2.0 Wastewater

2.1 Design Standards

The design standards used in the assessment are based on Auckland Council Code of Practice (CoP) for Land Development and Subdivision, v2.1. The following load factors were used:

- Occupancy Rate : 3 people/property
- Design Flow (Average Dry Weather Flow, ADWF) : 180 litres/person/day
- Peak Dry Weather Flow Peak Factor : 3
- Peak Wet Weather Flow Peak Factor : 6.7
- Pipe Roughness : 0.013 (Manning)

The proposed wastewater load is based on the recommended yields/dwellings as detailed in Section 2.2.

2.2 Catchment

Wastewater from the Oranga development area is discharged via the Onehunga branch sewer adjacent to the Onehunga branch railway line. The catchment is predominantly residential north of Mays Road with portions of commercial zones and community facilities. The south of the catchment is predominantly industrial zoned. **Appendix C** illustrates the extent of the wastewater catchment areas.

2.3 Yield

Appendix C illustrates the yield modelled for each of the highlighted wastewater catchment areas. The yields include additional Kāinga Ora growth, as well as growth outside of Kāinga Ora development.

A summary of the modelled yields are in **Table 3** below:

Table 3: Breakdown of Wastewater Catchment Yields

WASTEWATER CATCHMENT YIELDS				
	EXISITNG DWELLINGS	**REMOVED DWELLINGS**	**NON-KO GROWTH (I11)**	**KO GROWTH (1500ST) (MASTERPLAN N5 + 20%)**
Outside Neighbourhood	753	0	113	0
Inside Oranga Neighbourhood	729	-381	170	1465
Felix Street Catchment	425	-65	31	48
Whole Catchment (3288 Total)	**1907**	**-446**	**314**	**1513**

2.4 Capacity Modelling and Upgrade Requirements

Candor[3] completed wastewater capacity modelling on the existing network and the proposed future development. See **Appendix D** for the memo received from Candor[3]. The results of the modelling are illustrated in **Appendix E**. The analysis indicates that there are sections of the sewer network where peak wet weather flows exceed existing pipe capacity outside of the neighbourhood, and these sections will be exacerbated after the proposed KO development and non-KO infill (See **Appendix C** for the modelled yields).

Table 4 below summarises the upgrade requirements and proposals.

Table 4: Wastewater Analysis, Upgrade Requirements and Recommendations

Asset	Analysis	Upgrade Date Required
Ø225mm Captain Springs Road Sewer, from Mays Road to Onehunga trunk main	Sections from Mays Road to Onehunga trunk main currently under capacity. Exacerbated after the proposed development, with whole length of Captain Springs Road Under capacity.	Recommended completion by October 2023, when net-positive yield is achieved.
Ø150mm Mays Road Sewer, from Curzon Street to Captain Springs Road	Sections from Curzon Street to Captain Springs Road currently under capacity. Exacerbated after the proposed development, with more sections under capacity.	Recommended completion by October 2023, when net-positive yield is achieved.
Ø225mm Sewer through Industrial area, south of Felix Street (Felix Street Sewer)	Sections under Onehunga Trucnk main currently under capacity. Exacerbated after the proposed development, with sections under existing factory under capacity.	Recommended completion by October 2023, when net-positive yield is achieved.

Figure 2 below illustrates the sections of sewer that are currently under capacity. The proposed development exacerbates the problem resulting in more sections of sewer being under capacity as illustrated in **Appendix E**.

In addition to capacity issues, CCTV condition assessment of the sewer network presented by Candor[3] in "Oranga Stage 1 and 2 – Water Supply and Wastewater Analysis Report", dated 29th July 2019, illustrates that the structural condition of several pipe lengths within the neighbourhood have been assessed as "Poor" or "Fail" grade, primarily due to age, with most of the network constructed from earthenware pipe and installed circa 1938.

The proposed development exacerbates existing capacity issues as shown in **Appendix E**. All of the proposed upgrades are therefore recommended to be implemented before the KO development programme including i11 infill produces a net positive situation which is estimated to be in October 2023 (See **Appendix A** for net positive timing).

The recommended wastewater upgrades are illustrated in **Appendix F**.

