

Appendix 1: PPG - Bulk earthworks plans stages 8-9 (as approved by RM 161127)

# Northlake : Bulk Earthworks Stages 8-9



## PLAN INDEX

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Client & Location:  
**NORTHLAKE INVESTMENTS LTD**  
 Northlake Stages 8-9

Purpose & Drawing Title:  
**Plan Index**

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Checked by:	AGT	Job No:	Sheet No:	Revision No:
Approved by:	MJB	W4481-7	100	2
		Drawing No:	Date Created:	
		033	24/01/2017	

NOTES:  
 Major contour interval = 5.0m  
 Minor contour interval = 1.0m  
 Extent of Earthworks   
 Extent of RM160953 



Lot 3 DP 300408  
 Allenby Farms Ltd

Tractor Shed

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**Existing Contours**

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Approved by:	MJB		
Job No:	Drawing No:	Sheet No:	Revision No:
W4481-7	033	101	1
		Date Created:	
		07/12/2016	

NOTES:  
 Major proposed contour interval = 2.0m  
 Minor proposed contour interval = 0.5m  
 Extent of Earthworks - - - - -  
 Extent of RM160953 - - - - -



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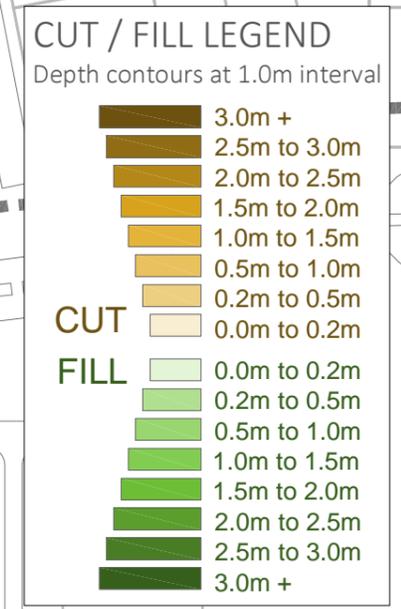
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Purpose & Drawing Title:  
**Proposed Contours**

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Job No:	W4481-7	Sheet No:	102	Revision No:	2	Date Created:	24/01/2017
Drawing No:	033						



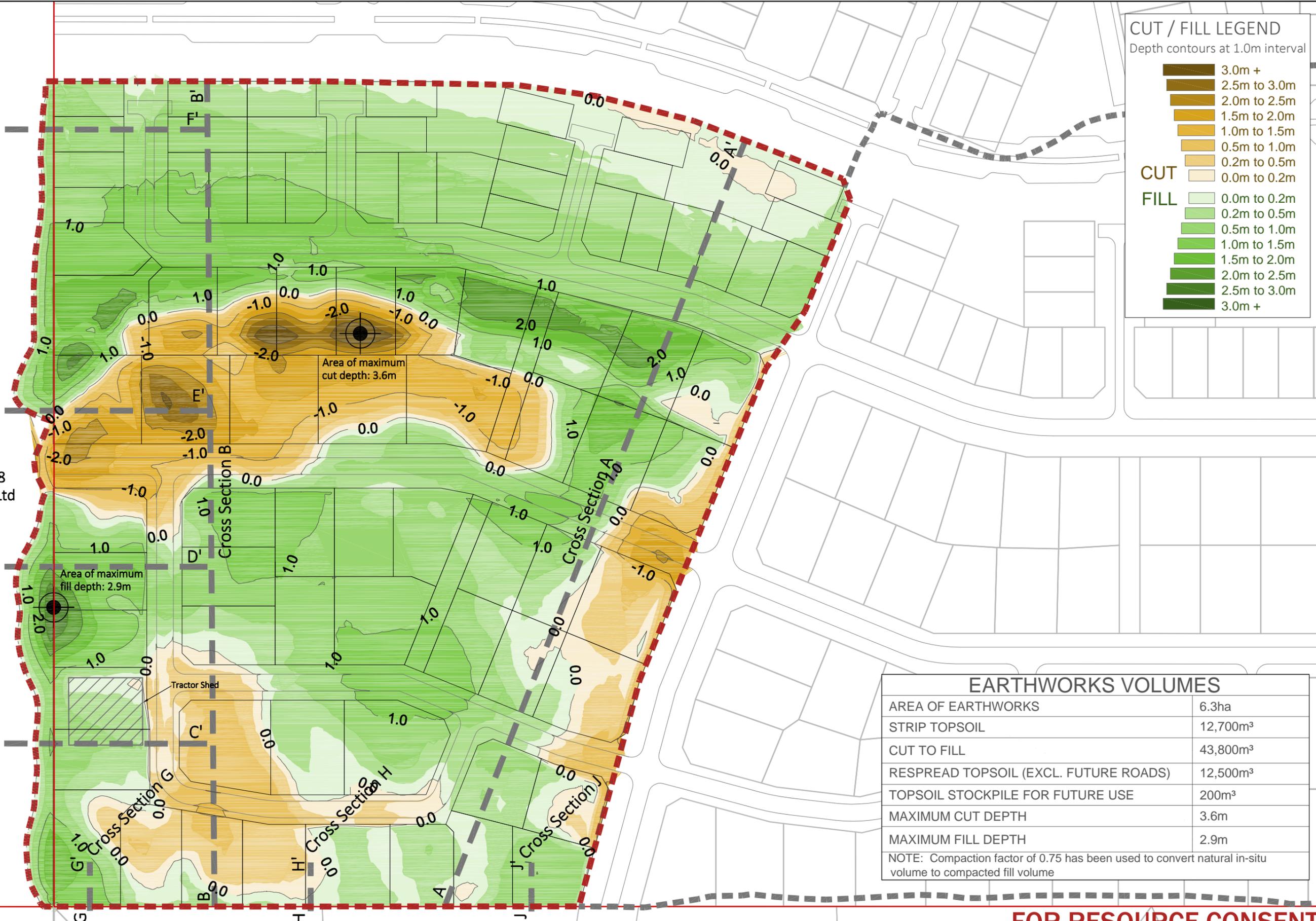
Cross Section F

Cross Section E

Cross Section D

Cross Section C

Lot 3 DP 300408  
Allenby Farms Ltd



EARTHWORKS VOLUMES	
AREA OF EARTHWORKS	6.3ha
STRIP TOPSOIL	12,700m <sup>3</sup>
CUT TO FILL	43,800m <sup>3</sup>
RESPREAD TOPSOIL (EXCL. FUTURE ROADS)	12,500m <sup>3</sup>
TOPSOIL STOCKPILE FOR FUTURE USE	200m <sup>3</sup>
MAXIMUM CUT DEPTH	3.6m
MAXIMUM FILL DEPTH	2.9m
NOTE: Compaction factor of 0.75 has been used to convert natural in-situ volume to compacted fill volume	

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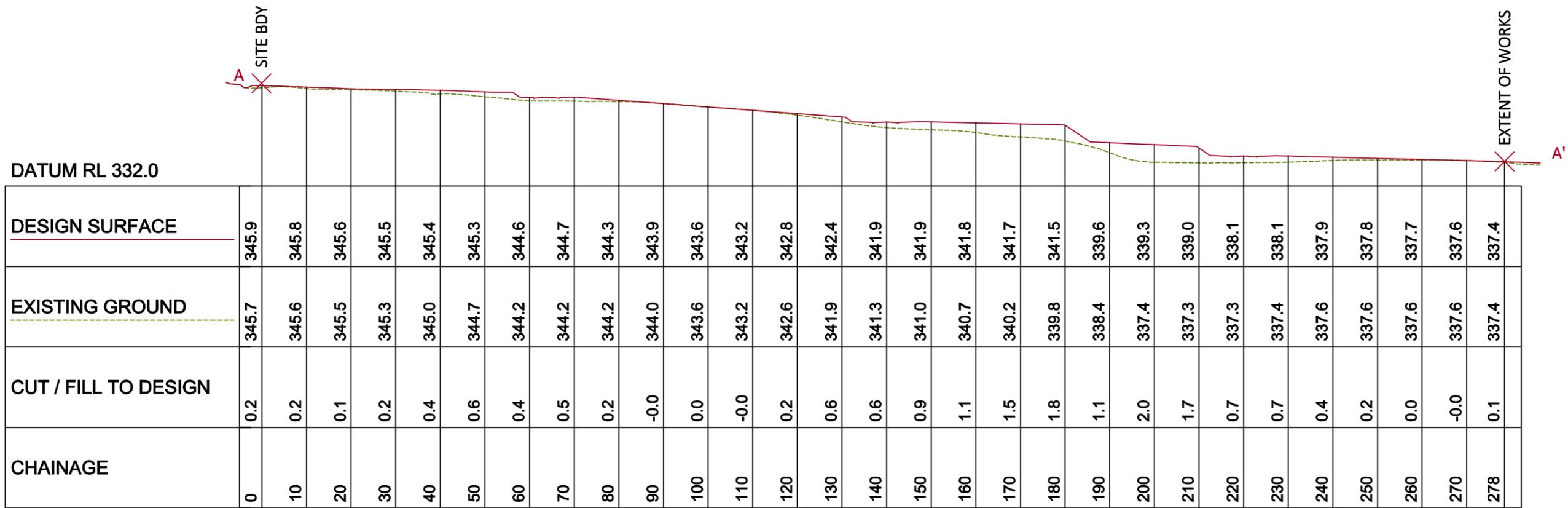
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Northlake Stages 8-9

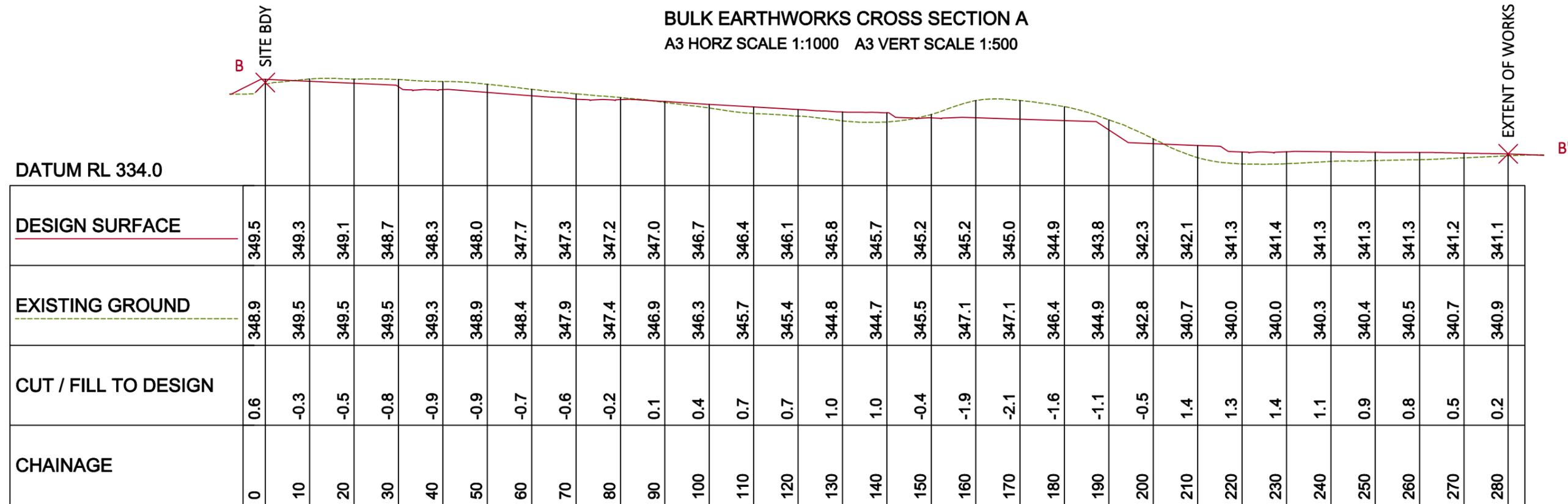
Purpose & Drawing Title:  
**Proposed Earthworks**  
Cut / Fill Plan

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		Sheet No:	103
		Revision No:	2
		Date Created:	24/01/2017

