the north-east of Wanaka and covering around 256 hectares will cover land legally described as Lot 1 DP 27290, Lot 3 DP 300408 and Lots 65, 66, 67, 68 & 69 DP 371470.

The structure plan for the development is yet to be finalised. However, it is expected that the structure plan will indicate areas of open space and varying density of housing development. The maximum proposed number of new house sites is estimated at 1,707.

We note that the assessment of the necessary development infrastructure provided below is limited to consideration of the scale of the development as it is currently proposed and excludes consideration of specific stages and the specific locations of future dwellings and infrastructure within the site.

3. Site Description

The area of the plan change request is located on 256 ha of land to the north of Aubrey Road and on both sides of Outlet Road in Wanaka. The current access to the site is from Aubrey Road, Outlet Road and from Peak View Ridge. There is existing infrastructure for water supply and wastewater located along Aubrey Road and the Beacon Point rising main and reservoir are sited along the western boundary of the site.

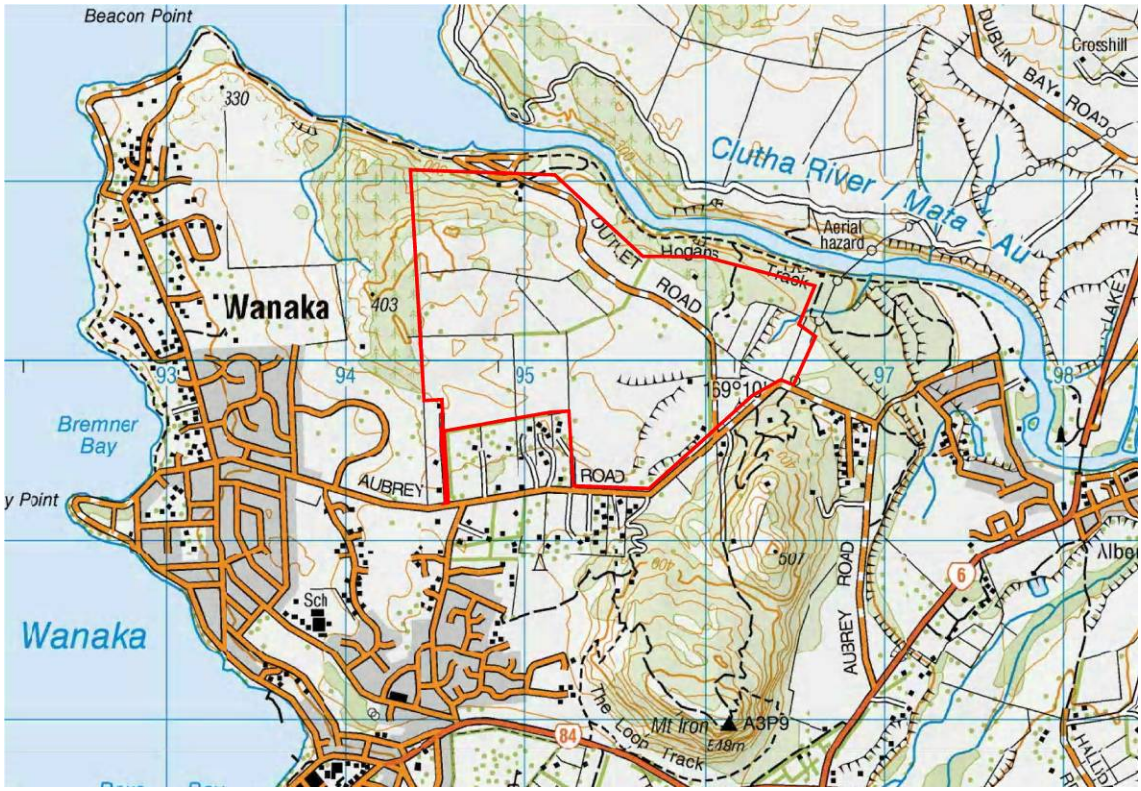


Figure 1 - Topographical map excerpt showing subject site

The site comprises gently sloping land in the central and southern areas with more moderate to steep gradients along the northern boundary where the land falls to the Clutha River. The overall topography of the site is gently falling to the north east.

Based upon the published geological information (Institute of Geological and Nuclear Sciences (IGNS), 1:250,000 Geological Map 18, Geology of the Wakatipu) and geological examination carried out by others the underlying geological materials within the central and western areas is glacial till, whilst the eastern areas are likely covered by outwash gravels. These soils overlie schist bedrock that can be seen as an outcropping a short distance to the south of the site on the slopes of Mount Iron and on the northern bank of the Clutha River.

The existing land use at the site comprises mainly farmland with some forestry and scrub covered areas. Vegetation covering the area is mainly that associated with highly modified farmland and consists of rough pasture, woodlots, shelter belts of mature pines and infestations of broom. However, there are small areas of native vegetation such as kanuka and matagouri. These native plants tend to occupy areas of the site characterised by steeper terrain.

There are no areas of naturally occurring standing water such as streams or saturated, swampy soils. However, it is possible that ephemeral watercourses may be formed in some of the topographic depressions on site during periods of high precipitation.

The proposed development site and surrounding Wanaka area experience generally cold winters with severe frosts at times and hot dry summers. Strong north-westerly winds are also a climatic characteristic of the area. The land receives approximately 700mm of rainfall per annum and may be subject to drought conditions during the summer months.

4. Water Supply

4.1 General

The Beacon Point reservoir is located in an allotment on the western boundary of the subject site. In addition, the rising main from the Lake Wanaka water intake and the falling main from the reservoir run in easements adjacent to the western boundary of the site.

4.2 Water Demand Assessment

Peak water demand would be expected during the summer months when seasonal populations are at their peak and irrigation usage will be at its highest. The following design figures have been adopted.

Demand Item	Potable Demand (litres/day)	No.	Total (litres/day)
Dwelling (average day)	2,100	1,707	3,584,700

The additional average daily water supply demand of 3,585 m³ per day equates to 41.5 litres per second average flow over twenty four hours.

From the QLDC amendments to *NZS4404:2004 Land Development and Subdivision Engineering*, the peaking factors for the Wanaka water supply are as follows:

Item	Peaking Factor
Average daily flow to peak daily flow	3.3
Average daily flow to peak hourly flow	6.6

Using the QLDC peaking factor, the peak hour flow is estimated at 273.8 litres per second.

4.3 Fire Fighting Demand

In accordance with *SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice,* the usage for the developed site is expected to fall into the *"Housing: includes single family dwellings, multi-unit dwellings but excludes multi storey apartment blocks"* category. This will result in a fire fighting water supply classification of FW2. An FW2 classification requires 12.5 l/s of water flow available within a distance of 135 metres and an additional 12.5 l/s of water flow available within a distance of 270 metres.

4.4 T&T Modelling Results

Water supply modelling was undertaken for a previous development proposal on the site. This modelling was undertaken by Tonkin and Taylor Ltd (T & T) who operate and maintain the water reticulation model for QLDC and involved modelling for a new demand across the site of 800 residential dwellings. The results of this concept level modelling for the proposed development are set out below. T&T have used an assumed future reticulation layout and trunk mains network.

Key findings from the modelling work are:

- The higher elevations of the site will require boosting to ensure adequate pressures and fire flows. Dependent upon the final reticulation layout, boosting will be required for all allotments above 348 metres.
- Connection to the falling main from the Beacon Point reservoir may be problematic (as there is no isolation valve) requiring a complete emptying of the Beacon Point Reservoir. Alternatively, connection could be made to the water main in Aubrey Road at the intersection with Peak View Ridge. Due to head losses, this point of connection would result in more of the development site requiring boosting.
- T & T have commented that the reservoir storage volume would need to be considered at the time of development. The suitability of the capacity of the existing reservoir will depend upon the timing of the construction of the planned Hawthenden Reservoir and the construction of the subdivision.

T & T have indicated that there are no problems with the capacity of the existing raw water intake, rising main and treatment plant. The two main restrictions on the water supply for the development highlighted by the modelling report are the capacity of the Beacon Point reservoir and the requirement for boosting of flows in order to achieve the required water pressures in higher areas of the proposed site.

A copy of the report from T & T is included in Appendix 1.

4.5 QLDC Liaison

Discussions with Mr Gerry Essenberg (the Queenstown Lakes District Council Infrastructure Services Three Waters Manager) have been held regarding the current 1,707 residential dwelling proposal.

He has confirmed that water supply will be available from Queenstown Lakes District Council (QLDC) reticulation at Beacon Point. He has also confirmed that there is no need for additional modelling at this time as the likely existing demand on the reticulation will change prior to the

development actually occurring and QLDC is currently working hard on reducing demand through the implementation of the Water Demand Strategy.

The timing of any necessary upgrades to the reservoir and associated facilities will be dependent upon the uptake of sections across a number of growth areas within Wanaka including Three Parks, North Three Parks and West Meadows amongst others. These all draw water from the same pressure zone and the speed of dwelling construction across the entire Wanaka water supply area will determine the timing of any future infrastructure upgrade.

QLDC have indicated that the significant capital expenditure items such as reservoirs would be funded by Developer Contributions. In order to give QLDC as much time to plan for future infrastructure upgrades, they have requested indicative staging information for the development be supplied as soon as it is available.

Mr Essenberg has confirmed that QLDC are interested in talking with the developer about the specific reticulation connections and design at the detailed design stage so that the most cost effective solutions are developed. He anticipates that all new water supply infrastructure will be required to be constructed to applicable QLDC standards.

4.6 Reservoir Capacity

In order to better understand the reservoir capacity restriction we have undertaken further analysis of the existing and future storage requirements.

The storage in the existing Beacon Point reservoir is 3,500 m^3. The most recent report prepared for Council relating to reservoir capacity is the report by MWH New Zealand Ltd titled “Queenstown Lakes District Council – Strategic Water Review” and dated February 2006. This indicated that in 2005, the storage capacity needed at Beacon Point for the population at that time was 3,200 m^3.

Based on the expected number of allotments, an additional 3,166 m^3 of storage is required for the subject site alone.

Since 2005, the zone of Wanaka that is serviced by the Beacon Point Reservoir has experienced significant growth with the establishment of Peninsula Bay subdivision, further stages at the Penrith Park subdivision, development of further stages of the Riverside Park subdivisions, establishment of initial stages of the West Meadows subdivision and other developments on Cardrona Valley Road and Golf Course Road. In addition, it is anticipated that there are other growth areas that will also increase the demand from the Beacon Point reservoir; these include the Three Parks development and the increases to the Ballantyne Road industrial zone.

We estimate that the Beacon Point reservoir is approaching capacity now with regards to storage. This will mean that the development of the subject land will require additional reservoir storage to be built prior to the first stages of the development. In the previous Long Term Council Community Plan (LTCCP), QLDC had programmed the Beacon Point reservoir upgrade to occur during the 2018-19 financial year. In the most recent LTCCP (2012-22), QLDC has not programmed the Beacon Point reservoir upgrade within the 10 year timeframe of the plan.

The upgrading of this reservoir will need to be discussed with QLDC once a site concept has been finalised and the timing for development evaluated. A cost sharing arrangement may need to be achieved to ensure a suitable outcome for all parties.

4.7 Water Supply - Option 1

The first option to address the water supply issues highlighted by the T&T modelling report would be to upgrade the water storage available within the existing Wanaka mains system by construction of an additional storage reservoir. The sizing of such a reservoir would be up to 3,166 m^3 as set out in Section 4.6 above.

We have viewed the as-built drawings for the existing reservoir (copy attached in Appendix 2) and it appears that there is sufficient area on the reservoir site to allow for the construction of a second reservoir. Should this area be insufficient for the size of reservoir required, we can confirm that there is land within the development's boundaries and adjacent to the Beacon Point reservoir that may be able to be utilised for the needed storage.

However, in order to achieve the required minimum residual pressure of 300kPa an elevation difference between supply point and consumer of approximately 30m is needed. The Beacon Point reservoir is located at approximately 380m which means that boosting of flows will be required for elevations of the site above approximately 348m in order to meet the minimum residual pressure. The area requiring boosting is shown in Figure 2 below.

If a new storage reservoir is to be constructed then the problem of low pressures could be addressed to a certain degree by locating the reservoir at a higher elevation (approximately 410m) on the western boundary of the site as shown in Figure 2 below. The increased hydraulic head achieved by locating a reservoir at this higher point would mean that boosting would be required for elevations above approximately 378m only. This would equate to a much larger area of the total site being fed by gravity flows than that possible from the lower elevation Beacon Point reservoir.

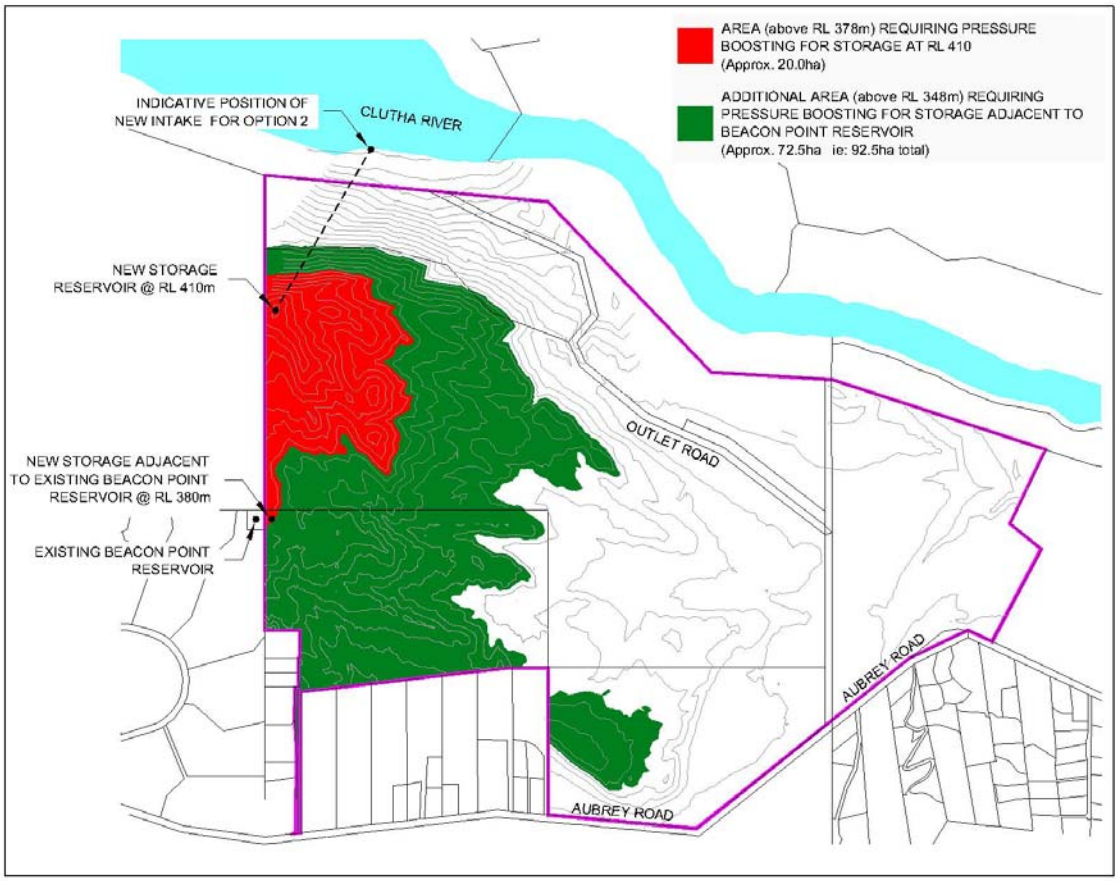


Figure 2 Map showing areas requiring boosting of water supply and indicative layout for Option 2.

It should be noted however that a pump station would be required to feed the new reservoir from the main supply if it was located at this high point. This would be in addition to the boosting pump station required for areas above 378m.

Another solution may be to construct a relatively small reservoir at the high point of RL 410m that just services the land above RL 348m and additional storage at the same level as the existing reservoir (RL 380m) is constructed to supply the remainder of the zone.

4.8 Water Supply - Option 2

The second option for providing a water supply for the development would be to construct a completely new water intake in the indicative location shown in Figure 2. In reality the intake could be at any number of locations along the river frontage of the subject site. This would mean that the North Wanaka development site would have a standalone water supply that was separate from the Wanaka area mains supply.

The basic components of such a system would include the water intake and pumps, rising main and storage reservoir as well as a water treatment system sufficient to bring the supply in line with Drinking Standards for New Zealand 2005 (Revised 2008) (DWSNZ).

The water supply storage reservoir for the development, based upon the reservoir capacity set out in Section 4.5, would be up to 3,166 m^3. The reservoir would just below located at the highest point within the development area at 410m near the site's western boundary and the water treatment facilities would either be adjoining to the reservoir site or would be sited adjacent to the intake itself. Locating the reservoir at this high point would enable much of the development to be serviced without the need of additional booster pumps. However, water supply flows for areas above 380m would still require to be boosted as shown in Figure 2 above.

As well as the physical construction issues involved with this option a number of consenting and maintenance matters would also need to be addressed. A resource consent will be required to construct the intake structure and it is likely that a further consent will be required for the water take itself as both the calculated total daily demand and the peak hourly flow exceed the permitted water take rates set out in the Otago Regional Council's Regional Plan for Water. Land use and building consents may also be required for the reservoir and water treatment facilities.

The main issue to be considered with regards to this option would be the on-going maintenance and management of the water supply and treatment system. One option would see the system vested with Council. Council may resist this because of the additional on-going costs a further intake, treatment plant and associated infrastructure would entail. Alternatively, the water supply could be owned by a lot owners association (or similar) responsible for the on-going management and maintenance of the infrastructure. A similar system to this has been used at Jacks Point near Queenstown.

