BEFORE THE HEARING PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Waikato District Plan

STATEMENT OF EVIDENCE OF PHILIP STEPHEN PIRIE (THREE WATERS)

Dated 17 February 2021

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INTRODUCTION

1. My full name is Philip Stephen Pirie.

2. My qualifications include Bachelor of Surveying (2013), Licenced Cadastral Surveyor (2017), and I am a Member of Surveying and Spatial NZ. I have seven years of experience in Land Development as design lead on several subdivisions under 65 lots and have been part of a design team for an 850-unit urban housing development.

3. I have been engaged by Shand Properties Limited (**Shand**) to provide evidence as a Licenced Cadastral Surveyor / Land Development Engineer in support of its submission on the Proposed Waikato District Plan (**PDP**).

CODE OF CONDUCT

4. I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014 and agree to comply with it. I confirm that the opinions expressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

SCOPE OF EVIDENCE

5. My evidence will address water supply and wastewater for the rezoning of 112 and 162 Russell Road and 3761 Great South Road, Huntly North.

SUMMARY OF EVIDENCE

6. The Industrial land (Area 1) will require pressure upgrades to the Kimiha Reservoir for potable water and further localised upgrades to get the necessary firefighting flows. Upgrades of the Huntly Wastewater Treatment Plant (**WWTP**) which are planned to occur in 2028, will be needed before there is capacity to take the wastewater flows from Area 1.

7. The residential land (Area 6) can be serviced without any wider detriment to Huntly's water and wastewater network once the project to increase the Kimiha Reservoir filling rate is undertaken. This is currently included in WDC's draft Long-Term Plan (**LTP**) for water pressure and is expected to happen in 2026. Development of Area 6 can occur prior to the Huntly WWTP upgrades.

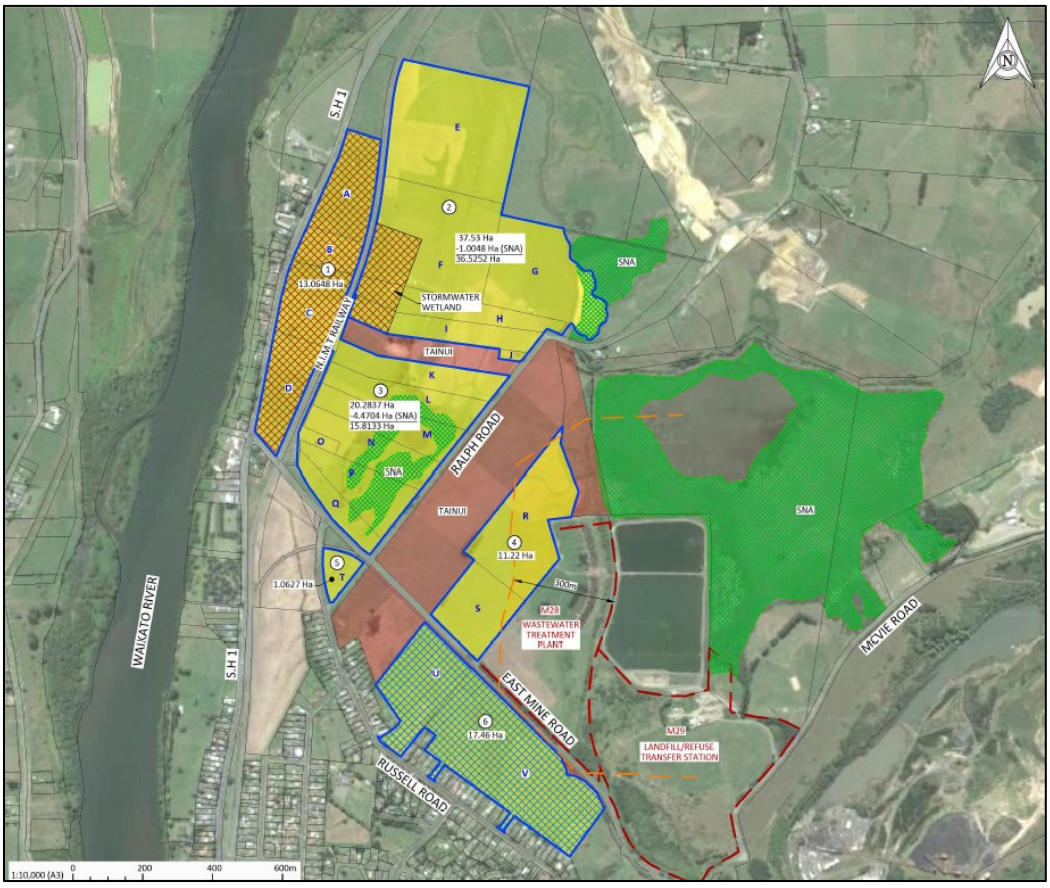

Figure 1: Areas proposed to be rezoned (hatched)

AREA 1 — INDUSTRIAL DEVELOPMENT

8. Area 1, which is the red hatched area in Figure 1 above, is the area of land Shand seeks to rezone from rural to industrial and is approximately 13.06ha in size. Area 1 is bordered by Great South Road to the west, agriculture land to the north, the North Island Main Trunk (**NIMT**) railway line to the east and East Mine Road to the south. The Huntly WWTP is located 1.2km to the east.

Water Supply

9. Reticulation for water supply is available on the southern side of East Mine Road which adjoins the southern boundary of Area 1. This development would be logical organic growth for water reticulation to the north of Huntly.

10. The Mid-Waikato Water & Wastewater Servicing Strategy[1] was prepared for Watercare which has responsibility for the operation and maintenance of Waikato District Council (**WDC**) water assets. The outcomes and recommendations of this report feed into the WDC Activity Management Plan, the Waikato District Long-Term Plan, and Infrastructure Strategy. In the report, the preferred servicing option identified for Mid-Waikato involves running a 355mm water main up Great South Road which will have the ability to service this rezoned land.

11. If the 355mm water main up Great South Road does not go ahead, other feasible options for servicing this land at a level of service sufficient to meet requirements for firefighting water flow rates exist, including the installation of a firefighting reservoir onsite.

[1] Mott MacDonald, Stantec (2020) *Mid-Waikato Water & Wastewater Servicing Strategy. Auckland:* Mott MacDonald, Stantec.

12. Currently there are capacity issues at the Kimihia Reservoir, resulting in it emptying at a rate faster than it can fill in a peak day situation. I refer to Appendix A of my report "Huntly North Rezoning: Three Waters Infrastructure Assessment for Rezoning Proposal" dated November 2020 which is **Attachment 1** to my evidence. There is an upgrade project planned to improve Huntly's water pressure included in WDC's draft LTP which is programmed to happen in 2026.

13. Once the issues with water pressure have been resolved, several feasible options exist to service this land, as outlined in the Mott Macdonald report which forms part of the three waters assessment attached as Appendix A to my report in **Attachment 1**.

Wastewater

14. The wastewater from this development can connect into WDC's reticulation at Wastewater Pump Station (**WWPS**) 77 which is located within the road reserve at 2 Great South Road, 100m south-west of the site.

15. Mr Chris Dawson and I met with representatives of Watercare twice towards the end of 2020 to discuss Shand's rezoning proposal. I refer to the meeting notes in Appendix C in **Attachment 1**. In our discussions, Watercare confirmed that overflows shown in the modelling report prepared by Mott Macdonald do not demonstrate the reality as currently there are very few wastewater connections to WWPS 77. There was an incorrect assumption in Mott Macdonald's Report that 3768 -3806 Great South Road connect into WDC's network. WWPS 77 pump activates 2-3 times a day which is less than the recommended one start per an hour under dry weather flow as advised in the Regional Infrastructure Technical Specification 2018. There is capacity in the network to reticulate the wastewater to the WWTP.

16. The capacity of the Huntly WWTP is expected to be improved in 2028 when it is programmed to be upgraded to a Membrane Bioreactor in the draft LTP. Prior to the proposed upgrade being undertaken, there will not be capacity to take the wastewater from Area 1.

AREA 6 — RESIDENTIAL DEVELOPMENT

17. Area 6, which is the blue hatched area in Figure 1 above, is the area of land that Shand seeks to rezone from rural to residential. Area 6 is located to the south of East Mine Road, to the north of the existing Residential Zone and 400m south of the Huntly WWTP. The lower lying land of Area 6 is located within the flood plain and a portion of this lower lying land has been assessed as being a natural inland wetland. For that reason, only 9.79ha of the total 17.47ha is intended to be developed. The steep nature of the site may result in bulk earthworks being undertaken along with some retaining walls to create flatter building pads.

Water Supply

18. Reticulation is available on the Southern Boundary of this site within Russell Road. This is a logical organic extension to the existing WDC network.

19. This site is also serviced by the Kimihia Reservoir. Watercare is currently reviewing the level of service issues within the network, in particular the capacity issues caused by the reservoir not filling as fast as it drains in a peak day event. These upgrades are included in WDC's draft LTP to occur in 2026. No further network upgrades are required to service this development for water.

Wastewater

20. Reticulation for wastewater is available at WWPS 65 located within East Mine Road, near the northern boundary of the site. Available capacity at this pump station would need to be confirmed at the time of consenting due to undeveloped residential land that is within its catchment. There is an existing gravity network that runs through the site which would need to be realigned to coincide with the road layout. A pump station would likely be required to service the western portion of the re-zoned land.

21. The re-zoning of Area 6 will have a negligible effect on available capacity at the Huntly WWTP.

CONCLUSION

22. The residential land (Area 6) can be serviced without any wider detriment to Huntly's water and wastewater network once the project to increase the Kimiha Reservoir filling rate is undertaken. This is currently included in WDC's draft LTP for water pressure and is expected to happen in 2026. Development of Area 6 can occur prior to the Huntly WWTP upgrades.

23. The Industrial land (Area 1) will require the pressure upgrades to the Kimiha Reservoir for potable water and further localised upgrades to get the necessary firefighting flows. Upgrades of the Huntly WWTP which are planned to occur in 2028 will be needed before there is capacity to take the wastewater flows from Area 1.

Philip Stephen Pirie

17 February 2021

Attachment 1

North Rezoning: Three Waters Infrastructure Assessment for Rezoning Proposal

SHAND PROPERTIES LIMITED

HUNTLY NORTH REZONING

THREE WATERS INFRASTRUCTURE ASSESSMENT FOR REZONING PROPOSAL

NOVEMBER 2020

BLOXAM BURNETT & OLLIVER

Document control

Project identification		
Client	Shand Properties Ltd	
Client representative	Jackie Rogers	
BBO details	**Bloxam Burnett & Olliver (BBO)** **Level 4, 18 London Street, Hamilton 3240**	
BBO representative	Philip Pirie	
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Job number/s	144370	
Job name	Shand Properties Rezoning	
Contract numbers	N/A	
Report name and number	Three Waters Infrastructure Assessment for Rezoning Proposal	
Date / period ending	November 2020	
File path	K:\144370 Shand Properties Rezoning\02 Industrial & Residential rezoning\Design\Reports\Shand Water Impact Assessment.docx	

Report status			
Status	**Name**	**Signature**	**Date**
Report prepared by	Philip Pirie	P. Pirie	27/11/2020
Checked by	Constantinos Fokianos		24/11/2020
Approved for issue	Jarred Stent		27/11/2020

Document history			
Version	**Changes**	**Signature**	**Issue date**
V1	Client Review		27/11/2020
V2			
V3			

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1. INTRODUCTION

1.1 OVERVIEW

This three waters infrastructure report provides a high-level assessment of the existing and future water, wastewater and stormwater infrastructure needed for the rezoning of the Shand Properties Ltd site which is located on the Northern boundary of Huntly. Please see **Figure 1** below. The land is to be rezoned from rural to residential / industrial.

Mott MacDonald have provided detailed modelling of the water supply and wastewater networks, within the township, this is included in **APPENDIX A.** The findings of this report have then been discussed with Watercare at a follow up meeting and meeting minutes be found in **APPENDIX C.** Initial discussions with Watercare indicate no Integrated Catchment Plan exists in this area and this report has been prepared prior to any lot and development layouts being finalised.

Stormwater matters are addressed within a separate Stormwater Management Report. The separate report provides a high-level stormwater management plan/layout for the proposed zones. Further investigation has been conducted on the proposed industrial area as which is located within the Kimihia catchment floodplain, it is located close to the Kimihia rural stop bank, and there are no discharge points located within the boundaries of the proposed industrial area. A preliminary level layout has been developed to provide a solution that addresses these challenges and demonstrates the feasibility of the proposed area to be developed for industrial use, while meeting all the criteria related to stormwater management.

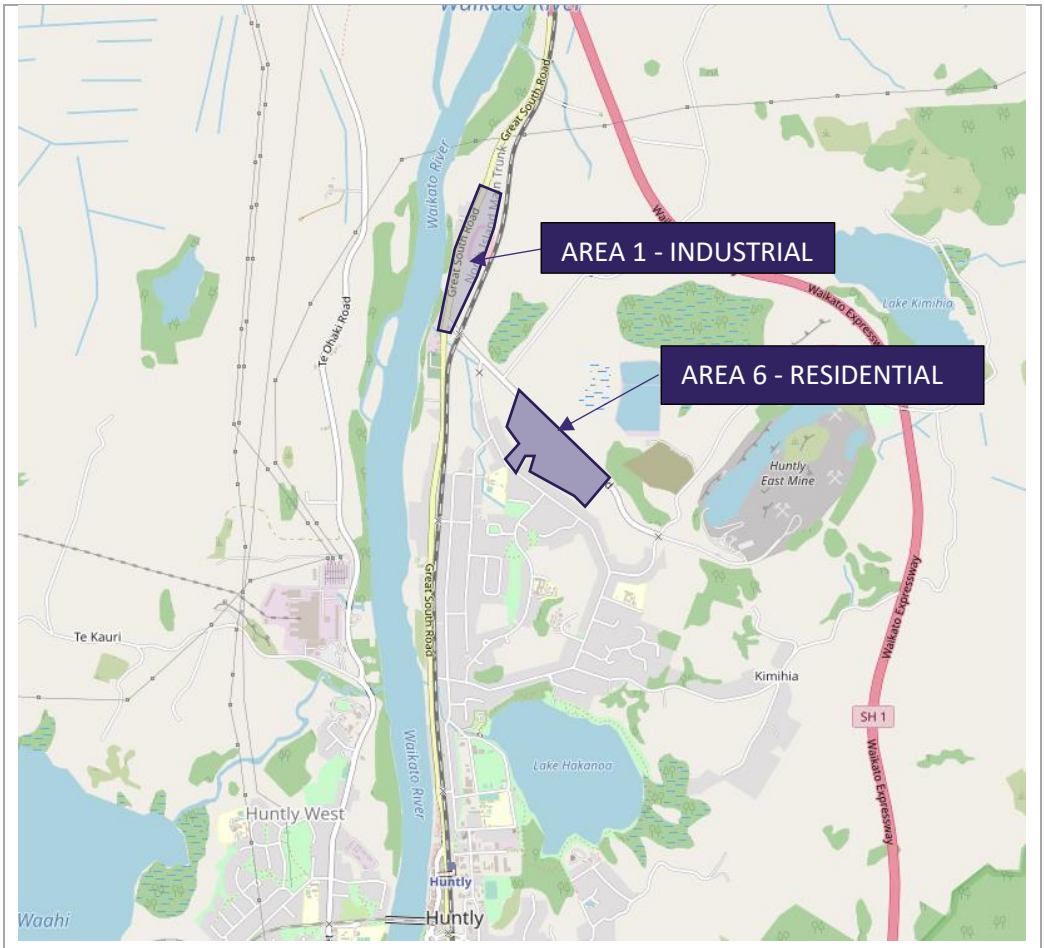

Figure 1: Site Locality Source: OpenStreetMap.Org

1.2 EXISTING ENVIRONMENT

There are two main sites to be developed which are summarised below.

1.2.1 AREA 1 – INDUSTRIAL (YELLOW AREA)

Area 1 – The land parcel, which is approximately 13.06 ha in size, is bordered by Great South Road to the west, the North Island Mainline Trunk (NIMT) railway line to the east and East Mine Road to the south. The parcel of land is made up of several allotments listed as follows:

- Lot 2 Deposited Plan South Auckland 12402, Record of Title SA9C/63, SA40C/873.
- Lot 1 Deposited Plan South Auckland 12402, Record of Title SA43C/865, SA40C/873.
- Part Lot 12 Deposited Plan 24355, Record of Title SA43C/865, SA40C/873.
- Lot 11 Deposited Plan 23455, Record of Title SA43C/866.

2.3653Ha will also be required for stormwater management covering

- PT Allotment 21 Taupiri Parish, Record of Title SA9C/63, SA40C/873
- Lot 1 DP 23455, Record of Title SA1086/107, SA40C/873
- Lot 2 DP 23455, Record of Title SA1086/107, SA40C/873

This site is subject to the Defended Area Overlay. Topography of the site is generally flat with under 1% slope across site and some small depressions and elevations ranging from RL11m to RL9m.The Waikato river is located 80m to the West of Site. No distinct drainage pattern exists onsite. The site is currently used for grazing with one farmhouse on the property.

1.2.2 AREA 6 – RESIDENTIAL (BLUE AREA)

Area 6 – The land parcel, which is approximately 17.46 ha is size, is located south of East Mine Road. The land is made up of two allotments listed as follows:

- Lot 2 Deposited Plan South Auckland 33575, Record of Title SA43C/876.
- Part Allotment 11 Parish of Taupiri, Record of Title SA2B/843, SA26B/948.

The topography of the site ranges from RL45m – RL10m with slopes of 20-25% located in parts of the site, draining to the north through a culvert under East Mine Road. The land is currently used for grazing with one farmhouse on the property.