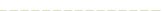


**BULK EARTHWORKS CROSS SECTION A**  
A3 HORZ SCALE 1:1000 A3 VERT SCALE 1:500

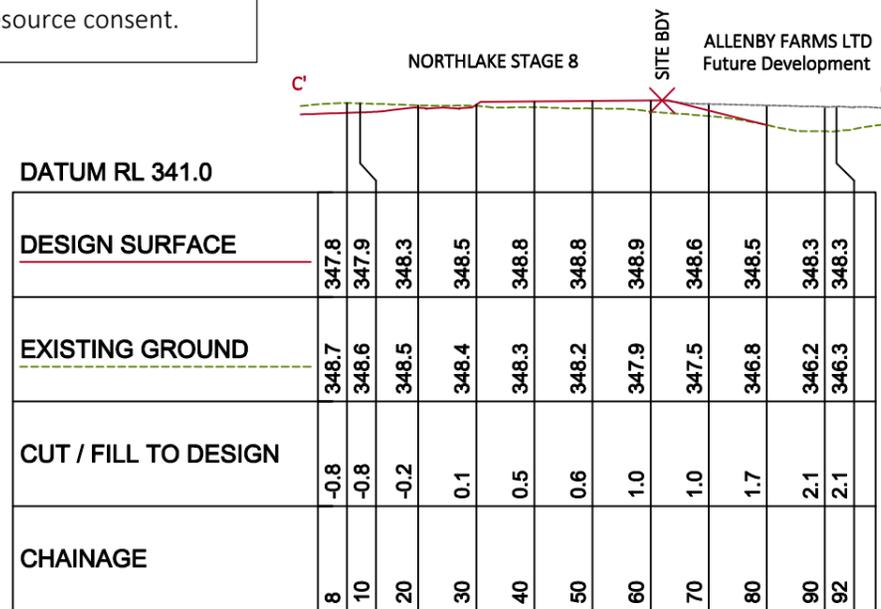


**BULK EARTHWORKS CROSS SECTION B**  
A3 HORZ SCALE 1:1000 A3 VERT SCALE 1:500

**FOR RESOURCE CONSENT**

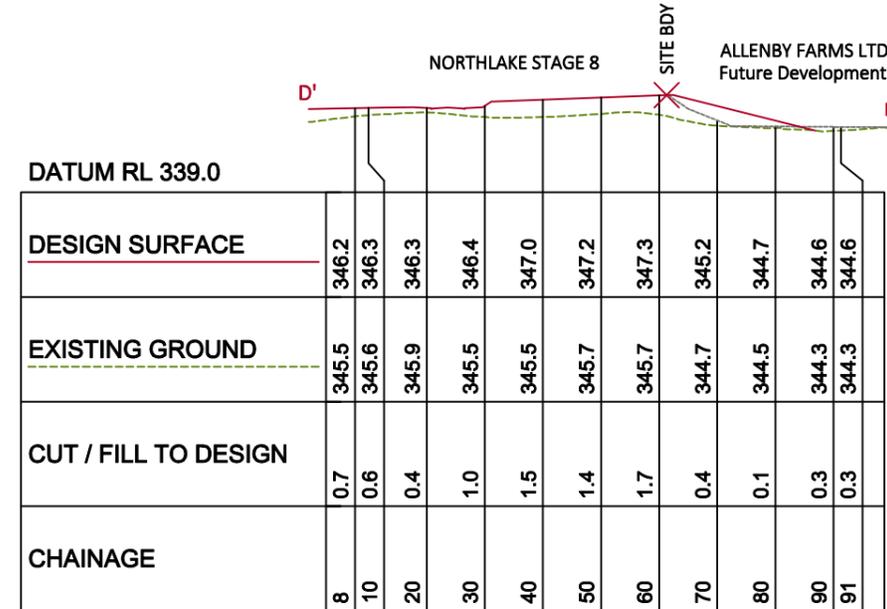
KEY:  
 Proposed Earthworks =   
 Existing Natural Surface =   
 Future Development (Allenby Farms Ltd) = 

Note: Design levels shown on Allenby Farms Ltd Land are indicative only and subject to future resource consent.



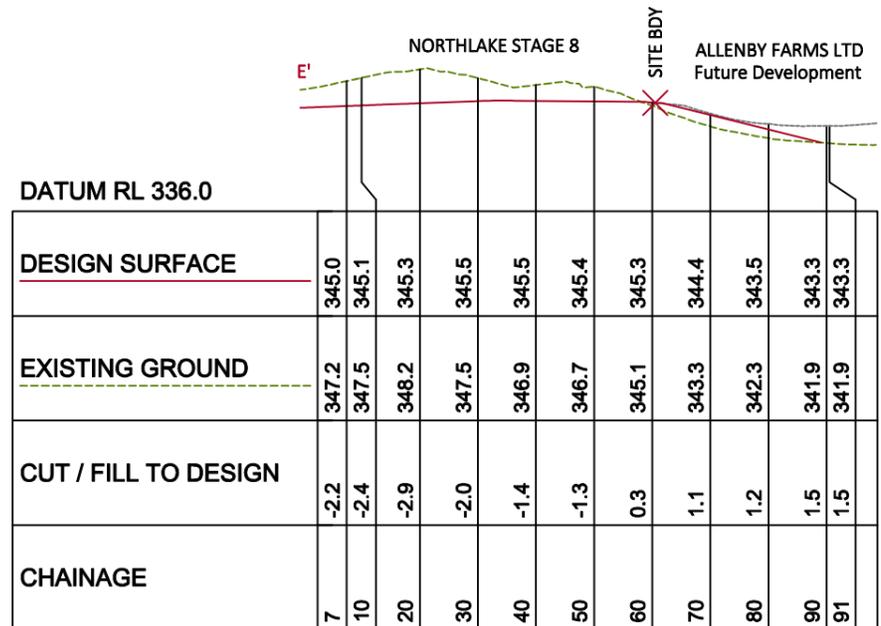
**BULK EARTHWORKS CROSS SECTION C**

A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625



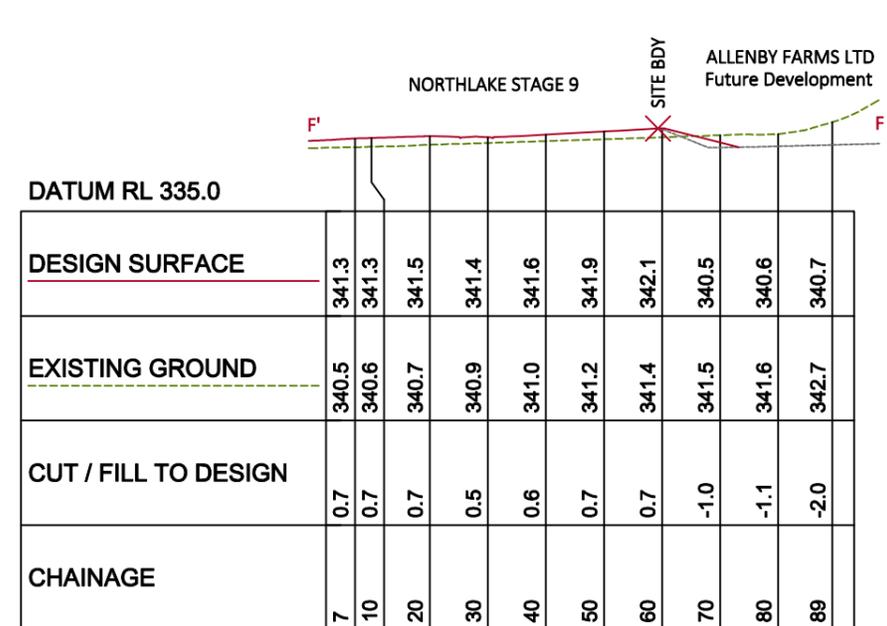
**BULK EARTHWORKS CROSS SECTION D**

A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625



**BULK EARTHWORKS CROSS SECTION E**

A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625



**BULK EARTHWORKS CROSS SECTION F**

A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625

**FOR RESOURCE CONSENT**



DATUM RL 342.0	
DESIGN SURFACE	348.9 349.4 349.3 349.2
EXISTING GROUND	348.5 348.3 348.0 348.2
CUT / FILL TO DESIGN	0.0 0.0 1.3 1.1
CHAINAGE	0 10 20 25

**BULK EARTHWORKS CROSS SECTION G**  
 A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625



DATUM RL 342.0	
DESIGN SURFACE	347.6 348.0 348.0 348.0
EXISTING GROUND	347.5 348.0 348.1 348.2
CUT / FILL TO DESIGN	0.0 0.0 -0.1 -0.2
CHAINAGE	0 10 20 25

**BULK EARTHWORKS CROSS SECTION H**  
 A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625



DATUM RL 338.0	
DESIGN SURFACE	343.3 343.2 344.1 344.2
EXISTING GROUND	343.3 343.2 343.2 343.3
CUT / FILL TO DESIGN	0.0 0.0 0.9 1.0
CHAINAGE	0 10 20 25

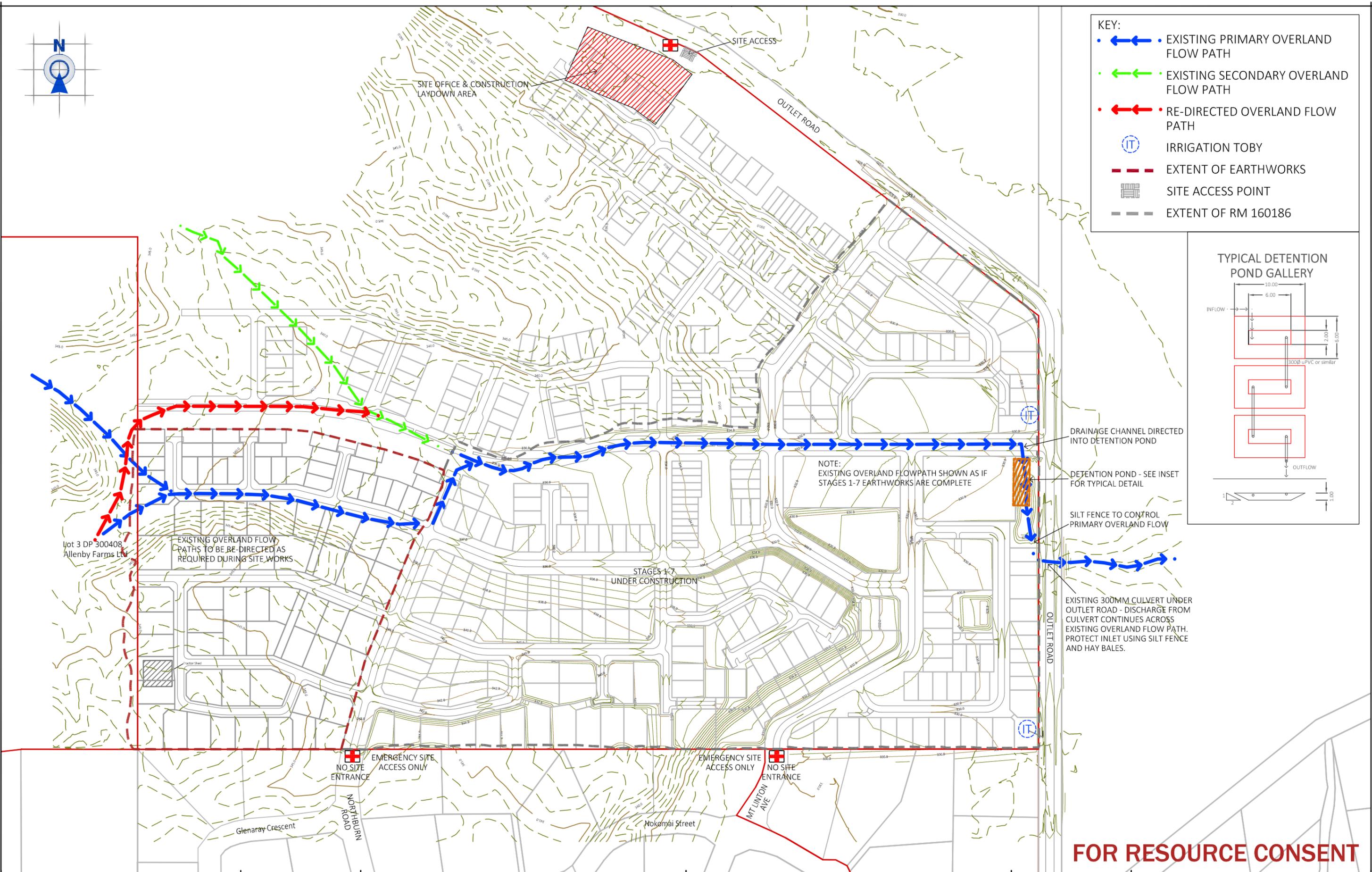
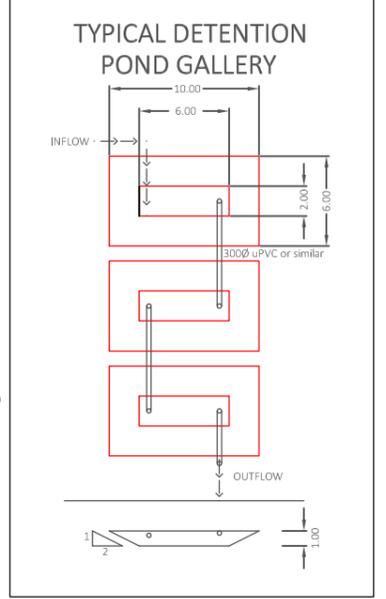
**BULK EARTHWORKS CROSS SECTION J**  
 A3 HORZ SCALE 1:1250  
 A3 VERT SCALE 1:625