4.9 Conclusions and Recommendations

Both of the two options outlined above to supply water to the subject site are feasible. Further investigation, consultation with Council and cost analysis will be necessary to establish the final methodology used.

Due to the site topography, elevated areas of the site will require boosting to provide the required pressure and flows. For Option 1 this would equate to an area up to 92.5 ha depending on reservoir location and for Option 2, 20 ha. Boosting flows in this manner is feasible and has been undertaken in other parts of Wanaka and across the QLDC district.

5. Wastewater Disposal

5.1 General

A Council reticulated sewerage scheme exists along Aubrey Road from near the Outlet Road intersection.

5.2 Demand Assessment

Peak wastewater generation is expected to coincide with peak water demand. The following design figures have been adopted:

Wastewater Generation Item	Potable Demand (litres/day)	No.	Total (litres/day)
Dwelling (average day)	1,050	1,707	1,792,350

The additional average daily wastewater generation of 1,792 m^3 per day equates to 20.74 litres per second average flow over twenty four hours.

From the QLDC amendments to *NZS4404:2004 Land Development and Subdivision Engineering*, the peaking factors for the wastewater network are as follows:

Item	Peaking Factor
Dry weather diurnal peak flow	2.5
Wet weather dilution/infiltration factor	2

Using the QLDC peaking factors, during the wet weather peak flow is estimated at 103.7 litres per second.

5.3 Council Reticulated Scheme

Hadley Consultants Ltd have previously been engaged by QLDC to carry out design and construction review for wastewater upgrades in the Aubrey Road area of Wanaka. We are fully aware of what has been allowed for in the design of the existing infrastructure and what upgrades will be required.

The Council reticulation on Aubrey Road comprises a 450mm diameter wastewater gravity main draining from near the Outlet Road intersection through to the Gunn Road intersection. From the

Aubrey Road Gunn Road intersection, there is temporary 150mm diameter pipe connecting into the Albert Town reticulation on Gunn Road.

The section of 450mm diameter main in Aubrey Road was constructed in 2008/09 and this size pipe is ultimately anticipated to be constructed all the way to the recently commissioned Project Pure Pump Station near the intersection of Aubrey Road and State Highway 6 and the connection into the Gunn Road reticulation will be removed (thereby effectively bypassing the Albert Town reticulation). This upgrade has been programmed in the most recent QLDC LTCCP (2012/22) for construction in the 2018/19 financial year. The development of the subject site will trigger the need for the extension of the 450mm diameter pipe along Aubrey Road.

Previous work has not identified how much residual capacity is available in the Albert Town reticulation. It is anticipated that the Northlake land will be developed in stages and that the Aubrey Road upgrade will not be triggered by the initial stage(s). This will need to be confirmed at the design phase for each stage of the development.

There are further measures open to the development of the Northlake land that could delay the need for the Aubrey Road upgrade. These include storing some or all of the wastewater flows and then draining these to the network in off peak times.

The Northlake development will require the proposed Aubrey Road wastewater upgrade project listed on the current LTCCP to be completed. This wastewater upgrade has been included in the contributions calculations for the Wanaka wastewater scheme and it is anticipated that Council will fund and construct this upgrade when required.

A sketch showing the existing and proposed wastewater pipe layout is below:

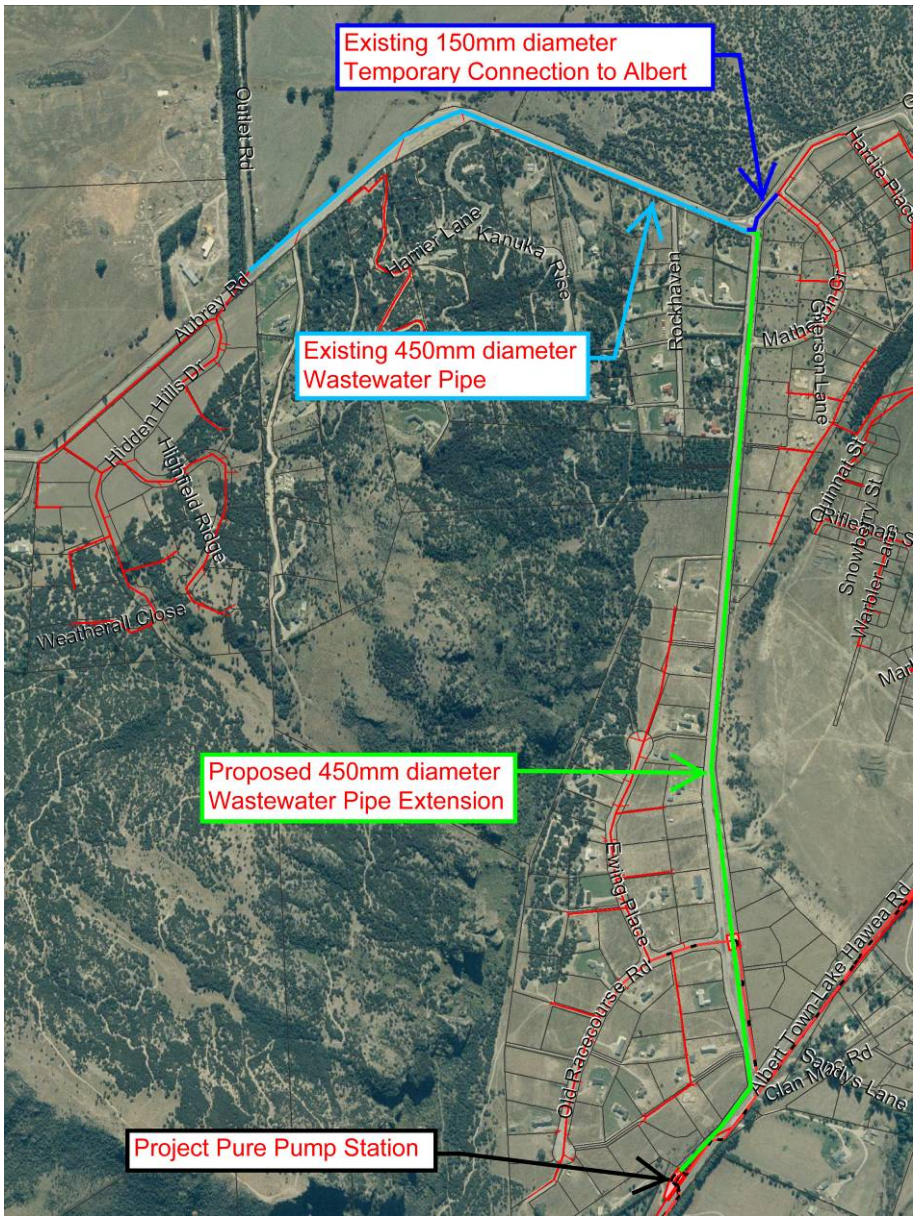


Figure 3 Existing and Proposed Wastewater Reticulation in Aubrey Road

5.4 QLDC Liaison

Discussions with Mr Gerry Essenberg (the QLDC Infrastructure Services Three Waters Manager) have been held regarding the current 1,707 residential dwelling proposal.

He has confirmed that a connection to the wastewater drainage network will be available from QLDC. He has also confirmed that there is no need for additional modelling at this time as the likely existing demand on the reticulation will change prior to the development actually occurring. The scale of the proposed development may require upgrades to Council wastewater pump stations and treatment facilities. The timing and scale of any upgrades will be dependent upon the rate of

growth across the entire Wanaka wastewater catchment and would need to be evaluated as development progressed.

QLDC have indicated that the significant capital expenditure items such as pump stations and treatment plant upgrades would be funded by Developer Contributions. In order to give QLDC as much time to plan for future infrastructure upgrades, they have requested indicative staging information for the development be supplied as soon as it is available.

Mr Essenberg has confirmed that QLDC are interested in talking with the developer about the specific reticulation connections and design at the detailed design stage so that the most cost effective solutions are developed. He anticipates that all new wastewater infrastructure will be required to be constructed to applicable QLDC standards.

5.5 Internal Reticulation

As previously stated, the site slopes generally to the east. The existing Council reticulation on Aubrey Road is on the southern side of the site. It is anticipated that much of the site will be able to be drained using standard trunk and lateral gravity pipelines.

Some areas on the northern and eastern side of the site will likely require the construction of pump stations at suitable low points to convey the wastewater flows into the existing reticulation. Provided appropriate infrastructure master planning for the site is carried out at the detailed design stage, the location of any pump stations will be able to be optimised in order to ensure least cost lifetime options are adopted.

5.6 Conclusions and Recommendations

It is recommended that the wastewater generated from the proposed development be disposed by way of connection to the QLDC reticulated scheme. The feasibility of this has been confirmed by work previously undertaken by QLDC. A significant upgrade will be required along Aubrey Road once a certain threshold of wastewater flows from the site has been reached. The Council has programmed to undertake this work, but the timing of the upgrade will depend upon the pace of development and the possible buffering of flows to off peak periods.

6. Stormwater Disposal

6.1 General

Generally, it is proposed to maintain the runoff characteristics of the existing catchment. However the proposed development on the site will alter the existing stormwater run off patterns and will serve to increase the peak flow runoff. We propose to collect and control the stormwater runoff and dispose via connection to the Clutha River or to dispose of on site using stormwater infiltration and soakage features.

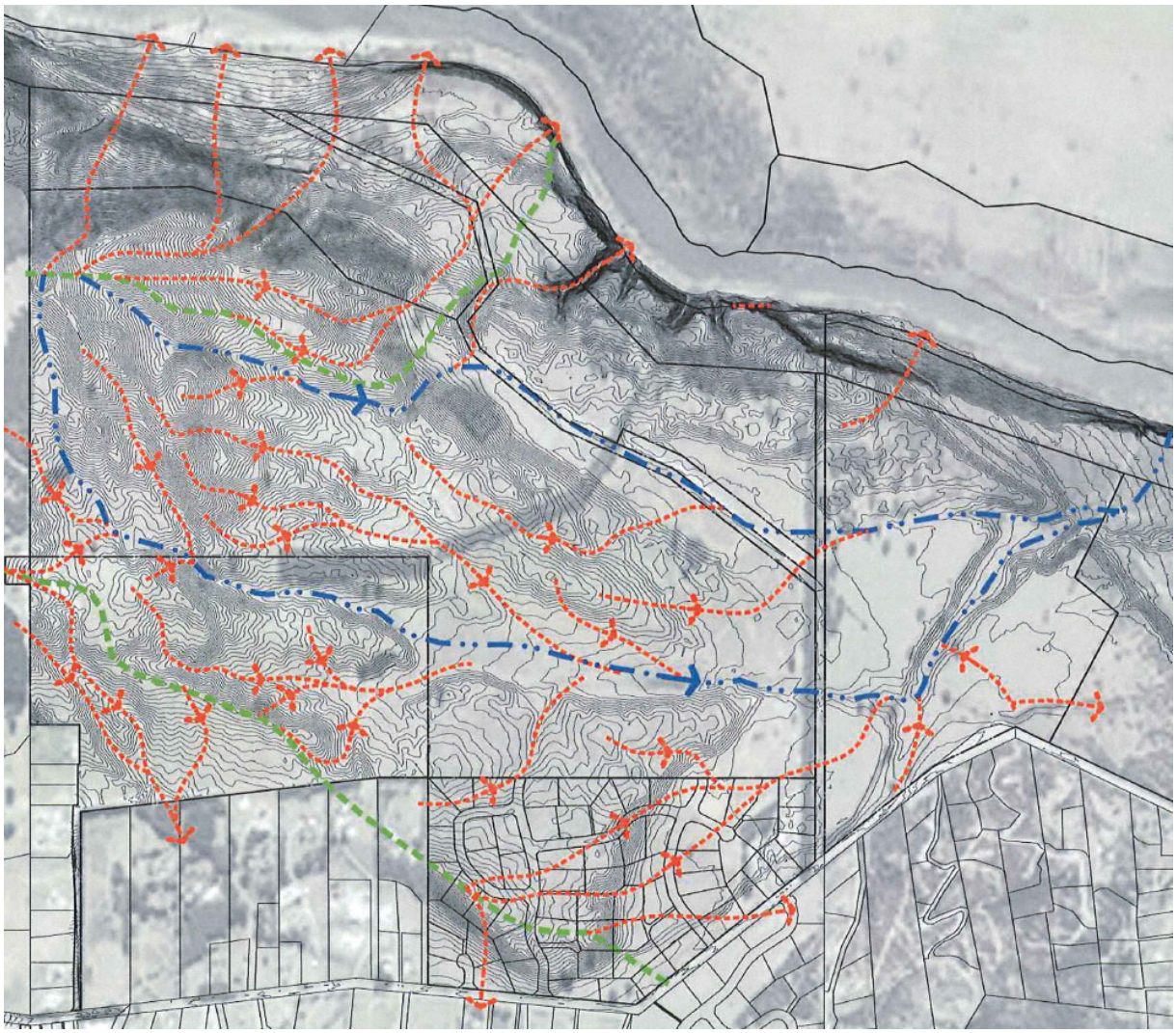


Figure 4 - Stormwater runoff paths (see Appendix 3)

6.2 Planning Rules and Regulations

Rule 12.5.1.1 of the Regional Plan: Water for Otago states that the discharge of drainage water to water (or onto land where it might enter 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 domestic allotments are as follows:

12.5.1.1 (b) The discharge, 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

…

(v) Any significant adverse effects on aquatic life.

It is further stated that:

The discharge of drainage water under Rule 12.5.1.1 will have no more than minor adverse effects on the natural and human use values supported by water bodies, or on any other person. This rule is adopted to enable drainage water to be discharged while providing protection for those values and the interests of those people. Any other activity involving the discharge of drainage water is a restricted discretionary activity in order that any adverse effects can be assessed.

Contaminants associated with vehicular traffic can include oils, rubber, heavy metals and sediments. In large amounts these contaminants can greatly decrease the natural and human use values of bodies of water. As the stormwater from the site will likely be discharging either directly into the Clutha River or to ground, appropriate protections will need to be installed in the on-site drainage system in order to remove such contaminants from the stormwater. The aim of stormwater quality treatment used at the site would be to ensure that the runoff from the new development is in a similar condition to that being achieved before the development. Of particular concern are the “first flush” flows that carry the highest pollutant loadings.

Appropriate technologies to separate contaminants from the stormwater flows might include the use of mud-tanks located in the on-site drainage sumps and a vortex separator mechanism such as a Hynds Downstream Defender which provide high removal efficiencies of suspended solids and floatables over a wide range of flow rates.

Careful design of the stormwater reticulation for the site will ensure that the requirements set out in the Regional Plan: Water for Otago are met.

6.3 Stormwater Quantities

At this early stage in the development of the proposed zone, it is difficult to determine the increase in storm water runoff from the site. Initial calculations have been undertaken and these indicate that for a 10 minute rain event with an average reoccurrence interval (ARI) of 10 years the development is expected to increase the storm water flow rate by approximately 10 m^3 per

second. This will vary depending upon the density of the development and the permeability of the site.

This level of increase in runoff would result in very large infrastructure if the traditional approach of reticulating all the flows from the site was adopted. If a single point of discharge was developed, the required outlet pipe would be approximately 2.4 metres in diameter. This level of infrastructure would be expensive and can be mitigated using a Low Impact Design (LID) approach.

From NZS4404:2010 Land Development and Infrastructure:

> *Low impact design aims 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 low impact design are reducing stormwater generation by reducing impervious areas, minimising site disturbance, and avoiding discharge of contaminants. Stormwater should be managed as close to the point of origin as possible to minimise collection and conveyance. Benefits include limiting discharges of silt, suspended solids, and other pollutants into receiving waters, and protecting and enhancing natural waterways.*

And:

> *Low impact design is a type of storm water system that aims to minimise environmental impacts by:*
> *(a) Reducing peak flow discharges by attenuation;*
> *(b) Eliminating or reducing discharges by infiltration or soakage;*
> *(c) Improving water quality by filtration;*
> *(d) Installing detention devices for beneficial reuse.*

The types of low impact devices and practices that could be included in the zone include the following:

(a) Detention Ponds;
(b) Vegetated swales;
(c) Rain gardens;
(d) Rainwater tanks;
(e) Soakage pits and soak holes;
(f) Filter strips; and
(g) Infiltration trenches/basins.

Subdivision urban design principles may also assist in mitigating runoff from the site. These include clustering development to increase open area around developed areas and decreasing road setbacks in order to decrease the likely impervious areas.

In addition to reducing the peak discharge from the site, LID approaches may also improve the quality of the runoff from the site.

It is noted that due to the local topography, the area in the southwest corner of the site drains off site and through private land. The storm water runoff solutions in this area will need to ensure that the post development runoff is no greater than the pre-existing development runoff. It is expected that the use of specific soakage and attenuation devices will be used to meet this requirement.

6.4 QLDC Liaison

Discussions with Mr Gerry Essenberg (the QLDC Infrastructure Services Three Waters Manager) have been held regarding the current 1,707 residential dwelling proposal.

He has confirmed that a combination of reticulation and low impact design approaches would be generally acceptable to QLDC.

Mr Essenberg has confirmed that QLDC are interested in talking with the developer about the specific reticulation connections and design at the detailed design stage so that the most cost effective solutions are developed. He anticipates that all new stormwater infrastructure will be required to be constructed to applicable QLDC standards.

6.5 Conclusions and Recommendations

We consider that the collection and subsequent disposal of stormwater from the proposed development is entirely feasible via collecting and controlling the stormwater runoff and disposing by draining to the Clutha River passing the site.