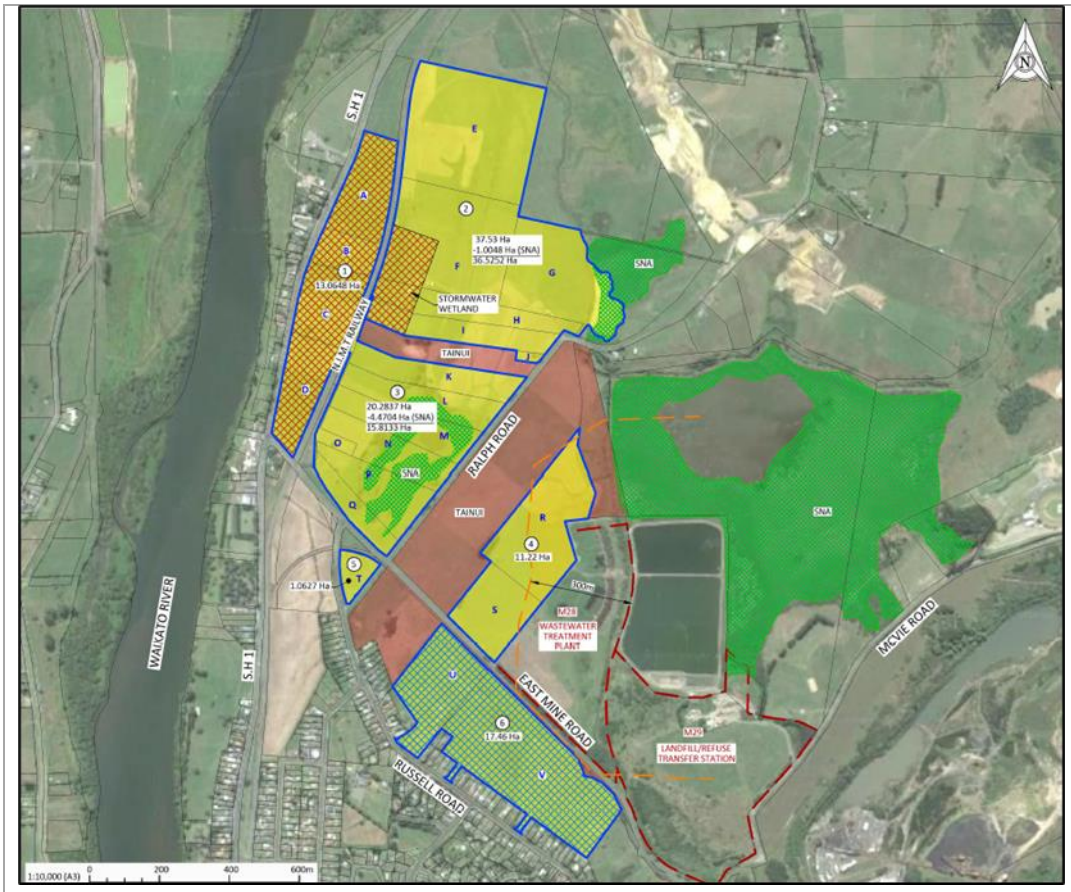

Figure 2: Plan of Shand Owned Property Subject to the Rezoning Submission – Yellow land = Land owned by Shand; Red Hatching = Area 1 (land proposed for Industrial Zoning); Blue Hatching = Area 6 (land proposed for Residential Zoning); Red = land owned by Tainui Source: BBO

1.3 PROPOSED DEVELOPMENT

1.3.1 AREA 1 - INDUSTRIAL

Final lot layouts will be determined at the time of consenting based on market demand, **Figure 3** below shows one option of how the land could be serviced. The wastewater would drain via gravity to a centralised pumping station that would then convey the wastewater to the existing pump station WWPS77, shown in **Figure 5** below. This is discussed in further detail in section **2.1.1** below. The proposed gravity lines would run approximately 450m either way from the pump station which would require a pump station of approximately 3.5m deep.

The development water would be reticulated through 150mm water mains on each side of the road in accordance with the RITS. The connection point to Council infrastructure would be confirmed at the time of detailed design, dependant on what water network upgrades is completed as part of the Council Long Term Plan. APPENDIX A - MOTT MACDONALD PARTIAL MODEL UPDATE contains options on how this land can be serviced to meet the fire flow requirements (FW3 firefighting category). Options that will enable this development to meet the firefighting requirements can include placing a firefighting reservoir onsite or installation of a 355mm watermain along Great South Road. Flow and pressure testing at the time of consenting would be required to confirm Mott Macdonald's Design assumptions.

Due to the flat nature of the site, bulk earthworks are required to ensure stormwater can flow to a proposed treatment wetland, this fill would be sourced from within the flood plain to minimise the need for imported fill. The proposed earthworks will be based on a level-for-level and flood volume balance to retain the existing flood volume capacity of the overall floodplain. More details are provided in the separate Stormwater Management Report.

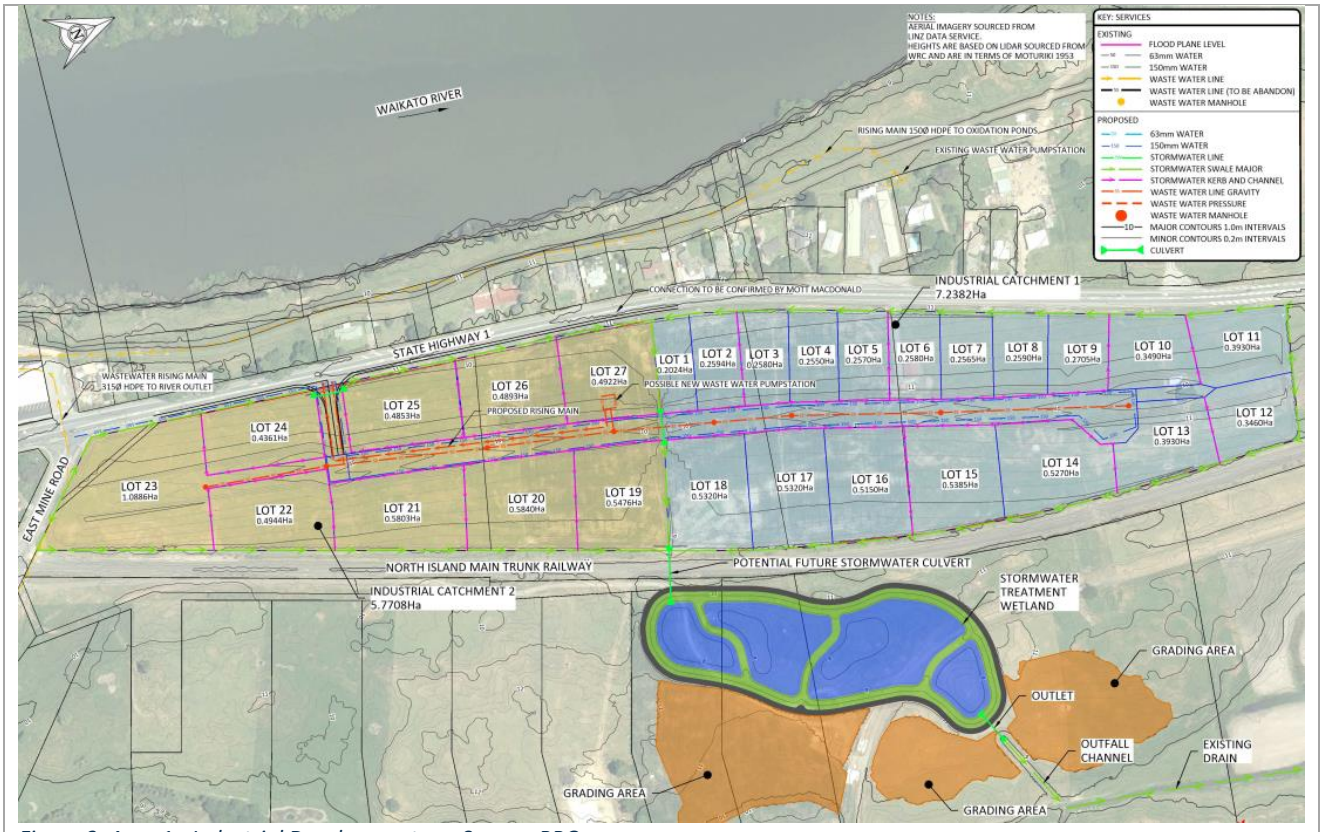

Figure 3: Area 1 - Industrial Development Source: BBO

1.3.2 AREA 6 - RESIDENTIAL

Significant areas of the site which are subject to the residential rezoning proposal request, are within the flood plain or existing wetland and are not likely to be developed. The total available area is 17.47ha, of which 9.79ha can be developed. The steep nature of the site may result in bulk earthworks being undertaken along with retaining walls will likely be required to create level building platforms..

The western part of the residential area will require a wastewater pump station to convey the existing council WW manhole indicated in Figure 4 below, as the invert of this manhole is only 1.56m deep (according to WDCGIS). The depth of this manhole means the wastewater is too shallow to provide a gravity connection for the proposed network. Inverts of existing wastewater manholes will need to be verified with onsite investigation. There is an existing council sewer line crossing the property that would likely need to be realigned to allow more lots to be developed. From the pump station on the north of East Mine Road, the wastewater can be pumped 400m to the Huntly wastewater treatment plant.

Water connections can be made to the existing 150mm watermain running along Russel road. With an additional connection to the 50mm rider main along East Mine Road this will ensure that lots 47-85 are not a single end feed. Fire flow requirements (FW2 Firefighting) are able to be met.

A high-definition version of Figure 4 below can be found in **APPENDIX B.**

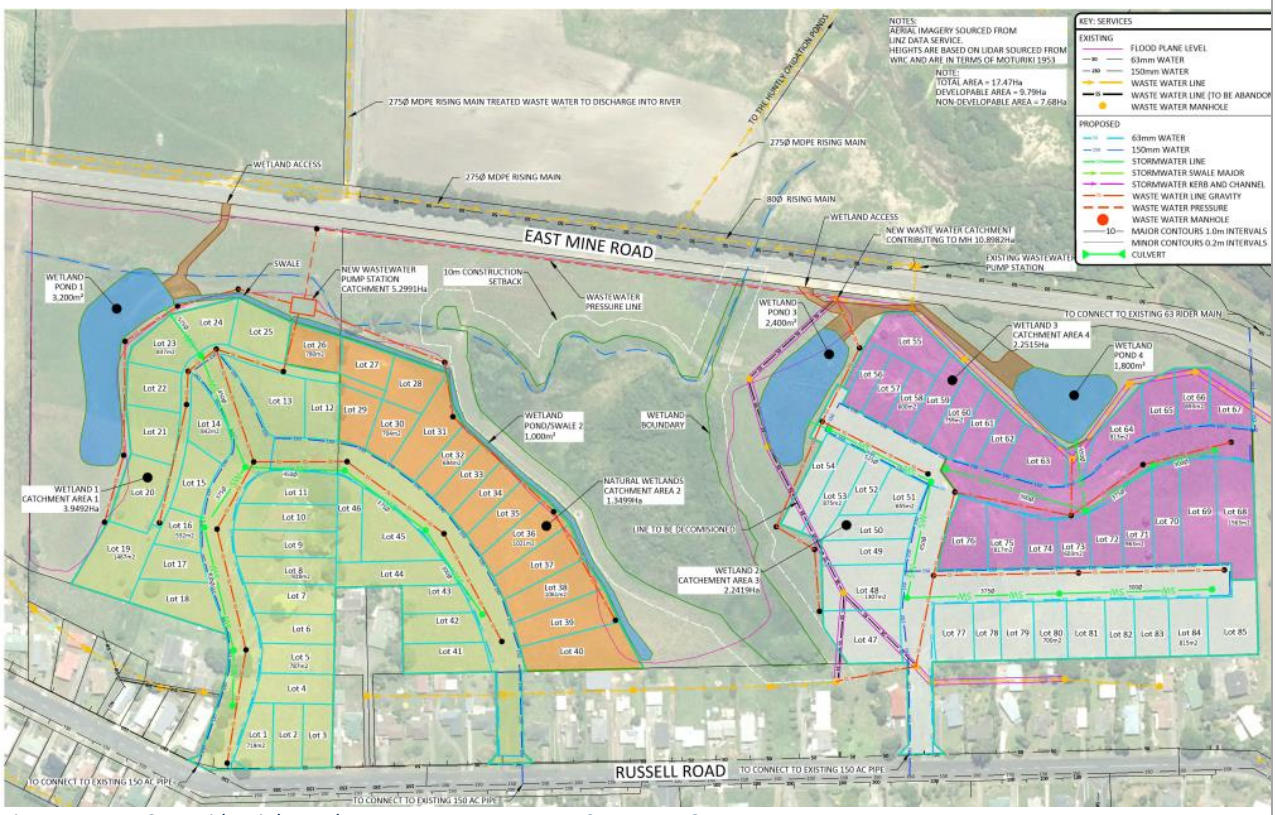

Figure 4: Area 6 - Residential Development *Source: BBO*

2. WASTEWATER

2.1 CURRENT SITUATION

2.1.1 AREA 1 – INDUSTRIAL

Currently there is only 1 house on the property with the wastewater being treated by an onsite septic tank. On the opposite side of Great South Road, the hotel connects to WWPSNT2. From discussions with Watercare this is a small grinder pump that does not have capacity to take the discharge volumes from the proposed industrial development.

BBO commissioned Mott MacDonald to undertake modelling on the effects of rezoning this land which the findings are attached in **APPENDIX A** as a technical Memo. Following the report, further discussions were held with Watercare to compare modelling, with empirical evidence which confirmed that the WWPS77 only activates 2-3 times a day and there is spare capacity for this pump. The overflows shown in the model do not occur as very few of the houses on the western side of Great South Road connect to the council network.

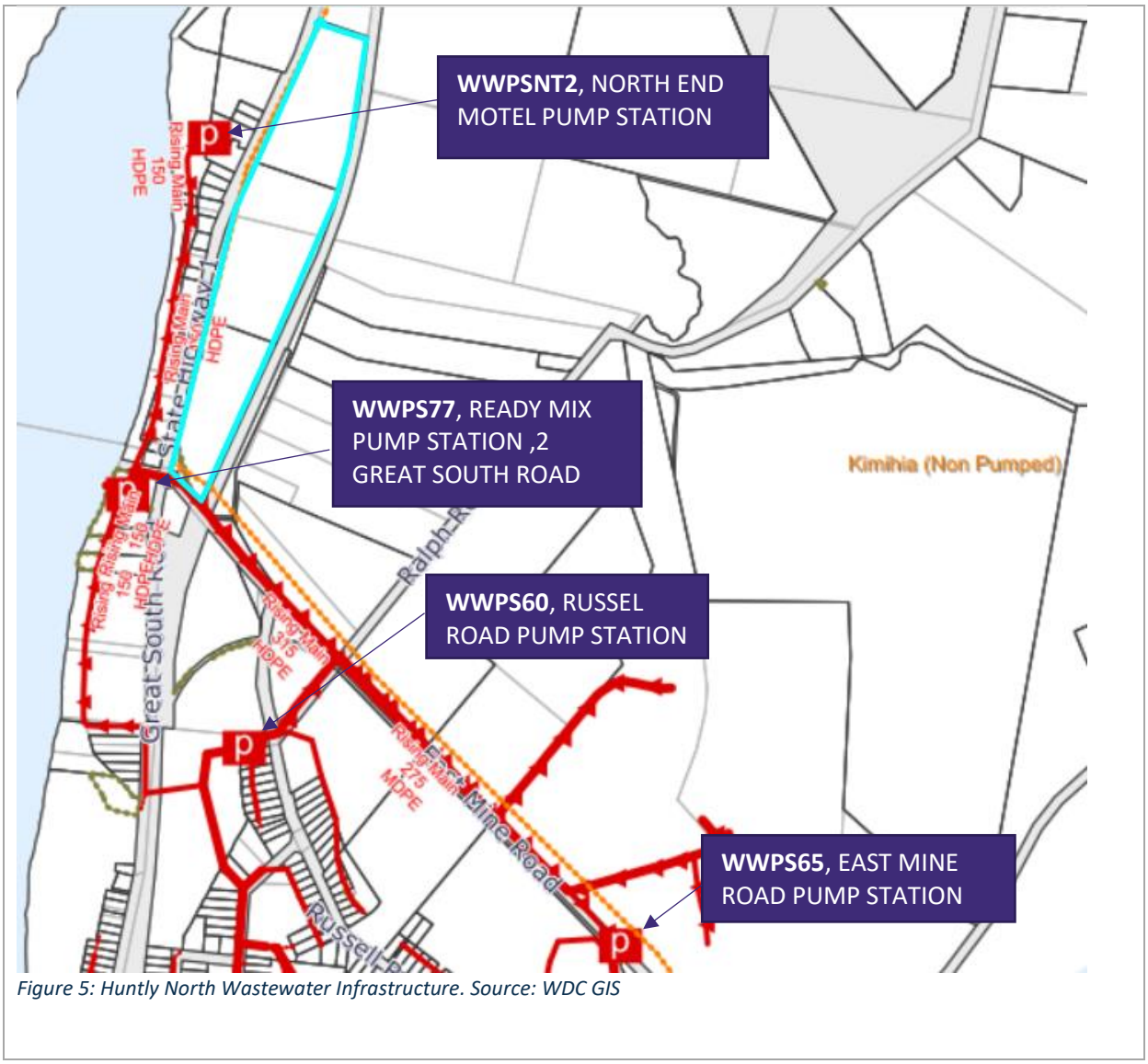

Figure 5: Huntly North Wastewater Infrastructure. Source: WDC GIS

2.1.2 AREA 6 – RESIDENTIAL

Refer to section **1.3.2** for discussion on servicing the residential area.

2.2 ESTIMATED FLOWS

The wastewater discharge volumes are on population per a hectare as referenced in the Regional Infrastructure Technical Specification (RITS), which was last updated in May 2018.
The wastewater discharge was calculated based on the following assumptions:

- Population Equivalent / ha **45** for residential and **30** for industrial
- Average daily flow (litres/person/day) **200**
- Infiltration allowance (litres/Ha/day) **2250**
- Surface water ingress (litres/Ha/day) **16,500**

Peaking factors are from Table 5-2 from the RITS 2018.

Average Daily Flow (ADF)

The Average Daily Flow is calculated as the sum of the infiltration allowance and the daily wastewater flow:

Equation 5-1: Average daily flow (ADF)

$$ADF\ (m^3/day) = (infiltration\ allowance \times catchment\ area) + (water\ consumption \times population\ equivalent)$$

Peak Daily Flow (PDF)

The system shall achieve a daily self-cleaning velocity the Peak Daily Flow.

Equation 5-2: Peak daily flow (PDF)

$$PDF\ (L/sec) = ((infiltration\ allowance \times catchment\ area) + (peaking\ factor \times water\ consumption \times population\ equivalent)) \div 86400$$

Peak Wet Weather Flow (PWWF)

The system shall accommodate the design Peak Wet Weather Flow without surcharge.