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**KEY:**

-  EXISTING PRIMARY OVERLAND FLOW PATH
-  EXISTING SECONDARY OVERLAND FLOW PATH
-  RE-DIRECTED OVERLAND FLOW PATH
-  IRRIGATION TOBY
-  EXTENT OF EARTHWORKS
-  SITE ACCESS POINT
-  EXTENT OF RM 160186



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Client & Location:  
**NORTHLAKE INVESTMENTS LTD**  
 Northlake Stages 8-9

Purpose & Drawing Title:  
**Preliminary Site Management  
 Plan For Bulk Earthworks**

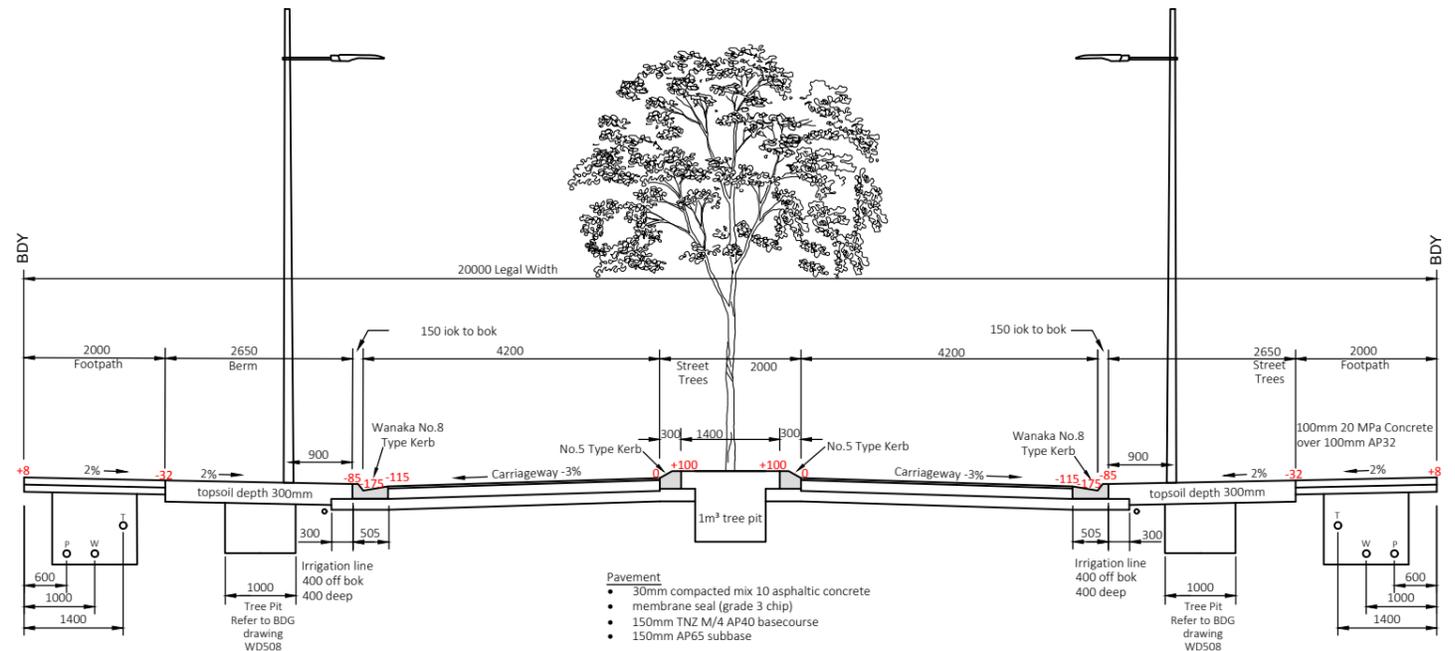
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Approved by:	MJB	Sheet No:	Revision No:
Job No:	W4481-7	107	1
Drawing No:	033	107	Date Created:
			07/12/2016

Appendix 2: PPG – Road classifications table

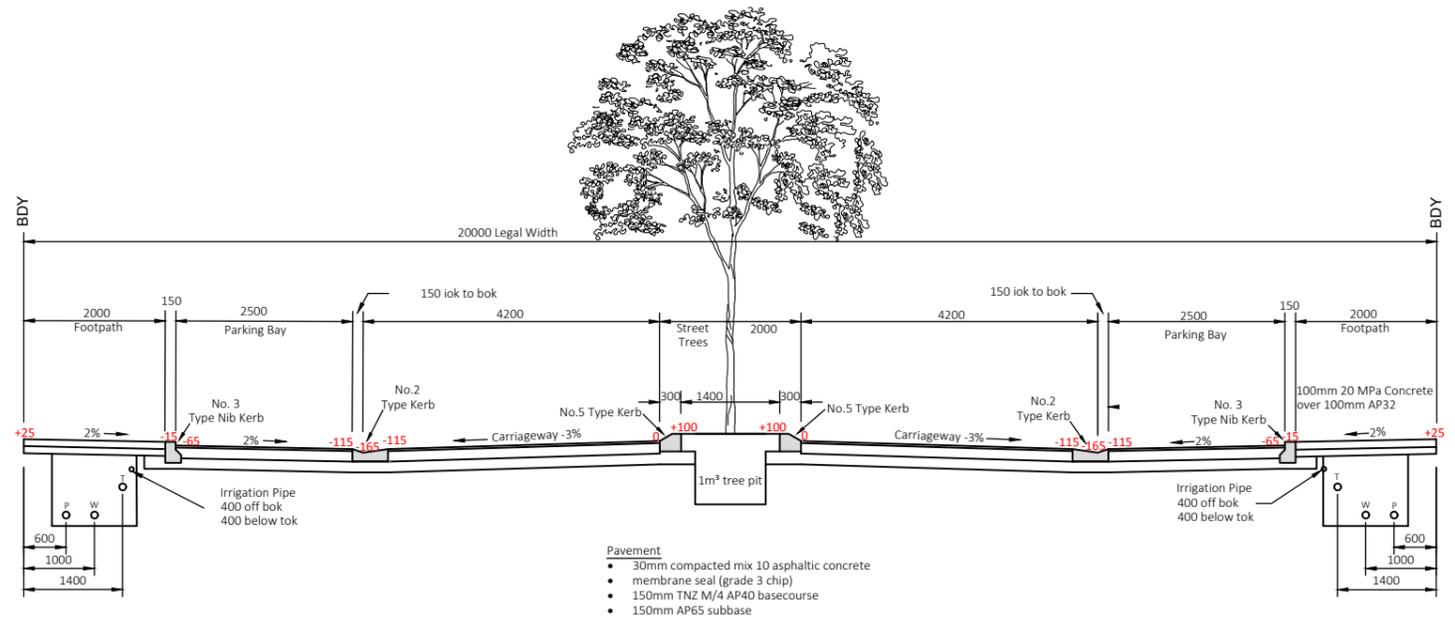
Project: Northlake - Stages 8 - 9																			
			Place Context			Design Environment					Link Context								
Road Number	LDS COP Cross Section Ref	Design Decision: Road Type	Area	Land Use	Local Attributes	Locality Served	Target Operating Speed (km/h)	Min. Road Width (m)	Design Decision: Road Width (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
Road 1 / Northlake Dr (extension)	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 authority defined cycle route	2 x 4.2	2 x 4.2m	NA	Connector / collector (= 8000vpd)
Road 15	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)
Road 11	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)
Road 14	E11	Type C - 12m	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 only	Shared (In movement lane)	No recessed parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Lane (= 200vpd)
Part Road 16	E11	Type C - 12m	Suburban	Live and Play	Access to houses/ townhouses	1 to 20 du	20	9	10	16.00%	Shared (In movement lane)	1.5m one side only	Shared (In movement lane)	No recessed parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Lane (= 200vpd)
Part Road 16	E11	Type D - 10m	Suburban	Live and Play	Access to houses/ townhouses	1 to 20 du	20	9	10	16.00%	Shared (In movement lane)	1.5m one side only	Shared (In movement lane)	No recessed parking	Shared (In movement lane)	5.5 - 5.7	5.7	NA	Lane (= 200vpd)
Access 10	E9	Type F - 10m	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	17 - 10	20.00%	Shared (In movement lane)	Shared (In movement lane)	Allow for passing up to every 50m	No recessed parking. Passing to be provided in courtyard / turning area	Shared (In movement lane)	2.75 - 3.0	3.0	T Shape	Lane (this would normally be a private road or private way)
Access 11	E9	Type F - 10m	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	17 - 10	20.00%	Shared (In movement lane)	Shared (In movement lane)	Allow for passing up to every 50m	No recessed parking. Passing to be provided in courtyard / turning area	Shared (In movement lane)	2.75 - 3.0	3.0	T Shape	Lane (this would normally be a private road or private way)

Appendix 3: PPG – Indicative road cross sections



Road Type AA (Northlake Drive)

2 x 4.2m carriageway / 2m median strip / 20m legal width / 2.0m footpath both sides



Road Type AA (Northlake Drive) - With Parking

2 x 4.2m carriageway / 2m median strip / 2.5m parking / 20m legal width / 2.0m footpath both sides

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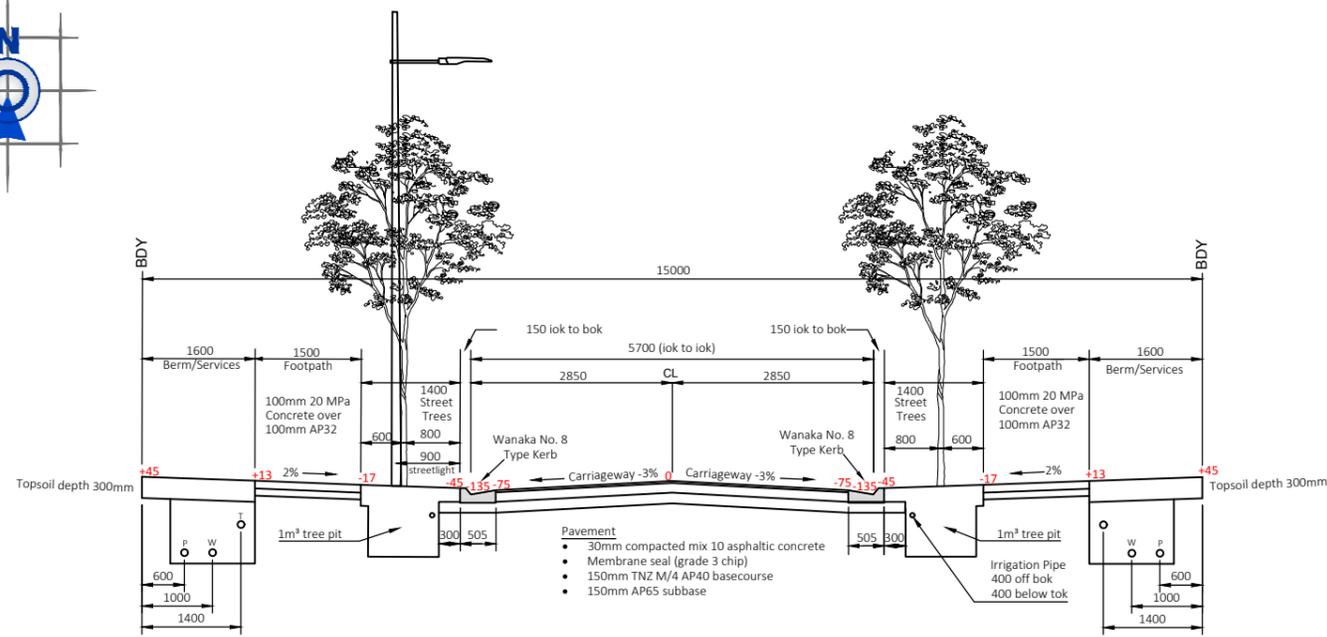
**NORHLAKE**  
 wanaka