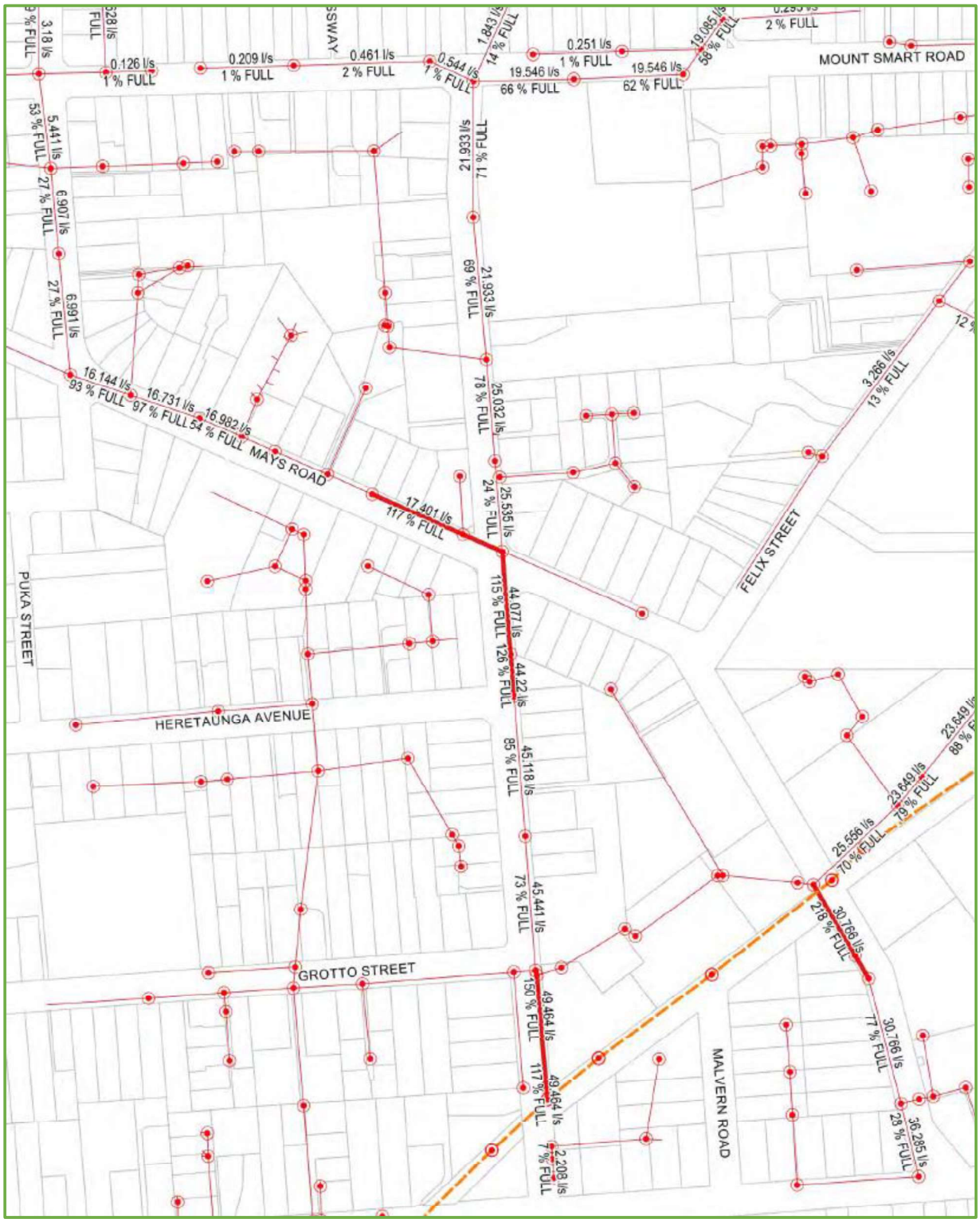


Figure 2: Oranga Neighbourhood Existing Wastewater Capacity

2.5 Technical Solutions

There are 3 sections of wastewater network shown to be under capacity as illustrated in **Table 4**. These are discussed individually below.

2.5.1 Wallath Road

Hydraulic modelling initially showed that a section of the Wallath Road sewer was over capacity at full build-out. This was due to incorrect GiS information obtained from the WSL GiS database. The GiS information incorrectly showed the gradient of the sewer, and furthermore, did not indicate that 2 additional manholes were present on site. The surveyed data confirmed that the sewer traversing OR63 has more fall than what GiS data indicated. The model was recalculated using site surveyed information, adopting the flattest grade of 0.96%, resulting in the sewer being 81% full at 11.98l/s at full build-out. **Appendix E** illustrates the updated modelling. **Figure 3** below illustrates the long section of the Wallath Road sewer, adopted from approved EPA ENG60365322 for relining work that was completed on this line. Wallath Road can therefore be considered acceptable without upgrades being required.

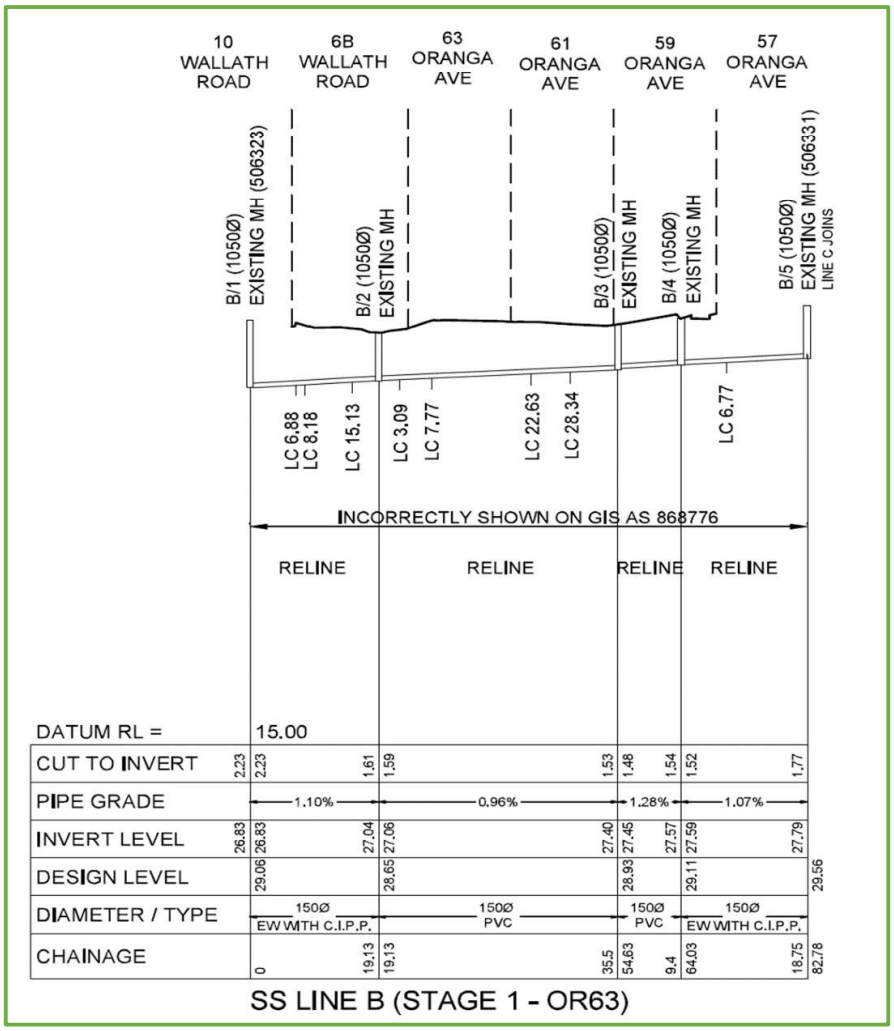


Figure 3: Wallath Road Sewer Longsection (OR63 Superlot)

2.5.2 Captain Springs/Mays Road sewer

Candor[3] have previously prepared and submitted a document to Watercare Services Ltd (WSL) titled "Oranga Stage 1 and 2 – Water Supply and Wastewater Analysis Report", dated 29th July 2019. The wastewater modelling included in this submission confirmed that upgrades were necessary. WSL initially approved Candor[3] EPA upgrade plans but have since undertook to reassess the project and consider the increased KO yields, which result in more pipes on the CSMR sewer exceeding capacity (Precinct Project).