Equation 5-3: Peak wet weather flow (PWWF)

$$PWWF\ (L/sec) = ((infiltration\ allowance \times catchment\ area) + (surface\ water\ ingress \times catchment\ area) + (peaking\ factor \times water\ consumption \times population\ equivalent)) \div 86400$$

2.2.1 AREA 1 – INDUSTRIAL

Equation 1: Industrial Wastewater Flows

Project :	Shand Re-Zoning Proposal								Date :	25-Sep-2020			
Client :	Shand Properties Limited												
Description :	New Industrial												
Standard Values used													
Average Daily wastewater flow	200	litres per capita											
Infiltration Allowance	2250	litres per hectare per day											
Surface water ingress allowance	16500	litres per hectare per day											
Residential Population Density	45	persons per hectare											
Commercial / Industrial Population Density	30	persons per hectare											
Using Lot Occupancy Method													
Description	**No. of Sites**	**occupants per Site**	**Area (Ha)**	**Zone (RES,IND,COM)**	**Population (persons)**	**Consumption (l/day)**	**P/A Ratio (Peaking Factor)**	**Infiltration (l/day)**	**SWI (l/day)**	**ADDWF (l/sec)**	**PDDWF (l/sec)**	**PWWF (l/sec)**	**Comments**
Industrial Catchment 1			7.47	IND	224	44,845	3.7	16,817	123,323	0.71	2.12	3.54	
Industrial Catchment 2			5.56	IND	167	33,389	4	12,521	91,821	0.53	1.69	2.75	
									Total Ultimate Flow entering pump station	**1.25**	**3.81**	**6.30**	
									Required 9hr Storage m³	**40.3**			

2.2.2 AREA 6 - RESIDENTIAL

Equation 2: Residential Wastewater Flows

Project :	Shand Re-Zoning Proposal								Date :	25-Sep-2020			
Client :	Shand Properties Limited												
Description :	New Residential												
Standard Values used													
Average Daily wastewater flow	200	litres per capita											
Infiltration Allowance	2250	litres per hectare per day											
Surface water ingress allowance	16500	litres per hectare per day											
Residential Population Density	45	persons per hectare											
Commercial / Industrial Population Density	30	persons per hectare											
Using Lot Occupancy Method													
Description	**No. of Sites**	**occupants per Site**	**Area (Ha)**	**Zone (RES,IND,COM)**	**Population (persons)**	**Consumption (l/day)**	**P/A Ratio (Peaking Factor)**	**Infiltration (l/day)**	**SWI (l/day)**	**ADDWF (l/sec)**	**PDDWF (l/sec)**	**PWWF (l/sec)**	**Comments**
Residential Lots 1 - 46			5.50	RES	248	49,533	4.1	12,383	90,811	0.72	2.49	3.54	Road included
Residential Lots 47 - 88			5.39	RES	243	48,551	4.1	12,138	89,009	0.70	2.44	3.47	Road included
									Total Ultimate Flow entering pump station	**1.42**	**4.94**	**7.02**	
									Required 9hr Storage m³	**46.0**			

2.3 IDENTIFIED CHALLENGES – PROPOSED OUTCOMES

2.3.1 AREA 1 – INDUSTRIAL

- Change in Demand: Based on the calculations above, the development does increase demand onsite. Early consultation with Watercare has indicated that the Huntly WWTP has capacity to take flows from the residential area (Area 6) currently. For flows from the industrial area it would be 2-3 years before the treatment plant would have capacity to take flows from the industrial land if they were dry industry due to minor planned upgrades and 2028 before the WWTP would have the ability to take wet industry. A full upgrade of the Huntly WWTP to a Membrane Bioreactor is planned for 2028 in the draft LTP (Long Term Plan).

- Connection of Re-Zoned Land. Mott MacDonald's technical memo has highlighted that more than one option exists to service this land. Consultation with Watercare following the Mott Macdonald report highlighted the WWPS77 (Ready Mix Pump Station at 2 Great South Road) is the preferred location that the wastewater from Area 1 is connected to, as this pump only turns over 2-3 times a day. Verification of the available capacity of this pump station would occur at the time of detailed design. The overflows in the gravity network model shown in the Mott MacDonald report do not occur as most of the properties adjacent to the Waikato river do not connect into the Council network.

  Detailed modelling and servicing solutions have been prepared by Mott MacDonald and are included in **APPENDIX A.** A proposed 3 waters layout is included in **APPENDIX B**.

2.3.2 AREA 6 – RESIDENTIAL

- Connection of Re-Zoned Land. An existing gravity main runs across the site that in some areas will need to be realigned to not impact on proposed lots. A pump station will most likely be required to service Lots 1-46 in order to convey wastewater to the existing council gravity network.

- Confirmation of Pump station capacity. Further investigation of capacity of *WWPS65* pump station will need to be undertaken at the time of consenting to confirm capacity as there is undeveloped residential zoned land in its catchment.

Detailed modelling and servicing solutions have been prepared by Mott MacDonald and are included in **APPENDIX A.** A proposed 3 waters layout is included in **APPENDIX B.**

3. WATER

3.1 CURRENT SITUATION

Both areas to be developed are currently zoned rural and have very low water usage. Modelling from Mott Macdonald demonstrates Huntly has existing issues with water pressure during a peak day event, which will require upgrades to lines feeding the Town reservoirs. There is currently no connection to Councils water supply to to Area 1, but there is the ability to connect to the 100mmØ pipe that runs up Great South Road onto East Mine Road.

Figure 6: Huntly North Water Supply Infrastructure Source: WDC GIS

Area 6 can connect to the 150Ø water line running along Russel Road and the 50Ø rider main running along East Mine Road.

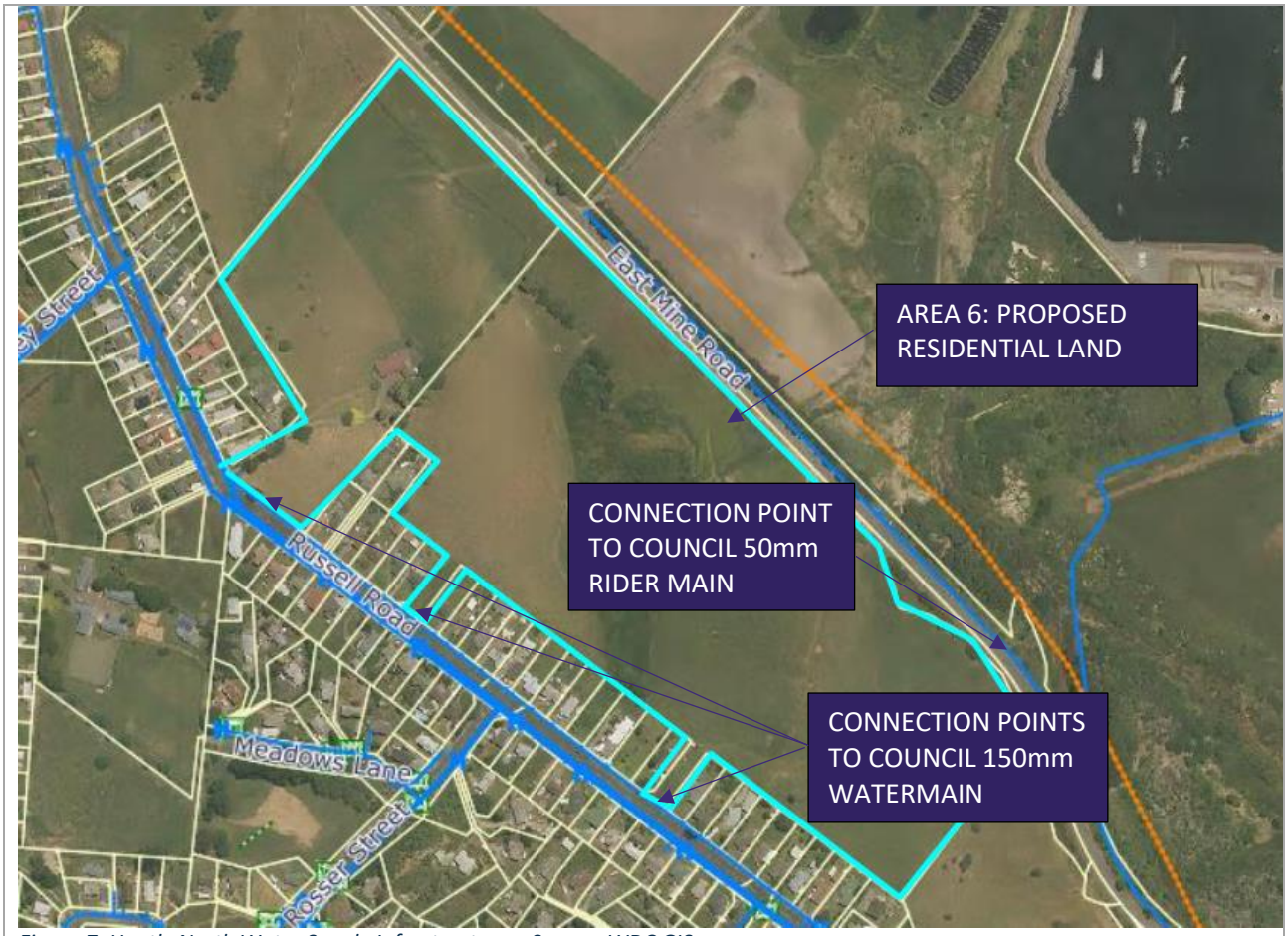

Figure 7: Huntly North Water Supply Infrastructure Source: WDC GIS

3.2 PREDICTED FLOWS

The Council standard for supply is based on the RITS 2018 which includes 260 litres/person/day with a peak flow rate of five times this amount for on demand supply, the wastewater values from section **2.2.1** above have been converted by a factor of 1.3 to get the potable consumption:

Potable supply demand:	The residual pressure and flow at point of supply to residential lots shall be a minimum of 200 kPa (20m) and 25 l/min.
Firefighting supply demand (RES):	FW 2 as defined in SNZ PAS 4509 with minimum residual pressure of 100kPa (10m) @ 25 l/s.
Firefighting supply demand (IND):	FW 3 as defined in SNZ PAS 4509 with minimum residual pressure of 100kPa (10m) @ 50 l/s.

3.2.1 AREA 1 – INDUSTRIAL

Equation 3: Potable Water Demand Industrial

Proposed Water Flow Calculation using Lot Occupancy Method							
Description	Waste Water flow	Conversion Factor	Potable consumption l/d	Average flow (per ha) l/s	Peaking Factor	Peak flow (per ha) l/s	Average Daily flow m³/d
Industrial Catchment 1	44,845	1.3	58297.98	0.09	5	0.45	58.29798
Industrial Catchment 2	33,389	1.3	43406.22	0.09	5	0.45	43.40622
Total							**101.7042**

3.2.2 AREA 6 – RESIDENTIAL

Equation 4: Potable Water Demand Residential

Proposed Water Flow Calculation using Lot Occupancy Method							
Description	Waste Water flow	Conversion Factor	Potable consumption l/d	Average flow (per ha) l/s	Peaking Factor	Peak flow (per ha) l/s	Average Daily flow m³/d
Residential Lots 1 - 46	49,533	1.3	64393.29	0.14	5	0.68	64.39329
Residential Lots 47 - 88	48,551	1.3	63115.65	0.14	5	0.68	63.11565
Total							**127.50894**

3.3 IDENTIFIED CHALLENGES – PROPOSED OPTIONS

- Connection of Re-Zoned Land. Mott MacDonald's technical memo has highlighted that network upgrades will be required for any additional development in the Kimihia Reservoir catchment, as there are existing issues with the filling rate of the reservoir. This work is currently included in the Councils draft LTP to occur in 2026. Once the upgrade proposed for 2026 have been undertaken Area 2 (Residential) will be able to be sufficiently serviced with water supply for potable and fire fighting supply. However, firefighting flows for Area 1 (Industrial) will still be insufficient, this issue is discussed below.
- Fire Fighting Flows to Area 1. As highlighted by Mott MacDonald, either a reservoir with fire pumps or upgrading the pipes on East Mine Road is required to meet the FW3 fire standard. The placing of a 355mm pipe along Great South Road will be required if the Ohinewai Development goes ahead and this may occur between 2025-2028. This may allow the industrial land to meet its firefighting requirements without the need for a reservoir to be constructed.

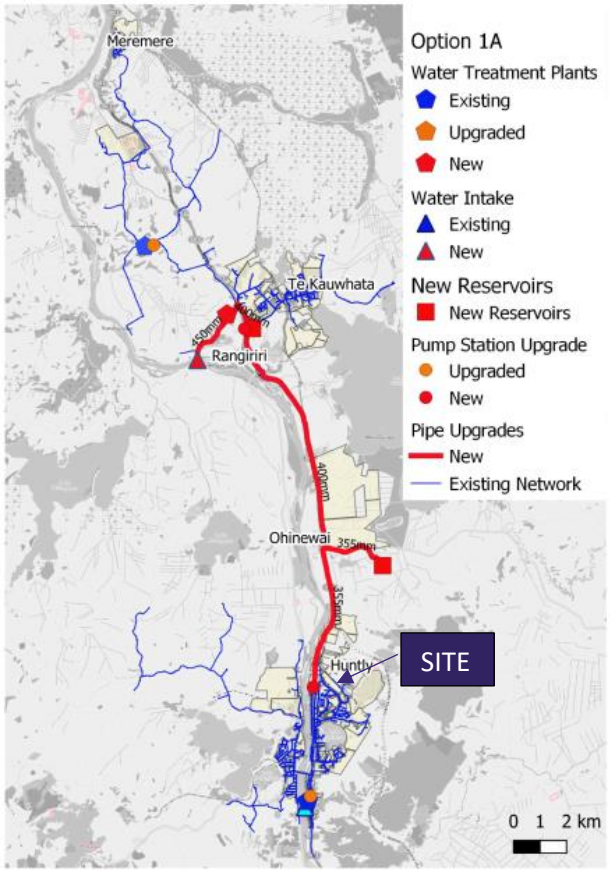

Figure 8: Huntly North Water Supply Infrastructure

Source: Mid-Waikato Water and Wastewater Servicing Strategy June 2020

4. CONCLUSION

4.1 WASTEWATER

4.1.1 AREA 1 – INDUSTRIAL

For connection to council network, WWPS77 has available capacity to take wastewater from this site, this would need to be confirmed again at time of detailed design.

In the draft long-term plan upgrades to the wastewater treatment plant that are planned to occur in 2028, will allow the additional flows from this development to be serviced.

4.1.2 AREA 6 – RESIDENTIAL

The connection of the proposed development will have a negligible effect on the Council infrastructure and there is current capacity at the WWTP.

Connecting the development to the council network should not cause any issues within the gravity network, however, confirmation of the capacity of the East Mine Road pumpstation (WWPS65) would be required at the time of detailed design and a new pump station may also be required in this development to service some of the catchment.

4.2 WATER

4.2.1 AREA 1 – INDUSTRIAL

The connection of the proposed development will impact the Council infrastructure, however any further growth within the Kimihia Road Reservoir catchment would also exasperate these effects caused by the reservoir outflow exceeding the filling rate in a peak day event. Following the upgrading of flows to the Kimihia Road Reservoir options exist as shown by Mott Macdonald to service this land for normal demand and fire flows and the effects can be considered minor.

4.2.2 AREA 6 – RESIDENTIAL

Following the upgrades to the filling rate of the Kimihia Road Reservoir, no further upgrades are required to service this development.

4.3 STORMWATER

A separate Stormwater Management Report has been prepared to address the stormwater matters of the proposed rezoning. The report indicates that the sites subject to this rezoning request can be serviced within the local, regional, and national requirements regarding stormwater management at the time of development.

4.4 CONCLUSION AND RECOMMENDATIONS

It is recommended that Area 6 be developed prior to Area 1, should the rezoning request be acceptable to Council. Engineering solutions exist that means this land can be serviced with upgrades to the Huntly water and wastewater network.

5. REFERENCES

- Burton, D., & Chau, C. (2020). *Partial model update in Huntly & East Mine Road development query.* Auckland: Mott Macdonald.
- Hamilton City Council. (May 2018). *Regional Infrastructure Technical Specification.* Hamiltom: Waikato Local Authority Shared Services.
- Mott MacDonald , Stantec. (2020). *Mid-Waikato Water & Wastewater Servicing Strategy.* Auckland: Mott MacDonald , Stantec.
- New Zealand Standard. (2010). *Land Development and Supdivision Infrastucture: NZS 4404:2010.* Wellington: Standards New Zealand.

APPENDIX A - MOTT MACDONALD PARTIAL MODEL UPDATE

MOTT MACDONALD

Technical Memo

Project:	Partial model update in Huntly & East Mine Road development query		
Our reference:	422398		
Prepared by:	David Burton & Chhan Chau	**Date:**	22 October 2020
Approved by:	Julie Plessis	**Checked by:**	Tom Lecomte
Subject:	Water supply and wastewater infrastructure assessment		

1 Background

A private plan change for land has been proposed on the northern side of Huntly. Mott MacDonald (MM) was commissioned by Bloxam Burnett Oliver (BBO) to assess the impact of the three developments on the water supply (WS) and wastewater (WW) networks, within the township. The results of the evaluation are detailed in this study, consisting of three main stages for both WS and WW:

- Model Update
- System Performance Assessment
- Options Analysis

2 Network update

Due to time restrictions, both the WW and WS networks were updated exclusively in the area that would affect the proposed development, which is situated in the north of Huntly.

2.1 Water supply model update

The Current Peak Day (CPD) model was compared with the latest GIS shapefiles, which were sourced from Watercare (April 2020). The following methodology was used to determine:

- The new assets in the GIS that did not already exist in the model;
- the abandoned assets which are no longer operational;
- The assets with differing properties between the latest GIS and current model.

The Identification number in the latest GIS for each asset (pipes, valves, hydrants, nodes and junctions) was compared to those in the current hydraulic model. This gave an initial grouping of the new, abandoned and missing assets;

1. The areas in the GIS that showed differences to the model were inspected and a sense check of the different assets was made to determine the correct connection to the existing model;
2. The ‘geometrylinedata’ of all new pipelines were then snapped to the chosen connection points and split on the new overlapping nodes;

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3. Shapefiles for each pipeline, junction, valve and hydrant were then inserted into the model and assets determined to be abandoned were unmodelled;
4. Relevant data for each of the updated assets (including name, description, diameter, installation date, material and elevation) was inserted;
5. Existing pipes with matching identification numbers but different diameters were updated to match those within the GIS data.

A summary of the total number of updated assets is shown in Figure 2-1 and Table 2-1 below:

Figure 2-1: Updated network from GIS 2020

Table 2-1: Breakdown of the updated assets within the WS network

Modelled links	
Pipelines	59 Individual Pipes 2.8 Km total length updated
Modelled Nodes	
Junctions	2
Valves	16
Hydrants	15

2.2 Wastewater model update

The latest Waikato GIS data was extracted and compared with the model assets. Although minor upgrades had been observed, they are not located near the development and would not affect the modelling results. As such, the non-relevant upgrades were not updated in the model and are not considered in this study.