Dependent upon the overall design approach for the subdivision, the storm water runoff leaving the site could be greatly reduced by the introduction of low impact design approaches including the use of attenuation and filtration devices.

7. Gas Supply

Discussions have been undertaken with Rockgas. Rockgas own and operate a reticulated gas supply network in Wanaka. They have indicated that they are interested in supplying reticulated gas to the proposed development site. This would need to be progressed by negotiations between Rockgas and the developer in order to ensure suitable terms for both parties.

Supply confirmation for the gas reticulation has been provided from Rockgas and is included in Appendix 4.

8. Conclusions and Recommendations

The subject site and the proposed development have been assessed to determine the suitability for development in relation to infrastructure services. No significant constraints have been identified and the site is suitable for the proposed development from an infrastructure servicing viewpoint.

There are two options for supplying water to the site. The first option would be to utilise the QLDC reticulated water supply. This would require the construction of additional water storage which could be achieved either in conjunction with the QLDC (subject to agreement) or as a standalone reservoir on the subject land. In addition, the necessity for reticulation to the higher elevations of the site would require the construction of a water supply boosting pump station. The second option would be to install a new, private water intake with the reservoir located at the highest point on the subject land. As with Option 1, sections of the subject site would still require a water supply boosting pump station but they overall area would be smaller than that required for Option 1. The final decision on which methodology to use will be decided at a later point following further investigation, consultation and cost analysis.

Wastewater drainage reticulation from the site will be able to be initially catered for with the existing QLDC reticulation. Later stages will require construction of a planned Council upgrade along Aubrey Road (between Gunn Road and the Project Pure Pump Station). The majority of the site will be able to be reticulated by the construction of gravity sewer pipes. However, it is anticipated that parts of the development site will require pump stations in order to convey flows to the existing QLDC infrastructure.

Stormwater runoff from the site can be satisfactorily disposed of by the construction of necessary reticulation with disposal to Clutha River. It is recommended that in order to reduce the peak runoff and to improve runoff quality, low impact design approaches are adopted.

The gas supply company Rockgas has confirmed that they are interested in reticulating the proposed development with an underground gas supply connected to their existing Wanaka reticulation network.

Overall, we confirm that there are no significant impediments to development of the site with respect to Infrastructure Services. The need for off-site upgrades of existing QLDC infrastructure will be required for later stages of the development and it is anticipated that these upgrades are able to be constructed without any major impediment.

We recommend that the timing and scale of the proposed infrastructure upgrades be further assessed once the layout of the proposed zone has been further progressed and staging of development has been confirmed.

9. Limitations

This report has been written for the particular brief to HCL and no responsibility is accepted for the use of the report for any other purpose, or in any other context or by any third party without prior review and agreement.

Appendix 1

Tonkin and Taylor Ltd

Water Modelling Report

Tonkin & Taylor

T&T Ref: 51556.013
02 August 2010

Hadley Consultants Ltd
PO Box 1356
Queenstown 9348

Attention: John McCartney

Dear John

Results of water modelling for proposed East Wanaka development rezoning, Aubrey Road, Wanaka

Following your email received 3:59 pm 19 July 2010, and in accordance with your request and our conditions of engagement, we have run our Wanaka water supply model to check the levels of service for the proposed East Wanaka development, between Aubrey Rd and the Clutha River, Wanaka. This work was performed for Hadley Consultants Ltd as our client.

Modelling proceeded at a concept level on the basis of 800 residential lots, as per the drawings provided by you (Darby Partners Ltd drawings RS-00 & 03, titled "*East Wanaka Resource Study*", dated 22 & 28 June 2010, attached).

Development setting

The proposed development is in the Beacon Point pressure zone, supplied from the Beacon Point Reservoir via the 575 mm NB PVC falling main. The Wanaka water supply network near the proposed development is shown in Figure 1 below.

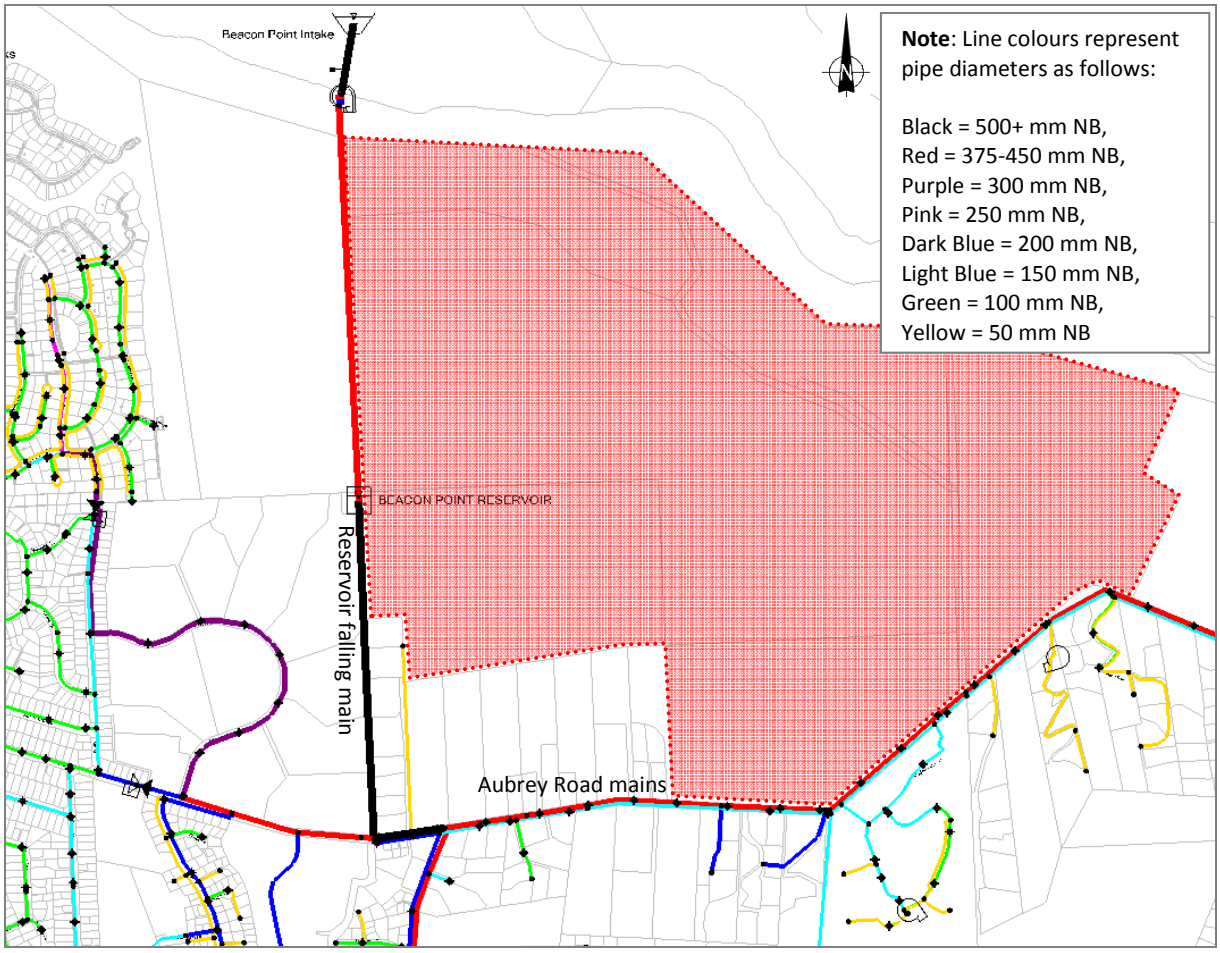


Figure 1 *Wanaka water supply network near the proposed rezoning (site outlined/shaded in red) [Not to scale]*

We understand that only that land south of the "outer growth boundary" is to be developed (see attached drawings).

Modelling methodology

The modelled demand scenarios used to determine levels of service for the Wanaka water supply network were

- **Peak day demand** - To determine whether available fire flows meet fire fighting requirements [1], and
- **Peak hour demand** - To determine whether minimum residual pressures at each connection are ≥ 300 kPa [2]

[1] Fire flow requirements are in accordance with SNZ PAS 4509:2008, "*New Zealand Fire Service Fire Fighting Water Supplies Code of Practice*".

[2] The minimum residual pressure requirement is as set out in Queenstown Lakes District Council Amendments and Modifications (2005) to NZS 4404:2004 , *"Land Development and Subdivision Engineering".*

We assumed an approximate layout of the pipe reticulation to cover most of the development area, with 150 mm and 300 mm NB PVC pipes as appropriate, as per Figure 2 below. We have also assumed hydrants at several locations throughout the development in order to gauge available fire flow.

The final proposed development, if constructed, would need to have more extensive reticulation, and more hydrants would be required. The modelling undertaken for this report is at a high-level proof of concept only.

This reticulation includes a connection to the Beacon Point Reservoir falling main at node J-98. We are uncertain at this stage whether such a connection would be practical. Alternative reticulation options are discussed in the Additional Modelling Comments section below.

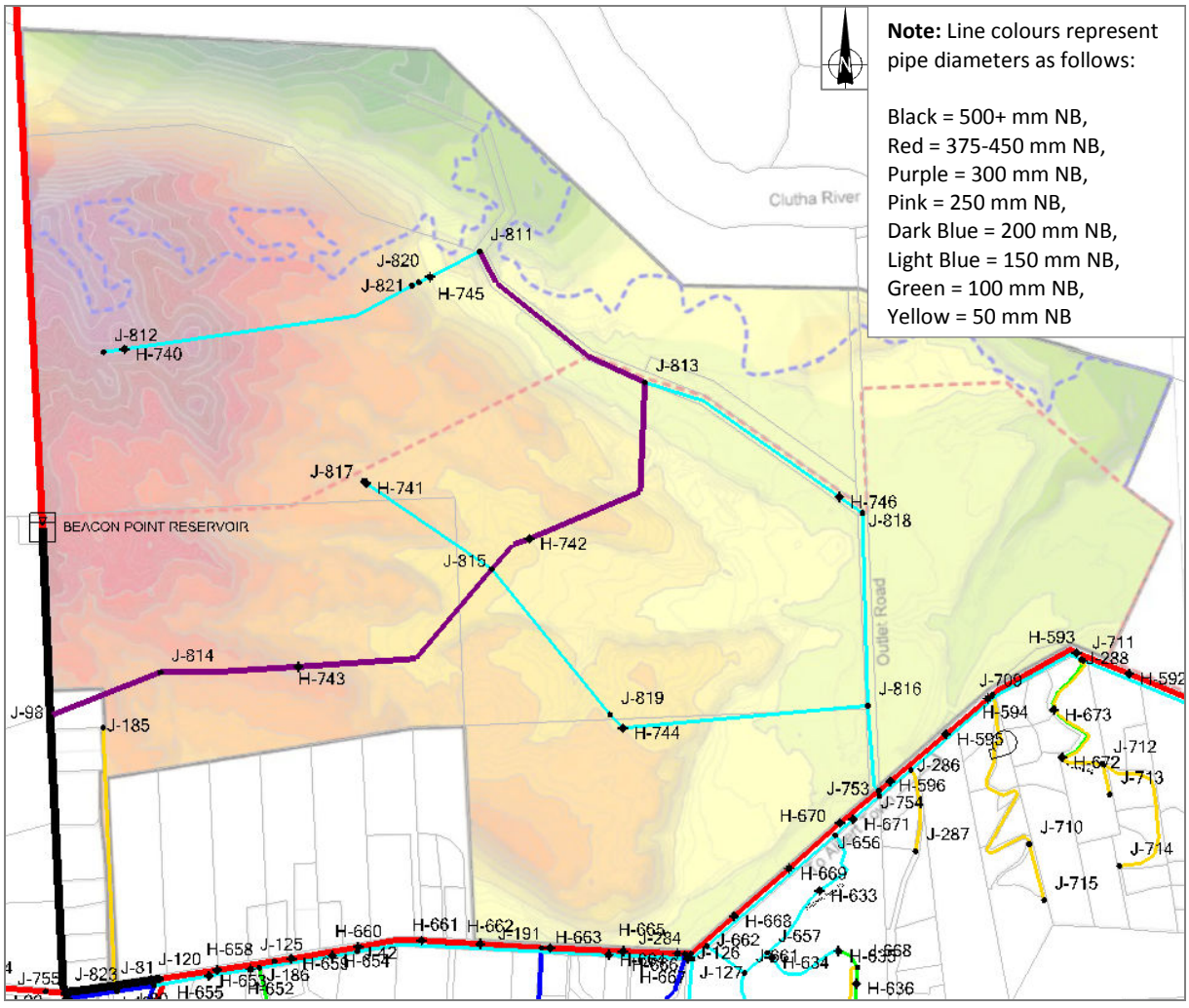


Figure 2 *Modelled reticulation layout for development [Not to scale]. The development area is shown by coloured shading: green = low elevation, red = high elevation.*

Demands

The average daily flow (ADF) demand was calculated assuming an average population of 3 people per residential dwelling and an average daily water consumption of 700 l/person.day, as per QLDC requirements. Development demands during the peak day and peak hour demand scenarios were calculated as follows:

- Peak day flow (PDF) = **3.3** x ADF
- Peak hour flow (PHF) = **6.6** x ADF

The total average daily flow (ADF) demand from the proposed 800 residential units is 1680 m^3/day, or 19.4 l/sec. This corresponds to a peak day flow (PDF) demand of 64.2 l/sec and a peak hour flow (PHF) demand of 128.3 l/sec.

We have added the above demand into our WaterGEMS dynamic network analysis model for Wanaka, last updated February 2010. Demands were entered into the model at nodes J-811 to J-819, (shown in Figure 2 above) as per the distribution in Table 1 below.

Table 1 Demand distribution throughout proposed East Wanaka development

Demand node	Proportion of demand
J-811	5%
J-812	10%
J-813	10%
J-814	10%
J-815	15%
J-816	10%
J-817	10%
J-818	15%
J-819	15%
Total	100%

Modelling results

Modelling results are presented in Table 2 below. Note that these results relate to the East Wanaka rezoning development alone with 2009 design demands, and do not include demands from other proposed developments recently modelled by Tonkin & Taylor.

Table 2 Minimum pressures and fire flow availability

Nodes assessed	Elevation (m RL amsl)	Residual pressure (kPa) [1]	Fire flow available (l/sec) [2][3]
J-811	325	540 ≥ 300 **OK**	-
J-812	395	< 0 **Not OK**	-
J-813	328	520 ≥ 300 **OK**	-
J-814	354	300 ≥ 300 **OK**	-
J-815	341	390 ≥ 300 **OK**	-
J-816	329	500 ≥ 300 **OK**	-
J-817	350	300 ≥ 300 **OK**	-
J-818	329	490 ≥ 300 **OK**	-
J-819	344	350 ≥ 300 **OK**	-
H-740	395	-	0 ≤ 25 **Not OK**
H-741	356	-	58 ≥ 25 **OK**
H-742	340	-	200 ≥ 25 **OK**
H-743	355	-	200 ≥ 25 **OK**
H-744	345	-	99 ≥ 25 **OK**
H-745	335	-	113 ≥ 25 **OK**
H-746	329	-	127 ≥ 25 **OK**

(1) A minimum residual peak hour pressure of 300 kPa is required as per QLDC amendments to NZS 4404:2004.

(2) A total of 25 l/sec is required from within 270 m of each non-sprinklered, residential dwelling for Class FW2 fire fighting as per SNZ PAS 4509:2008.

(3) A minimum of 12.5 l/sec is required from each hydrant as per SNZ PAS 4509:2008.

Modelling shows that, during the 2009 design peak hour demand scenario, the residual pressures in the development will be less than 0 kPa (without pressure boosting). Hence, the Queenstown Lakes District Council (QLDC) requirement for minimum pressures being ≥ 300 kPa is **not met** within the proposed development. The low pressures are mainly due to high elevations within the development, and partially due to headlosses within the development.

As an approximate guide, pressure boosting would be needed at the following locations:

- Above **348 m** RL above mean sea level (amsl) in the **northwest** of the development
- Above **354 m** RL amsl in the **southwest** of the development, and
- Above **349 m** RL amsl in the **southeast** of the development.

In total, approximately **30%** of the development area would require pressure boosting.

Modelling also shows that, for approximately **80%** of the development area, a minimum of Class FW 2 fire flow **can** be achieved during the 2009 design peak day demand scenario, as required for a non-sprinklered, residential development.

The remainder of the development (near H-740) will require pressure boosting to achieve the required fire flow. Note that this area is covered by the previous requirement for pressure boosting above 348 m RL amsl in the northwest of the development.

Additional Modelling Comments

Wider network effects

Modelling indicates that the effect on fire fighting and residual pressure levels of service in the rest of the network is negligible.

Pressure boosting

A booster pump near H-745 with a design flow of 12.8 l/sec and design head of 58 m would enable land up to 405 m RL amsl in the northwest of the development (near J-812) to achieve 300 kPa. Note that the design head is quite sensitive to the demand flow through the booster station.

The area to the southeast of the development that does not meet residual pressure requirements is only a small area. It is possible that it could be supplied via a separate boosted connection to the Aubrey Road 375 mm NB PVC main. We have not modelled such a connection.

Alternative connection reticulation

Should connection directly to the Beacon Point falling main not be possible, we recommend a connection to the Aubrey Road main at J-823, running up Peak View Ridge to connect at node J-814. This reticulation would result in additional headlosses, for which modelling indicates that residual pressures would reduce by approximately 30 to 40 kPa throughout the development. Approximately 40% of the development area would require pressure boosting.