Purpose & Drawing Title:

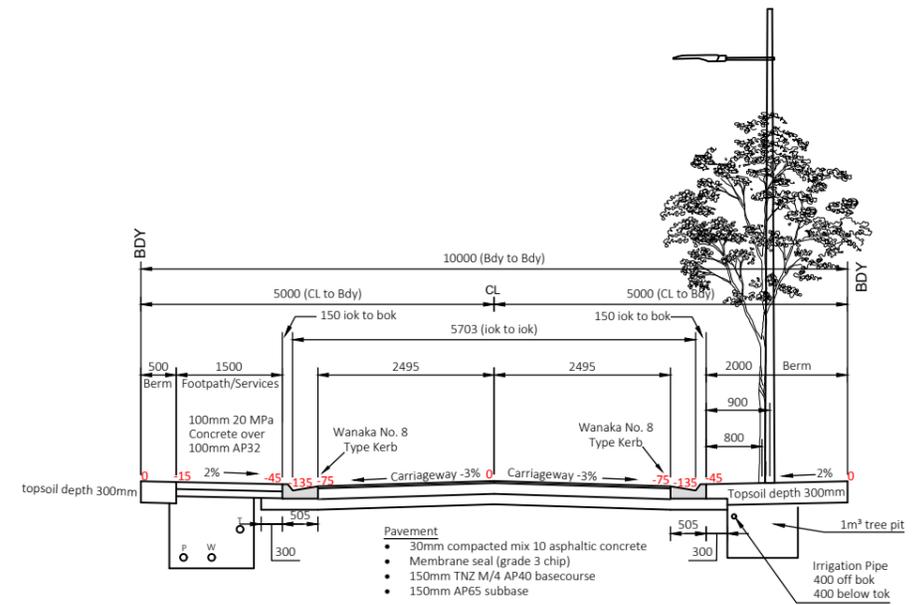
**Stages 8-9**  
**Typical Road Cross Sections**

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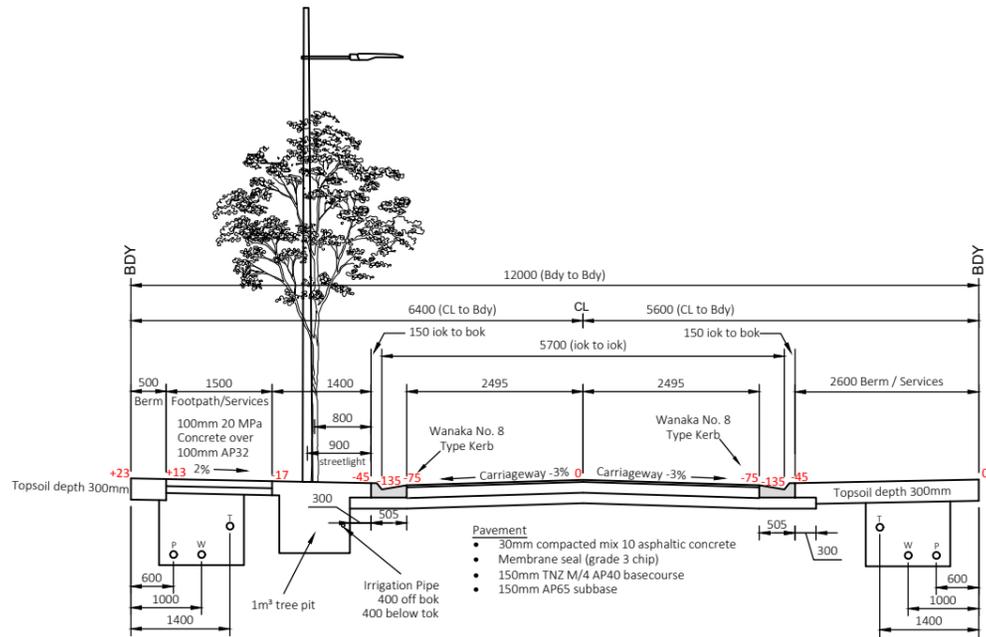
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Sheet No:	Revision No:		
100	0		



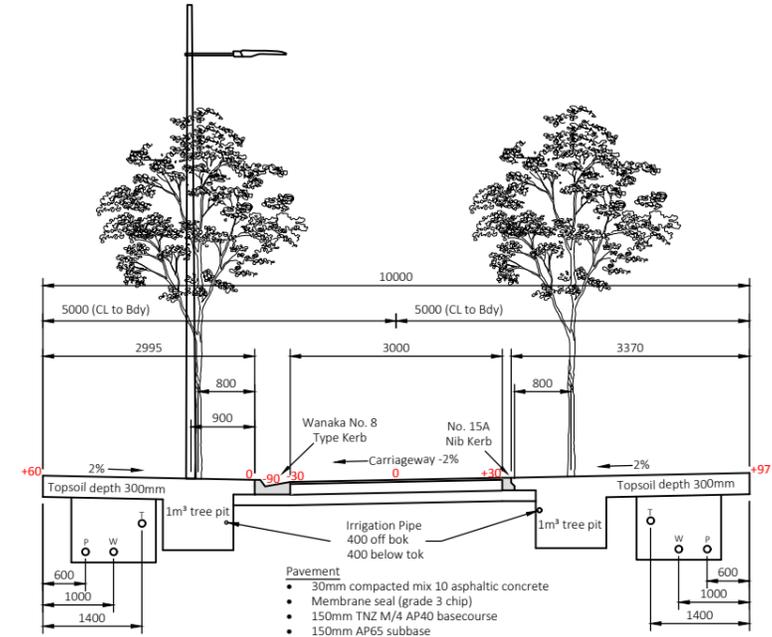
Road Type B Without Parking - Roads 11 & 15  
5.7m carriageway / 15m legal width / 1.5m footpath both sides



Road Type D - Road 16 (part of)  
5.7m carriageway / 10m legal width / 1.5m footpath on one side



Road Type C - Roads 14 & 16 (part of)  
5.7m carriageway / 12m legal width / 1.5m footpath one side



Road Type F - Accesses 10 & 11  
3.0m carriageway / 10m legal width / no footpath  
Note: legal width increases to 17m at northern end

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**NORHLAKE**  
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Purpose & Drawing Title:

Stages 8-9  
Typical Road Cross Sections

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Approved by:	MJB				DO NOT SCALE
Job No:	W4481-7	Sheet No:	101	Revision No:	0
Drawing No:	071	Date Created:			09/04/2016

Appendix 4: PPG – Preliminary water supply network stages 4-9



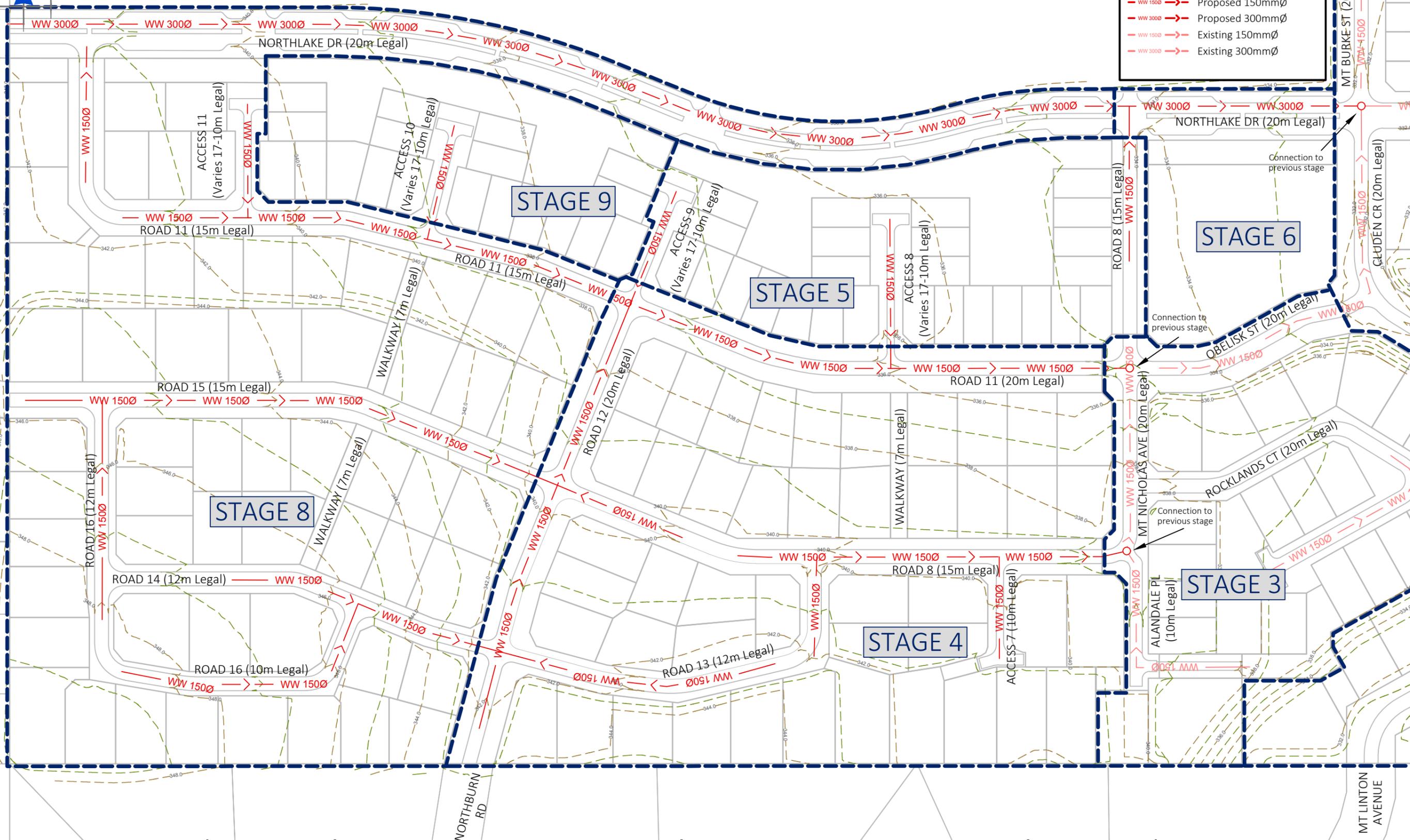
Appendix 5: PPG – Preliminary wastewater network stages 4-9



**Legend**

Waste Water Pipe Diameters (ID)

- Stage Boundaries
- > Proposed 150mmØ
- > Proposed 300mmØ
- - - Existing 150mmØ
- - - Existing 300mmØ



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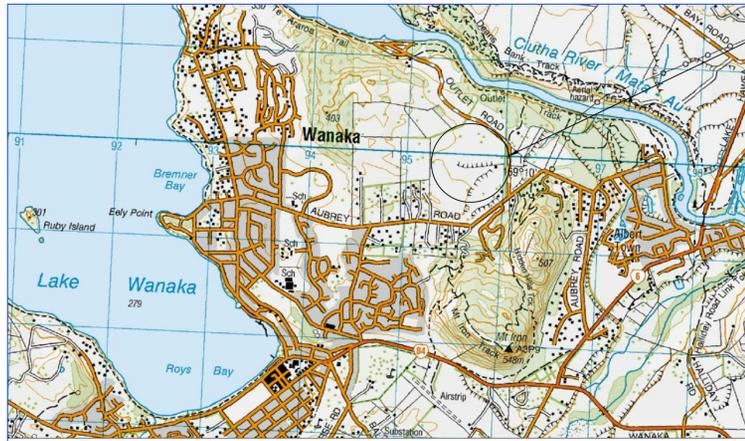
Purpose & Drawing Title:

**Stages 4-9**  
**Preliminary Wastewater Layout**

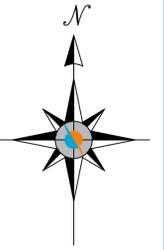
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Approved by:	MJB				<b>DO NOT SCALE</b>
Job No:	W4481-7	Sheet No:	101	Revision No:	0
Drawing No:	064			Date Created:	04/04/2016

Appendix 6: Peak Power – Preliminary electrical design for ODP area

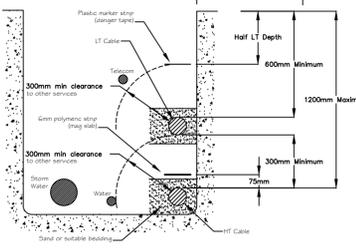


Site Location

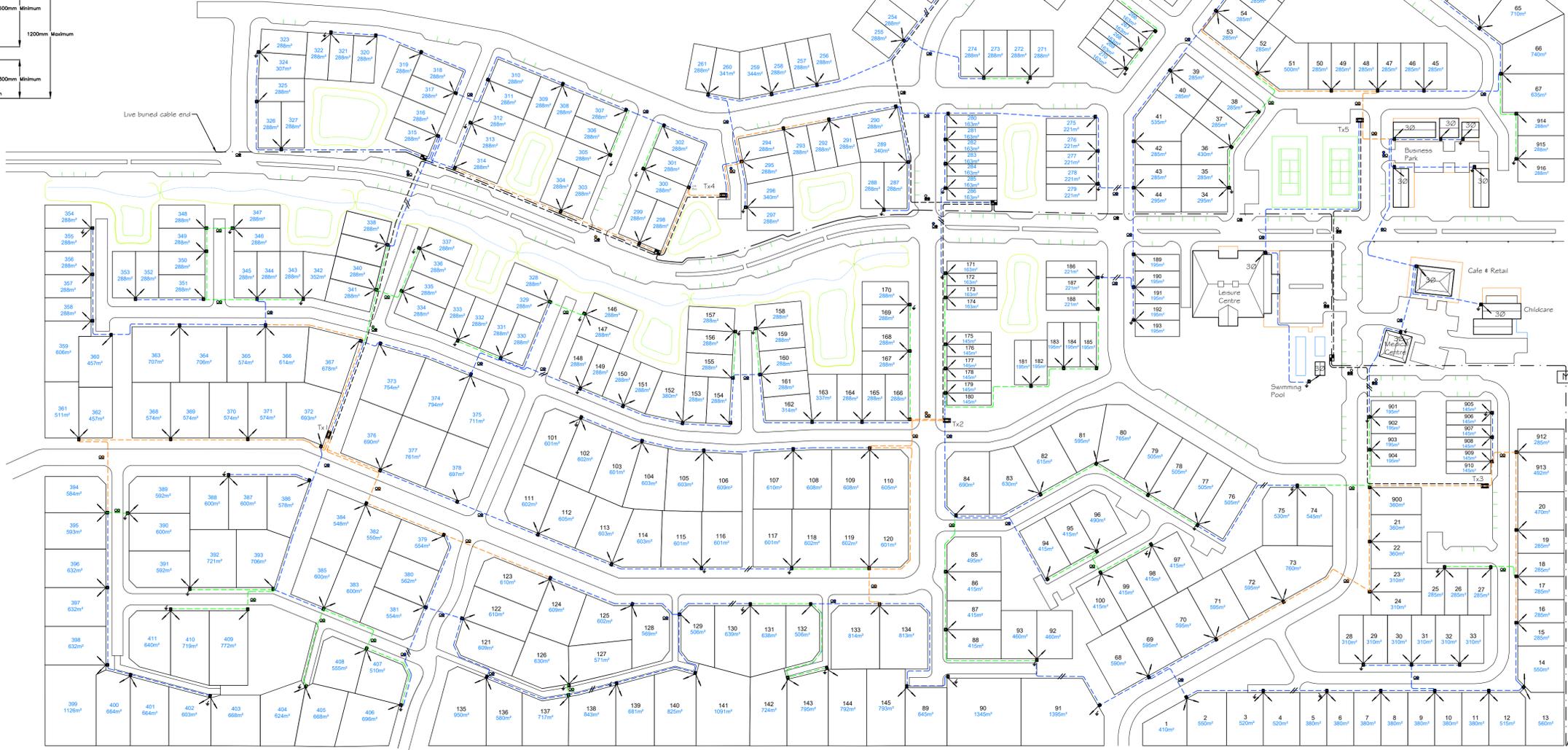


- 95mm<sup>2</sup> NS x 2,350m
- 165mm<sup>2</sup> NS x 5,650m
- 300mm<sup>2</sup> NS x 1,480m
- 185mm<sup>2</sup> XLPE 3core 11kV x 1,240 metres
- 35mm<sup>2</sup> XLPE 3core 11kV x 1,050 metres
- 150mm Duct x 240 six metre lengths (showing cable occupancy)
- Halo 11kV Switchgear
- Service box showing two single phase 63A connections
- Break in LV between transformer feeds

**TRENCH PROFILE**



Other services (e.g. Telecom, water, drainage) to have minimum 300mm clearance from power cables. (Refer to Telecom for their own requirements).  
Cables installed across a roadway are to be installed in a 150mm duct at right angles to the lane.  
One spare duct must be laid for every two ducts installed with cables across a roadway.  
Bulking material to have no greater than 10mm particle size and be laid at least 50mm above and 50mm below the cable.  
300mm separation between HT and LT cables may be in a vertical or horizontal direction.



OUTLET ROAD

11kV Metering Unit

To Aubrey Rd Overhead - approx 200m

<p>Sheet: 1 of 1</p> <p>Current Issue Date:</p>	<p>Amendments</p>	<p>Issued To: R Paterson 8/5/16 Dyson Gentler 8/5/16 Marc Bretherton 8/5/16</p>	<p>Drawn By: IDB</p> <p>Date: 8 May 2016</p> <p>Scale (A1): 1:1333</p> <p>Drawing File:</p>	<p>Prepared For: <i>Winton Partners</i></p> <p>Job Number: 51071</p>	<p><b>NORTHLAKE SUBDIVISION</b> <b>PowerNet Design</b> CONSTRUCTION LAYOUT To accompany tender documents for construction</p>	 <p>PO Box 1207 Queenstown (03) 450 9007 contact@peakpowerservices.co.nz www.peakpowerservices.co.nz</p>
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Appendix 7: Peak Power – Confirmation of electrical supply (email)

## Alex Todd

---

**From:** Ian Boud <ianb@peakpower.co.nz>  
**Sent:** Wednesday, 5 April 2017 12:06 p.m.  
**To:** Alex Todd  
**Subject:** Northlake Electrical Supply Stages 8 & 9

Hi Alex.

I can confirm that Peak Power Services Ltd, working as an agent for Powernet Ltd, have been contracted to provide electrical supply to Stage 8 and Stage 9 of the Northlake development on Outlet Rd, Wanaka.

Power supply will be provided to the boundary of each lot in accordance with PowerNet and QLDC requirements.

Regards

### Peak Power Services Ltd

Ian Boud  
**Project Manager**  
P O Box 1207  
**QUEENSTOWN**

Mob 027-201 0812



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Appendix 8: Chorus – Confirmation of telecom supply (email)

## Alex Todd

---

**To:** George Condon  
**Subject:** RE: W4481-7: Northlake Stages 8 & 9

**From:** George Condon [mailto:George.Condon@chorus.co.nz]  
**Sent:** Monday, 10 April 2017 11:17 a.m.  
**To:** Alex Todd <Alex.Todd@ppgroup.co.nz>  
**Cc:** Marc Bretherton <marc.bretherton@wintonpartners.co.nz>  
**Subject:** RE: W4481-7: Northlake Stages 8 & 9

Hi Alex

Stages 8 & 9 will be an extension of the work we will be doing in Stages 4 & 5. The design for any of the earlier stages are planned to take into account the subsequent or the possibility of further stages within the subdivision. I see no problem providing communications to Stages 8 & 9 as long as Stages 4 & 5 progress.

Regards

George Condon | Delivery Specialist  
 Chorus | T : +64 3 940 3060 | M : +64 21 504 138  
Level 1, 12 Moorhouse Ave  
Christchurch

---

**From:** Alex Todd [mailto:Alex.Todd@ppgroup.co.nz]  
**Sent:** Monday, 3 April 2017 2:36 p.m.  
**To:** George Condon <George.Condon@chorus.co.nz>  
**Cc:** Marc Bretherton <marc.bretherton@wintonpartners.co.nz>  
**Subject:** W4481-7: Northlake Stages 8 & 9

Hi George,

We are about to lodge a subdivision consent application for stages 8 & 9 at Northlake (see attached scheme plan) and I am hoping you can provide me an email confirming that telecom supply will be available for these lots. Ordinarily I would have sent this request to TSG but I don't actually want a contact just a confirmation of supply for Council when processing the application.

Are you able to help here? Happy to discuss

Kind regards

**Alex Todd**  
Senior Surveyor  
M 021 082 52333  
E [alex.todd@ppgroup.co.nz](mailto:alex.todd@ppgroup.co.nz)

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Appendix 9: Tonkin & Taylor- Water modelling report Feb 2016

Queenstown Lakes District Council  
Private Bag 50072  
Queenstown 9348

Attention: Rob Darby

Dear Rob

## **Northlake Developments Water Supply Modelling**

### **1 Introduction**

Tonkin and Taylor Ltd (T+T) was engaged<sup>1</sup> by Queenstown Lakes District Council (QLDC) to undertake water supply modelling for the proposed Northlake subdivision in Wanaka. The scope of work completed by T+T includes modelling of interim and ultimate development scenarios to determine whether levels of service in the area can be met by the proposed water supply reticulation sizing and layout.

11 stages of development are proposed across four different landowners (Northlake Investments Limited, Urquhart, Allenby Farms Limited and Gilbertson). Initial modelling connected the first four stages (owned by Northlake Investments Ltd.) into the existing Northlake reticulation off Aubrey Road. The ultimate scenario expanded on this initial modelling to include all of Stages 1-11. These zones were all connected into the current network through connections to the Beacon Point outflow pipe and Aubrey Road. Refer to Appendix A for maps of the proposed layout and a contour plan of the area.

### **2 Network setting**

Existing development in the Northlake area is confined to an approximately 30 hectare block north of Aubrey Road. This area, as well as areas surrounding Aubrey Road, is serviced by the Beacon Point inlet booster stations on the bank of Lake Wanaka, and corresponding reservoir, situated at an elevation of 382 m RL. The existing Northlake development water reticulation network connects into the current Wanaka network at three locations along the 375 mm Aubrey Road main – via two 150 mm mains which reticulate water throughout the development and one 100 mm lateral.

#### **2.1 Criteria and assumptions**

The purpose of the water supply modelling was to determine whether the proposed Northlake Development reticulation sizing and layout would allow QLDC levels of service and firefighting requirements to be met. The following demand scenarios were modelled to determine this:

---

<sup>1</sup> Email between Dominic Fletcher (T+T) and Rob Darby (QLDC) dated Wednesday 13 January 2016.

- Peak day demand – To determine whether available fire flows achieve the firefighting requirements as per NZS 4509:2008.
- Peak hour demand – To determine whether minimum residual pressures at each connection are  $\geq 300$  kPa.

The firefighting water classification for the development is FW2 (12.5 l/s within a distance of 135 m from any point in the network with an additional 12.5 l/s available within a distance of 270 m).