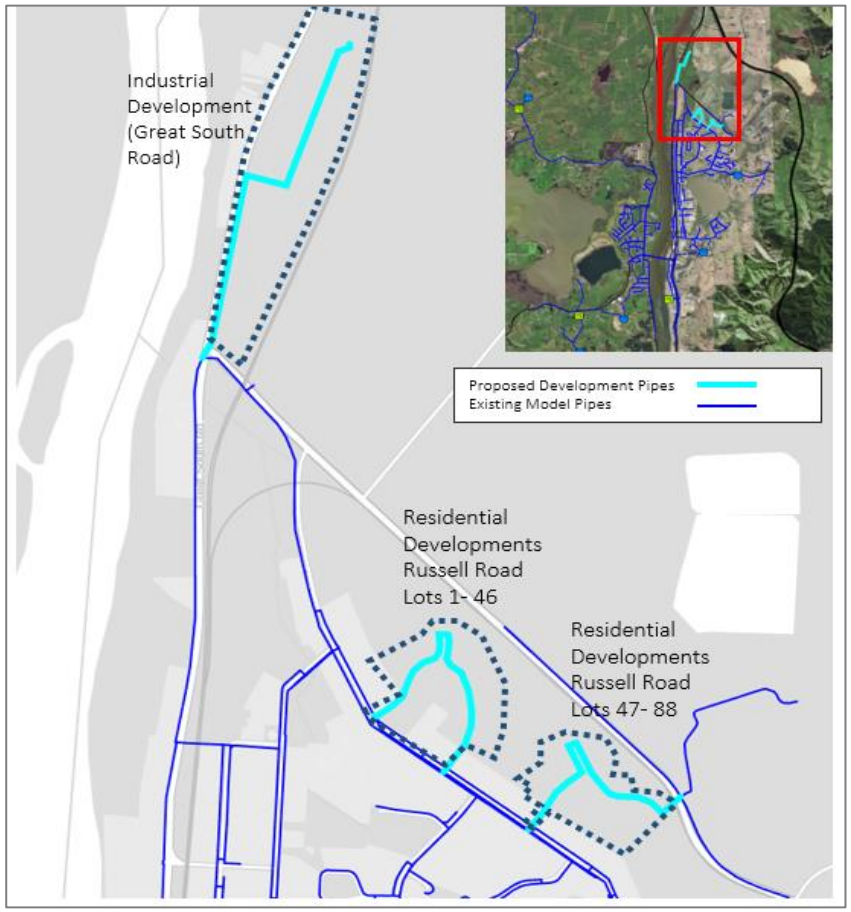
The properties located along State Highway 1 discharge into a pump station (PS) at the North End motel. Previously, the motel PS had not been included in the previous modelling, therefore, was added for this study. Additionally, the previous model only featured 1 Person Equivalent (PE) within this catchment. The population serviced by this PS has been increased from 1 PE to 80 PE, to account for the motel and the twenty-two properties observed via satellite imagery.

3 Developments location

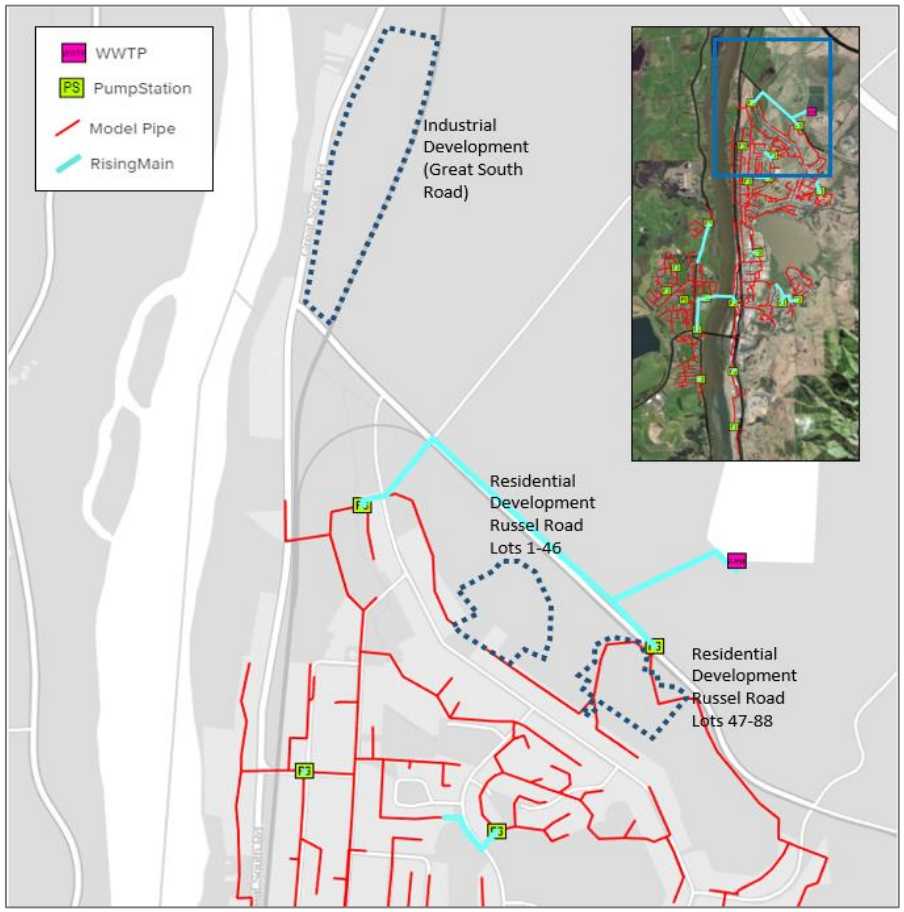
The location of the proposed development site is shown in Figure 3-1, alongside the WS and WW networks.

Figure 3-1 – Development locations within their relevant network

WS network



WW network



4 Assumptions

The demand and discharge were respectively calculated for WS and WW based on the number of lots referenced in the Regional Infrastructure Technical Specifications (RITS), which was last updated in May 2018. The calculation details are presented in the subsequent section.

4.1 Water supply: demand calculations

The WS demand of the proposed development has been calculated based on a per capita flow of 260 litres/day/person and a peaking factor of 5, as specified in the RITS. The population per hectare (ha) for the residential and industrial developments were 45 and 30, respectively. The demand calculations are summarised in Table 4-1 below:

Table 4-1 - Demand calculation

Demand Calculation	Industrial Development (Great South Road 1)	Residential Development (Russell Road Lots 1- 46)	Residential Development (Russell Road Lots 47- 88)
Total Area (ha)	13.0	5.5	5.4
Population per Hectare	30	45	45
Total population	391	248	243
Peaking Factor	5	5	5
Average flow rate (l/p/day)	260	260	260
Average flow (m^3/day)	**101.6**	**64.4**	**63.1**
Instantaneous Peak Flow (l/s)	**5.9**	**3.7**	**3.6**

4.2 Wastewater: discharge calculations

The Wastewater discharge was calculated based on the following assumptions:

- Population Equivalent/ha: **45** (refer to RITS)
- Average daily flow (litres/person/day): **200**
- Infiltration allowance (litres/ha/day): **2,250**
- Surface Water (litres/ha/day): **16,500**

The Average Daily Flow (ADF) or Average Dry Weather Flow (ADWF) and Peak Wet Weather Flow (PWWF) were calculated based on the equations respectively shown in Figure 4-1 and Figure 4-2.

Figure 4-1 Average daily flow (ADF)

Average Daily Flow (ADF)

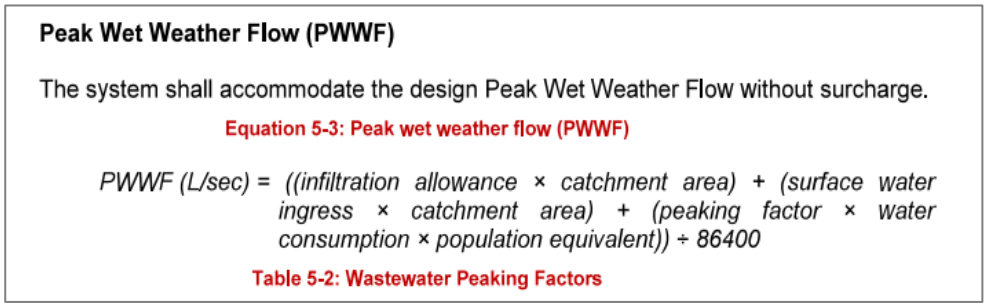
The Average Daily Flow is calculated as the sum of the infiltration allowance and the daily wastewater flow:

Equation 5-1: Average daily flow (ADF)

$$ADF\ (m^3/day) = (infiltration\ allowance \times catchment\ area) + (water\ consumption \times population\ equivalent)$$

Source: RITS (2018)

Figure 4-2 Peak wet weather flow (PWWF)



Source: RITS (2018)

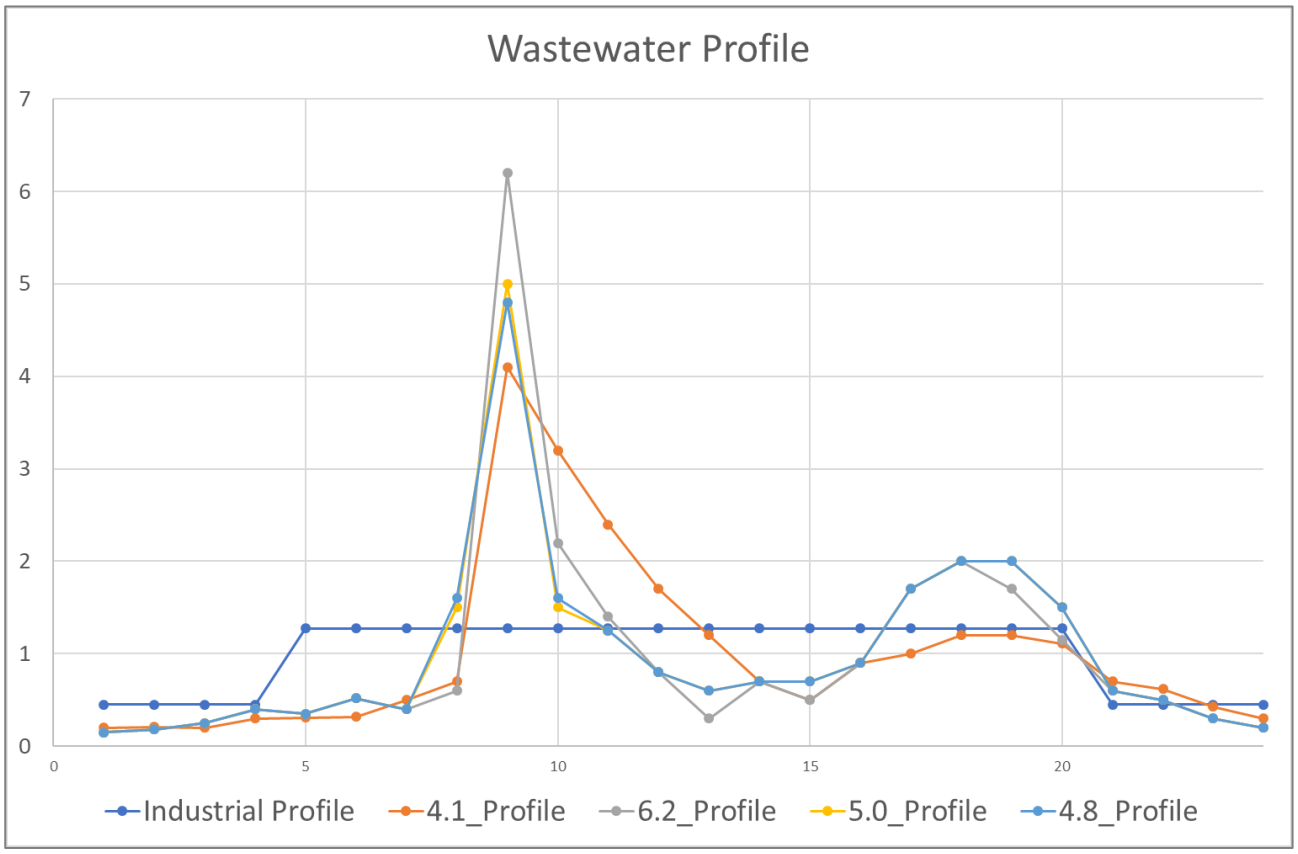
The Industrial Development was split into two zones (see Figure 4-6) and the residential area was split into four zones (see Figure 4-7). The corresponding discharge for each of the six zones has been summarised in Table 4-2 below.

Table 4-2 Wastewater discharge calculation

Area (ha)	Lots	Type	Population	ADWF (l/s)	DWF peaking factor	Wastewater Profile	WWF (l/s)
4.1	1 to 25 – 41 to 46	Residential	185	0.53	4.1	P4.1	2.64
1.4	26 to 40		63	0.18	6.2	P6.2	1.21
3.0	47 to 88		135	0.39	4.8	P4.8	2.15
2.4	58 to 79		108	0.31	5	P5	1.77
5.6	19 to 27	Industrial	168	0.53	4	R1	2.77
7.5	1 to 18		225	0.72	3.7	R1	3.55

The standard residential pattern was applied to all four residential areas, using the corresponding peak factors listed in the table above and is based on the area in ha. A Standard Industrial pattern was also applied to the industrial area, adhering to the same methodology. Figure 4-3 shows the wastewater profile used for the industrial and residential areas.

Figure 4-3 Wastewater profiles



4.3 Proposed network and connection points

4.3.1 Water supply connection points

The following assumptions were made regarding network connectively to the WS network:

- The proposed industrial development will be serviced via the existing 100mm ID watermain, on the corner of Great South Road and East Mile Road.
- Lots 1 - 46 of the proposed residential development will be serviced via two connection points on the 150mm ID watermain, along Russell Road.
- Lots 47 - 88 will be serviced via one connection point on the 150mm ID main on Russell Road and an additional connection point on the 63mm ID watermain on East Mine Road.

The layout of the proposed pipes connected to the industrial and residential developments are shown in Figure 4-4 and Figure 4-5, respectively.

Figure 4-4: Industrial development: connection point location

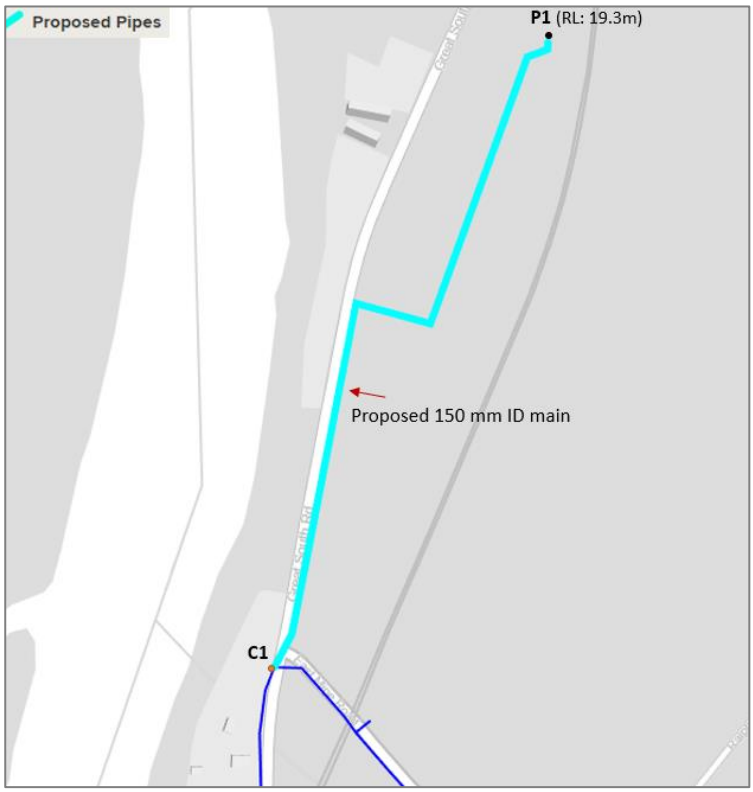
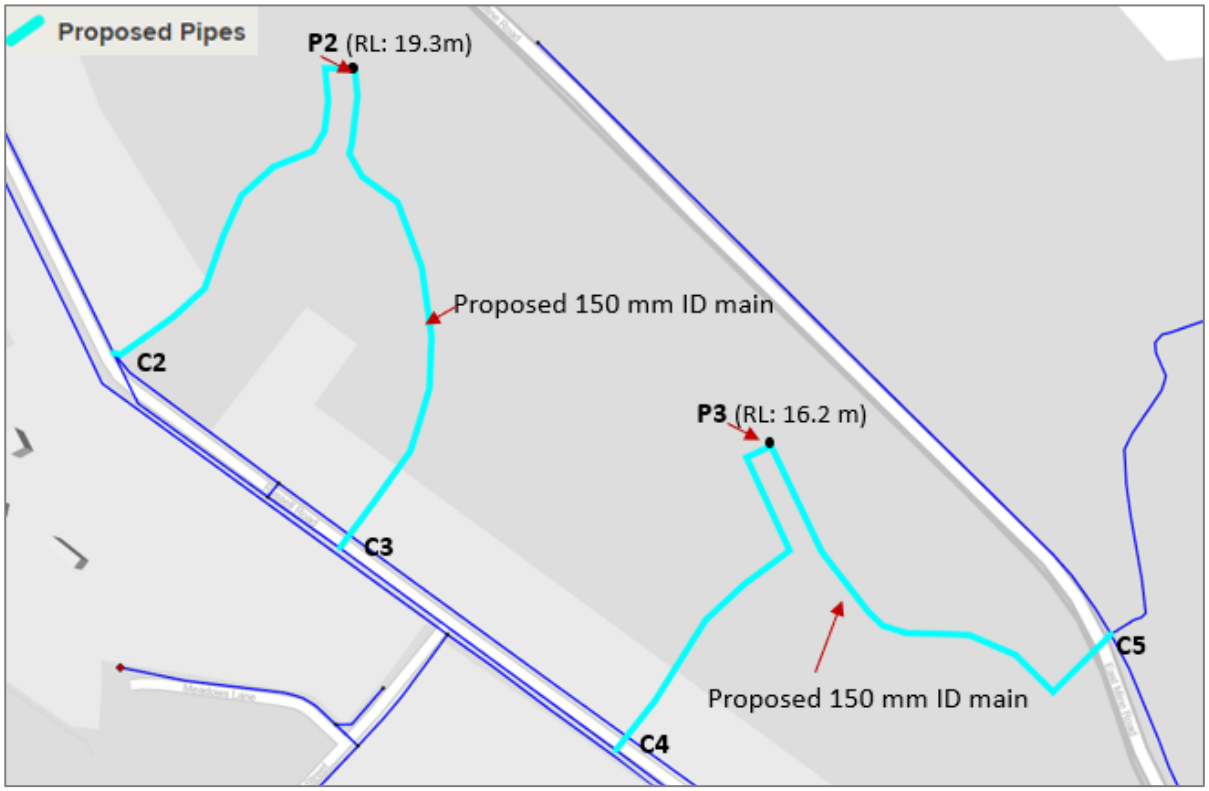