We have also considered connection at Outlet Road only (using 300 mm and 150 mm sizes in different locations to those assumed previously). Modelling indicates that the additional headlosses along Aubrey Road under this reticulation would reduce minimum residual pressures by 60 to 90 kPa, meaning approximately 50 to 60% of the development area would require pressure boosting.

Where FW2 fire flow is available in the connection scenario of Table 2, FW2 fire flow is still available under the two different connection scenarios mentioned above.

Reservoir storage

We have also checked the reservoir storage capability of the Beacon Point Reservoir. The existing storage capacity under the 2009 design demands is already below recommended storage guidelines set out in a report by MWH[3]. Connection of this development would mean that reservoir storage issues at Beacon Point should be carefully considered by QLDC. Parts of the Beacon Point pressure zone may be supplied from a new reservoir (namely the Hawthenden Reservoir) in the future, which would also affect the storage requirements at Beacon Point.

[3] MWH New Zealand Ltd, *"Queenstown Lakes District Council – Strategic Water Review",* February 2006.

Applicability and Closure

The model is a numerical representation of the physical reality, and subsequently bears some uncertainty. The demands and peaking factors used are based on assumptions regarding the patterns of water use in the township, and are an approximation of the physical reality. Hence, actual demands within the network may differ from those modelled.

This report has been prepared for the benefit of Hadley Consultants Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

In addition, the modelling results presented in this report show the available levels of service for the **current** Wanaka network, based on the **2009 design demands**, and are not a guarantee of available levels of service in the future.

Finally, this modelling report has considered the development at a high level only. Once development layout is confirmed, additional modelling with more detailed reticulation will be required to confirm levels of service and pumping demands.

We trust this modelling report meets your requirements. Please contact Dominic Fletcher (dfletcher@tonkin.co.nz) on 03 363 2472 if you wish to discuss these results or any other aspect of this modelling report.

Yours sincerely,

TONKIN & TAYLOR LTD

Grant Lovell
CHRISTCURCH GROUP MANAGER

Report prepared by:
Pieter Vanderpoel
CIVIL ENGINEER

Technical review by:
Dominic Fletcher
T&T PROJECT MANAGER

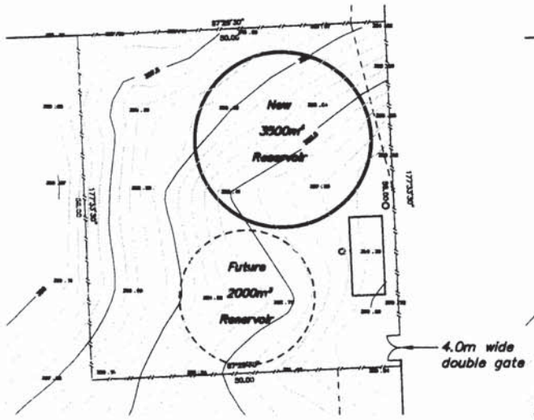
Attachments:

- Darby Partners Ltd drawings RS-00 & 03, titled "*East Wanaka Resource Study*", dated 22 & 28 June 2010.

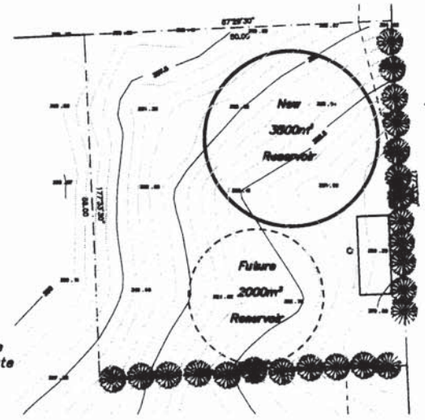
2-Aug-10
p:\51556\51556.013\workingmaterial\2010-07-30.pav.ltr.water modelling results.doc

Appendix 2

Beacon Point Reservoir Site Plan



FENCING LAYOUT PLAN
1:500 at A1
1:1000 at A3



PLANTING LAYOUT PLAN
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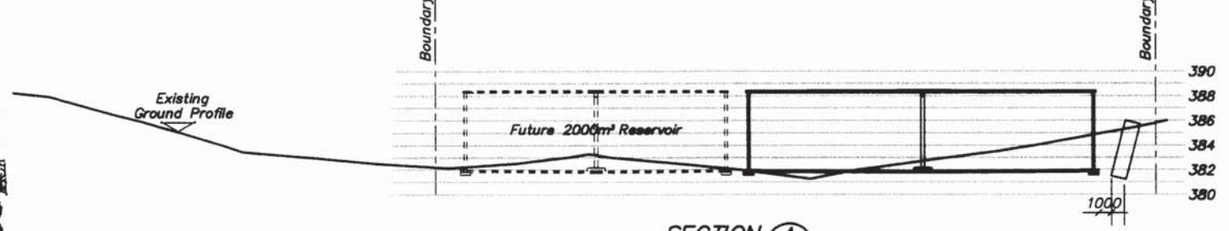
1:1000 at A3



SECTION A
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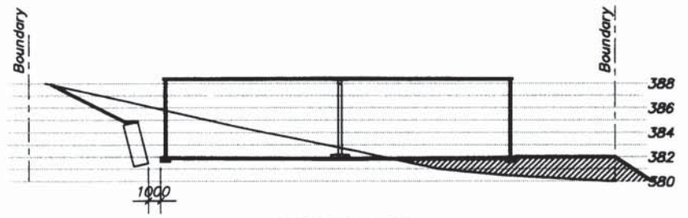

SECTION B
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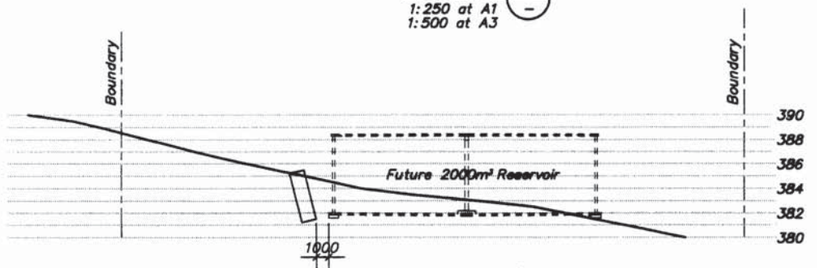

SECTION C
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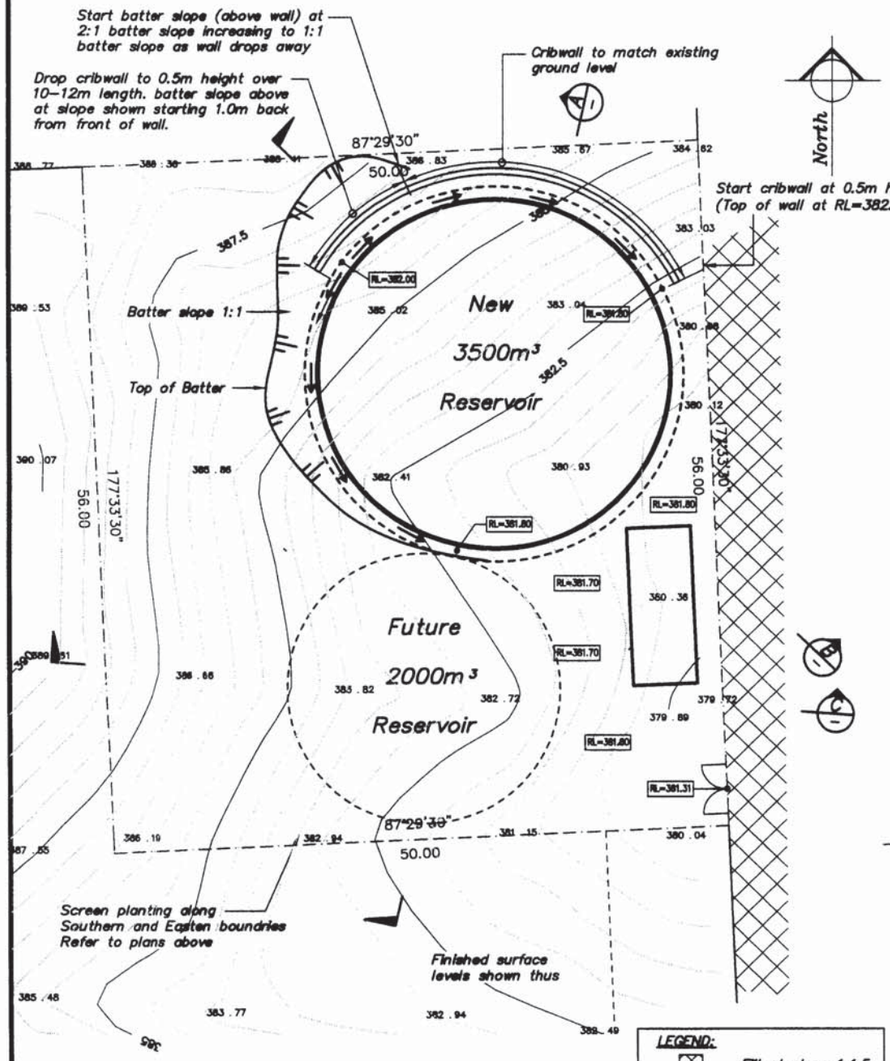
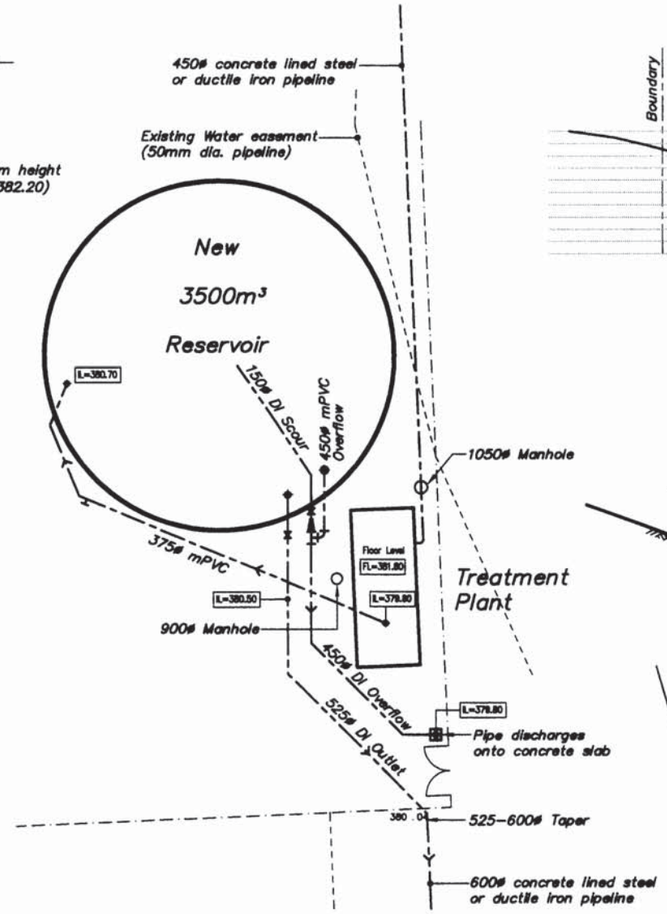


LAYOUT PLAN
1:250 at A1
1:500 at A3

Legal Description: Lot 13 DP 300734

LEGEND:
- Fill at slope 1:1.5
- Rising Main
- Gravity Main
- Crib Wall
- Fencing



PIPELINE LAYOUT PLAN
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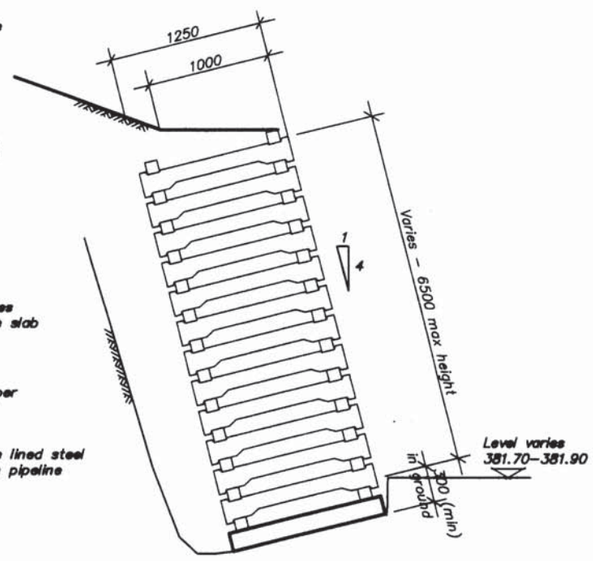
1:500 at A3



TYPICAL CRIB WALL SECTION
1:25 at A1
1:50 at A3
1200 SERIES CRIB WALL

A	As-Built		23/04
No.	Revisions		Date Appvd
Designed	A.Steel	Date 4/03	Print Date
Drawn	J.Knox	Apr'03	
Checked			
Approved			
File		Ref cRES--L1	

Client: Queenstown Lakes District Council

Project: CONTRACT No 417
WANAKA WATER SUPPLY BEACON POINT SYSTEM

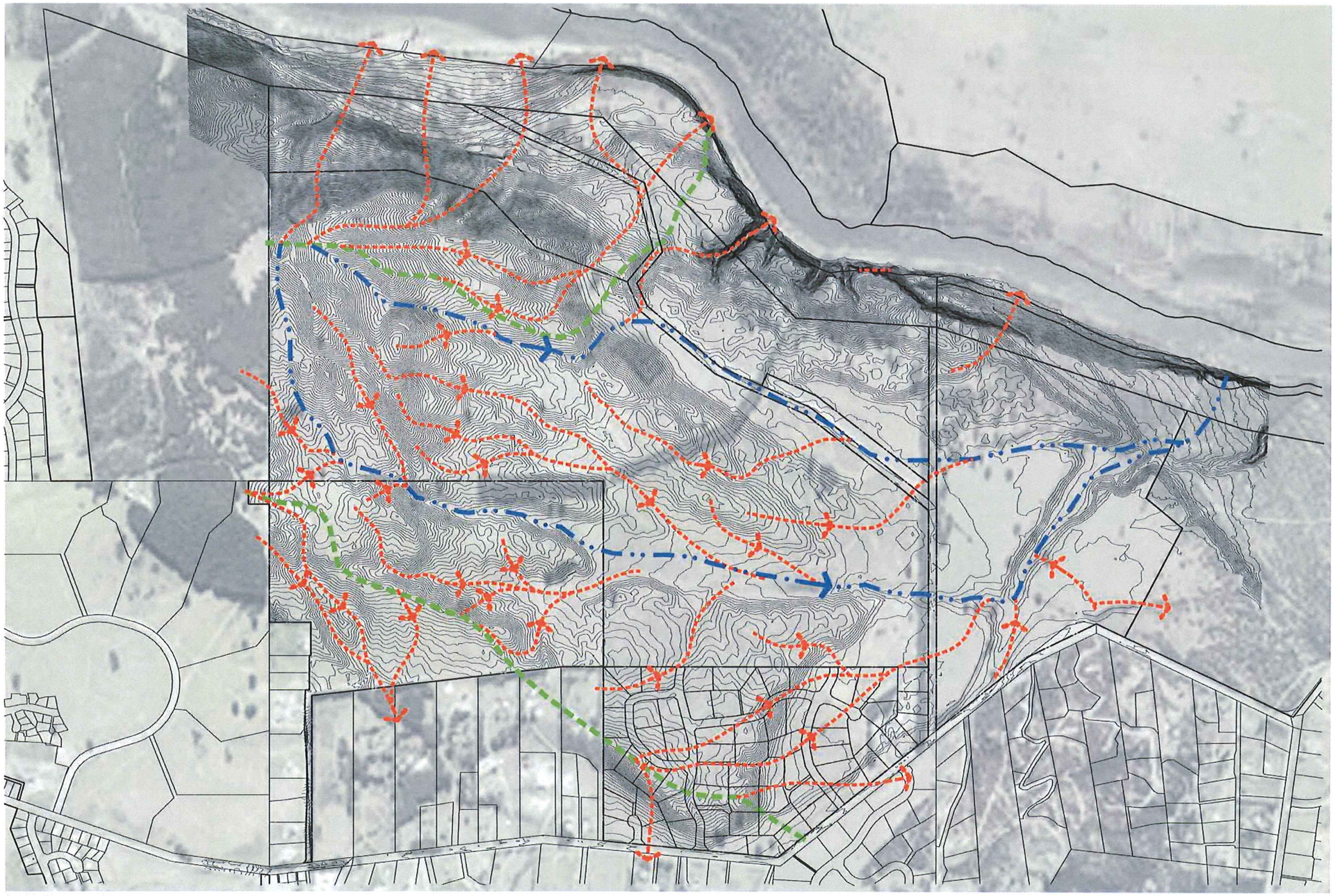
Sheet Title: NEW RESERVOIR SITE LAYOUT PLAN AND TYPICAL SECTIONS

Job No.	Sheet No.	Revision
57388	R1 of shts	A

Duffill Watts King Ltd

Appendix 3

Stormwater Runoff Paths



+ NORTHLAKE
HYDROLOGY

REFERENCE : 1788-G SCALE 1:10000 AT A3 FEB 2013

Plan detail adapted from Darby Partners Ltd plan ref. RS-004 rev C

FIGURE G

baxter design group

Appendix 4

Gas Reticulation Confirmation

John McCartney

From: John McCartney
Sent: Monday, 2 August 2010 12:01 p.m.
To: John McCartney
Subject: FW: North Wanaka Special Zone reticulation
Attachments: image001.jpg; image001.gif; image002.jpg

Sent: Friday, 30 July 2010 3:28 p.m.
To: John McCartney
Subject: FW: North Wanaka Special Zone reticulation

From: Stuart Brown [mailto:Stuart.Brown@contactenergy.co.nz]
Sent: Friday, 30 July 2010 3:17 p.m.
To: Laura Shadbolt
Subject: RE: North Wanaka Special Zone reticulation

Hi Laura

Just to confirm our conversation from Wednesday, We have reticulated gas in Aubrey Rd and Rata St. This is a 200 mm main suppling L.P.G. Vapour @ 70 KPa . This is adjacent to the Koromiko Block in Rata St, runs down Aubrey Rd then up Kings Drive.