WSL has advised that CSMR under capacity will not prevent any existing resource and building consent applications within the neighbourhood from being processed and the current proposal cost estimated.

2.5.3 Felix Street

As shown in **Appendix E**, it was determined that the Felix Street sewer is under capacity at full KO build-out, including i11 infill. Technical discussions with WSL resulted in a proposal to divert wastewater flow away from the Felix Street catchment, into the transmission main. At worst case, approximately 10l/s was required to be diverted away from the Felix Street catchment in order to relieve this sewer of capacity constraints at full build-out including i11 infill. A recommended solution for the diversion of wastewater flows from the Felix Street catchment was discussed in a technical discussion with WSL and is therefore illustrated below.

- Wastewater diversion from Edmonton Road sewer to Onehunga Transmission Main

New Ø225mm localised sewer pipe from MH 538105 to MH 18623, through 167 and 167A Rockfield Road, as illustrated below in **Figure 4**. The recommended diversion is aligned entirely through a KO Stage 7 superlot, has taken into consideration future build footprints and will reroute 9.29l/s of wastewater flow to the Onehunga Transmission Main. The Felix Street sewer will be at resulting capacity as illustrated in **Figure 5** after the diversion. The implementation of this diversion is proposed to take place following the removal of existing houses in stage 7, circa 2004. Before this diversion can be confirmed, surveyed invert levels of existing manholes are required.