Figure 4-5: Residential development: connection point location



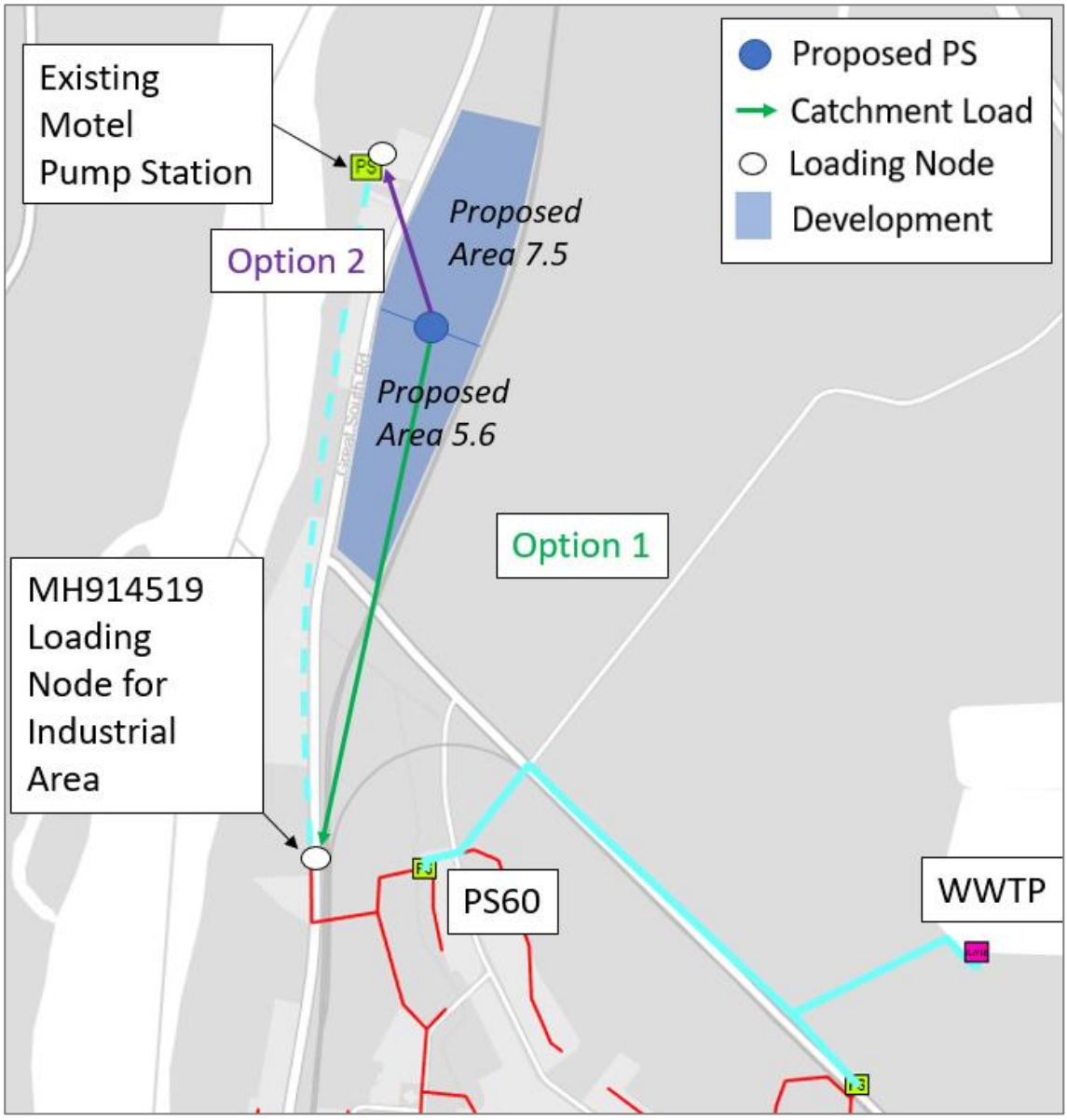
4.3.2 Wastewater connection points

The GIS network indicates a PS at North End Motel, unfortunately, information regarding the pump rate and storage tank volume is unknown. Assumptively, the PS services the motel and the 22 lots along Great South Road.

The Motel PS discharges flow into manhole 914519, which is located at 34 Great South Road. This manhole has been assumed as the loading node for the industrial flows (option 1) since the GIS shows no other WW manhole near the proposed site. If more information is available regarding the motel PS, this could also be considered as an alternative loading node (option 2). Continually, this could be confirmed by providing the pump rate and the storage tank volume and comparing them to the peak discharge of the development.

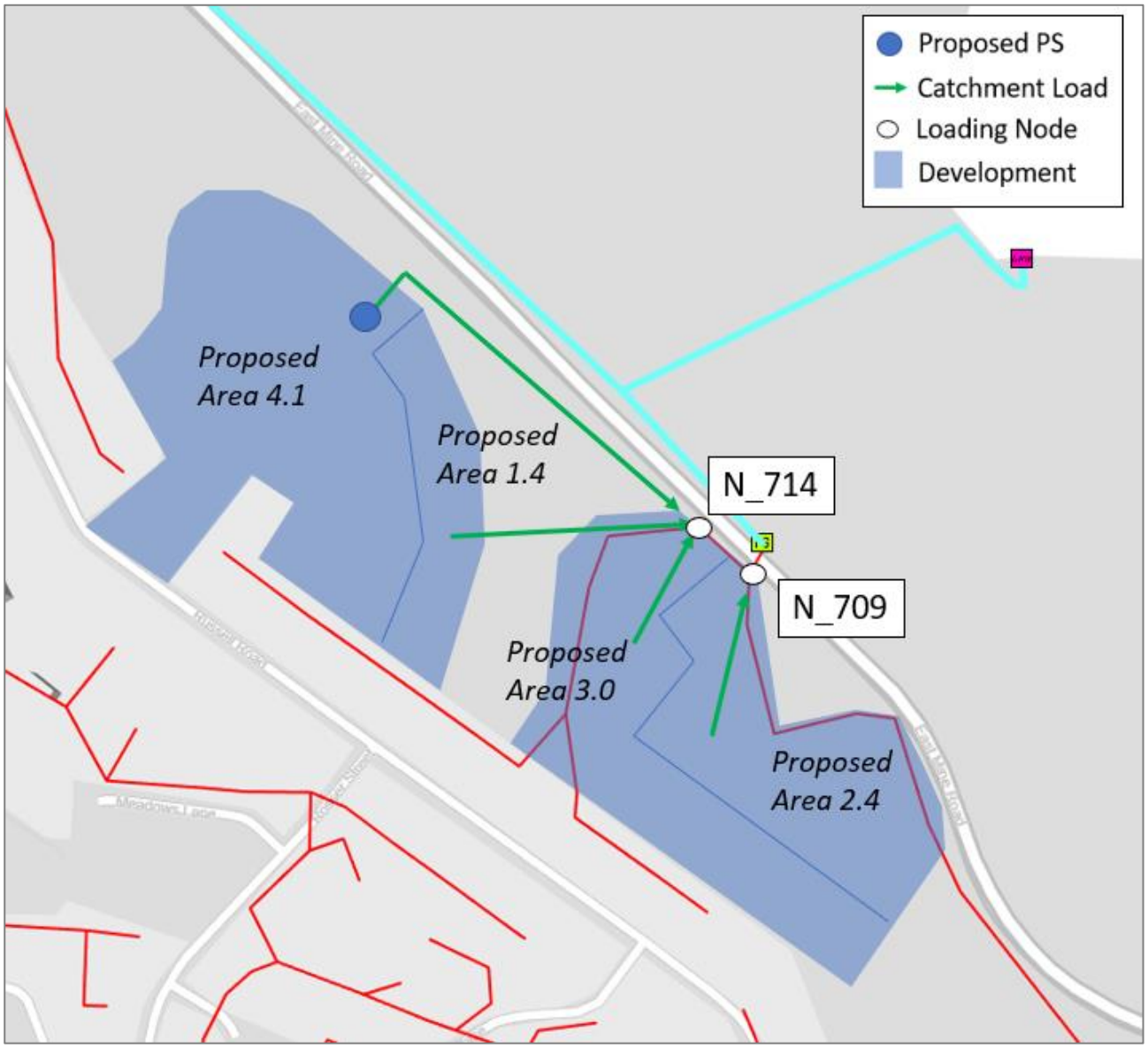
Flow from manhole 914519 gravitates towards PS60, located at the back of 195 Russell Road. PS60 conveys flow to the Huntly Treatment Works, which is located at East Mine Road.

Figure 4-6: Industrial development – wastewater load



The residential development loading nodes were indicated on the as-built drawings, provided by BBO. Area 4.1 and 1.4 are serviced by a proposed PS, which conveys the flow towards manhole N_714. In this study, the internal network was not modelled and both areas were directly loaded onto this manhole. Area 3.0 gravitates toward manhole N_714 and Area 2.4 discharges into manhole N_709.

Figure 4-7: Residential development wastewater load



4.4 Scenarios investigated

Both the proposed residential and industrial developments were incorporated into the Peak Day (PD) 2014 scenario. The impact of the proposed development was assessed by comparing the system performance pre and post integrating the Huntly development into the relevant scenario.

For the WW WWF scenario, a 5-year Average Recurrence Interval (ARI) was recorded on 24th July 2012; this event was used for the wet weather flow simulation.

The following WS and WW scenarios were simulated using the updated GIS 2020 networks:

Water supply:

- PD 2014: Pre-Development
- PD 2014: Post-Development

Wastewater:

- DWF: Pre-Development
- DWF: Post-Development
- WWF: Pre-Development (5-year ARI)
- WWF: Post Development (5-year ARI)

5 System Performance Assessment

5.1 Water supply

5.1.1 System performance analysis criteria

The system performance within Huntly was assessed against the levels of service (LOS), as per the RITS and is detailed below:

Table 5-1: System Performance Criteria

Criteria	Category	Threshold (peak Day)
Pressure	Minimum pressure Maximum pressure	200Kpa (20m) 1000kPa (100m)
Main head losses	Maximum head losses	5m/km for DN⩽150mm * 3m/km for DN⩾200mm *
Fire flows	Minimum residual pressure	10m during fire flows
	Fire Flow	Fire flows (informed by SNZ PAS 4509:2008)

***Standards from NZS4404**

5.1.2 System performance analysis within the proposed development

As part of the system performance analysis, the demands associated with the proposed developments were added to the PD 2014 scenario. The results have been analysed, to verify whether levels of service can be maintained within the proposed development, both with and without the network modification. Table 5-2 summarises the results, both in terms of minimum pressure and maximum head losses, at the locations of the proposed developments.

Table 5-2 – System performance analysis within the proposed development

Location	Minimum Pressure (m)	Maximum Unit Head Loss of Proposed Pipe (m/km)
P1 (State Highway 1)	45.0	1.0
P2 (Russel Road)	39.0	0.1
P3 (Russel Road)	42.2	0.3

As per the RITS, WS design standards require the residual pressure to be 200kPa (20m) at the supply point. As shown in Table 5-2, the desired LOS can be met within each of the proposed developments.

The required firefighting capacity for the proposed development is calculated by simulating a discharge of 25 l/s (equivalent to FW2) at a hydrant proximal to the residential development. Similarly, 50 l/s (equivalent to FW3) was simulated for industrial development. The firefighting demand was added to the model, during a

diurnal time where the demand is equal to 60% of the peak demand. The residual pressure predicted at the hydrant is summarised in Table 5-3:

Table 5-3 - Firefighting Capacity

Location	Residual pressure within the development (m)	
	FW2	**FW3**
P1 (State Highway 1)	-15.0	-147.0
P2 (Russel Road)	32.7	Not required
P3 (Russel Road)	34.1	Not required

The required residual pressure during fire flow is 100kPa (10m). As shown in Table 5-3, the model predicts that residential fire flow requirements can be met for the two residential developments. The industrial development, however, does not meet either FW2 or FW3 requirements partially due to large head losses throughout the 100mm watermains along Great South Road and Russell Road. This result is subject to onsite confirmation from a hydrant test.

5.1.3 System performance analysis within the existing network

The section below describes the results of the system performance, within the remainder of the WS network. Results have been analysed to assess the effect of the proposed development upon the remainder of the network, during the PD 2014 scenario. Figure 5-1 shows the system performance results from pre and post-developments scenarios and the same information is tabulated in Table 5-4 and Table 5-5.

Figure 5-1:Exisiting network system performance results: pre and post-developments

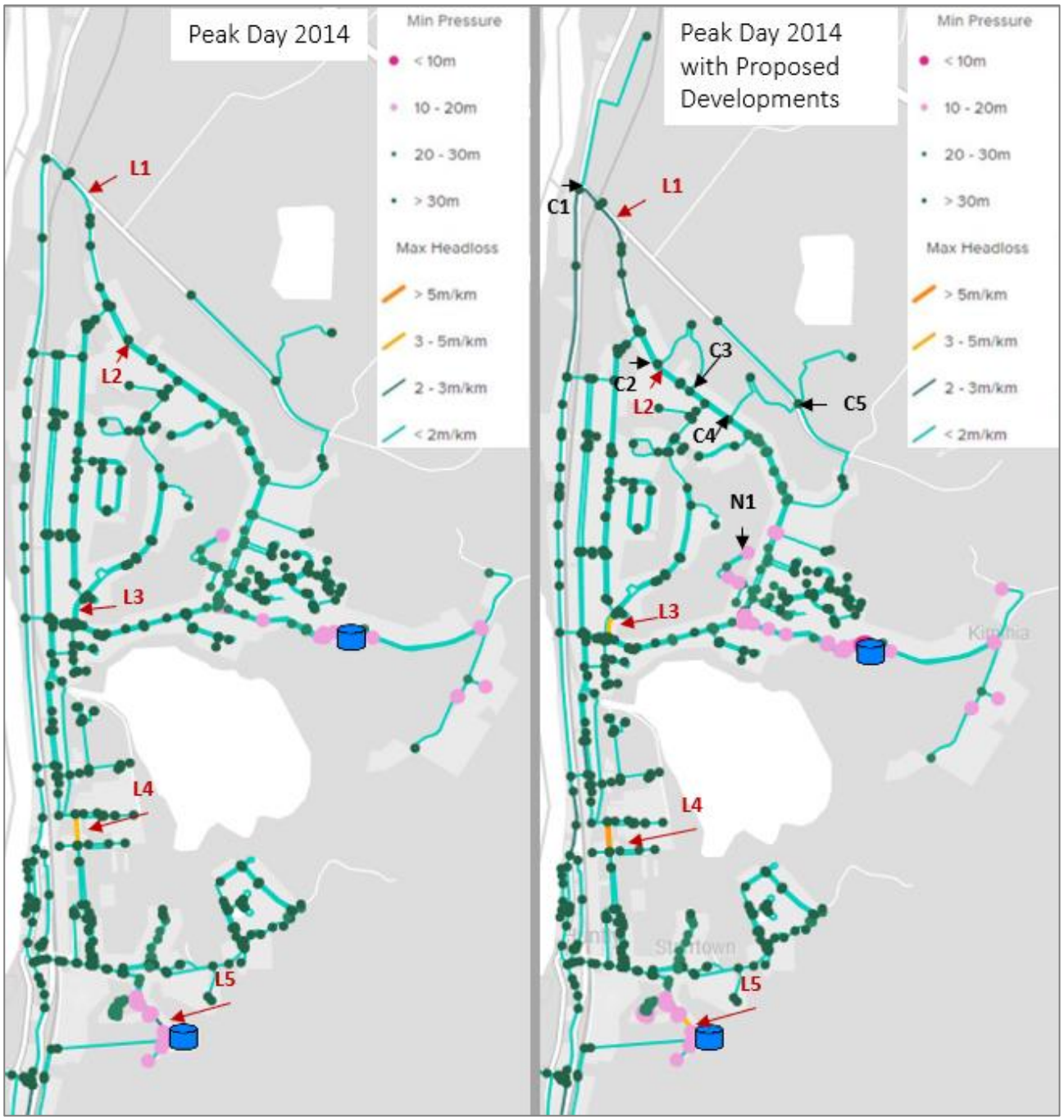


Table 5-4 and Table 5-5 show the minimum pressures at the developments' connection point C1-C5 and the maximum head losses in the pipes L1-L4, shown in Figure 5-1. Additionally, the minimum pressure predicted at node N1 was listed, as it shows pressure below 20m.

Table 5-4 – Minimum pressure

Points	Min pressure before development (m)	Min pressure after development (m)	Pressure drop (m)
C1	50.6	45.5	5.1
C2	38.6	35.5	3.1
C3	33.8	30.7	3.1
C4	33.8	30.8	3.0
C5	50.5	47.5	3.0
N1	19.7	17.4	2.3

Table 5-5 – Maximum head losses

Locations	Max head losses before development (m/km)	Max head losses after development (m/km)	Head losses increase (m/km)
L1 (100mm East Mine Road)	0.3	2.5	2.2
L2 (150 mm Russell Road)	0.1	0.1	0
L3 (150 mm Rosser Street)	1.5	3.7	2.2
L4 (100mm William Street)	4.1	5.9	1.8
L5 (200mm Upland Road)	2.1	3	0.9

As shown in the figures and tables above, the proposed developments are predicted to have a significant impact on the WS network, both in terms of pressure and head losses. The results show a maximum pressure drop of 5.1m at the proposed industrial development (connection point P1) under the PD 2014 scenario. Bearing in mind the required LOS is 20m (informed by RITS), the minimum pressure predicted at Point N1 decreases from 19.7m to 17.4m.

The drop in pressure across all points is partially due to the drop in levels at Kimihia Road Reservoir. Under current pumping conditions, the additional collective demand from all of the proposed developments causes the total outflow from the reservoir to exceed the filling rate.

The additional demand is predicted to have an impact on the existing L1, L3, L4 and L5 pipes, with a maximum head loss increase of 2.2m/km, post-development. Pipe L4 does not comply with the head loss requirement of 5m/km for DN≤150mm from NZS:4404.

5.2 Wastewater

5.2.1 Methodology

Pipe capacities were evaluated in two ways and are summarised below:

- Firstly, by comparing the modelled peak flow with the theoretical pipe full capacity (Q_{max}/Q_f).
- Secondly, by comparing the modelled peak depth with the pipe diameter (H_{max}/Diameter).
  - Peak flows above the theoretical pipe capacity indicate that the pipe is undersized and cannot convey the peak flows that are required through the network.
  - Pipe where capacity is exceeded show $Q_{max}/Q_f > 1$.
  - Other pipes still have capacity but will be surcharged due to downstream constraints ($Q_{max}/Q_f <1$ and H_{max}/Diameter > 1).

The table below summarises the different pipe states based on the pipe filling and capacity:

Table 5-6: Pipe States Criteria

Free Flow (Qmax/Qf < 1 AND Hmax/Diam < 1)
Downstream Constraint (Qmax/Qf < 1 AND Hmax/Diam > 1)
Pipe Capacity Constraint (Qmax/Qf > 1 AND Hmax/Diam > 1)

5.2.2 System performance results

The number of pipes in the network that are under capacity or surcharged due to downstream constraint is presented in Table 5-7

Table 5-7: Pipe state results in dry and wet weather flow (pipes number %)

Scenario	Free Flow Conditions	Pipe Capacity Exceeded	Surcharged due to downstream capacity
Dry Weather			
Existing	95.0%	1.1%	2.8%
Existing + Huntly Dev	95.2%	1.1%	2.6%
Wet Weather			
Existing	54.1%	14.4%	30.5%
Existing + Huntly Dev	54.7%	14.5%	29.8%

Regarding the pipe flow capacity and pipe surcharge, there is negligible difference between the pre and post-development scenarios, However, the overflow results suggest the development does have an impact on the existing network. Although two minor overflows locations are shifted, the overall overflow volume is predicted to increase. The total number of spill locations for the dry weather and the 5-year ARI storm events are presented in Table 5-8.