## 2.2 Design demands

The average daily demands (ADF) for each of Stages 1-11, as well as the existing Northlake developed area off Aubrey Road, were calculated by assuming a water allocation of 700 l/person/day and 3 people per lot (refer Appendix B). 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.

**Table 1** Calculated demands for the existing development and Scenarios One and Two (refer Appendix B for individual stage demands)

Area	ADF (l/s)	PDF (l/s)	PHF (l/s)
Existing Northlake development	1.31	4.33	8.66
Scenario One (Stages 1-4)	13.17	43.47	86.95
Scenario Two (Stages 1-11)	30.31	100.02	200.04

## 3 Modelled scenarios

Two scenarios were modelled, an initial scenario and ultimate scenario. Modelling assumed the current Wanaka peak day design network demands and reticulation and did not take into consideration future network upgrades or demand increases beyond those mentioned below for the Northlake Development.

### 3.1 Initial Scenario: Stages 1-4

The initial scenario extended the existing 150 mm rising mains servicing the current network development north of Aubrey Road into Stages 1-4. These 150 mm mains were then connected via a 300 mm main (refer Appendix C for network layout). Modelling of this scenario was undertaken to determine whether the proposed interim reticulation upgrades would meet levels of service for the areas and the effect, if any, on the existing network.

### 3.2 Ultimate development: Stages 1-11

The ultimate scenario consisted of all 11 proposed stages across the Northlake, Allenby, Gilbertson and Urquhart developments. The modelled network extended the 300 mm main in the initial scenario to connect both into the Beacon Point reservoir outlet pipe to the west of the development, as well as into the existing 375 mm Aubrey Road falling main to the east of the development. Three laterals of diameter size 100 mm and 150 mm extended off the 300 mm main to service Stages 6-8.

## 4 Modelling results

### 4.1 Scenario One: Stages 1-4

Modelling determined that the Beacon Point Reservoir (382 m RL) and corresponding network infrastructure has sufficient capacity to meet the additional 47.80 l/s demand of Stages 1-4 with little impact on pressure and demand to the surrounding current network. However, minimum residual pressures of 300 kPa were not met at areas of higher elevation (above 343 m RL). This is due to the reservoir elevation relative to the higher levels of the development and is not considered as a result of head losses in the network (refer Appendix C for results).

It is noted that minimum residual pressures in the current network off Aubrey Road were not all greater than 300 kPa prior to the addition of the Scenario 1 upgrades. This is considered due to the high elevation of certain areas of the network in comparison to the elevation of the Beacon Point reservoir.

Modelling of available firefighting flows took into consideration local head loss at each fire hydrant. Results determined that the required firefighting category FW2 (25 l/s) was available throughout the network for Stages 1-4.

**Table 2 Residual pressures and fire flows at each junction throughout the existing development north of Aubrey Road and proposed Scenario One network**

Area	Junction ID	Elevation (m RL)	Minimum Residual Pressure(kPa)	Available Fire flow (l/s) (Inc. hydrant losses)
Existing Network	922	332	481 ≥ 300 OK	> 50 l/s OK
	912	348	265 < 300 NOT OK	46 ≥ 25 l/s OK
	919	352	206 < 300 NOT OK	41 ≥ 25 l/s OK
	918	356	147 < 300 NOT OK	34 ≥ 25 l/s OK
	917	348	196 < 300 NOT OK	40 ≥ 25 l/s OK
	916	348	216 < 300 NOT OK	42 ≥ 25 l/s OK
	911	348	216 < 300 NOT OK	43 ≥ 25 l/s OK
	956	346	235 < 300 NOT OK	44 ≥ 25 l/s OK
	910	331	383 ≥ 300 OK	>50 l/s OK
	923	331	383 ≥ 300 OK	40 ≥ 25 l/s OK
	914	331	441 ≥ 300 OK	>50 l/s OK
	915	333	422 ≥ 300 OK	43 ≥ 25 l/s OK
	925	346	294 < 300 NOT OK	43 ≥ 25 l/s OK
	924	346	255 < 300 NOT OK	36 ≥ 25 l/s OK
920	343	235 < 300 NOT OK	44 ≥ 25 l/s OK	
Northlake	927	331	363 ≥ 300 OK	> 50 l/s OK
Stage 1	928	343	284 < 300 NOT OK	> 50 l/s OK
	926	347	137 < 300 NOT OK	38 ≥ 25 l/s OK
	930	329	324 ≥ 300 OK	> 50 l/s OK
Stage 2	933	351	206 < 300 NOT OK	47 ≥ 25 l/s OK
Stage 3	932	351	196 < 300 NOT OK	45 ≥ 25 l/s OK
	929	352	196 < 300 NOT OK	40 ≥ 25 l/s OK
Stage 4	931	329	314 ≥ 300 OK	39 ≥ 25 l/s OK

## 4.2 Scenario Two: Ultimate development

Modelling indicated that with the additional demand for the ultimate development on top of current network operations, the Beacon Point reservoir would drain to empty towards the peak hour of the day without further network upgrades. This means levels of service are unable to be met throughout the ultimate development without upgrades to the current network.

The third pump at the Beacon Point inlet was included as a duty assist pump for modelling purposes, with the same duty head as the two existing operational pumps. Operation of all three pumps enabled network demands to be met, noting that specific assessment of the current intake ability to enable three pumps to operate concurrently has not been undertaken as part of this modelling work.

With the third operational pump at the intake, the required levels of service and firefighting flows in the area were not achieved for the higher areas in the development due to the elevation difference with the Beacon Point Reservoir (refer Appendix D). Table 3 below details the minimum residual pressures and fire flows achievable at each modelled junction in the development.

The results show that with three operating pumps, the required network demands and levels of service are achievable for the Gilbertson and Urquhart developments and Stages 1-4 of the Northlake Investments Limited development. However, due to the high elevation of the Allenby Farms Ltd development and Stages 6-8 of the Northlake Investments Ltd development, the same requirements cannot be met without localised pressure boosting or an additional upper reservoir. In general, this applies to all development and network connections at or above 355 m RL.

The proposed development pipe network is adequate to meet the additional development demands but only with localised boosting to higher areas of the network and upgrades to the current Beacon Point reservoir. An additional reservoir situated at the highest point in the network (414 m RL) could provide adequate levels of service to all areas below 384 m RL. However, the highest point in the proposed development is 393 m RL and therefore localised boosting would be required to meet areas of elevation higher than 384 m RL in the proposed development.

A small area in the existing network Northlake (around Junctions 918 and 919, refer Appendix B) does not meet levels of service for pressure due to its relative elevation to the Beacon Point Reservoir. Localised pressure boosting or connection to a higher pressure zone would be necessary to enable the 300 kPa minimum pressure requirement to be met in this location.

**Table 3 Levels of service throughout the ultimate development with an additional pump at the Beacon Point intake**

Area	Junction ID	Elevation (m RL)	Minimum Residual Pressure (kPa)	Available Fire Flow (l/s)
Existing Network	922	332	491 ≥ 300 OK	> 50 l/s OK
	912	348	324 ≥ 300 OK	> 50 l/s OK
	919	352	284 < 300 NOT OK	50 ≥ 25 l/s OK
	918	355	245 < 300 NOT OK	44 ≥ 25 l/s OK
	917	348	304 ≥ 300 OK	50 ≥ 25 l/s OK
	916	348	324 ≥ 300 OK	> 50 l/s OK
	911	348	324 ≥ 300 OK	> 50 l/s OK
	956	346	334 ≥ 300 OK	> 50 l/s OK
	910	331	481 ≥ 300 OK	> 50 l/s OK
	923	331	481 ≥ 300 OK	45 ≥ 25 l/s OK

Area	Junction ID	Elevation (m RL)	Minimum Residual Pressure (kPa)	Available Fire Flow (l/s)
	914	331	481 ≥ 300 OK	> 50 l/s OK
	915	333	471 ≥ 300 OK	47 ≥ 25 l/s OK
	925	346	353 ≥ 300 OK	41 ≥ 25 l/s OK
	924	346	334 ≥ 300 OK	41 ≥ 25 l/s OK
	920	343	363 ≥ 300 OK	> 50 l/s OK
Stage 1(Northlake)	927	331	491 ≥ 300 OK	> 50 l/s OK
	928	343	461 ≥ 300 OK	> 50 l/s OK
	926	347	314 ≥ 300 OK	> 50 l/s OK
	930	329	500 ≥ 300 OK	> 50 l/s OK
Stage 2 (Northlake)	933	351	383 ≥ 300 OK	> 50 l/s OK
Stage 3 (Northlake)	932	351	383 ≥ 300 OK	> 50 l/s OK
	929	352	383 ≥ 300 OK	> 50 l/s OK
Stage 4 (Northlake)	931	329	491 ≥ 300 OK	48 ≥ 25 l/s OK
Stage 5 (Allenby Farms Ltd)	934	345	343 ≥ 300 OK	> 50 l/s OK
	935	350	304 ≥ 300 OK	> 50 l/s OK
	936	355	255 < 300 NOT OK	48 ≥ 25 l/s OK
	937	362	196 < 300 NOT OK	40 ≥ 25 l/s OK
	938	366	167 < 300 NOT OK	34 ≥ 25 l/s OK
	939	359	245 < 300 NOT OK	45 ≥ 25 l/s OK
	945	370	118 < 300 NOT OK	23 < 25 l/s NOT OK
Stage 6 (Northlake Investments Ltd.)	950	346	334 ≥ 300 OK	50 ≥ 25 l/s OK
	946	372	98 < 300 NOT OK	16 ≤ 25 l/s NOT OK
Stage 7(Northlake Investments Ltd.)	951	357	226 < 300 NOT OK	34 ≥ 25 l/s OK
	952	359	206 < 300 NOT OK	30 ≥ 25 l/s OK
	953	361	186 < 300 NOT OK	27 ≥ 25 l/s OK
Stage 8 (Northlake Investments Ltd.)	949	393	0 < 300 NOT OK	0 ≤ 25 l/s NOT OK
	948	378	39 < 300 NOT OK	0 ≤ 25 l/s NOT OK
	947	374	78 < 300 NOT OK	8 ≤ 25 l/s NOT OK
Stage 9 (Urquhart)	954	329	481 ≥ 300 OK	32 ≥ 25 l/s OK
	955	329	402 ≥ 300 OK	23 ≤ 25 l/s NOT OK
Stage 10 (Gilbertson)	943	328	510 ≥ 300 OK	> 50 l/s OK
	944	329	500 ≥ 300 OK	> 50 l/s OK
Stage 11 (Gilbertson)	942	326	530 ≥ 300 OK	> 50 l/s OK

## 5 Conclusion

There is sufficient capacity for the Beacon Point reservoir to meet both peak day demand and fire flow levels of service requirements of Stages 1-4 of the Northlake Development with the proposed network. However, due to the elevations in the development, not all areas are able to achieve minimum residual pressure. Localised pressure boosting for areas above 350 m RL elevation would be necessary to ensure a minimum residual pressure of at least 300 kPa is achieved throughout the network (for Stages 1 -4 reticulation only).

Three Beacon Point intake pumps are required to operate (duty-assist-assist type operation) to meet current design network demands with the additional design demand from the full development (Stages 1 - 11) on the design peak day.

Provided the increased network demand can be met by Beacon Point intake (i.e. an additional operational pump at the Beacon Point intake), levels of service can be met within the development for the proposed areas below 355 m RL (i.e. Stages 1 - 4 and 9 - 11). Localised boosting (i.e. pump stations and/or upper reservoir) to areas of higher elevation (i.e. Stages 5 – 8) in the proposed development and isolated areas in the existing Northlake development network is required to enable levels of service requirements to be met.

The proposed development pipe network capacity is adequate for the design demands modelled and when combined with pressure boosting measures (to overcome the elevation difference between the development area and the Beacon Point Reservoir). Specific pressure boosting measures (i.e. upper reservoir and/or pump station(s)) have not been modelled.

## 6 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.

The modelling results presented in this report show the levels of service for the proposed developments to the Wanaka network, based on adopted design demands and particular network upgrades, and are not a guarantee of available levels of service in the future. In addition, modelling has been undertaken using the current partially calibrated Mike Urban dynamic model for Wanaka. QLDC are in the process of developing a new water supply model and results may vary between the existing and new models.