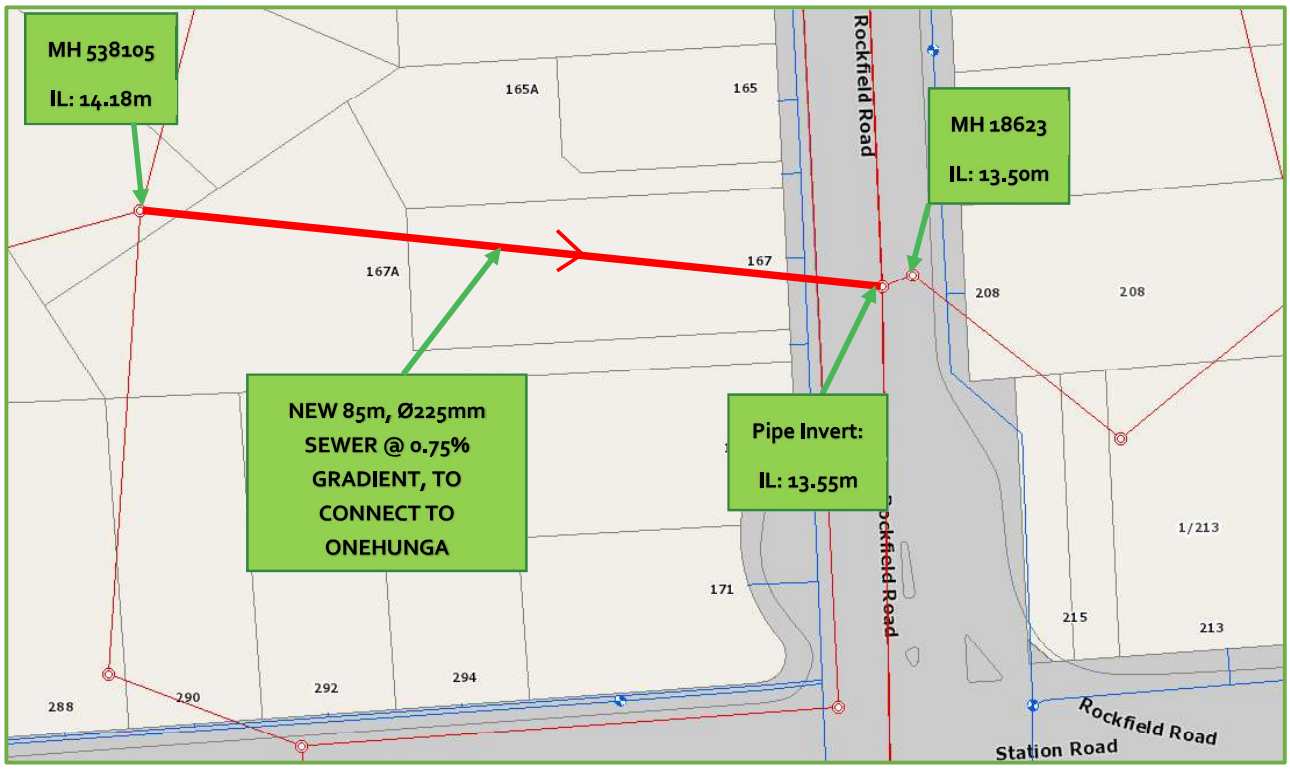


Figure 4: Recommended Wastewater diversion to Onehunga Transmission Main

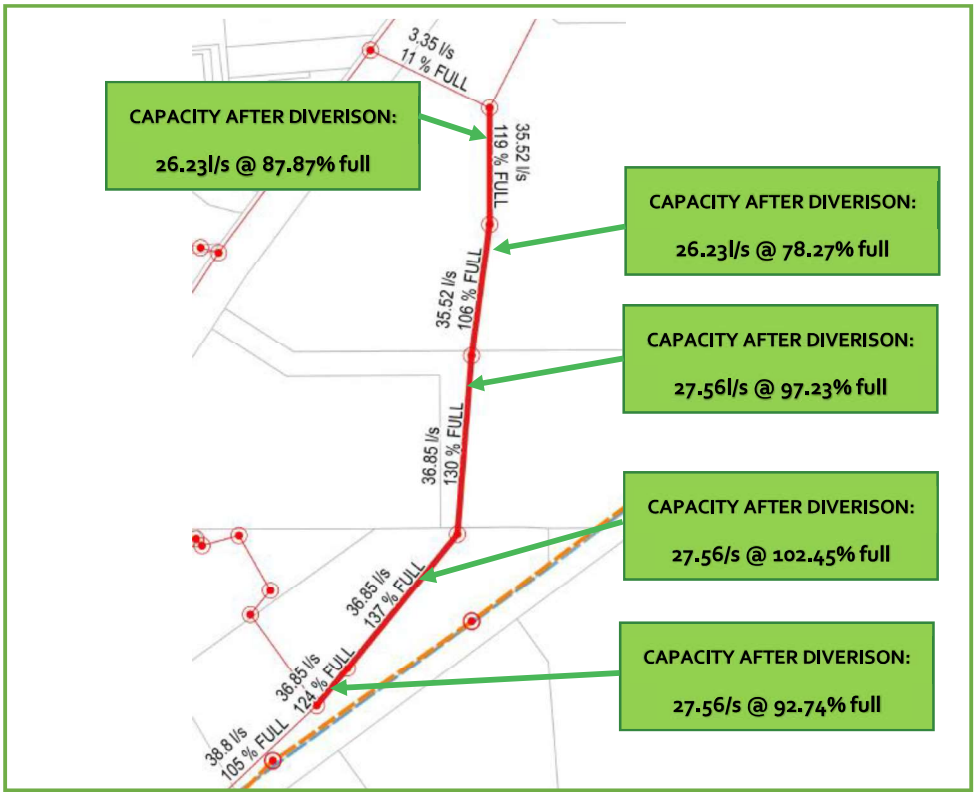


Figure 5: Felix Street Sewer Resultant Capacity after diversion

2.5.4 Neighbourhood Upgrades

The proposed neighbourhood upgrades are limited to the following:

- Detours

Throughout the development stages, sewer diversions are proposed where future build footprints clash with sewer alignments and alternative alignments are therefore necessary. These are undertaken at Kāinga Ora's cost. These realignments will be coordinated with the overall neighbourhood development.

- Repairs

The Oranga Development is situated above a water quality aquifer and the neighbourhood approach is "leave better than found". Throughout the development stages, where sewers within the neighbourhood are found to be in poor condition, WSL will be notified and will assess if the network is acceptable, needs future repair or requires urgent remediation. Where possible and where not deemed urgent, these upgrades will be coordinated with the overall neighbourhood development and the cost share model applied.

There are no sewer capacity constraints within the Oranga Neighbourhood as a result of the proposed development. The neighbourhood upgrades outlined are not the result of capacity requirements and are therefore not subject to any dependencies.

2.6 Staging and Dependencies

Based on the current development programme, Stage 1, 2 and 3 Superlots can be developed and occupied prior to any sewer upgrade taking place. This is based on a net-negative yield until the end of 2023. The wastewater sections of pipe mentioned in Section 2.4 are subject to capacity issues pre-development and are only exacerbated during development once there is a net positive yield.

WSL and Kainga Ora have agreed to proceed with the upgrades proposed for Captain Springs and Mays Road before net-positive yield is achieved and once the Precinct Project scope has been determined.

The full development [redacted] also does not trigger any neighbourhood wastewater upgrades however, the development [redacted] is subject to the watermain capacity upgrades, which will determine the consent conditions for the superlot development.

3.0 Water Supply

3.1 Design Standards

The design standards used in the assessment are based on Auckland Council Code of Practise (CoP) for Land Development and Subdivision, v2.1, and are as follows:

- Pressure Head : 25 – 80 m
- Maximum Headloss:
  - For pipe diameter ≤ 150mm : ≤ 5m/km
  - For pipe diameter > 150mm : ≤ 3m/km
- Velocity : 0.5 – 2.0 m/s
- Fireflow : FW2, 25 l/s, 100kPa residual pressure at 60 minute duration

3.2 Water Demand

The water demand standards were based on the Auckland Council/Watercare CoP and the Onehunga Water Network Model was used (H2O Map) (Consumption data and Onehunga Model Supplied by WSL). Peak hour flow and Fire Flow scenarios have been analysed for this assessment.

The following assumptions were used:

- Occupancy Rate : 3 people/property
- Daily Consumption (Average Day Demand, ADD) : 220 litres/person/day
- Peak Day Demand Peak Factor (PDD/ADD) : 1.5
- Peak Hour Demand Diurnal Peak Factor (PHD/PDD) : 2.5

The proposed water demand is based on the recommended yields/dwellings as detailed in Section 3.4.

3.3 Water Supply Zone

The Oranga Development is located within the Onehunga Water Supply Zone. The supply zone is fed from a reservoir located on One Tree Hill. The development area is located toward the eastern boundary of the supply zone.

The current water supply network within the Oranga Development consists mainly of Cast Iron pipes and dates from 1915 when the area was first developed, with the majority installed in 1937. The layout of the existing water network is illustrated in **Figure 6** and is colour coded by pipe size.