The predicted overflows from two manholes during the dry weather flow for scenario ‘Existing + Huntly Dev’ are located at PS68, Onslow Street. This area is not impacted by the development, therefore, this minor spilling (totalling at 2.6m^3) is likely to be related to model instability.

The model shows the Huntly developments will cause detriment to the downstream catchment, at manhole 914519, the proposed loading node for the industrial areas. The overflow volume increases from 15m^3 to 95m^3 during the WWF flow.

Figure 5-2: System performance results comparison (WWF scenario)

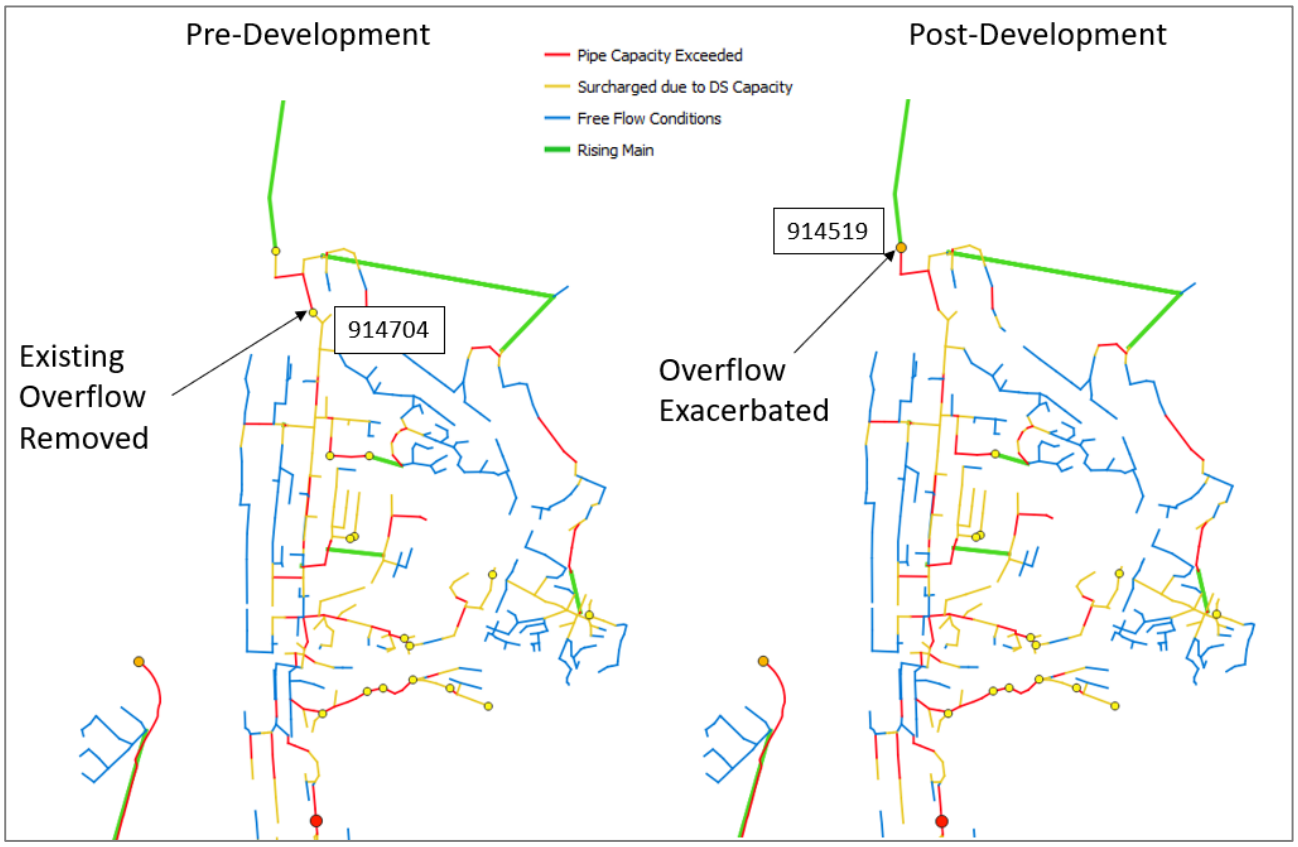


Table 5-8: Overflows

Scenario	Number of Overflows	Overflow Volume (m3)
Dry Weather		
Existing	0	0
Existing + Huntly Dev	2	1.6
Wet Weather		
Existing	28	837.5
Existing + Huntly Dev	26	892.5

The residential development is not affecting the network apart from a slight increase in water levels. Four long section profiles were also plotted along the closest pipelines to verify the effect of the development upon the maximum water levels.

Figure 5-3 to Figure 5-6 illustrate the maximum levels along the four sections highlighted in Figure 5.2 above.

Figure 5-3: Long section profiles overview

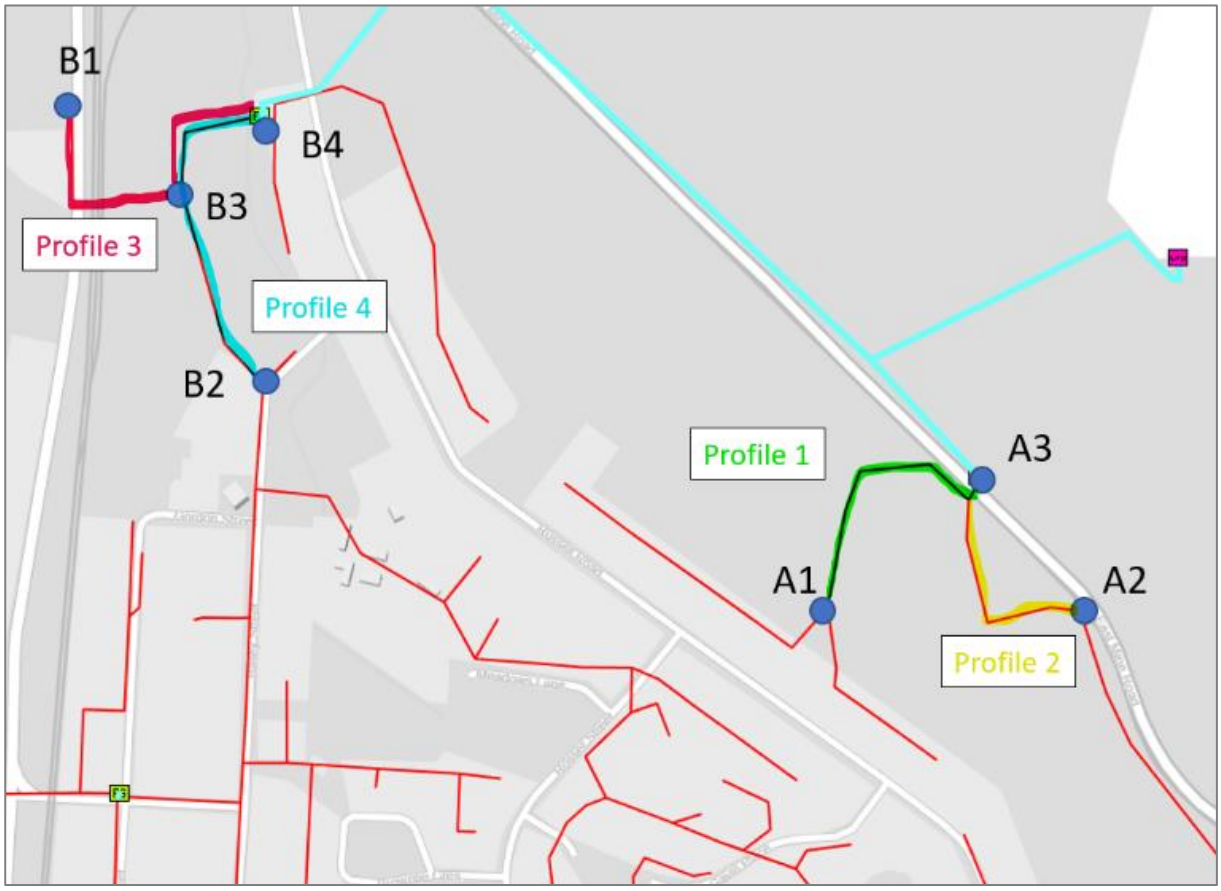
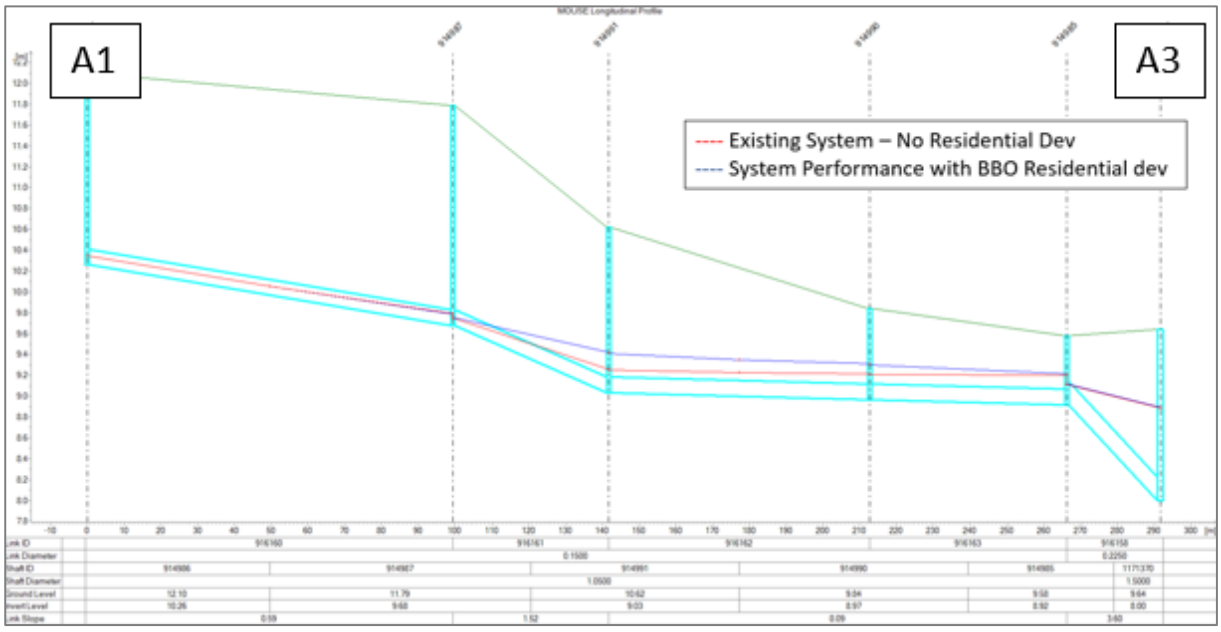


Figure 5-4: WWF system performance results – profile 1



The maximum water levels are predicted to increase slightly along the lower gradient pipeline, but, are not likely to cause any additional spilling.

Figure 5-5: WWF system performance results – profile 2

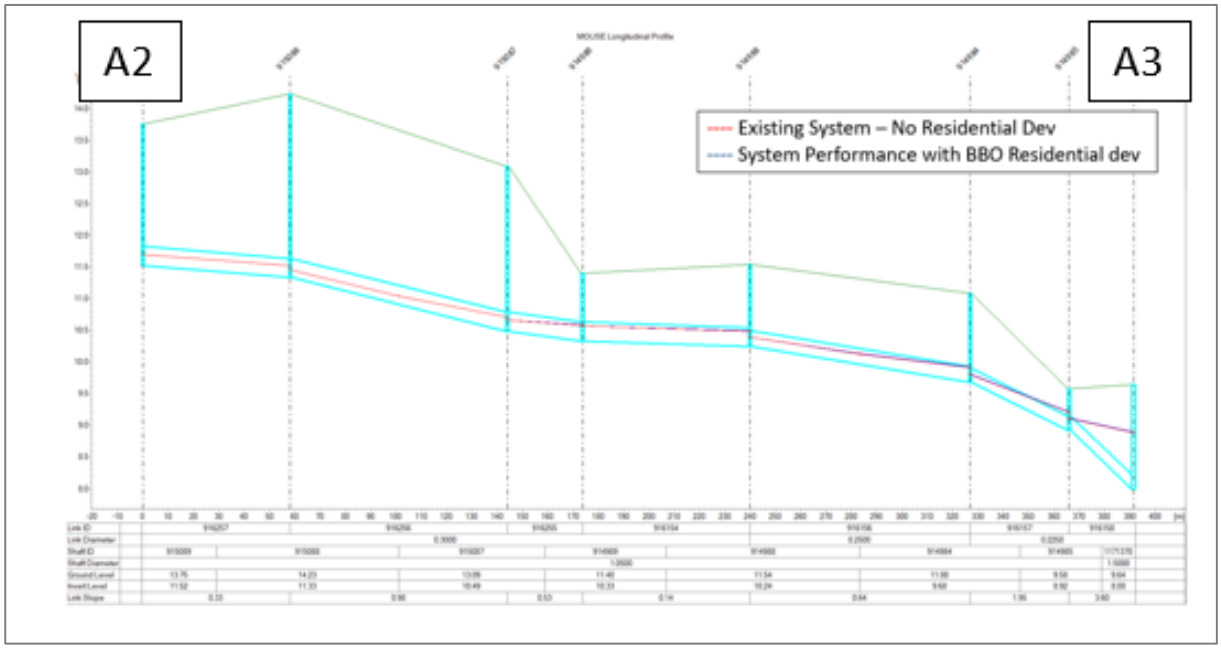


Figure 5-6: WWF system performance results – profile 3

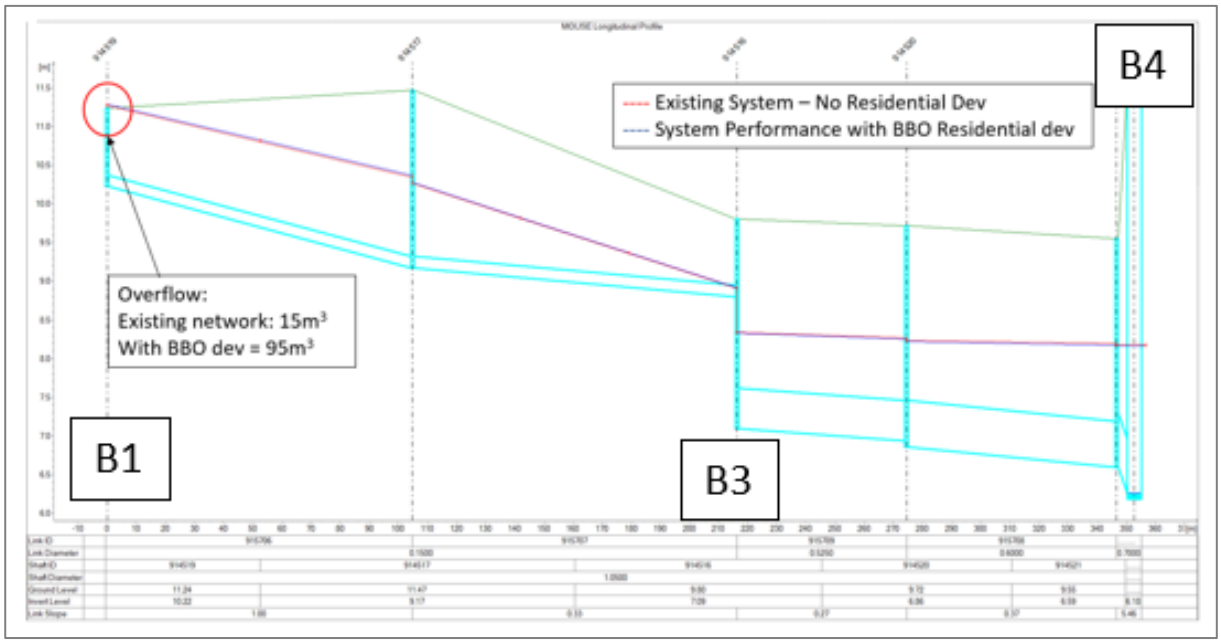
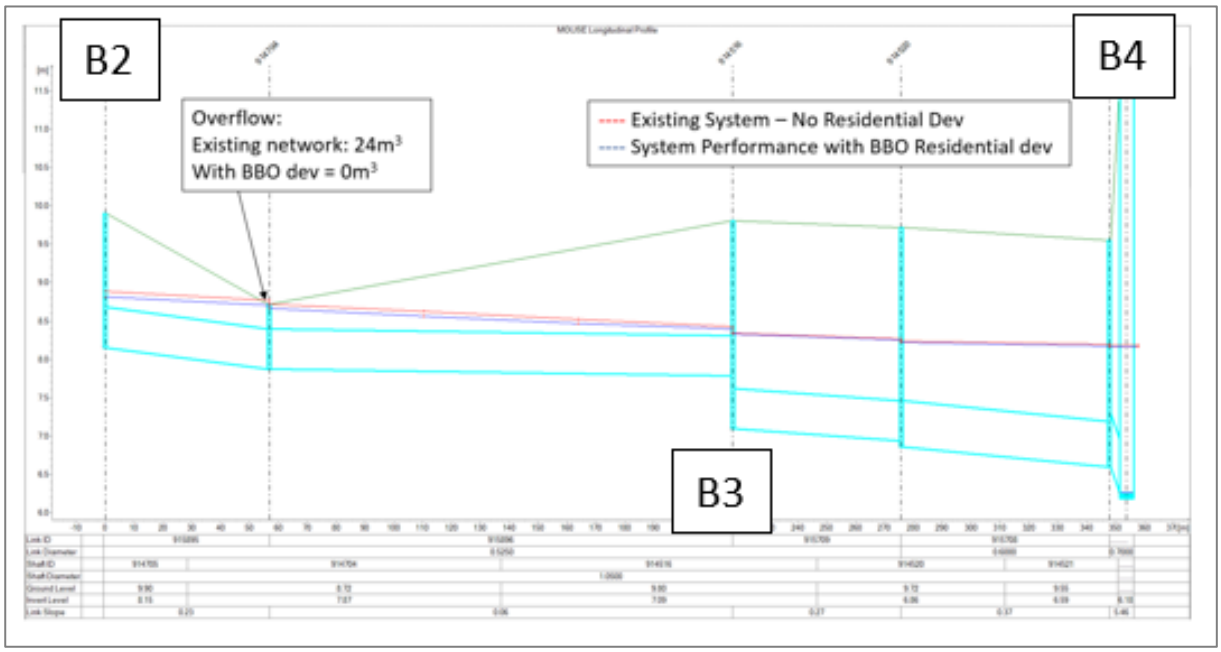
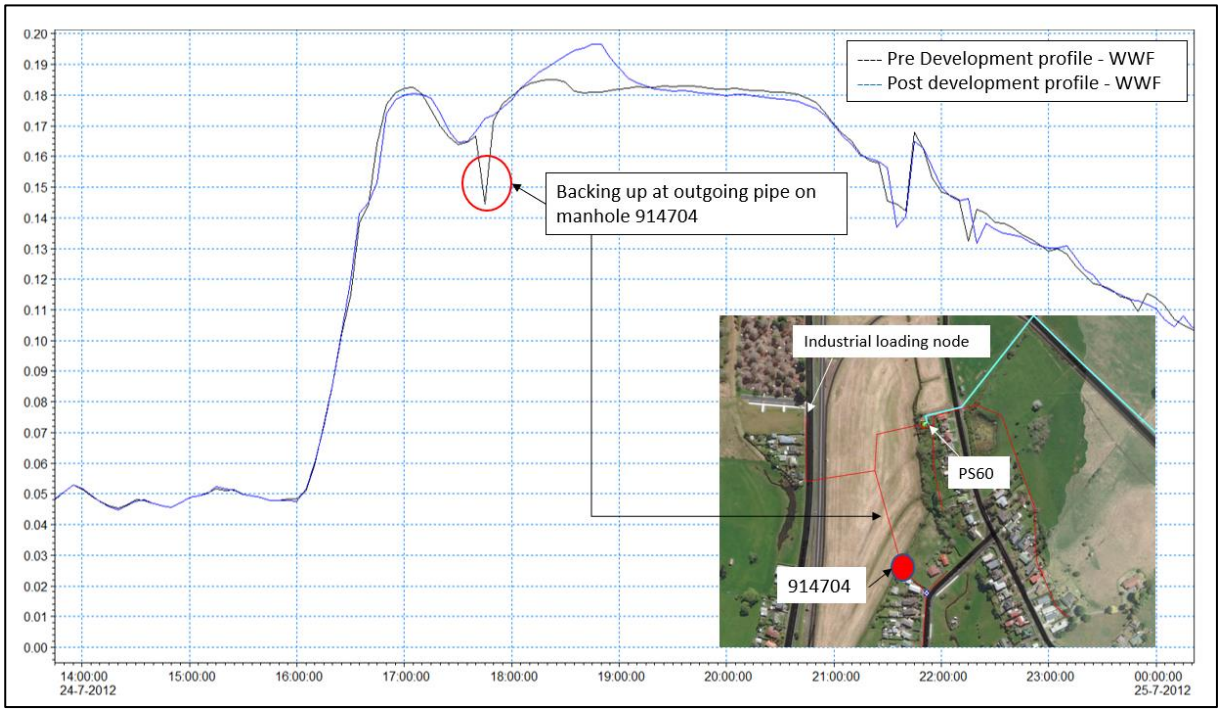