This report has been prepared for the benefit of Queenstown Lakes District Council, 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 out prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:

.....

.....

Michaela Aspell

Grant Lovell

Civil Engineer

Project Director

Technical review by: Dominic Fletcher (Water Resources Engineer)

MLAA

p:\50553\50553.3 - wanaka\50553.3240 - northlake\workingmaterial\2016-02-10.mlaa.ltr rpt.northlake developments v4.docx

**Appendix A: Draft Development Plans (Winton Partners)**

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DRAFT

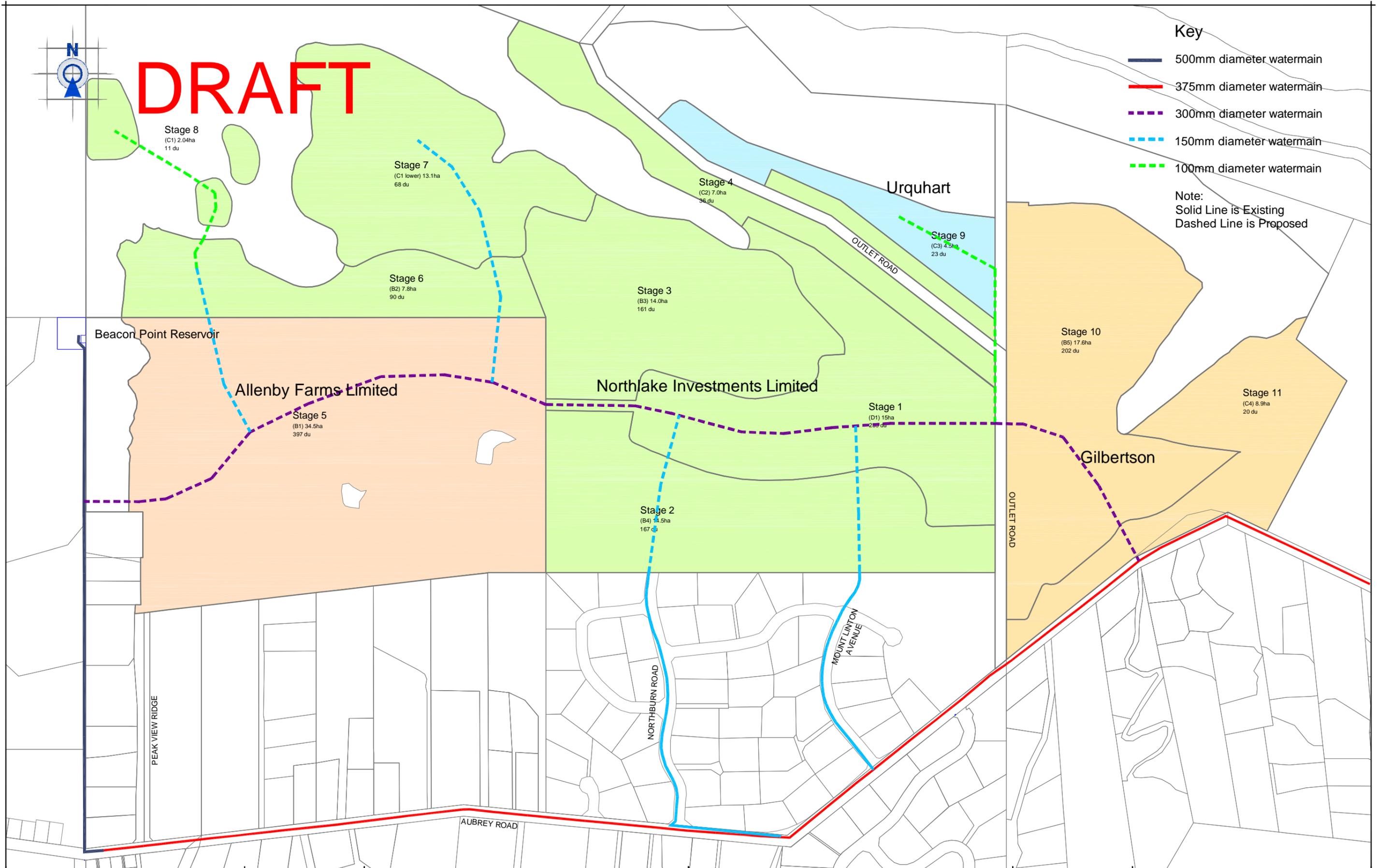


# DRAFT

Key

- 500mm diameter watermain
- 375mm diameter watermain
- - - 300mm diameter watermain
- - - 150mm diameter watermain
- - - 100mm diameter watermain

Note:  
Solid Line is Existing  
Dashed Line is Proposed



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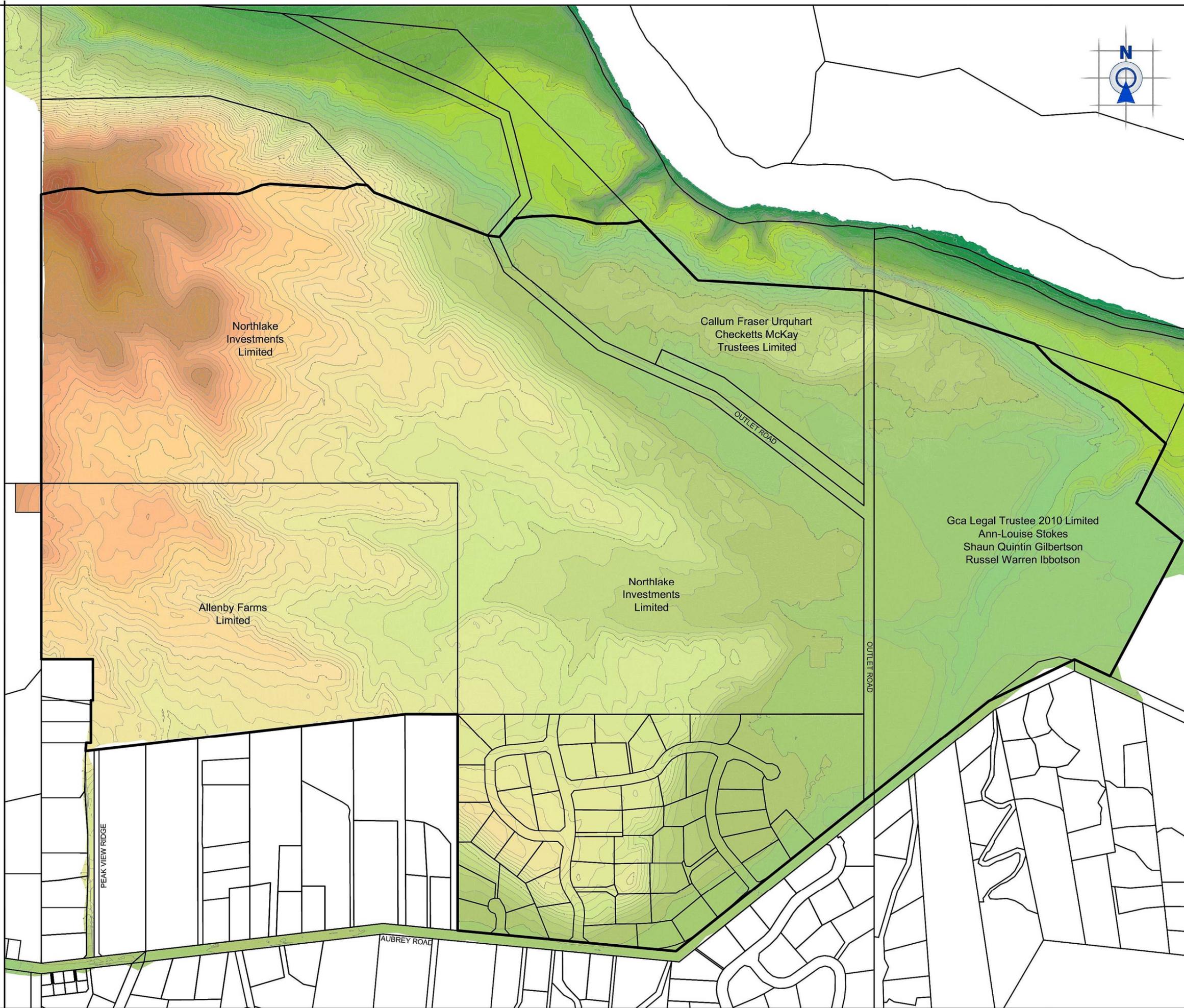
WANAKA BRANCH  
19 Reece Crescent  
or P.O. Box 283  
Wanaka 9343  
T 03 443 0110  
E wanaka@ppgroup.co.nz

Client & Location:  
**Winton Partners  
NORTHLAKE**

Purpose & Drawing Title:  
**Northlake Stages 1 - 11  
Primary Watermains**

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Checked by:	MJB				
Approved by:	MJB				<b>DO NOT SCALE</b>
Job No:	W4481-7	Sheet No:	2e	Revision No:	1
				Date Created:	17/12/2015



**KEY**

- 430 - 420m
- 420 - 410m
- 410 - 400m
- 400 - 390m
- 390 - 380m
- 380 - 370m
- 370 - 360m
- 360 - 350m
- 350 - 340m
- 340 - 330m
- 330 - 320m
- 320 - 310m
- 310 - 300m
- 300 - 290m
- 290 - 280m
- 280 - 270m

— Zone Boundary  
 - - - Parcel Boundaries

Contour Interval = 2m

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Client & Location:  
**Winton Partners  
 WANAKA**

Purpose & Drawing Title:  
**Northlake  
 Contour Plan**

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Drawn by:	RP		DO NOT SCALE
Checked by:	MJB		
Approved by:	-	Job No:	Revision No:
		W4481-7	0
		Drawing No:	Date Created:
		006	17/12/2015
		Sheet No:	
		102	

## Appendix B: Modelling Design Demands

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Job no. 50553.324  
 Description Northlake Developments Water Supply Modelling Demands  
 Computed 15/01/2015 mlaa

**NORTHLAKE SUBDIVISION**

Density 3 people/lot  
 Water allowance 700 l/person/day

Stage	No. of lots	ADF (l/s)	PDF (l/s)	PHF (l/s)
1	225	5.47	18.05	36.09
2	145	3.52	11.63	23.26
3	140	3.40	11.23	22.46
4	32	0.78	2.57	5.13
Scenario 1 (1-4)	542	13.17	43.47	86.95
5	345	8.39	27.67	55.34
6	78	1.90	6.26	12.51
7	59	1.43	4.73	9.46
8	9	0.22	0.72	1.44
9	20	0.49	1.60	3.21
10	176	4.28	14.12	28.23
11	18	0.44	1.44	2.89
Scenario 2 (1-11)	1247	30.31	100.02	200.04