Contact / Rockgas would look at extending this main to supply this area subject to securing a sustainable load and meeting supply criteria.

Please contact me directly with any further Questions.

Kindest Regards

Stu Brown
Project Engineer LPG
Queenstown

contact.

DDI: 64-03 441 8490 • **Mobile:** 64-027 459 2931
Phone: 64-03 442 9979 • Fax: 64-03 442 9987
119 Gorge Rd.QUEENSTOWN 9348.
PO Box 215
New Zealand • www.contactenergy.co.nz

From: Laura Shadbolt
Sent: Tuesday, 27 July 2010 5:27 p.m.
To: 'stuart.brown@contactenergy.co.nz'
Subject: North Wanaka Special Zone reticulation

Hi Stuart,

I've attached a drawing of the area concerned, just to confirm that we're on the same page! Very early stages, but indicative road locations are shown by the heavy black line.

If you could, a letter from Rockgas confirming the feasibility of connecting supply, and willingness to put forward a proposal at the appropriate time would be very helpful.

Thanks Stuart,

Laura Shadbolt
Civil Engineer

PO Box 1356
44 Robins Road
Queenstown 9348

Phone: 64-3-450 2140
Fax: 64-3-441 3513
Mobile: 021 1321376
Email: laura@hadleys.co.nz
Web: www.hadleys.co.nz

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Northlake Wanaka

SUBDIVISION INFRASTRUCTURE REPORT

PROJECT:	**Northlake Wanaka Stages 1 - 3**
PRINCIPAL:	**Northlake Investments Limited**
OUR REF:	**W4481-7**
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REVISION / APPROVAL PANEL

Rev:	Date:	Prepared By:	Reviewed By:	Comments:
0	13/05/16	MJB	AGT	Original issue
1	02/06/16	MJB	AGT	Consent application issue

CONTENTS

1. SCOPE

This report covers the availability of the following infrastructure elements and is intended to accompany a resource consent application for Subdivision Consent for Stages 1 – 3 of Northlake Investments Limited development of Northlake, Wanaka.

- Earthworks
- Roading Design Statement
- Roading Design Parameters
- Wastewater
- Water Supply
- Network Utility Services (electricity and telecommunications)

Stormwater, landscaping and geotechnical are covered by separate consultant reports.

2. PROPOSED INFRASTRUCTURE

All infrastructure for the Northlake development has been designed in accordance with Councils Land Development Code of Practice (LDCP)

The following information is contained in Appendices A – I;

Appendix A: Roading Hierarchy Plans & Typical Cross Sections
Appendix B: Table 3.2 Road Classification Table
Appendix C: Aubrey Road/Outlet Road Concept Intersection Layout
Appendix D: Waste Water Overview Plan
Appendix E: Waste Water Catchment Plan
Appendix F: Waste Water Internal Reticulation Plan
Appendix G: Water Supply Internal Reticulation Plan
Appendix H: Electricity Supply Confirmation
Appendix I: Telecommunications Supply Confirmation

2.1 Earthworks

RM160186 granted consent for bulk earthworks across Stages 1 – 7 of the Northlake ODP area. Consent was granted for bulk earthworks of 297,858m³ over an area of 20.4ha. The bulk earthworks covers the formation of roading to subgrade, the levelling and contouring of residential allotments, and the topsoiling of road berms, reserve areas and allotments.

2.2 Road Design Statement

2.2.1 Scope of Roading Design Statement

The intention of this roading design statement is to outline to Council details of the proposed roading network for the Northlake Development as a whole and in doing so give context to the stage 1-3 application for subdivision consent.

This roading design statement covers all aspects of the proposed roading design as required by Section 3.2.6 of QLDC LDCP. This includes:

(a) Road dimensions and layout
(b) Place and link functions
(c) Connectivity
(d) How target operating speeds have been achieved
(e) How LID principles have been considered for stormwater run-off from the roads

2.2.2 Roading Dimensions & Layout

The road layout for the Northlake development is shown on the plans contained in **Appendix A.** The roading layout has been governed primarily by the location of existing road connections i.e. Outlet Road, Northburn Road and Mount Linton Avenue and the requirements of the Northlake structure plan.

Road dimensions have been based initially on the minimum requirements outlined in Table 3.2 QLDC LDCP and then modified to suit the functional and aesthetic goals of the proposed development. Refer **Appendix B** for our modified table 3.2.

The proposed roads have a movement lane widths of either 2 x 4.2m, 5.5 – 5.7m or 2.75 – 3.0m. The reasons for these width options is as follows;

1. Road Type A
Road Type A on the roading hierarchy plan corresponds to an E13 type road in table 3.2 of QLDC LDCP. This is classed as a collector road.

This features movement lanes of 2 x 4.2m width, recessed parallel car parking with a dimensions of 2.5m x 6.0m parking bays, footpaths on both sides with a width of 2m.

An added feature is proposed within Road type A includes a central planting island and a large swale providing the primary stormwater conveyance down the middle of the site.

Road type A is contained within a 30m legal width to provide sufficient room to accommodate the swale, central planting Island, the 2m wide footpaths, recessed parking, the movement lane, landscaping and services.

2. Road Type AA
Road Type AA on the roading hierarchy plan corresponds to an E13 type road in table 3.2 of QLDC LDCP. This is classed as a collector road.

This features movement lane widths of 2 x 4.2m, recessed parallel car parking with a dimensions of 2.5m x 6.0m parking bays, footpaths on both sides with a width of 2m.

An added features proposed within Road type AA includes a central planting island. This road type does not include the large swale. Road type AA is contained within a 20m legal width to provide sufficient room to accommodate the central planting island, the 2m wide footpaths, recessed parking, the movement lane, landscaping and services.

3. Road Type B – 20m Width
Road Type B – 20m width on the roading hierarchy plan corresponds to an E12 type road in table 3.2 of QLDC LDCP. This is classed as a local road.

This features a movement lane width of 5.7m, recessed parallel car parking with a dimensions of 2.5m x 6.0m parking bays, footpaths on both sides with a minimum width of 1.5m.

Footpaths will be provided on both side where the road is servicing 20 or more dwellings or is longer than 100m in length. Recessed car parking will be provided where the road is servicing more than 100 dwellings.

Road Type B – 20m Width is contained within a 20m legal width to provide sufficient room to accommodate the 1.5m wide footpaths on both sides, recessed parking, the movement lane, landscaping and services.

4. Road Type B – 15m Width
Road Type B – 15m width on the roading hierarchy plan corresponds to an E12 type road in table 3.2 of QLDC LDCP. This is classed as a local road.

This features a movement lane width of 5.7m, car parking is shared in movement lane, footpaths on one or both sides with a minimum width of 1.5m.

Footpaths will be provided on both sides where the road is servicing 20 or more dwellings or is longer than 100m in length.

Road Type B – 15m Width is contained within a minimum 15m legal width to provide sufficient room to accommodate the 1.5m wide footpaths, recessed parking, the movement lane, landscaping and services.

A 5.7m movement lane width provides for the ability to park on one side of the road and one through lane or alternatively two through lanes. Neither option will be delineated but rather this will be left for road users to decide.

5. Road Type C
Road Type C on the roading hierarchy plan corresponds to an E11 type road in table 3.2 of QLDC LDCP. This is classed as a lane.

This features a movement lane width of 5.7m, car parking is shared in the movement lane, footpaths on one side with a minimum width of 1.5m.

Road Type C is contained within a minimum 12m legal width to provide sufficient room to accommodate the 1.5m wide footpath, the movement lane, landscaping and services.

6. Road Type D
Road Type D on the roading hierarchy plan corresponds to an E11 type road in table 3.2 of QLDC LDCP. This is classed as a lane.

This features a movement lane width of 5.7m, car parking is shared in the movement lane, and pedestrian access is shared within the movement lane.

Road Type D is contained within a minimum 10m legal width to provide sufficient room to accommodate the movement lane, landscaping and services.

7. Road Type - Access
Road Type Access corresponds to an E9 or E10 road in table 3.2 of QLDC LDCP. This is classed as a lane and will be either private or public depending on the number of lots serviced.

This features a movement lane width of 3.0m, allows for passing every 50m, and pedestrian access is shared within the movement lane.

Road Type Access is contained within a width of 6m to 10m legal width to provide sufficient room to accommodate the movement lane, landscaping and services.

8. Road Type – Semi Rural
Road Type Semi Rural corresponds to an E8 road in table 3.2 of QLDC LDCP. This is classed as a collector road.

This features a movement lane of 5.7m width, sealed shoulders with a water table drain. Pedestrians are catered for by a 2m wide gravel, timber edge footpath along one side.

Road Type Semi Rural is contained within a 20m legal width.

2.2.3 Place and Link Functions

Section 3.2.4 QLDC LDCP states that "the two fundamental roles of a road are to provide a space for interaction between people for a range of purposes and access to land so that movement between places can occur".

The following two sections discuss the proposed design in terms of both 'place context' and 'link context'

Place Context
Place context is defined for both the specific land use served and the broader area type in which it is located. The land use characteristic is defined according to the description of predominant activities in individual areas. QLDC LDCP uses the descriptions "live, play, shop, work and learn, in addition to activities associated with growing, manufacturing and transporting of goods and products".

Using Table 3.1 from QLDC LDCP, we have categorised the development area as:

(a) Land use: **live and play**
(b) Area type: **suburban**

The live and play land use is defined as "homes, home based businesses, and mixed use developments with residential uses, as well as parks and low impact recreation". The proposed use of the development is for residential homes, local purpose and/or recreation reserves, walkway linkages and stormwater reserves and is consistent with the live and play land use.

The suburban area type is defined as "low and moderate density housing up to 15 units per hectare in an area where housing is the exclusive or dominant use". The first three stages proposed development site is approximately 11.888ha and will contain approximately 108 houses once fully developed thus yielding a dwelling unit density of 8.7 units per hectare. Residential housing will be the predominant land use allowing for the fact that there will likely be a few home based businesses established.

The 'urban' area type anticipates much a higher residential density (50 units per hectare) plus the inclusion of other land uses and is therefore not an appropriate category for the subject site. Similarly, the 'rural' area type is not appropriate because this is intended for a residential population outside of the urban limits.

Table 3.1 explains the transport context for the suburban area type as private vehicles being the predominant form of transport with public transport providing for peak flow on arterial and connector/collector roads. It further explains that non-motorised trips are primarily recreational and occur on local roads. Whilst the public transport component of this explanation is not currently applicable in the Wanaka context and private vehicles will be the predominant form of transport for the next few years, it is anticipated that public transport will be in place at some time in the future. With this in mind it would appear logical that bus stops could be situated on the Type A and Type B roads by converting some of the recessed parking into a suitable bus stop or by constructing a suitable bus stop at the appropriate time in the future by removal of street landscaping as required.

Link Context

Link context is classified by the extent of access and the degree of through movement intended to be served. This standard includes three levels of link context;

(a) Lane: a road that provides very high local access and very limited through movement connectivity. Very low vehicle speeds with shared pedestrian and vehicle access predominate;
(b) Local road: A road that provides access and connectivity for a local area. Low vehicle speeds, pedestrian and local amenity values predominate;
(c) Connector/collector road: A road that provides circulation in local areas and links to arterial roads, while balancing this with pedestrian and local amenity values. Higher vehicle and access for all modes of transport including public transport predominate.

The proposed road classification table contained in **Appendix B** contains columns that detail which of the above classification options has been assigned to each of the proposed roads.

2.2.4 Connectivity

Section 3.2.5 of QLDC LDCP states that well connected networks (roads and other links) are achieved with smaller block sizes and regular connections. Network connectivity shall be designed to achieve:

(a) Shorter travel distances;
(b) An increased number of alternative routes for all types of users;
(c) Increased opportunity for interaction;
(d) Improved access to public transport, cycling and walking networks, and access to destinations.

The proposed roading layout provides considerable options for route choice by utilising all connection points to existing roads.

The proposed roading layout linkage points and connectivity is consistent with the routes shown in the Wanaka Transportation and Parking Strategy 2008 and Wanaka Structure Plan 2007

Access to public transport has been mentioned earlier in this report.

2.2.5 Target Operating Speeds

Section 3.3.5 of QLDC LDCP states that traffic management shall be included in the road design to ensure that the target operating speeds are achieved. Target operating speed can be managed by physical and psychological devices such as narrowed movement lanes, reduced forward visibility, slow points, build outs, lengths, chicanes, planting and landscaping and street furniture and art works. The two key geometric factors that contribute to achieving the target operating speed are carriageway width and forward visibility.

The proposed carriageway widths are consistent with the requirements of QLDC LDCP in order to provide a suitable number of through lanes as well as making provision for car-parking and passing manoeuvres.

2.2.6 LID Principles for Stormwater Runoff from Roads

It is proposed to direct all stormwater runoff from roads to the roadside kerb and channel which will in turn discharge into mudtanks and an underground piped network. Ultimately all stormwater runoff from the roads will be piped to various stormwater reserves located across the site where the runoff will be detained so as to balance pre and post flows.

The design of the stormwater reserves is discussed in a separate report prepared by Riley Consultants. In summary the design is considered to be 'low impact' since all stormwater will be attenuated to pre-development flows.

Other LID options such as road side swales have been discounted due to the density of housing and the resulting number of vehicle crossing which would limit the effectiveness of any roadside swales, the maintenance requirements of these options (and degradation of visual appeal if maintenance is not undertaken.

2.3 Roading Design Parameters

Typical cross sections for all proposed roads are shown on the roading hierarchy plans contained in **Appendix A.**

The road design parameters proposed are as follows: (refer also the proposed road classification Table 3.2 contained in **Appendix B)**

2.3.1 Road 1

Feature	Design Features	Reason for Departure if any
Road No	1	
Cross Section Ref	E13	
Our Road Type	Type AA	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	Up to 800du	
Target operating speed	50km/h	
Legal road width	20m	

Pedestrians	A footpath will be constructed on both sides of the road 2.0m wide	
Passing, parking, loading and shoulder	Recessed parking	
Cyclists	Shared in movement lane	
Movement lane width	2 x 4.2	
Classification	Connector Road (~8000 vpd)	
Turning Head	Not Required	

2.3.2 Rd 2 up to intersection with Rd3

Feature	Design Features	Reason for Departure if any
Road No	Rd 2 up to intersection with Rd3	
Cross Section Ref	E12	
Our Road Type	Type B – 20m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	20m	Wider than minimum of 15m
Pedestrians	1.5m each side	
Passing, parking, loading and shoulder	Recessed parking	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.3 Rd 2 along Lot 1008 western bdy

Feature	Design Features	Reason for Departure if any
Road No	Rd 2 along Lot 1008 western bdy	
Cross Section Ref	E15	
Our Road Type	Type B – 20m	
Area	Suburban	
Local attributes	Access to trade, office and education	
Locality served	Suburban village, access to office and education, 1 - 200 lots	
Target operating speed	40km/h	
Legal road width	20m	Wider than minimum of 18m
Pedestrians	2.0m each side	Less than 3.0m width each side as considered area will be a low demand shop & trade area

Passing, parking, loading and shoulder	Recessed parking	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.4 Road 3

Feature	Design Features	Reason for Departure if any
Road No	3	
Cross Section Ref	E12	
Our Road Type	Type B – 15m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	15m	Slight width reduction at Lot 27 to 14.7m.
Pedestrians	1.5m each side	
Passing, parking, loading and shoulder	No recessed parking as under 100du	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.5 Road 4

Feature	Design Features	Reason for Departure if any
Road No	4	
Cross Section Ref	E12	
Our Road Type	Type B – 20m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	20m	Wider than minimum of 15m to provide room for recessed parking
Pedestrians	1.5m each side	
Passing, parking, loading and shoulder	recessed parking as considered a through road servicing more than 100du	

Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.6 Road 5

Feature	Design Features	Reason for Departure if any
Road No	5	
Cross Section Ref	E12	
Our Road Type	Type B – 20m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	20m	Wider than minimum of 15m to provide room for recessed parking
Pedestrians	1.5m each side	
Passing, parking, loading and shoulder	Recessed parking as considered a through road servicing more than 100du	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.7 Road 6

Feature	Design Features	Reason for Departure if any
Road No	6	
Cross Section Ref	E12	
Our Road Type	Type B – 15m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	15m	
Pedestrians	1.5m one side	
Passing, parking, loading and shoulder	No recessed parking as under 100du	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	

Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.8 Road 7

Feature	Design Features	Reason for Departure if any
Road No	7	
Cross Section Ref	E11	
Our Road Type	Type C	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 20 du	
Target operating speed	20km/h	
Legal road width	12m	Wider than minimum of 9m to allow for footpath 7 landscaping
Pedestrians	1.5m one side	Provision of footpath rather than shared in movement lane
Passing, parking, loading and shoulder	Shared in movement lane	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.9 Road 8

Feature	Design Features	Reason for Departure if any
Road No	8	
Cross Section Ref	E12	
Our Road Type	Type B – 15m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	15m	
Pedestrians	1.5m one side	
Passing, parking, loading and shoulder	Shared in movement lane	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.10 Road 9