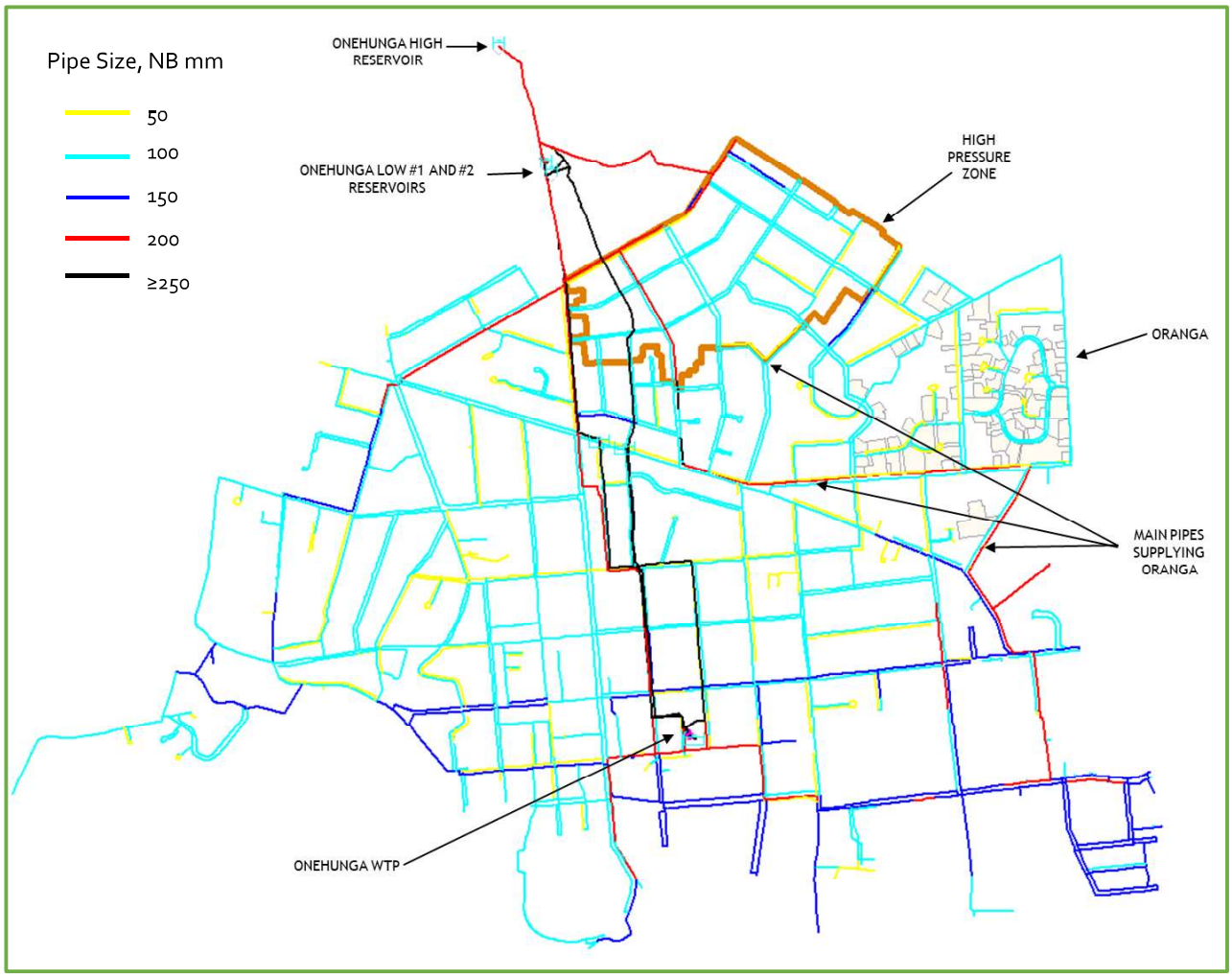


Figure 6: Oranga Neighbourhood Existing Water Supply

3.4 Yield

Table 5 illustrates the yield modelled for the water network. The yields include Kāinga Ora growth, as well as growth outside of Kāinga Ora development. This is over and above the existing number of houses. The water supply memo in Appendix K shows the total existing and proposed number of DUE, within Oranga and the whole Onehunga water supply zone. **Figure 7** below illustrates the water supply zone and Oranga.

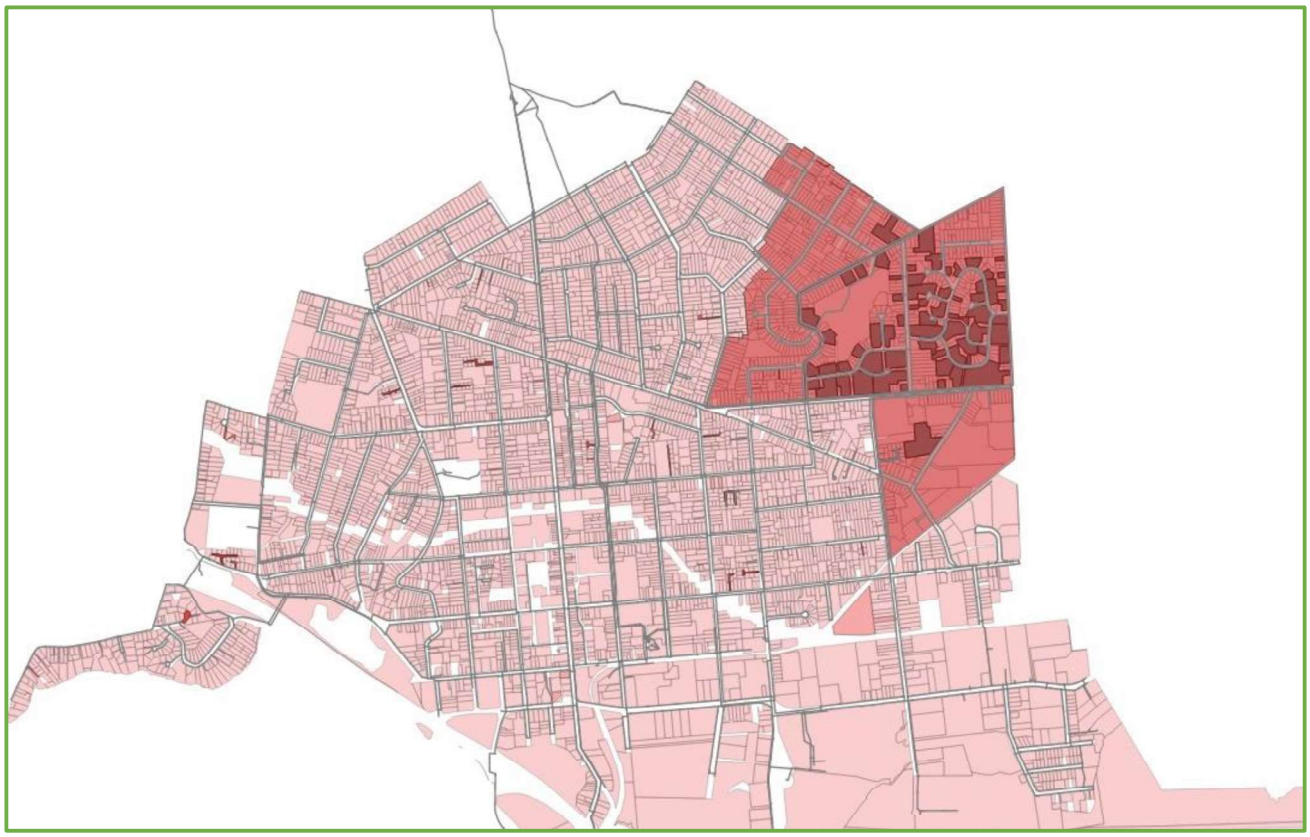


Figure 7: Onehunga water supply zone (highlighted area referred to as 'Oranga', development properties in dark red)