Figure 5-7: WWF System Performance Results – Profile 4



Within the existing system, an overflow of 24m³ has been predicted at manhole 914704, located in a field between Russell Road and Thermal Explorer Highway. However, the model predicts no overflow at this manhole post-development. The overflow is caused by downstream backflow. The model predicts that during the 'Existing + Huntly Dev' scenario, the pump PS60 starts operating sooner, which prevent backing up to manhole 914704 (refer to Figure 5-8).

Figure 5-8 WWF system performance results – discharge at the outgoing pipe on manhole 914704.



6 Option investigation

6.1 Water supply optioneering

The two major issues found as a result of the additional demand from the proposed developments are:

- High head losses throughout the 100mm ID mains along Great South Road and East Mine Road during fire flow modelling. This resulted in the proposed industrial development on Great South Road being unable to meet FW2 and FW3.
- Emptying of the Kimihia Road Reservoir, which is caused by the outflow from the reservoir exceeding the filling rate under current conditions, caused by the additional demand.

The subsequent sections outline the results of the options investigated, in aid of addressing the predicted issues with the WS network.

6.1.1 Upgrade of Great South Road watermain

Two pipe upgrade options were investigated to address the failure of FW3 requirements at the industrial development on Great South Road. The option layouts and results under FW3 flow modelling is shown in Figure 6-1 and Table 6-1.

Figure 6-1: Great South Road Main Upgrade Options

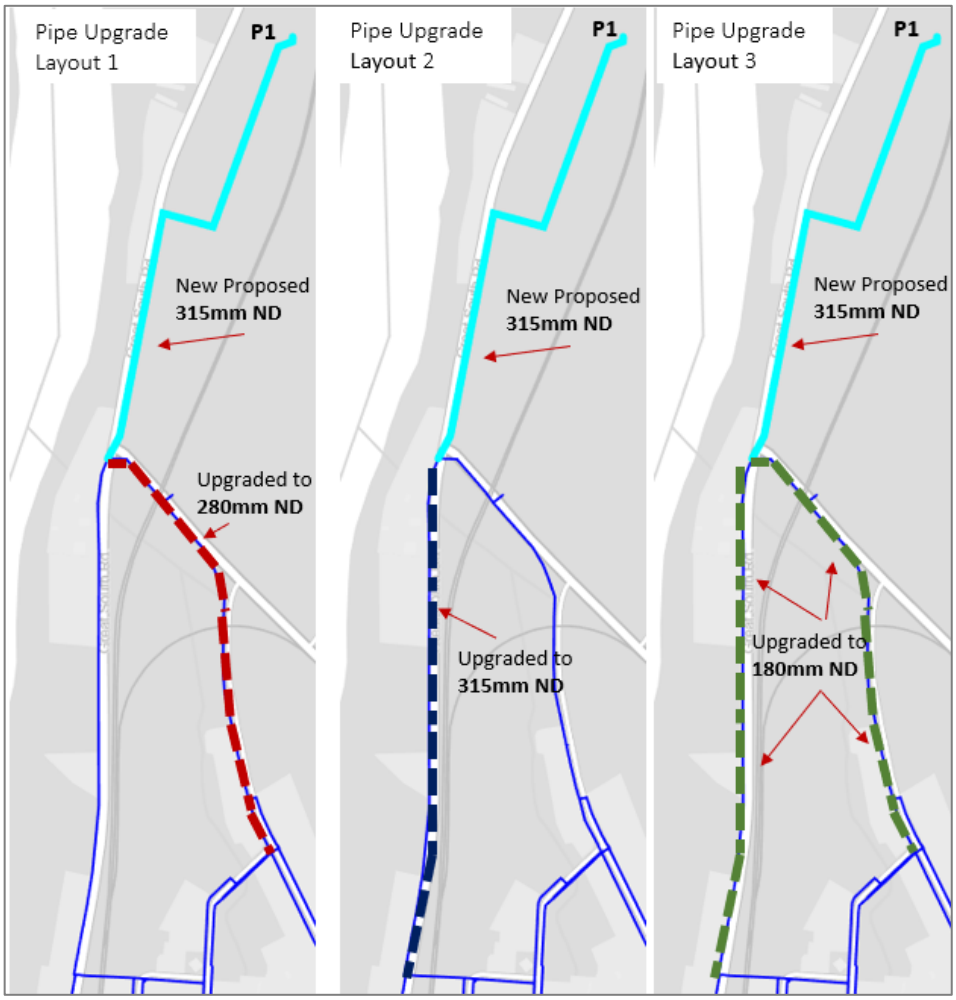


Table 6-1: Great South Road Main Upgrade Option Results

Point	Minimum pressure when considering the FW3 flows (m)			
	Pre upgrades	Layout 1	Layout 2	Layout 3
P1	-147.0	15.2	13.9	14.8

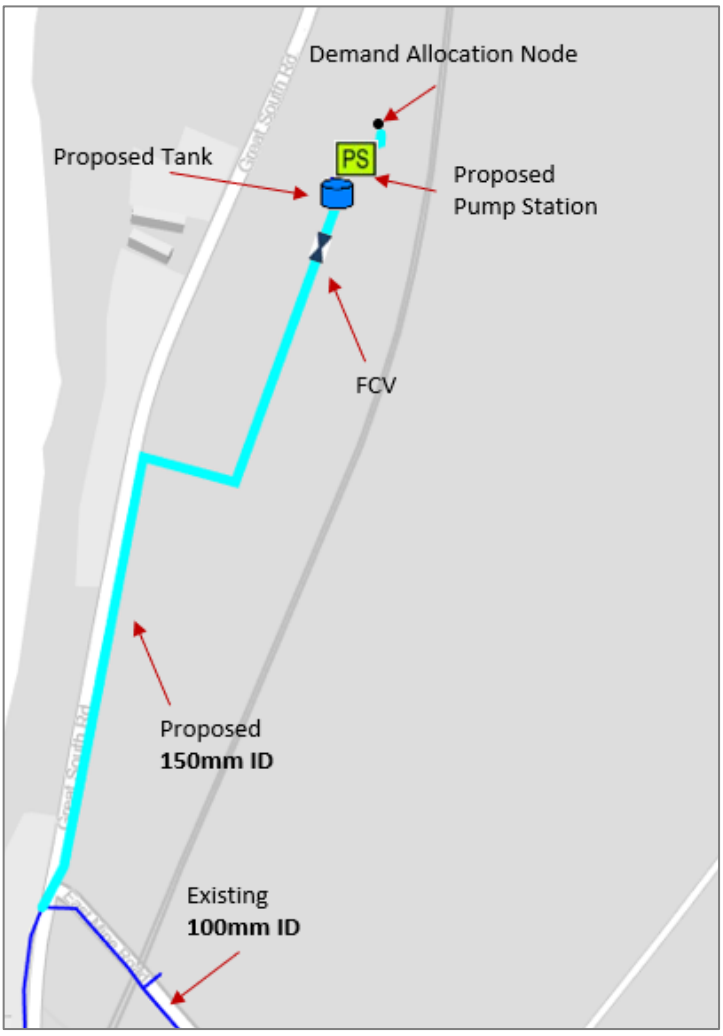
Concisely, the following upgrades should be considered (refer to Figure 6-1 and Table 6-1) :

- Layout 1: the minimum diameter required along East Mine Road and Russell Road is 280mm ND and 315mm ND within the new development.
- Layout 2: to achieve similar FW3 minimum pressure results, a 315 mm ND diameter watermain upgrade is required along Great South Road.
- Layout 3: the watermains along East Mine Road, Russel Road, and Great South Road, will require upgrades to 180mm ND.

Any of the three layout options allow the industrial development to meet FW3 pressure requirements.

6.1.2 Industrial development site tank and pump station

Figure 6-2: Industrial site: tank and pump station optional layout



The construction of a tank and PS at the industrial development site was investigated as an alternative option for addressing the FW3 flow requirement. An additional fire pump will be required to meet FW3 requirements. A flow control valve was set to the average flow rate of the industrial development, providing a constant flow into the proposed tank.

The minimum required specifications of the site reservoir and PS are provided in Table 6-2. The minimum tank volume was calculated based on 24-hour peak day flow. The required pump head was based on the RITS requirement of 20m minimum pressure.

Additionally, a fire pump will be required in to meet FW3 requirements (10m residual pressure in the network and 50l/s).

Importantly, although this option provides a solution to meet FW3 requirements at the industrial development site, it does not address the low-pressure issue caused by the Kimihia Rd Reservoir emptying. Therefore, it cannot be considered solely as a network solution and must be considered in conjunction with other options or upgrades.

Table 6-2: Industrial Development Site Pump and Tank Option Specifications

Minimum Required Tank Volume m^3	Pump Head (m)	Maximum Pump Flow (l/s)
590	25	5.9

6.1.3 Kimihia Road Reservoir: booster pump and zone delineation

To maintain the Kimihia Reservoir level, an option that considers the integration of a booster pump and delineating the zone was investigated. The proposed booster pump is shown in Figure 6-3.

A minimum of 180mm ND pipe is required for the proposed filling line to keep head losses below the required 3m/km. The PS minimum requirements are given in Table 6-3.

Figure 6-3: Kimihia Rd Reservoir Booster Pump Option

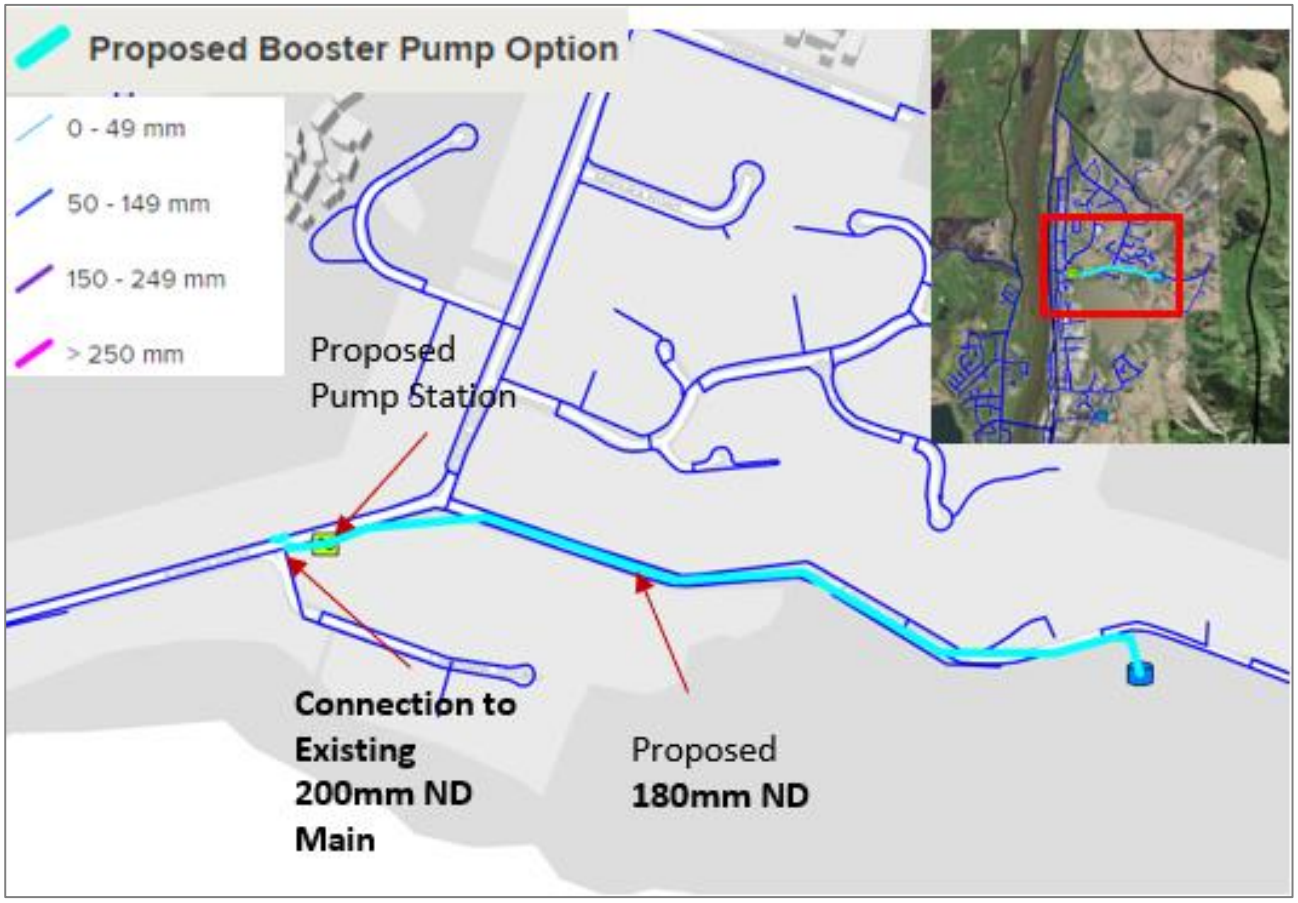
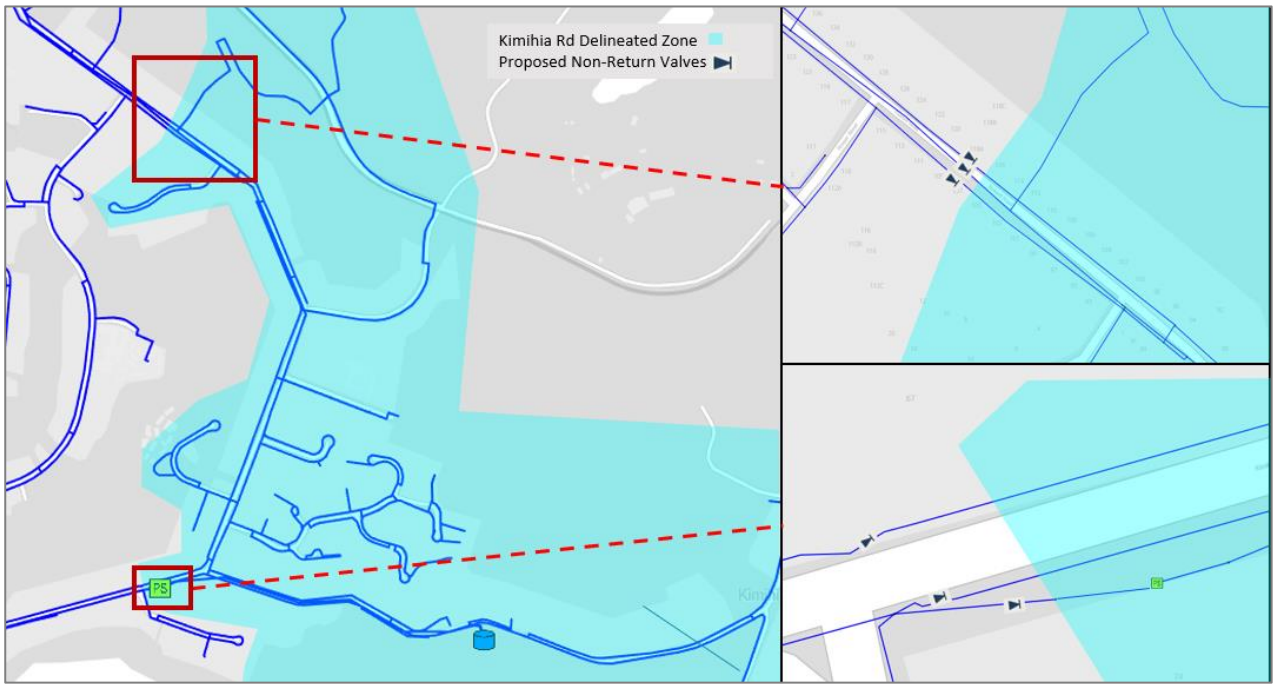