Feature	Design Features	Reason for Departure if any
Road No	9	
Cross Section Ref	E12	
Our Road Type	Type B – 20m	
Area	Suburban	
Local attributes	Primary access to housing	
Locality served	1 to 200 du	
Target operating speed	40km/h	
Legal road width	20m	
Pedestrians	1.5m each side	Wider than minimum of 15m to provide room for recessed parking
Passing, parking, loading and shoulder	Recessed parking as considered a through road servicing more than 100du	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	Not Required	

2.3.11 Road 10

Feature	Design Features	Reason for Departure if any
Road No	10	
Cross Section Ref	E11	
Our Road Type	Type C	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 20 du	
Target operating speed	20km/h	
Legal road width	12m	Wider than minimum of 9m to allow for footpath 7 landscaping
Pedestrians	1.5m one side	Provision of footpath rather than shared in movement lane
Passing, parking, loading and shoulder	Shared in movement lane	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Local road (~2000 vpd)	
Turning Head	T Shaped as per LDCP Figure3.4	

2.3.12 Access 1

Feature	Design Features	Reason for Departure if any
Road No	Access 1	
Cross Section Ref	E10	
Our Road Type	Type - Access	
Area	Suburban	
Local attributes	Side or rear service access	
Locality served	1 to 20 du	
Target operating speed	10km/h	
Legal road width	6m	
Pedestrians	Shared in movement lane	
Passing, parking, loading and shoulder	No passing as less than 50m and low traffic volume from 2 Lots	
Cyclists	Shared in movement lane	
Movement lane width	3.0m	
Classification	Lane (≈ 200vpd)	
Turning Head	Not required	

2.3.13 Access 2

Feature	Design Features	Reason for Departure if any
Road No	Access 2	
Cross Section Ref	E9	
Our Road Type	Type - Access	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 3 du	
Target operating speed	10km/h	
Legal road width	6m	
Pedestrians	Shared in movement lane	
Passing, parking, loading and shoulder	No passing as less than 50m and low traffic volume from 3 Lots	
Cyclists	Shared in movement lane	
Movement lane width	3.0m	
Classification	Private - Access Lot	
Turning Head	T Shaped as per LDCP Figure 3.4	

2.3.14 Access 3

Feature	Design Features	Reason for Departure if any
Road No	Access 3	
Cross Section Ref	E9	
Our Road Type	Type - Access	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 3 du	
Target operating speed	10km/h	
Legal road width	10m	Wider than minimum to allow for T turning head and landscaping
Pedestrians	Shared in movement lane	
Passing, parking, loading and shoulder	No passing as less than 50m and low traffic volume from 3 Lots	
Cyclists	Shared in movement lane	
Movement lane width	3.0m	
Classification	Private - Access Lot	
Turning Head	T Shaped as per LDCP Figure 3.4	

2.3.15 Access 4

Feature	Design Features	Reason for Departure if any
Road No	Access 4	
Cross Section Ref	E11	
Our Road Type	Type - Access	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 20 lots	
Target operating speed	20km/h	
Legal road width	10m	Wider than minimum to allow for T turning head and landscaping
Pedestrians	Shared in movement lane	
Passing, parking, loading and shoulder	Shared in movement lane	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Lane (≈ 200vpd)	
Turning Head	T Shaped as per LDCP Figure 3.4	

2.3.16 Access 5

Feature	Design Features	Reason for Departure if any
Road No	Access 5	
Cross Section Ref	E9	
Our Road Type	Type - Access	
Area	Suburban	
Local attributes	Access to houses/ townhouses	
Locality served	1 to 3 du or 1 to 6 du	
Target operating speed	10km/h	
Legal road width	10m	Wider than minimum to allow for landscaping
Pedestrians	Shared in movement lane	
Passing, parking, loading and shoulder	No passing as less than 50m and low traffic volume from 2 Lots	
Cyclists	Shared in movement lane	
Movement lane width	3.0m	
Classification	Private - Access Lot	
Turning Head	Not required	

2.3.17 Outlet Road

Feature	Design Features	Reason for Departure if any
Road No	Outlet Road	
Cross Section Ref	E8	
Our Road Type	Type – Semi Rural	
Area	Rural	
Local attributes	All (serving land uses not specified elsewhere in this table(	
Locality served	NA	
Target operating speed	50km/h	
Legal road width	20m	
Pedestrians	2m wide gravel footpath on western road side	Providing one footpath on western side as eastern side would be installed by future developer of adjacent block once their development layout is known
Passing, parking, loading and shoulder	Sealed shoulder	
Cyclists	Shared in movement lane	
Movement lane width	5.7m	
Classification	Connector / collector (≈ 2500vpd)	
Turning Head	Not required	

2.4 Stormwater

For stormwater refer separate report by Riley Consultants which provide the overall stormwater disposal concept for the ODP.

2.5 Wastewater

Council's Project Manager (Infrastructure) has been consulted during the investigation of the proposed development's wastewater requirements. Rationale Ltd were engaged by Council to assess whether there is sufficient capacity in the existing network to accommodate the connection of the Northlake Zone and to determine whether there is an opportunity to optimise the network by identifying and assessing a range of technical options for the servicing of this development.

Consultation with Myles Lind of Council has confirmed that Council is happy with the proposed connection of Northlake to its infrastructure but requires further modelling to be carried out by Council using a calibrated model before offsite upgrades, if any are required, can be confirmed.

Enclosed in **Appendix C** is an updated plan showing the overview of the Northlake zone. The number of units in Stages A and B has been updated to reflect the final number of units shown on the ODP. This plan has been provided to Council for further modelling. The result of this further modelling is dependent on the calibrated model being updated by Council.

2.5.1 Waste Water Catchments

Enclosed in **Appendix D** is waste water catchment plan with height relief showing that there are two primary catchments required to be serviced within the land owned by Northlake Investments and the upstream land owned by Allenby Farms. These are labelled catchments 1 and 2. Both of these catchment will be serviced by connection to an existing 300 diameter trunk main located in Outlet Road.

Catchment 3 comprises the land currently owned by Gilbertson. This catchment is able to be serviced directly from Aubrey Road.

2.5.2 Internal Reticulation

The proposed concept internal waste water reticulation is enclosed within **Appendix E**. The proposed point of connection is to an existing 300mm diameter trunk main located in Outlet Road. Note this main is not shown on Council GIS as the final as-builts for the adjacent subdivision have not been submitted. The existing 300 diameter main is to be extended up Outlet Road and then up the central collector road through Northlake Investments ODP. This will service all of waste water catchment 1.

An assessment by Council will be required as part of modelling to confirm what proportional offsetting is appropriate to allow for the servicing of upstream land. Any increases in pipe sizes above that only required to service the Northlake Investment development would be offset against development contributions.

A second smaller 225 diameter trunk main is to be extended further along Outlet Road to service waste water catchment 2. Note there is likely to be parts of future stages in catchment 2 that will likely require low pressure pump due to the height relief, however all of Stages 1 -3 can be serviced by gravity drainage. Note the trunk main cannot be installed any deeper due to existing level of the 300 diameter drainage located in Outlet Road.

The remaining parts of each catchment are shown as being serviced by smaller 150 diameter waste water lines following the road layout. There are options for part of Stage 1 to be connected back into the existing drainage located in the adjacent subdivision via Mount Linton Avenue. The final arrangement will be confirmed as part of detailed engineering design with Council.

2.6 Water Supply

Council's Project Manager (infrastructure) has been consulted during the investigation of the proposed development's potable water requirements. Tonkin and Taylor Ltd were engaged by Council to assess whether there is sufficient capacity in the existing network to accommodate the connection of the Northlake development and to determine whether there is an opportunity to optimise the network by identifying and assessing a range of technical options for the servicing of this development.

Consultation with Mark Baker of Council has confirmed that Council is happy with the proposed connection of Northlake to its infrastructure but requires further modelling to be carried out by Council using a calibrated model before offsite upgrades, if any are required, can be confirmed.

Enclosed in **Appendix C** is an updated plan showing the overview of the Northlake zone. The number of units in Stages A and B has been updated to reflect the final number of units shown on the ODP. This plan has been provided to Council for further modelling. The result of this further modelling is dependent on the calibrated model being updated by Council.

2.6.1 Internal Reticulation

The proposed concept internal water reticulation is enclosed within **Appendix F**. The proposed point of connection is to the existing 150 diameter lines located in Outlet Road, Mount Linton Avenue and Northburn Road. These are extended through to the central collector road to connect to a larger 250 diameter water trunk main.

The 250 diameter trunk main is proposed to be ultimately extended up along the main collector road through Allenby Farms and connect back into the main trunk main from the Beacon Point Reservoir thereby creating a loop and providing sufficient pressure. The exact timing for this connection is subject to the further modelling by Council.

The 250 diameter trunk main will also be extended through to Aubrey Road via the Gilbertson land. This connection does not provide any benefits for Northlake Investments but is required to provide sufficient water and pressure for the Gilbertson land when it is developed.

An assessment by Council will be required as part of modelling to confirm what proportional offsetting is appropriate to allow for the servicing of adjacent blocks. Any increases in pipe sizes above that only required to service the Northlake Investment development would be offset against development contributions.

The remaining parts of Stages 1 – 3 are shown as being serviced by smaller 100 diameter water lines following the road layout.

2.7 Network Utility Services

2.7.1 Electricity

There is existing electrical reticulation in the earlier stages of Northlake adjacent Aubrey road that can be extended into the development. The local electricity authority, Aurora Energy, have been consulted and they confirm that supply can be made available to this site. This supply is currently limited to single phase 15kVA per lot. A letter from Aurora confirming this is attached **Appendix G**.

2.7.2 Telecommunications

Chorus has confirmed that telecommunications can be made available to the site. This will require extension of a new telecom feeder cable to be installed offsite. The final design is subject to confirmation with Chorus. An email from Chorus confirming this is attached in **Appendix H**.

2.8 Conclusion

All of the network operators for water, waste water, power and telecom have confirmed connection to their system by Northlake is possible.

While some system upgrades are known to be necessary, further modelling is required by Council using its new calibrated waste water and water supply models to confirm the exact timing. At this stage the subdivision of Stage 1 -3 covers only a small part of the Northlake zone. It is anticipated that detailed modelling by Council will confirm what subdivision stages can connect before triggering offsite upgrades.

Development contributions payable for this development (less the credit for upgrading the system) will mitigate any effect this development will have on Council's existing infrastructure.

Mike Botting
Paterson Pitts Group Limited (Wanaka)

Appendix A: Roading Hierarchy Plans & Typical Cross Sections

North

ROAD TYPE A
COLLECTOR (NORTHLAKE DRIVE)

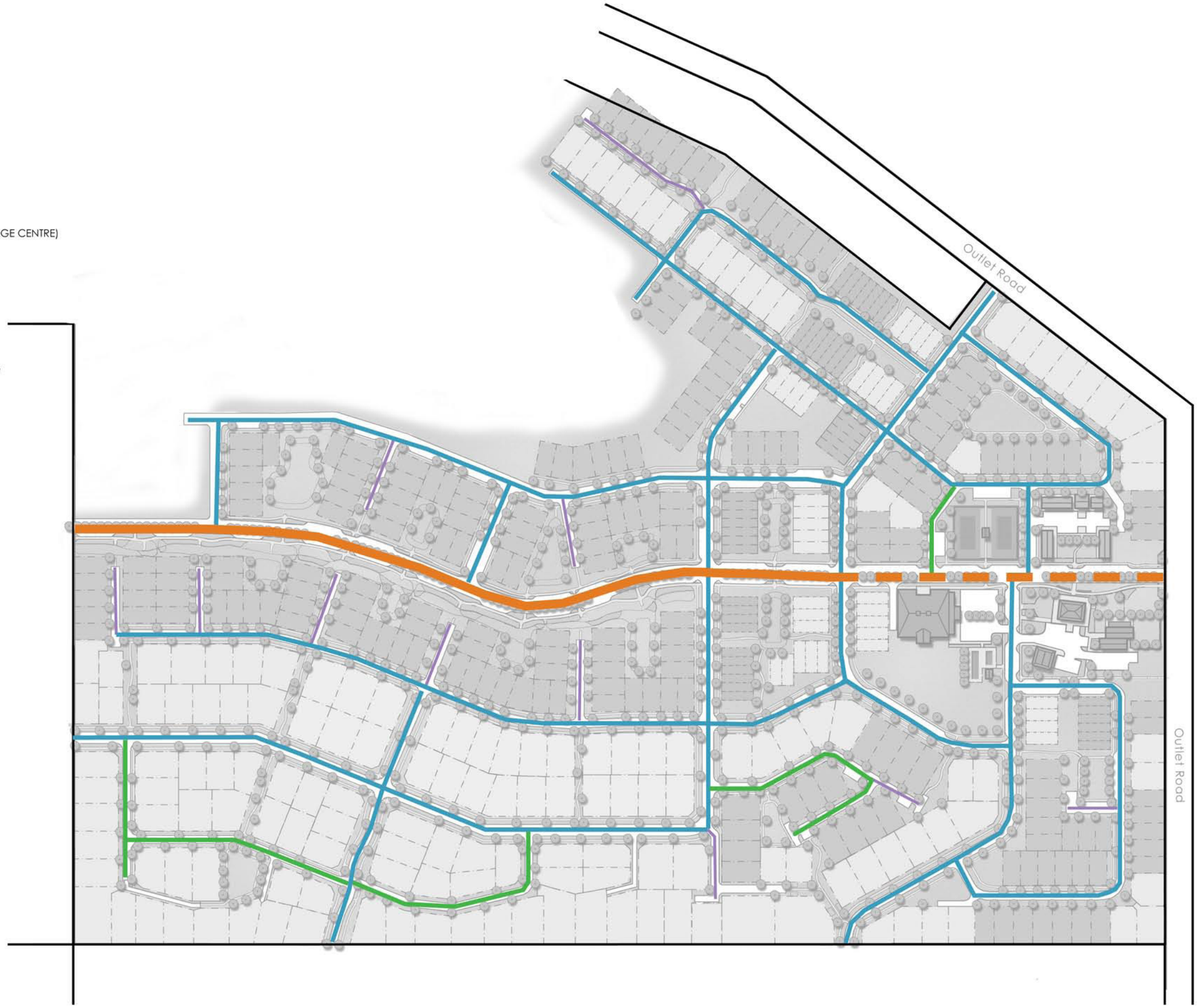
ROAD TYPE AA
COLLECTOR (NORTHLAKE DRIVE - VILLAGE CENTRE)

ROAD TYPE B
LOCAL ROAD

ROAD TYPE C
LANE

ROAD TYPE D
LANE

Note: The proposed roads have been categorised in accordance with QLDC Land Development and Subdivision Code of Practice, Section 3.2.4.2 'Link Context'



+ NORTHLAKE WANAKA- ODP ROAD HIERARCHY - REVISED

REFERENCE : 1949 - SK-524 - SCALE =1:1500 AT A1. 1;3000 AT A3 - 14 APRIL 2016

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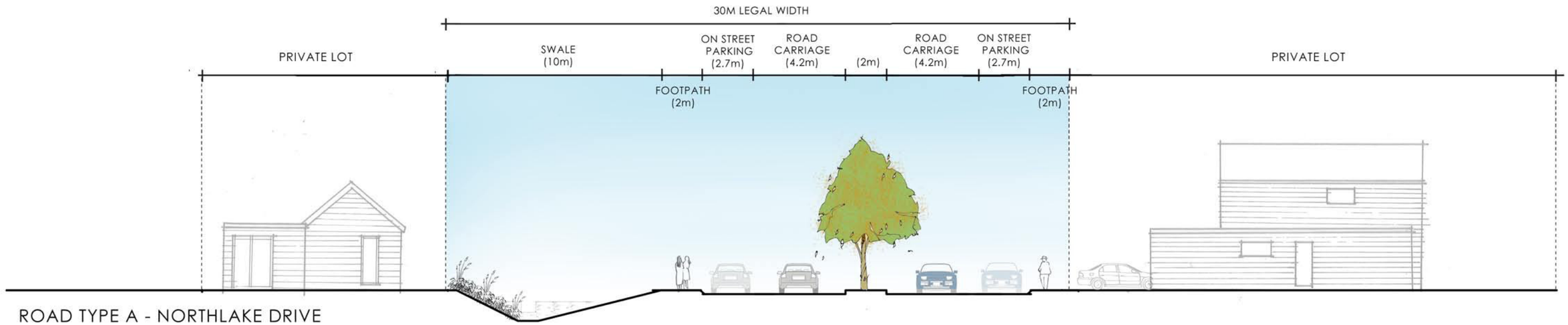
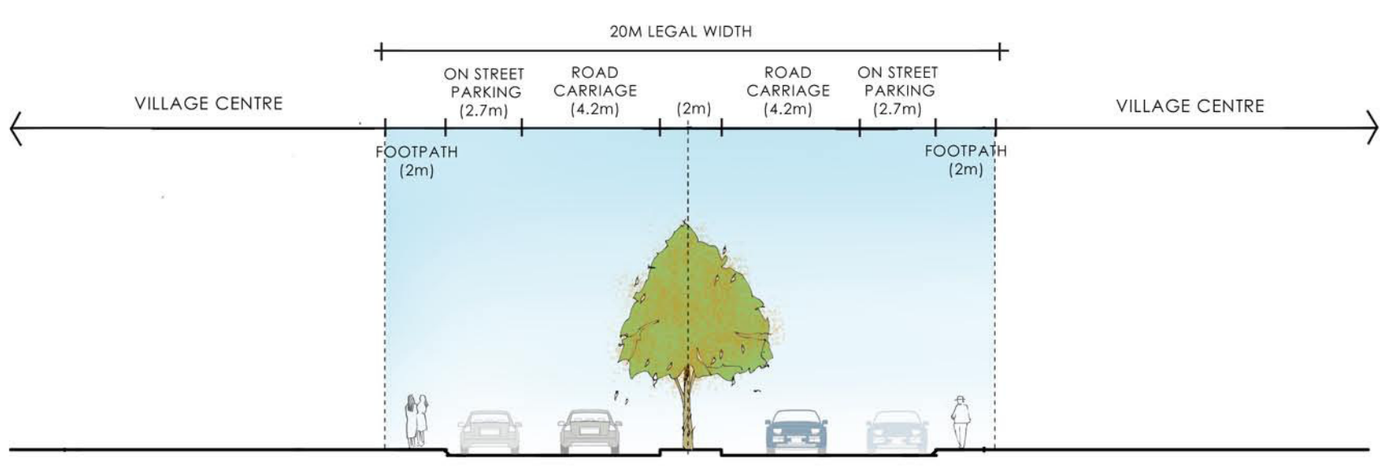