Table 5: Water Supply Yield

WATER SUPPLY YIELDS DUE			
	NON-KO GROWTH (INFILL FROM I11V3)	**KO GROWTH (1500ST) (MASTERPLAN N5 + 20%)**	**TOTAL**
Onehunga Zone (Outside Neighbourhood)	8 277	0	**8 277**
Inside Oranga Neighbourhood	-128	1 513	**1 385**
Whole Catchment	**8 149**	**1 513**	**9 662**

3.5 Capacity Modelling

Hydraulic modelling was completed on the water network to determine capacity of the existing network and the upgrades required for the future proposed development. The modelling aimed to determine the following:

- Confirm whether the Oranga development triggers the need for precinct wide upgrades
- Confirm upgrades within the Oranga neighbourhood
- Determine at which stage of the development the upgrades are required
- Examine options for any precinct upgrades that may be required

To achieve and determine the above, the following scenarios were modelled and analysed:

- Existing network condition
- Existing network with future demands
- Upgraded network with future demands

3.5.1 Existing Network with current and future demands

Appendix G illustrates the capacity modelling on the existing water network using current demands (scenario 1) and future demands (scenario 2). The existing network minimum pressures are above Code of Practice (CoP) standards (16m Pressure head) but would fall below this once future demand is applied. The head loss in the network also significantly increases once the future demand is applied, with some pipes, internally within the neighbourhood and the precinct exceeding the 10m/km head loss CoP. Fireflow supply is sufficient for future demands through the existing network. It can be concluded that the current network will not support the full build out and neighbourhood and precinct upgrades will be required.

The current Onehunga network also experiences maximum pressures that are above WSL CoP (80m). WSL are aware of the issue and have acknowledged the findings of this modelling. The Oranga Development will increase maximum pressures throughout the network by a maximum of 3m and has been agreed as an acceptable increase by WSL. A future proposal for pressure management will be developed by WSL. **Figure 8** below illustrates the maximum pressures in the Onehunga water network currently, before any upgrades to the network.

Figure 8: Onehunga Water Network Maximum Pressures

3.5.2 Neighbourhood Upgraded network with future demands

Several proposed upgrades were modelled to determine the network capacity and resilience to the proposed full build out.

The following scenarios were considered.

- Scenario 1 – Existing network, existing demand
- Scenario 2 – Existing network, 1500ST demand
- Scenario 3 – Previous Proposal (Current Consented EPA), 1500ST demand
- Scenario 4 – Recommended Upgrade, 1500ST demand

A summary of the scenario results are included in **Table 6** below. Precinct upgrades would be required to solve the minimum pressure issues outside of the development.

Table 6: Summary of scenario results

SCENARIO		NETWORK	DEMAND	RESULTS			
				Min Pressure	**Max Headloss**	**Fire flow**	**Other comments**
1	Existing Network	2020	Existing	No issues. Min pressure 28m	Minor locations where headloss exceeds 10m/km	Some locations with fire flows below 25L/s, but all in proximity of a node with sufficient fire flow	
2	Ultimate 1500ST development without upgrades	2020	1500ST	Extensive area with low pressure outside of development area. Min pressure 16m	Considerable increase of pipes with HL>10m/km	Same as above. Fire flow not an issue for the neighbourhood	
3	Upgraded network for ultimate 1500ST	*Previous Proposal (Current Consented EPA)	1500ST	Extensive area with low pressure outside of development area. Min pressure 18m	Single new pipe with HL >5m/km. All else OK withing Oranga	-	No pressure issues outside Oranga beyond those mentioned. High headloss in area south of Oranga
4	Upgraded network for ultimate 1500ST	Recommended Upgrade	1500ST	Extensive area with low pressure outside of development area. Slightly smaller area than alternatives above. Min pressures 18m	No issues within Oranga	-	No pressure issues outside Oranga beyond those mentioned. High headloss in area south of Oranga

***Previous Proposal and currently consented EPA was not evaluated based on demand growth, but rather, from a technical perspective and achievability**

3.6 Neighbourhood Upgrade proposals

The modelling shows that watermain upgrades are required within the neighbourhood and precinct to service the proposed development. Predevelopment condition issues discussed in Section 3.5 have been identified in watermains outside of the Oranga Neighbourhood and therefore, water main upgrades will be required outside of the neighbourhood in order to support the full proposed development.

The below options for upgrades were assessed in the modelling:

- Previous Proposal (Current Consented EPA) – Previous proposal and currently consented EPA was not evaluated based on demand growth, but rather, from a technical perspective and achievability
- Recommended Neighbourhood Upgrade – Upgrades for watermains based on yield growth. Upgrades located within neighbourhood roads, no upgrades to watermains located on perimeter roads, except for Namata Road

The results of the modelling are shown in **Table 8**. In summary:-

- Recommended Upgrade produces best operational results and does not require to replace watermain at boundaries (except for Namata Rd)
- Recommended Upgrade is similar to Previous Proposal and current consented EPA, with difference of pipe sizing on certain roads as described in **Table 7** below.
- Maximum head loss and available fireflow requirements are met by recommended upgrade
- Precinct upgrades are required in conjunction with the neighbourhood upgrades to solve the low pressures in Oranga
- KO have accepted the recommended watermain upgrades based on the latest modelling (**Appendix H**)

Table 7: Recommended Upgrade Proposal vs Previous Proposal

ROAD NAME	PREVIOUS PROPOSAL	RECOMMENDED UPGRADE
State Avenue South Berm – Between Waitangi Road and Edmonton Avenue	Ø150mm watermain	Ø200mm watermain
Roosevelt Avenue	Ø100mm watermain – North Berm Ø150mm watermain – South Berm	Ø150mm watermain – North Berm Ø200mm watermain – South Berm
Namata Road East Berm	Ø150mm watermain	Ø300mm watermain with Ø50mm rider main – Between Roosevelt Avenue and Mt Smart Road
Edmonton Avenue North Berm	Ø100mm watermain	Ø200mm watermain

Table 8: Water main Analysis, Upgrade Requirements and Proposals

Year (Model Stage)	Development Stages	Results With No Upgrades	Results With Neighbourhood Recommended Upgrades
2023 October	1 to 3	Pressure OK. Headlosses start going over 10m/km.	Pressure OK. No pipes headloss over 2m/km.
2024 October	1 to 4	Pressure OK. More widespread pipes with losses over 10m/km.	Pressure OK. No pipes headloss over 3m/km.
2025 October	1 to 5	Pressure OK. Headlosses start going over 15m/km.	Pressure barely below CoP (24m). No pipes headloss over 3m/km.
2026 October	1 to 6	Precinct Pressure issues (Min pressure 23m). More widespread pipes with losses over 15m/km.	Pressure falls below CoP (23m). No pipes headloss over 4m/km.
2027 October	1 to 7	Precinct Pressure issues. Major headloss issues.	Pressure falls below CoP (19m). No pipes headloss over 4m/km.
2068 (Ultimate)	1 to 7	Precinct Pressure issues. Major headloss issues.	Pressure falls below CoP (16m). No pipes headloss over 4m/km.