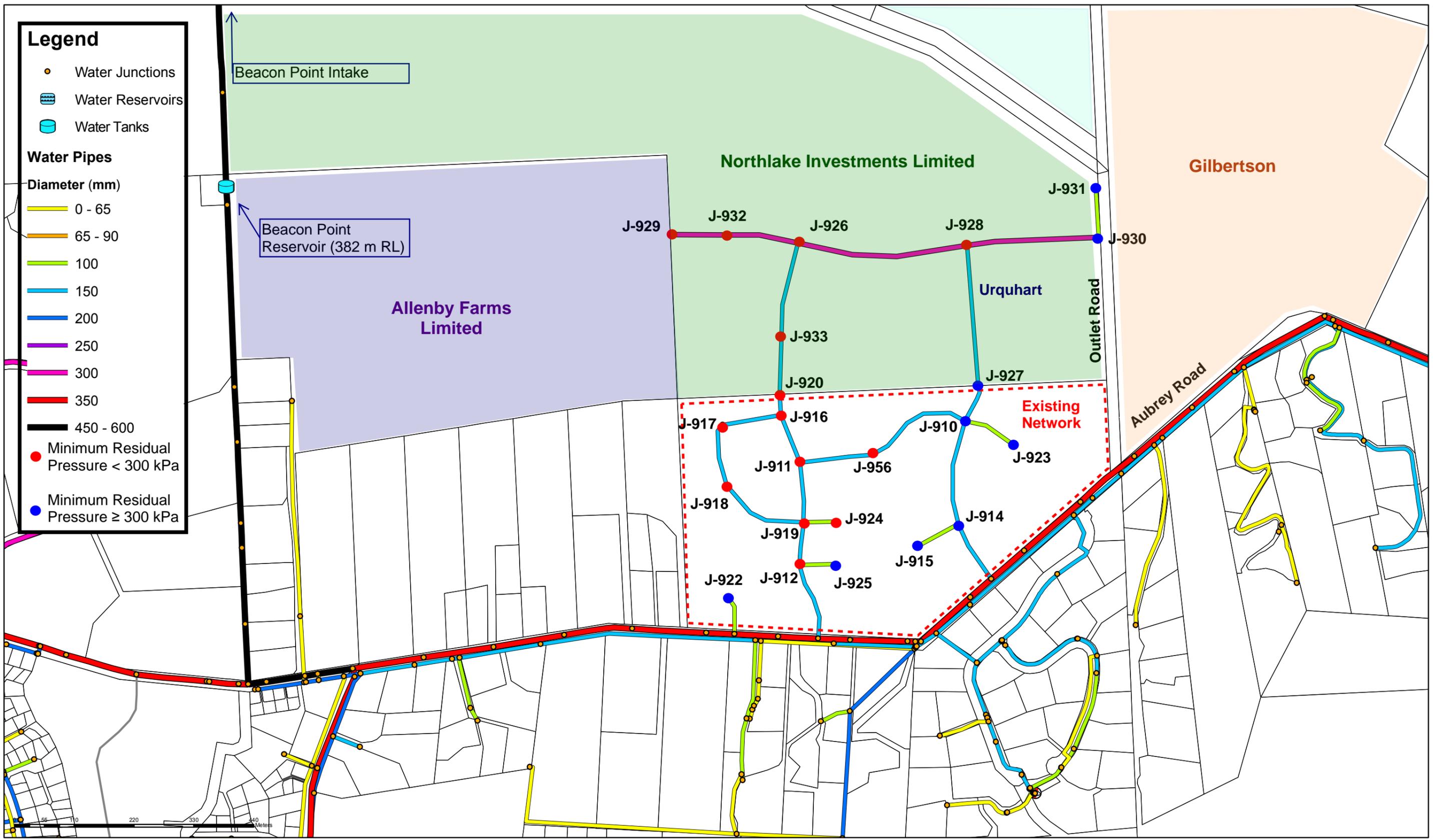
**EXISTING NETWORK NORTH OF AUBREY ROAD**

Density (people/lot)	3
Water allowance (l/person/day)	700
Number of lots	54
ADF (l/s)	1.31
PDF (l/s)	4.33
PHF (l/s)	8.66

## Appendix C: Initial Scenario: Stages 1-4

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DRAFT



Initial Scenario: Stages 1-4  
Water Supply Reticulation

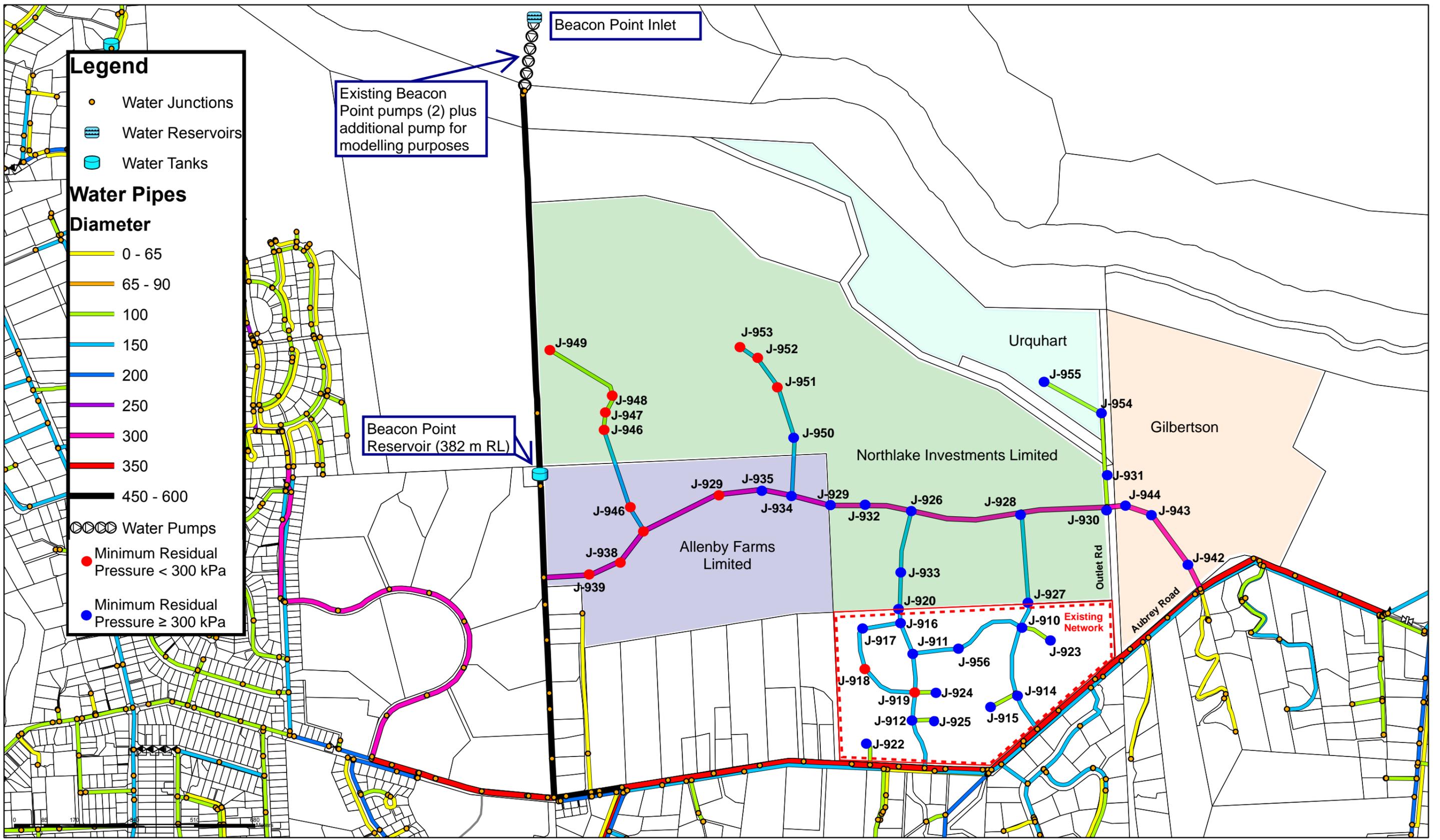


Drawn By:	MLAA
Date:	04/02/2016
Approved:	
Scale:	1:6,500

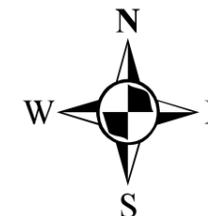
**Appendix D: Ultimate scenario (All Stages)**

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DRAFT



Ultimate Development  
Water Supply Reticulation  
- with additional inlet pump



Drawn By:	MLAA
Date:	04/02/2016
Approved:	
Scale:	1:10,000

Appendix 10: Watershed – Water modelling Northlake Stages 1-7 June 2016



# WATERSHED

3 June 2016

Queenstown Lakes District Council  
10 Gorge Road  
Queenstown

Dear Mark Baker,

## NORTHLAKE DEVELOPMENT STAGES 1-7

As per your request, we have undertaken hydraulic modelling to review the proposed water supply layout provided by Patterson Pitts Group, with respect to achieving the levels of service required by Queenstown Lakes District Council.

### DEMAND ASSESSMENT

The demand has been assessed based on the Northlake Stages 1-7 Proposed Water Supply Layout drawing W4481-7 011 Rev3 and the Queenstown Lakes District Council Land Development and Subdivision Code of Practice (2015).

The key design parameters outlined in Code of Practice are as follows:

- Daily consumption of 700 L/p/day
- Number of people per dwelling = 3
- Peak Day Demand (over a 12-month period) = Average Day Demand x PF:
  - (a) PF = 1.5 for populations over 10,000;
  - (b) PF = 2 for populations below 2,000.
- Peak Hourly Demand = Average Hourly Demand (on peak day) x PF (over a 24-hour period):
  - (a) PF = 2 for populations over 10,000;
  - (b) PF = 5 for populations below 2,000.
- Firefighting demands as specified in SNZ PAS 4509

**Table 1: Average and Peak Day Demand Calculations**

Development Stage	No. of Residential Lots	Population	Average Demand (l/s)	Peak Daily Demand (L/s)
Stage 1	36	108	0.875	1.750
Stage 1 A	10	30	0.243	0.486
Stage 2	37	111	0.899	1.799
Stage 3	33	99	0.802	1.604
Stage 4	45	135	1.094	2.188
Stage 5	25	75	0.608	1.215
Stage 6	20	60	0.486	0.972
Stage 7 <sup>1</sup>	30	90	0.729	1.458
<b>Total</b>	<b>236</b>	<b>708</b>	<b>5.736</b>	<b>11.472</b>

<sup>1</sup> Stage 7 is the Village Centre and the information provided by the developer assesses the demand as equivalent to 30 Residential Lots.



## WATERSHED

Based on the recent calibration of the hydraulic model during peak demand, the per capita demand for the Beacon Point area was determined as 0.048 L/property/day. This equates to a peak day demand of 1382L/p/day or using the average to peak day factor of 2, 692 L/p/day. This agrees well with the code of practice assumption of 700L/p/day.

The firefighting classification for the village center is assumed to be FW3 50L/s.

### **Peak Hour Demand**

The peak hour factor for the Beacon Point area based on the calibrated hydraulic model is 1.437, the domestic equivalent peak hour factor is 2.3. The suggested design peak hour factor is 5 for population less than 2000. Given the demand assessed in the model matches well with the design assumption, it is reasonable to assume that a similar peak hour factor would apply. For the purposes of assessing the Northlake subdivision, the domestic equivalent profile has been used applying a peak hour factor of 2.3.

### **LEVELS OF SERVICE**

The levels of service agreed upon with QLDC for the current system performance assessment as part of the model development and calibration project are outlined below:

- The minimum service pressure is 200-300kpa
- The maximum service pressures is 700-800kpa

These levels of service along with the requirements of the Fire Fighting Water Supplies Code of Practice form the basis for the system performance analysis.

Queenstown Lakes District Council does not prescribe any level of service criteria relating to pipe head loss, generally speaking pipe head loss per unit length for new pipes should ideally be < 2 m/km, or 2- 5 m/km for normal operation.

### **MODEL RESULTS**

For current peak day demand, pressures within the new sub-division are above 300kPa. The firefighting classification of 50L/s is easily achieved. The proposed pipes have head loss per unit length under 2 m/km or only slightly over.

The only area of concern are existing properties at higher elevation on Glenaray Crescent. These properties have been identified in the current system performance assessment as receiving minimum pressure between 200 – 300 kPa. Pressure to these customers could be reduced by a further 150kPa, however the model results indicate they do remain above 250kPa. The lower pressures are a factor of elevation (~357m) with respect to the Beacon Point Reservoir (TWL HGL 388.1m), where the maximum static pressure would be 31m. There are no significant high head loss pipes contributing to the lower pressures, however the proposed future 250mm connection will ensure minimal head loss.



## SUMMARY

The hydraulic model is a representation of the physical water supply system and as noted in the model development and calibration report it has limitation to its accuracy. The demands and peaking factors used to assess the development are based on assumptions and the actual finally water demands may vary.

The modelling results indicate the proposed new development can be supplied through the proposed reticulation layout and meet the desired levels of service indicted by Queenstown Lakes District Council. Provided Queenstown Lakes District Councils are comfortable with the level of service provide to the properties on Glenaray Road, the proposed water supply design should be accepted.

We trust this report meet your requirements. Please contact Charlotte Broadbent on 021766475 [charlotte.broadbent@wse.co.nz](mailto:charlotte.broadbent@wse.co.nz) if you wish to discuss any aspects of this report further.

Regards,

Charlotte Broadbent

Director / Senior Civil Engineer