ROAD TYPE A - NORTHLAKE DRIVE
CLASSIFICATION: COLLECTOR



ROAD TYPE A - NORTHLAKE DRIVE - VILLAGE CENTRE
CLASSIFICATION: COLLECTOR

+ NORTHLAKE WANAKA- INDICATIVE TYPE A ROAD CROSS SECTIONS - REVISED

REFERENCE : 1949 - SK-525 - SCALE =1:100 AT A1. 1;200 AT A3 - 14 APRIL 2016

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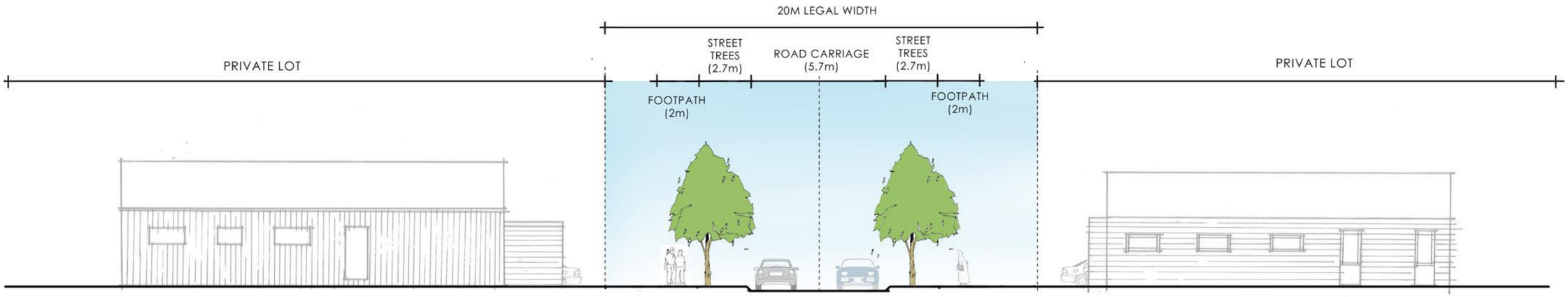
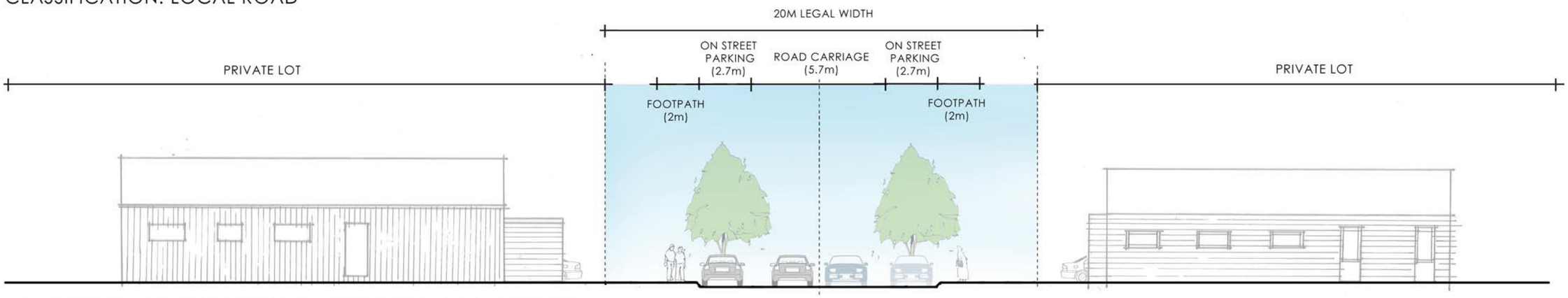


ROAD TYPE B - WITH STREET TREES (20M LEGAL WIDTH)
CLASSIFICATION: LOCAL ROAD

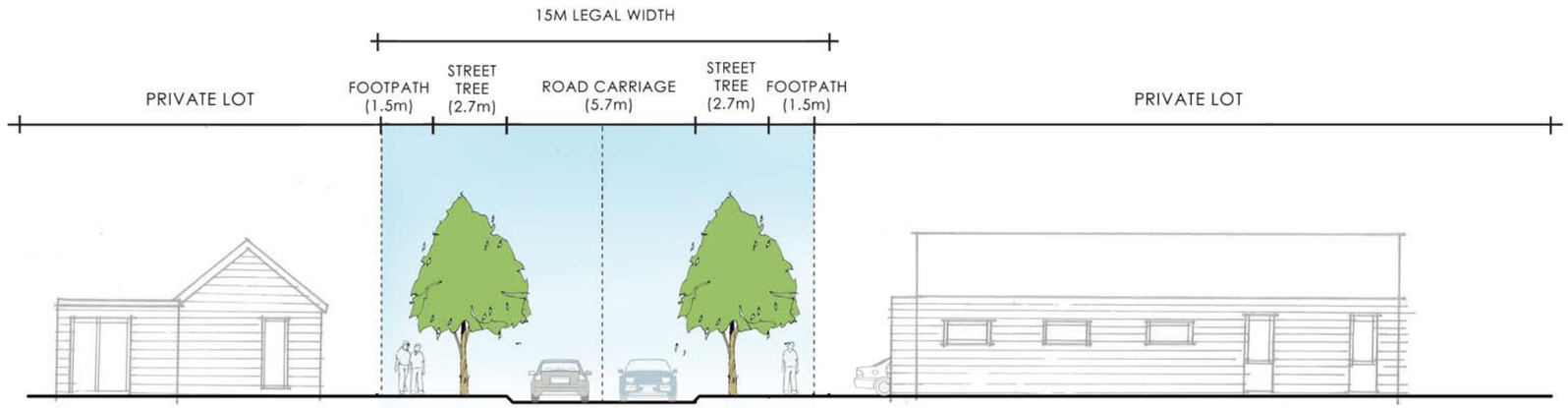


ROAD TYPE B - WITH ON STREET PARKING (20M LEGAL WIDTH)
CLASSIFICATION: LOCAL ROAD

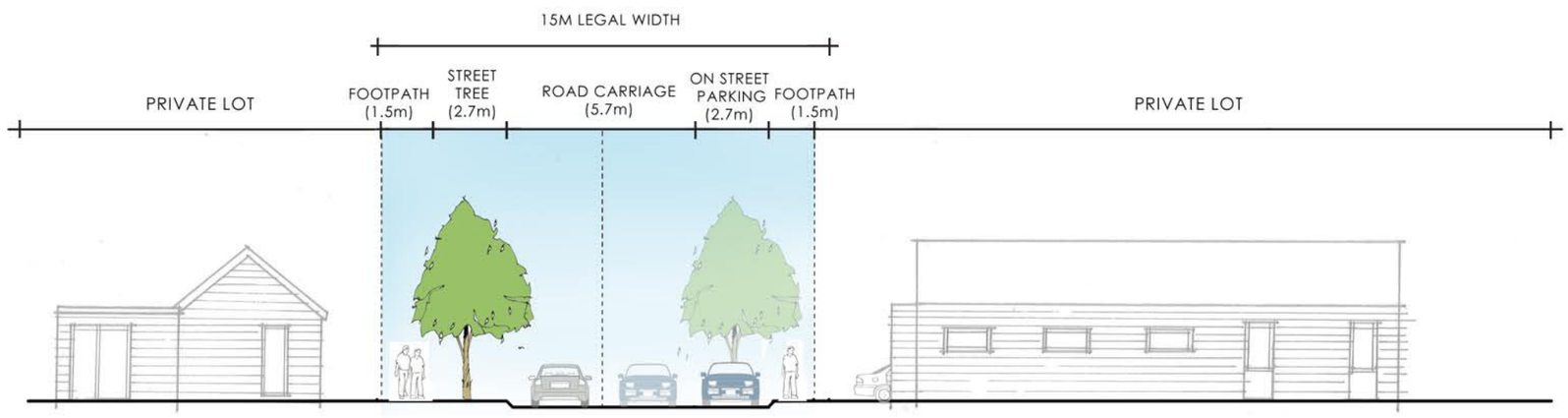
+ NORTHLAKE WANAKA- INDICATIVE TYPE B ROAD CROSS SECTIONS

REFERENCE : 1949 - SK-526 - SCALE =1:100 AT A1. 1;200 AT A3 - 14 APRIL 2016

baxter design group



ROAD TYPE B - WITH STREET TREES (15M LEGAL WIDTH)
CLASSIFICATION: LOCAL ROAD

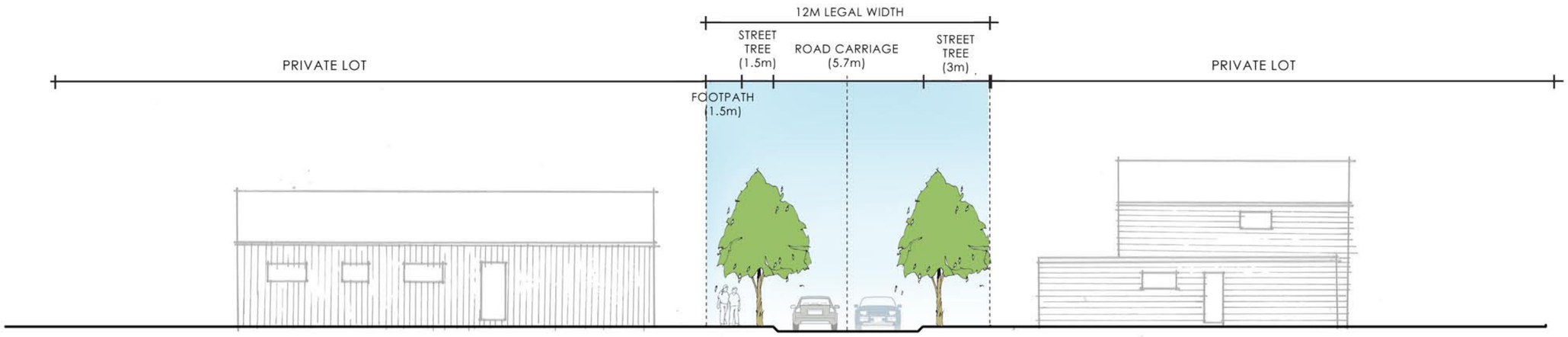


ROAD TYPE B- WITH ON STREET PARKING (15M LEGAL ROAD)
CLASSIFICATION: LOCAL ROAD

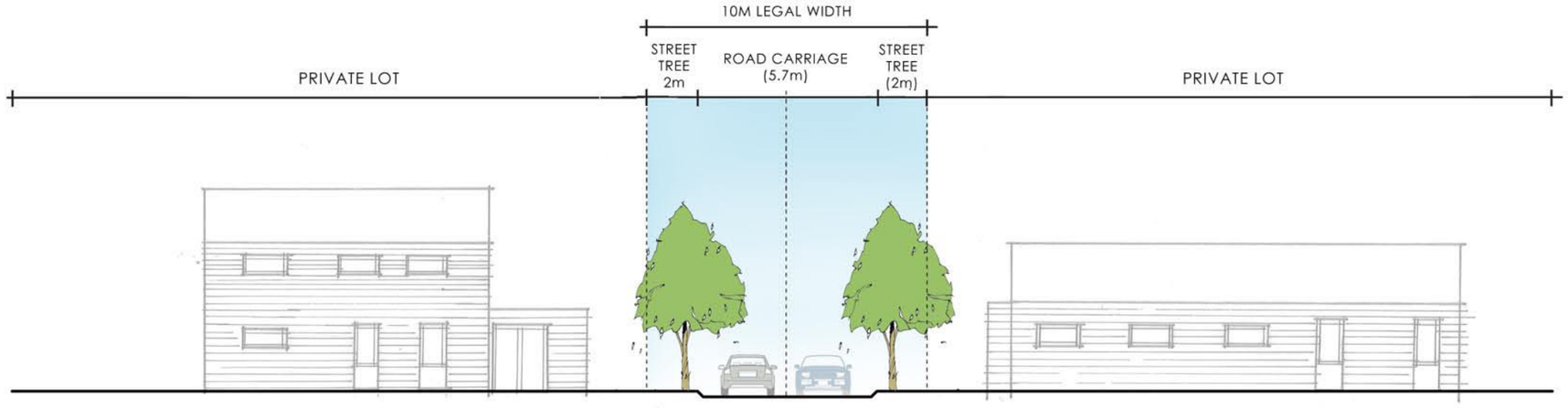
+ NORTHLAKE WANAKA- INDICATIVE TYPE B ROAD CROSS SECTIONS

REFERENCE : 1949 - SK-527 - SCALE =1:100 AT A1. 1;200 AT A3 - 14 APRIL 2016

baxter design group



ROAD TYPE C - WITH STREET TREES
CLASSIFICATION: LANE



ROAD TYPE D - TRAFFIC LANE + PASSING BAYS/ON STREET PARKING
CLASSIFICATION: LANE

Note: The above typical cross section for Road Type D is in accordance with NZS4404:2010 Figure E11 suitable for servicing 1-20 dwelling units. Where this typical cross section is utilised to service less dwelling units there will be a reduction in legal road width and movement lane width in accordance with NZS4404:2010 Table 3.2

+ NORTHLAKE WANAKA- INDICATIVE TYPE C & D ROAD CROSS SECTIONS

REFERENCE : 1949 - SK-528 - SCALE =1:100 AT A1. 1;200 AT A3 - 14 APRIL 2016

baxter design group

Appendix B: Table 3.2 Road Classification Table

Project: Northlake - Stages 1 - 3

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			Place Context			Design Environment					Link Context								
Road Number	NZS4404 Cross Section Ref	Design Decision Road Type	Area	Land Use	Local Attributes	Locality Served	Target Operating Speed (km/h)	Min. Road Width (m)	Design Decision Road Width (m)	Max. Grade	Provision of Footpath for Pedestrians	Design Decision Provision of Footpath for Pedestrians	Passing, parking, loading and shoulder	Design Decision Provision of Recessed Carparking	Cyclists	Min. Movement Lane (excl. shoulder) (m)	Design Decision Movement Lane (excl. shoulder) (m)	Design Decision Turning Head Type	Classification
Rd 1	**E13**	Type AA	Suburban	Live and Play	Primary access to housing	Up to 800 du	50	20	20	10.00%	2.0m each side	2.0m each side	Parking is separate and recessed. See 3.3.6 Public transport is likely (see clause 3.3.1.4, 3.3.1.5)	Recessed Parking	Separate provision where local authoirity defined cycle route	2 x 4.2	2 x 4.2	NA	Connector / collector (≈ 8000vpd)
Rd 2 up to intersection with Rd3	**E12**	Type B - 20m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	20	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m each side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 2 along Lot 1008 western bdy	**E15**	Type B - 20m	Suburban	Shop and trade, work and learn	Access to trade, office and education	Suburban village, access to office and education, 1 -	40	18	20	10.00%	3.0m each side	2.0m each side, as considered low demand shop & trade area	Parking and loading bays both sides may be in the movement lane or recessed. See 3.3.6.	Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 3	**E12**	Type B - 15m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	15	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m each side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	No Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 4	**E12**	Type B - 20m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	20	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m one side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 5	**E12**	Type B - 20m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	20	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m each side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 6	**E12**	Type B - 15m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	15	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m one side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	No Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd 7	**E11**	Type C	Suburban	Live and Play	Access to houses/ townhouses	1 to 20 du	20	9	12	16.00%	Shared (In movement lane)	1.5m one side	Shared (In movement lane)	No Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Lane (≈ 200vpd)
Rd8	**E12**	Type B - 15m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	15	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m one side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	No Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd9	**E12**	Type B - 20m	Suburban	Live and Play	Primary access to housing	1 to 200 du	40	15	20	12.50%	1.5m one side or 1.5m each side where more than 20 du or more than 100m in length	1.5m each side	Shared parking in the movement lane up to 100 du, separate parking required over 100 du	Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Local Road (≈ 2000vpd)
Rd10	**E11**	Type C	Suburban	Live and Play	Access to houses/ townhouses	1 to 20 du	20	9	12	16.00%	Shared (In movement lane)	1.5m one side	Shared (In movement lane)	No Recessed Parking	Shared (In movement lane)	5.5 - 5.7	5.7	T Shaped as per LDCP Figure3.4	Lane (≈ 200vpd)
Access 1	**E10**	Type - Access	Suburban	Live and Play	Side or rear service access	Up to 100, in length between streets, 1 to 20 lots	10	6	6	16.00%	Shared (In movement lane)	NA	Allow for passing up to every 50m	No passing less than 50m, low traffic volume 2 lots	Shared (In movement lane)	2.75 - 3.0	3	NA	Lane (≈ 200vpd)
Access 2	**E9**	Type - Access	Suburban	Live and Play	Access to houses/ townhouses	1 to 3 du or 1 to 6 du	10	3.6m for up to 3 du or 4.5m for up to 6 du	6	20.00%	Shared (In movement lane)	NA	Allow for passing up to every 50m	No passing less than 50m, low traffic volume 3 lots	Shared (In movement lane)	2.75 - 3.0	3	NA	Lane (this would normally be a private road or private way)
Access 3	**E9**	Type - Access	Suburban	Live and Play	Access to houses/ townhouses	1 to 3 du or 1 to 6 du	10	3.6m for up to 3 du or 4.5m for up to 6 du	10	20.00%	Shared (In movement lane)	NA	Allow for passing up to every 50m	No passing less than 50m, low traffic volume 3 lots	Shared (In movement lane)	2.75 - 3.0	3	T Shaped as per LDCP Figure3.4	Lane (this would normally be a private road or private way)