Figure 9 below illustrates the recommended upgrade with pipe sizing indicated. **Appendix I** illustrates the upgrade plan, showing the change between the Previous Proposal and the recommended upgrades based on this report, in addition to the staging of these upgrades. Where watermain is being upsized, realignment around stormwater devices will be included in the EPA amendments.

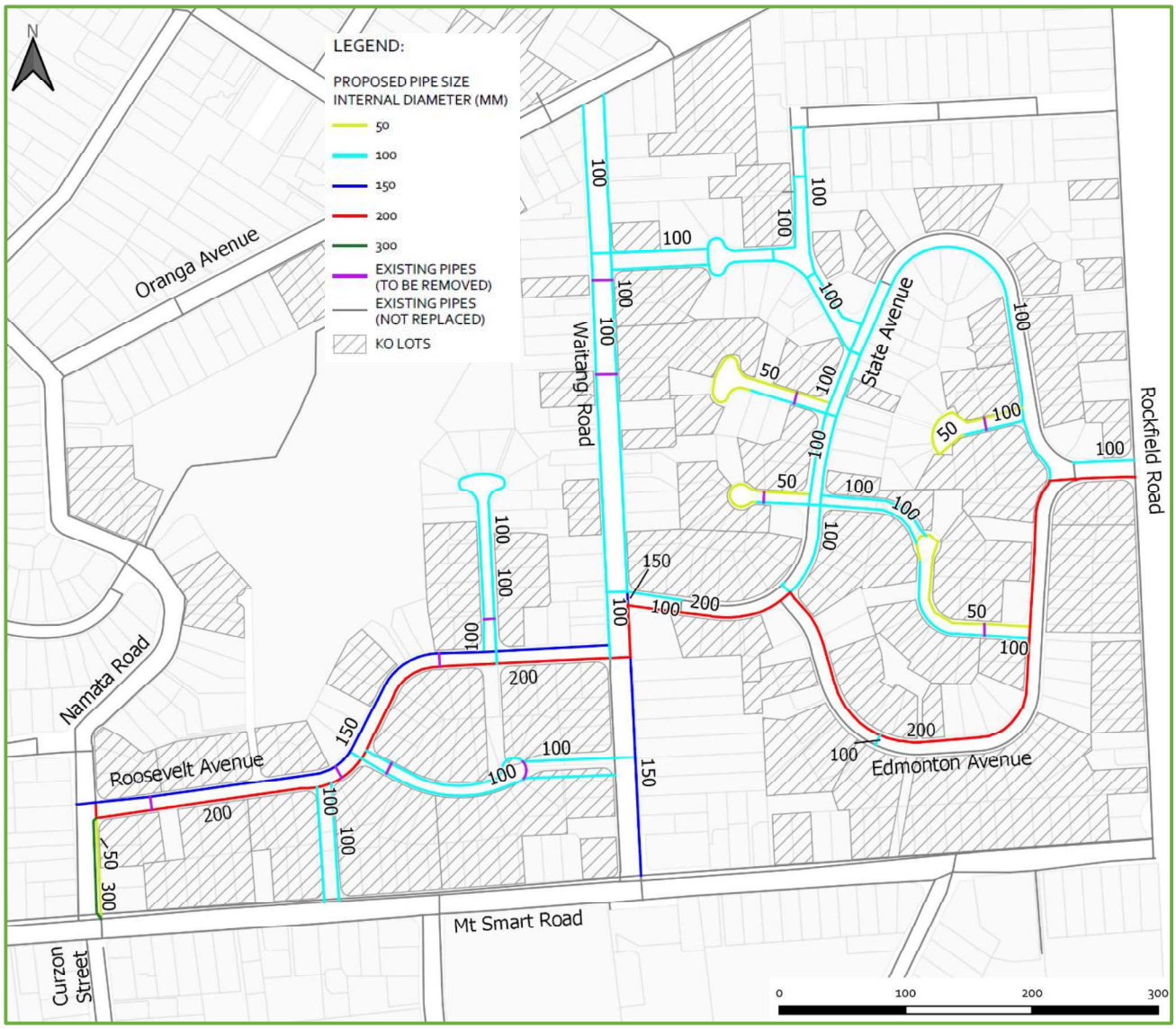


Figure 9: Recommended Oranga Neighbourhood Upgrades

3.7 Precinct Watermain Upgrades

Precinct upgrade options were explored to improve the network and to reduce the head loss and low pressures experienced post development. It is understood that WSL have previously assessed the following upgrades:

- Hoheria Rd watermain (DN200)
- Mt Smart Rd Watermain (DN250)

Since these upgrades were assessed, the KO development yields have increased. The model has shown that even with the recommended neighbourhood upgrades described previously, the previously proposed WSL upgrades are not able to meet minimum pressure and head loss CoP limits. The results of these can be seen in **Appendix J**.