Table 6-3: Kimihia Rd Booster Pump Required Specifications

Filling Schedule	Head (m)	Flow (l/s)
24 Hour Filling	10	9

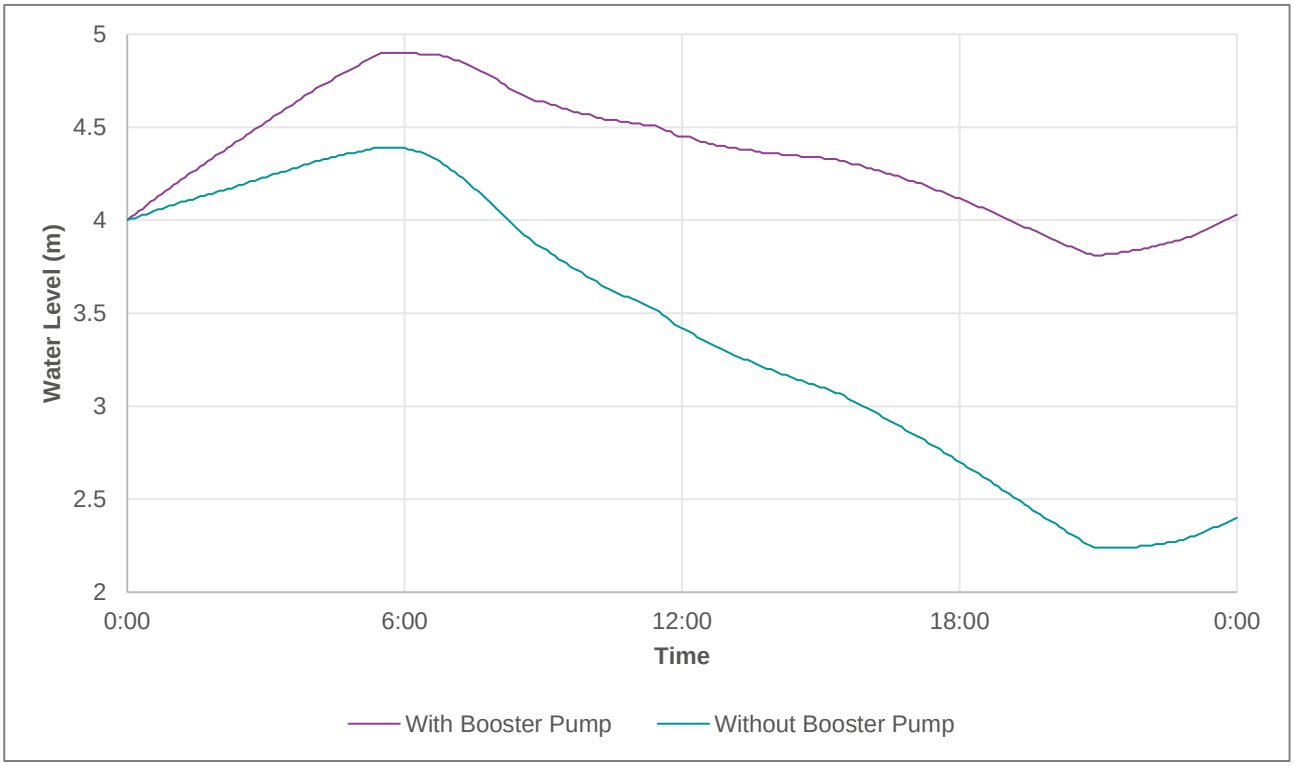
In combination with the proposed booster pump, a series of non-return valves (NRVs) were modelled to reduce the area supplied by the Kimihia Reservoir. The proposed NRVs are shown in Figure 6-4.

Figure 6-4: Proposed Non-Return Valves



The water level at Kimihia Road Reservoir pre and post-instalment of the proposed booster pump is shown in Figure 6-5. The combination of a booster pump and zone delineation is shown to prevent the Kimihia Rd Reservoir from emptying, which allows pressure to be maintained around the reservoir.

Figure 6-5: Booster Pump effect on Kimihia Road Reservoir Level



6.2 Wastewater optioneering

The GIS shows no wastewater network near the vicinity of the industrial area. The following options for the industrial areas should be considered:

- Different load allocations:
  - Connect to the Motel PS: further investigation is required, including the pump rate, rising main diameter and storage volume. This will provide greater clarity as to whether the PS can take the additional flow and would buffer the peak flow from the development.
  - PS connected directly to the Huntly treatment pond: this option will not cause any detriment to the current network. However, it is essential to investigate whether the Huntly treatment pond can take on the additional flow.
- Network Upgrade:
  - 225mm pipe upsizing from manhole 914519 to manhole 914516.
  - In addition to the pipe upsize, PS60 located downstream (DS) may potentially require an upgrade, as the current model shows a lack of capacity at this PS.

Importantly, the abovementioned options have not been tested in this study.

7 Conclusions and Recommendations

Both WS and WW models were updated to assess the impact of the development upon the network. The demand and discharge were respectively calculated and added to the models on both Russell Road and Great South Road.

7.1 Water supply

The system performance within the proposed development was assessed. The desired LOS for minimum pressure (20m) is predicted to be met within all the developments during the PD 2014 scenario. Head losses are predicted to remain below 3m/km for all the modelled 150mm mains within the developments.

The model predicts that residential fire flow requirements (FW2 firefighting category) can be met for the two residential developments. However, the industrial development does not meet requirements due to large head losses throughout the 100mm mains along Great South Road and Russell Road. This result is subject to onsite confirmation from a hydrant test.

The system performance in the extended network was also verified. The additional demand is predicted to have an impact on the existing pipes L1, L3, L4 and L5 with a maximum head loss increase of 2.2m/km, post-development. Pipe length L4 does not comply with the head loss requirement of 5m/km for DN≤150mm from NZS:4404, therefore, an upgrade is recommended.

The proposed developments are predicted to have a significant impact on the minimum pressures within the WS network. The results show a drop in minimum pressure of 5.1m at the proposed industrial development connection point (P1) during the PD 2014 scenario.

The modelled pressure drop is partially due to a drop in water levels at the Kimihia Road Reservoir. The additional combined demand from the proposed developments causes the total outflow from the reservoir to exceed the filling rate under current conditions.

Three options to address issues with the WS network were investigated and listed below:

1. Upgrading the Great South Road main (see layouts 1, 2 and 3)
2. Industrial development site tank and PS
3. Kimihia Reservoir booster pump and zone delineation

Of these options, a combination of options 1 and 3 or 2 and 3 is recommended. By implementing either of these combinations, the pressure at the industrial development remains above 10m during FW3 flows, and the pressure within the vicinity of the Kimihia Reservoir is prevented from dropping below pre-development levels.

7.2 Wastewater

In this study, the model was updated to incorporate the proposed industrial and residential developments in Great South Road and East Mine Road. Wastewater loads from the development were estimated and are based on information provided by the developers and using RITS (May 2018).

The system performance was compared before and after implementing the WW load from the development into the model for both the DWF and WWF scenarios.

The connection pipe located DS of the industrial development shows existing issues with capacity during the wet weather event. The model predicts an overflow of 15m^3 at manhole 914519, located at 34 Great South Road. This overflow is predicted to increase to 95m^3 if the industrial developments were to be discharged into this 225mm pipeline.

The residential areas are not predicted to cause any detrimental impact. Maximum water levels are predicted to increase slightly along the lower gradient pipeline but are not likely to cause any additional spillage.

The following options were identified to eliminate the predicted overflow at MH914519, which is exacerbated by the additional discharge from the industrial development.

- Different allocations:
  - Connect to Motel PS: based on it having enough capacity and would buffer the inflow of the development.
  - PS directly connected to Huntly treatment pond.
- Network Upgrade:
  - 225mm pipe upsizing from manhole 914519 to manhole 914516.
  - In addition to the pipe upsizing, PS60 located DS may potentially require an upgrade, as the current model shows a lack of capacity at the PS.

The WW options proposed in this memo have not been tested in this modelling study. It is highly recommended that additional modelling and verification is undertaken, before proceeding with detailed design. Additionally, it is recommended that the assumptions regarding the WW loads from the proposed development are confirmed, before proceeding with any further work.

APPENDIX B - DRAWINGS

100mm

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

NOTES:
AERIAL IMAGERY SOURCED FROM LINZ DATA SERVICE.
HEIGHTS ARE BASED ON LIDAR SOURCED FROM WRC AND ARE IN TERMS OF MOTURIKI 1953

NOTE:
TOTAL AREA = 17.47Ha
DEVELOPABLE AREA = 9.79Ha
NON-DEVELOPABLE AREA = 7.68Ha

KEY: SERVICES

EXISTING
- FLOOD PLANE LEVEL
- 63mm WATER
- 150mm WATER
- WASTE WATER LINE
- WASTE WATER LINE (TO BE ABANDON)
- WASTE WATER MANHOLE

PROPOSED
- 63mm WATER
- 150mm WATER
- STORMWATER LINE
- STORMWATER SWALE MAJOR
- STORMWATER KERB AND CHANNEL
- WASTE WATER LINE GRAVITY
- WASTE WATER PRESSURE
- WASTE WATER MANHOLE
- MAJOR CONTOURS 1.0m INTERVALS
- MINOR CONTOURS 5.0m INTERVALS
- CULVERT

275Ø MDPE RISING MAIN TREATED WASTE WATER TO DISCHARGE INTO RIVER
TO THE HUNTLY OXIDATION PONDS
275Ø MDPE RISING MAIN
WETLAND ACCESS
275Ø MDPE RISING MAIN
80Ø RISING MAIN
WETLAND ACCESS
NEW WASTE WATER CATCHMENT CONTRIBUTING TO MH 10.8982Ha
EAST MINE ROAD
EXISTING WASTEWATER PUMP STATION
SWALE
NEW WASTEWATER PUMP STATION CATCHMENT 5.2991Ha
10m CONSTRUCTION SETBACK
WASTEWATER PRESSURE LINE
WETLAND POND 1 3,200m²
WETLAND POND 3 2,400m²
TO CONNECT TO EXISTING 63 RIDER MAIN
WETLAND 3 CATCHMENT AREA 4 2.2515Ha
WETLAND POND 4 1,800m²
WETLAND POND/SWALE 2 1,000m²
WETLAND BOUNDARY
NATURAL WETLANDS CATCHMENT AREA 2 1.3499Ha
LINE TO BE DECOMISIONED
WETLAND 1 CATCHMENT AREA 1 3.9492Ha
WETLAND 2 CATCHEMENT AREA 3 2.2419Ha
RUSSELL ROAD
TO CONNECT TO EXISTING 150 AC PIPE
TO CONNECT TO EXISTING 150 AC PIPE

Lot 1 719m2; Lot 2; Lot 3; Lot 4; Lot 5 787m2; Lot 6; Lot 7; Lot 8 928m2; Lot 9; Lot 10; Lot 11; Lot 12; Lot 13; Lot 14 842m2; Lot 15; Lot 16 532m2; Lot 17; Lot 18; Lot 19 1467m2; Lot 20; Lot 21; Lot 22; Lot 23 837m2; Lot 24; Lot 25; Lot 26 780m2; Lot 27; Lot 28; Lot 29; Lot 30 704m2; Lot 31; Lot 32 694m2; Lot 33; Lot 34; Lot 35; Lot 36 1021m2; Lot 37; Lot 38 1061m2; Lot 39; Lot 40; Lot 41; Lot 42; Lot 43; Lot 44; Lot 45; Lot 46; Lot 47; Lot 48 1307m2; Lot 49; Lot 50; Lot 51 655m2; Lot 52; Lot 53 875m2; Lot 54; Lot 55; Lot 56; Lot 57; Lot 58 600m2; Lot 59; Lot 60 759m2; Lot 61; Lot 62; Lot 63; Lot 64 813m2; Lot 65; Lot 66 693m2; Lot 67; Lot 68 1563m2; Lot 69; Lot 70; Lot 71 963m2; Lot 72; Lot 73 603m2; Lot 74; Lot 75 817m2; Lot 76; Lot 77; Lot 78; Lot 79; Lot 80 700m2; Lot 81; Lot 82; Lot 83; Lot 84 815m2; Lot 85

	Date	Issue/revision detail	By	Chk	Appr
A	20/10/2020	INITIAL ISSUE	BSC	CF	–

mx model version:

Designed: PP | Checked: CF
Drawn: BSC | Approved: –

BLOXAM BURNETT & OLLIVER

Client: SHAND PROPERTIES LIMITED

Project: HUNLTY NORTH REZONING

Drawing: RESIDENTIAL ZONE CONCEPTUAL THREE WATERS LAYOUT

Status: PRELIMINARY
Date: 20/10/2020
Scale (Original Size A3): 1:2000
Drawing Number: 144370/02 /- /0702
Revision: A

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Version 2.04 – October 2013

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100mm

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

NOTES:
AERIAL IMAGERY SOURCED FROM LINZ DATA SERVICE.
HEIGHTS ARE BASED ON LIDAR SOURCED FROM WRC AND ARE IN TERMS OF MOTURIKI 1953

KEY: SERVICES

EXISTING
- FLOOD PLANE LEVEL
- 50 63mm WATER
- 150 150mm WATER
- WASTE WATER LINE
- SS WASTE WATER LINE (TO BE ABANDON)
- WASTE WATER MANHOLE

PROPOSED
- 50 63mm WATER
- 150 150mm WATER
- SW STORMWATER LINE
- STORMWATER SWALE MAJOR
- STORMWATER KERB AND CHANNEL
- SS WASTE WATER LINE GRAVITY
- WASTE WATER PRESSURE
- WASTE WATER MANHOLE
- 10 MAJOR CONTOURS 1.0m INTERVALS
- MINOR CONTOURS 0.2m INTERVALS
- CULVERT

WAIKATO RIVER

RISING MAIN 150Ø HDPE TO OXIDATION PONDS

EXISTING WASTE WATER PUMPSTATION

CONNECTION TO BE CONFIRMED BY MOTT MACDONALD

INDUSTRIAL CATCHMENT 1
7.2382Ha

STATE HIGHWAY 1

WASTEWATER RISING MAIN
315Ø HDPE TO RIVER OUTLET

LOT 1 0.2024Ha
LOT 2 0.2594Ha
LOT 3 0.2580Ha
LOT 4 0.2550Ha
LOT 5 0.2570Ha
LOT 6 0.2580Ha
LOT 7 0.2565Ha
LOT 8 0.2590Ha
LOT 9 0.2705Ha
LOT 10 0.3490Ha
LOT 11 0.3930Ha
LOT 12 0.3460Ha
LOT 13 0.3930Ha
LOT 14 0.5270Ha
LOT 15 0.5385Ha
LOT 16 0.5150Ha
LOT 17 0.5320Ha
LOT 18 0.5320Ha
LOT 19 0.5476Ha
LOT 20 0.5840Ha
LOT 21 0.5803Ha
LOT 22 0.4944Ha
LOT 23 1.0886Ha
LOT 24 0.4361Ha
LOT 25 0.4853Ha
LOT 26 0.4893Ha
LOT 27 0.4922Ha

POSSIBLE NEW WASTE WATER PUMPSTATION

PROPOSED RISING MAIN

EAST MAIN ROAD

NORTH ISLAND MAIN TRUNK RAILWAY

POTENTIAL FUTURE STORMWATER CULVERT

INDUSTRIAL CATCHMENT 2
5.7708Ha

STORMWATER TREATMENT WETLAND

GRADING AREA

OUTLET

OUTFALL CHANNEL

EXISTING DRAIN

GRADING AREA

GRADING AREA

						Designed: PP	Checked: CF	
						Drawn: BSC	Approved:	
A	10/09/2020	INITIAL ISSUE	BSC	CF	–	mx model version:		
	Date	Issue/revision detail	By	Chk	Appr			

Version 2.04 – October 2013

PBLOXAM BURNETT & OLLIVER 0431

Client: SHAND PROPERTIES LIMITED

Project: HUNTLY NORTH REZONING

Drawing: INDUSTRIAL ZONE CONCEPTUAL THREE WATERS LAYOUT

Status: PRELIMINARY

Date: 10/09/2020

Scale (Original Size A3): 1:2500

Drawing Number: 144370/02 /- /0704

Revision: A

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APPENDIX C - CONSULTATION WITH WATERCARE

Meeting Notes

Shand Properties
144370
Meeting with Watercare staff
28 September 2020
3.00 pm
Watercare offices, Te Rapa, Hamilton

		Attendance
Philip Pirie	**BBO**	
Chris Dawson	**BBO**	
Sharon Danks	**Watercare**	
Richard Pullar	**Watercare**	

Item	Discussion	Action	Date
1	**Introduction**		
1.1	Chris & Philip introduced the Shand rezoning project at a very high level and introduced the 3 Waters related questions for the meeting.		
1.2	Sharon noted that this area had already been flagged to them by Council as an area of future growth so it was no surprise.		
1.3	**Wastewater** - Sharon noted that the Huntly Wastewater treatment plant currently has some process issues and is non compliant with its resource consent. Council are proposing some interim upgrade works to keep the plant going until a full upgrade of the plant to a MBR (Membrane Bio-Reactor) plant is undertaken in 2028. This work is programmed in the draft LTP.		
1.4	Sharon noted that the Shand rezoning could be accommodated given its location of the residential portion (next to Russell Road and close to the wastewater treatment ponds) and the industrial portion (next to Great South Road). She also noted that there is no capacity for any wet industries to located in the Industrial area.		
1.5	**Water** – no capacity for large industrial capacity (wet industry) but Shand rezoning should be able to be accommodated.		
1.6	Sharon recommended that BBO review the **Mid Waikato Wastewater Servicing Strategy** document from Watercare.		

K:\144370 Shand Properties Rezoning\02 Industrial & Residential rezoning\Correspondence\BBO\Meeting Minutes\Shand Properties - 3 Waters meeting with Watercare (28 Sept 2020).docx

Meeting Notes

Shand Properties
144370
Meeting with Watercare staff
5 November 2020
9.00 am
Watercare offices, Te Rapa, Hamilton

		Attendance
Philip Pirie (PP)	**BBO**	
Richard Pullar (RP)	**Watercare**	

Item	Discussion	Action	Date
1	**Introduction**		
1.1	**Wastewater**		
1.2	PP discussed the results of the modelling that has been undertaken by Mott Macdonald in the Technical Memo dated the 22 October 2020.		
1.3	Residential Land RP indicated that the WWPS65 on East Mine Road is a suitable connection point for residential land, however confirmation of capacity and condition would need to occur at the time of Resource Consent. The alternative option is to connect into the gravity network that flows to the WWPS60 Russell Road Pump Station which has available capacity.		
1.4	Industrial Land Connection to WWPSNT2 is not an option as mentioned in the Mott Macdonald report as it is not sized appropriately. The recommended connection point for the industrial zoned land is WWPS77,(Ready Mix Pump Station at 2 Great South Road) as this pump only turns over 2-3 times a day. The overflows in the gravity network as shown in the Mott MacDonald report do not occur in reality as most of the lots by the river are not connected to the public reticulation network.		
1.5	**Water**		
1.6	Residential Land Issue with the rate of filling Kimihia reservoir in a peak day scenario. This is a known issue in Huntly. This project is included in the Councils draft LTP for water pressure. This upgrade is planned to happen in 2026 and could be moved forward if a paper is summitted to the board.		
1.7	Industrial Land If Ohiniwai development goes ahead a new 355mm main is proposed in the draft Long Term Plan, along great south road, to feed into a new reservoir by Ohinewai. This may go ahead in 2025-2028 in good economic conditions or 2028-2030 in the event of a recession.		