Project: Northlake - Stages 1 - 3

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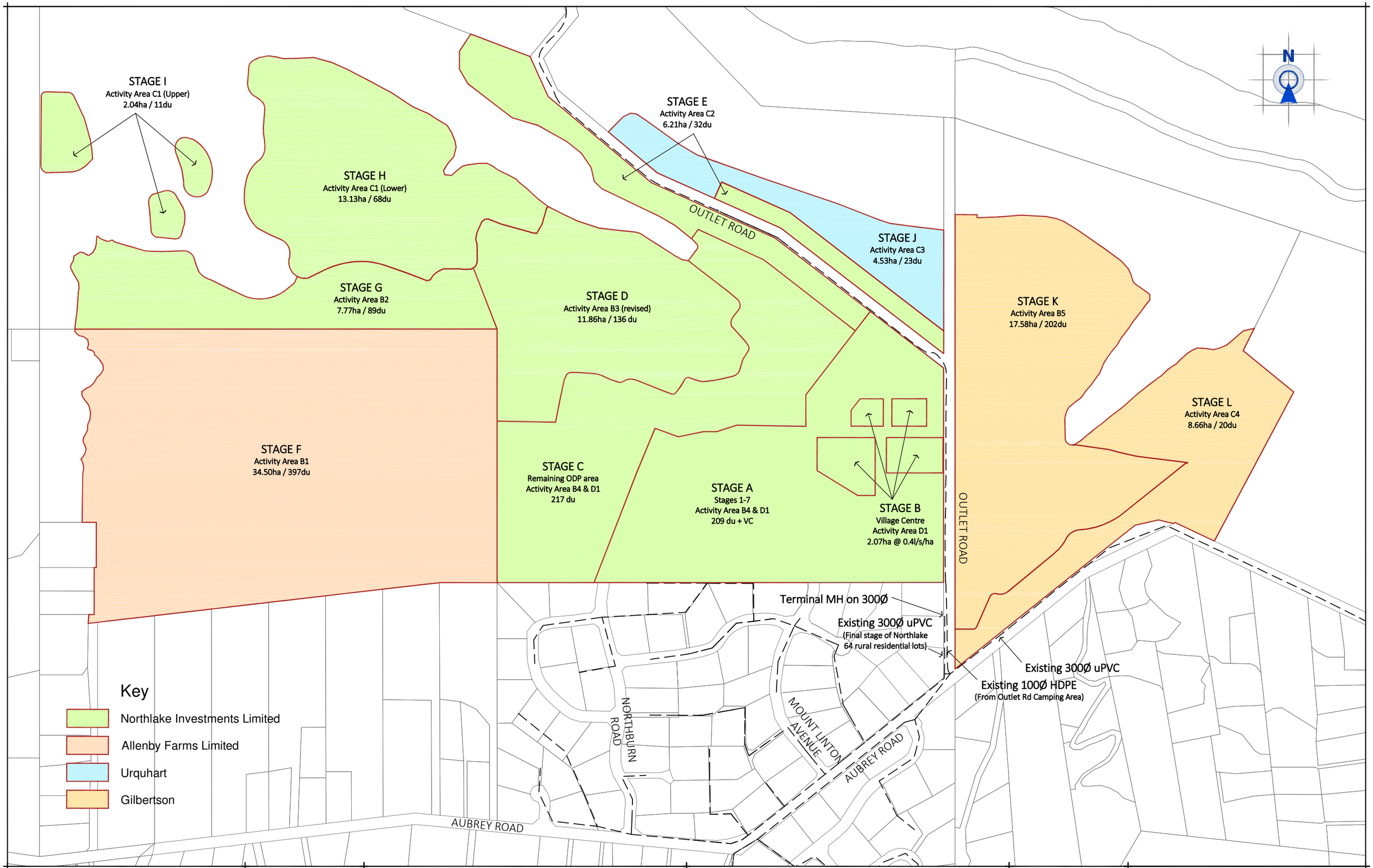
			Place Context			Design Environment					Link Context								
Road Number	NZS4404 Cross Section Ref	Design Decision Road Type	Area	Land Use	Local Attributes	Locality Served	Target Operating Speed (km/h)	Min. Road Width (m)	Design Decision Road Width (m)	Max. Grade	Provision of Footpath for Pedestrians	Design Decision Provision of Footpath for Pedestrians	Passing, parking, loading and shoulder	Design Decision Provision of Recessed Carparking	Cyclists	Min. Movement Lane (excl. shoulder) (m)	Design Decision Movement Lane (excl. shoulder) (m)	Design Decision Turning Head Type	Classification
Access 4	**E11**	Type - D	Suburban	Live and Play	Access to houses/ townhouses	1 to 20 du	20	9	10	16.00%	Shared (In movement lane)	NA	Shared (In movement lane)	Shared (In movement lane) as width proposed is 5.7	Shared (In movement lane)	5.5 - 5.7	5.7	T Shaped as per LDCP Figure3.4	Lane (≈ 200vpd)
Access 5	**E9**	Type - Access	Suburban	Live and Play	Access to houses/ townhouses	1 to 3 du or 1 to 6 du	10	3.6m for up to 3 du or 4.5m for up to 6 du	10	20.00%	Shared (In movement lane)	NA	Allow for passing up to every 50m	No passing less than 50m, low traffic volume 2 lots	Shared (In movement lane)	2.75 - 3.0	3	NA	Lane (this would normally be a private road or private way)
Outlet Road	**E8**	Type - Semi Rural	Rural	All other situations	All (serving land uses not specified elsewhere in this table(	-	Up to 100	20	20	10.00%	Separate from the carriageway, 1.5m each side	2.0m gravel one side	Total shoulder 1.5m, sealed shoulder 1.0m	NA	On sealed shoulder where it is a local authority defined cycle route	5.5 - 5.7	5.7	NA	Connector / collector (≈ 2500vpd)

Appendix C: Overview Plan of Northlake Zone and Densities



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T 03 443 0110
E wanaka@ppgroup.co.nz

Client & Location:

Northlake Investments Limited
NORTHLAKE

Purpose & Drawing Title:

Northlake: Wastewater Layout Overview

Surveyed by:	-	Original Size:	Scale:
Designed by:	AGT	A3	1:6000 @ A3
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Checked by:	AGT		
Approved by:	MJB		
Job No: W4481-7	Drawing No: 014	Sheet No: 100	Revision No: 0
			Date Created: 13/03/2016

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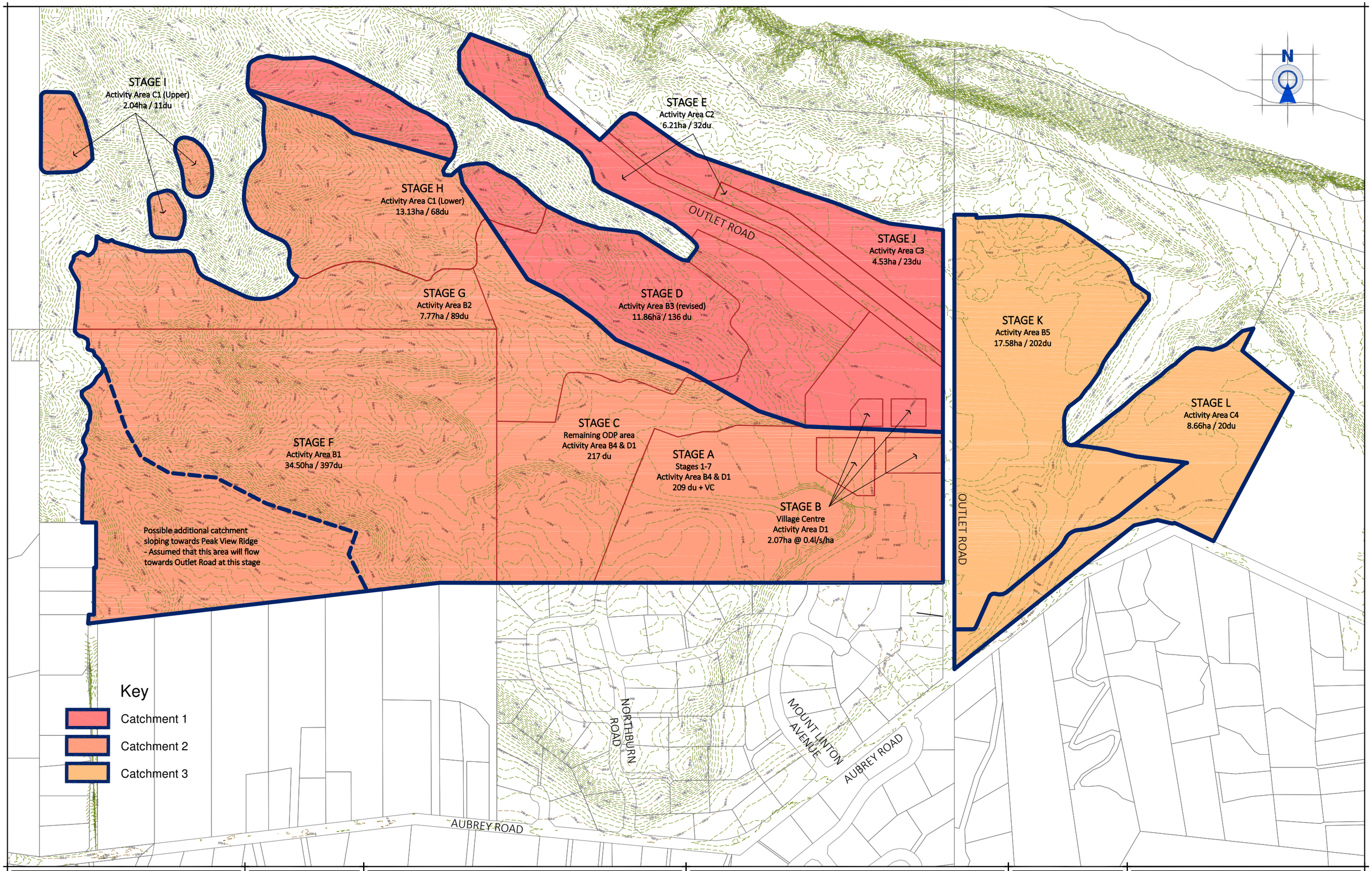
Appendix D: Waste Water Catchment Plan



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Client & Location:

Northlake Investments Limited
NORTHLAKE

Purpose & Drawing Title:

Northlake: Wastewater Layout
Catchment Plan

Surveyed by:	-	Original Size:	Scale:
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Checked by:	AGT		
Approved by:	MJB		
Job No: W4481-7	Drawing No: 014	Sheet No: 101	Revision No: 0
			Date Created: 13/03/2016

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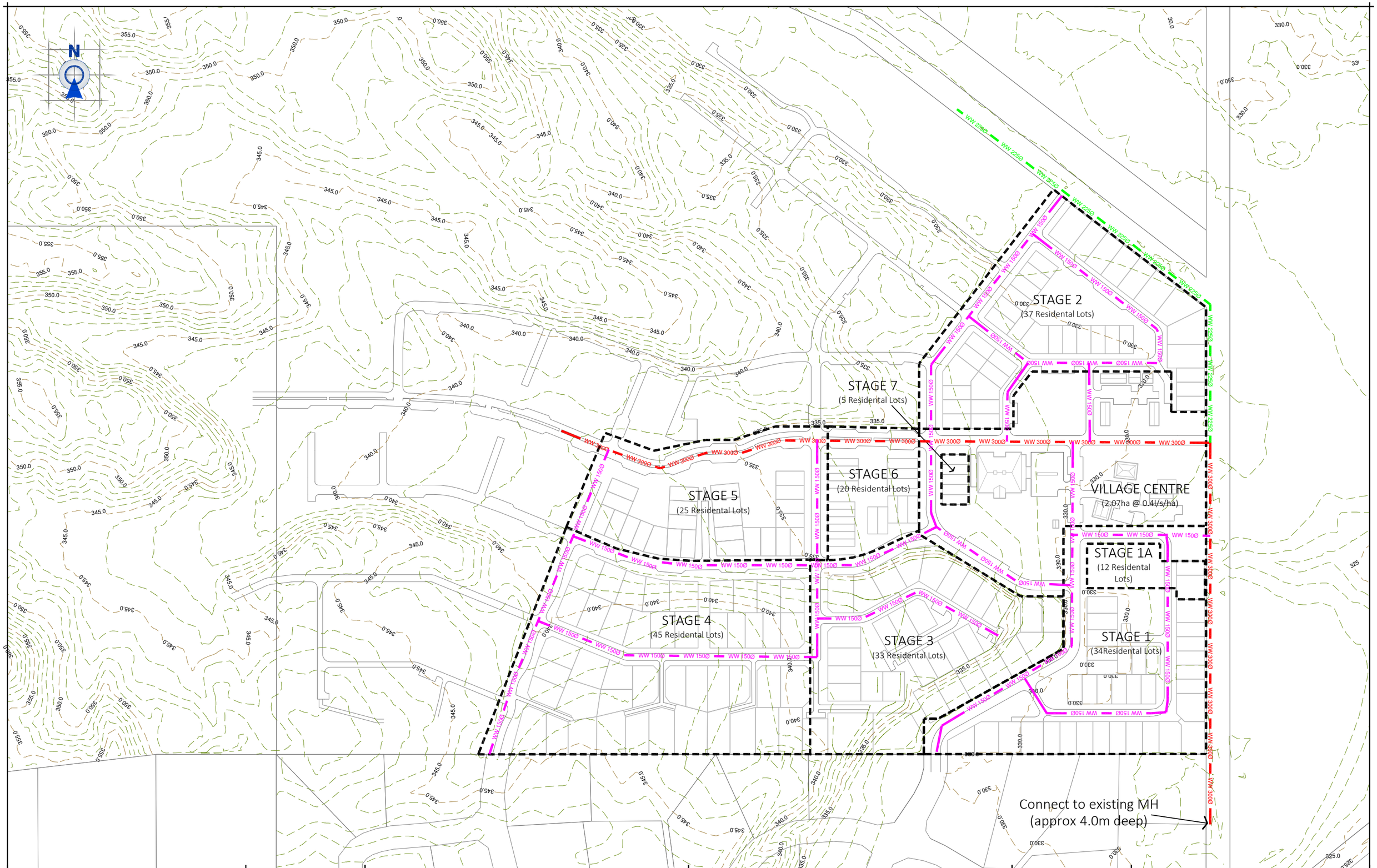
Appendix E: Waste Water Internal Reticulation Plan



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Client & Location:

Northlake Investments Limited
NORTHLAKE

Purpose & Drawing Title:

Northlake: Wastewater Layout
Stages 1 - 7 and Village Centre

Surveyed by:	-	Original Size:	Scale:
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Checked by:	AGT		
Approved by:	MJB		
Job No: W4481-7	Drawing No: 014	Sheet No: 102	Revision No: 0
			Date Created: 13/03/2016

L:\DATA\4400\4481-7 STAGES 1-3\ACAD\W4481-7 014 PROPOSED WASTEWATER NETWORK.DW(

Appendix F: Water Supply Internal Reticulation Plan

Legend

PE Water Pipe Diameters (ID)

- STAGE BOUNDARIES
- 150Ø EXISTING 150mmØ
- 100Ø PROPOSED 100mmØ
- 150Ø PROPOSED 150mmØ
- 250Ø PROPOSED 250mmØ

Note: Rider mains not shown at this stage

OUTLET ROAD

STAGE 2
(37 Residental Lots)

STAGE 7
(5 Residental Lots)

REV 3: Update principal main Ø as per Council requirements

FUTURE CONNECTION TO WTBP - BEACON POINT

STAGE 6
(20 Residental Lots)

STAGE 5
(25 Residental Lots)

VILLAGE CENTRE
(Equivalent of 30 Residental Lots)

STAGE 1A
(10 Residental Lots)

STAGE 4
(45 Residental Lots)

STAGE 3
(33 Residental Lots)

STAGE 1
(36 Residental Lots)

OUTLET ROAD

NORTHBURN ROAD

MOUNT LINTON AVENUE

Extend existing 150mmØ in Outlet Road to Northlake Drive intersection. 300mmØ capped for future extension into Gilbertson land

Connect to existing 150mmØ in Outlet Road

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Client & Location:

Winton Partners
NORTHLAKE

Purpose & Drawing Title:

Northlake Stages 1-7
Proposed Water Supply Layout

Surveyed by:	-	Original Size:	Scale:
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Drawn by:	LMR		DO NOT SCALE
Checked by:	AGT		
Approved by:	MJB		

Job No:	Drawing No:	Sheet No:	Revision No:	Date Created:
W4481-7	011	100	3	06/05/2016

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