Additional precinct upgrade options were therefore considered:

- Watermain from Onehunga 2 WM via Hoheria St – Upstream Connection point at Onehunga Mall, Ø250mm
- Watermain from Onehunga 2 WM via Mt Smart Rd – Upstream Connection point at Onehunga Mall, Ø250mm
- Watermain from Onehunga 3 WM via Grey St - Upstream Connection point at intersection of Grey St and Spring St, Ø300

It was determined that all 3 upgrade options help meet the minimum required pressure issues post development within Oranga. Hoheria Street and Grey Street upgrade options are aligned through local roads, thereby less disruptive to the neighbourhood. The Grey Street upgrade option results in minimum pressure heads up to 6m more than existing, and significantly improves head loss across the overall Onehunga network. This option is also less than half the length of Hoheria Street upgrade while producing better network performance. The Hoheria Street upgrade will also require upgrade of the watermain on Namata Road, between Oranga Avenue and Roosevelt Avenue. The Mt Smart Road is not recommended due to Mt Smart Road being an arterial road, with less space in the berm for new infrastructure.

Within Oranga, the headloss would be satisfactory with the recommended neighbourhood upgrades described in Section 3.6, and any of the precinct upgrades mentioned above. Minimum required pressures within the neighbourhood will be affected by lack of precinct capacity and therefore additional precinct upgrades are required. Pressure management should be considered with the wider zone upgrading to solve the issue of maximum pressures exceeding CoP within the greater Onehunga network.

Figure 10 below illustrates these precinct upgrade options on plan and **Table 9** shows a comparison of the precinct upgrade options. A plan is included in the Water Supply Assessment Memo in **Appendix K** showing the precinct upgrade alternatives. The preferred precinct upgrading option will be agreed between KO and WSL.

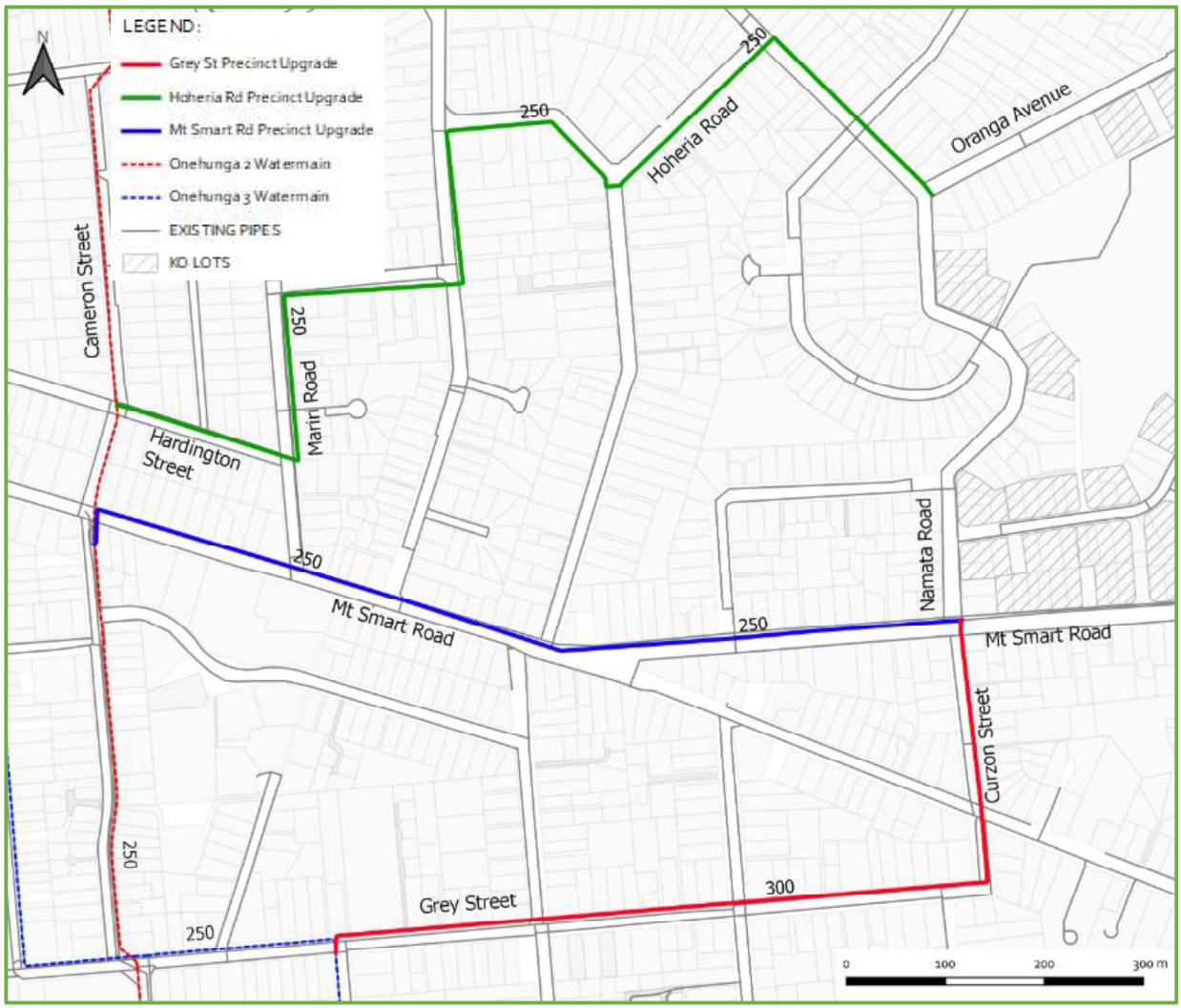


Figure 10: Precinct watermain upgrade options

Table 9: Precinct Upgrade Option Comparison

CHANGE IN PRESSURE FROM EXISTING 2020 (ABSOLUTE VALUE)				
ORANGA NEIGHBOURHOOD UPGRADES WITH:	**Maximum Pressure**	**Minimum Pressure**	**Fire Flow**	**Headloss**
PRECINCT MT SMART RD	2.3m higher (95m in Oranga)	7.9m lower (26m in Oranga)	Residential fireflow achieved in Oranga for all alternatives	Headloss below CoP for all alternatives
PRECINCT HOHERIA RD	2.3m higher (95m in Oranga)	7.1m lower (26m in Oranga)		
PRECINCT GREY ST	2.9m higher (96m in Oranga)	4.6m lower (31m in Oranga)		

3.8 Onehunga Pressure Management

The high maximum pressures encountered in the modelling exceed the WSL CoP limits of 80m. This is due to the fact that Onehunga is a pumped network, with pumps directly connected to the reticulation system supplying consumers. When there is an increase in demand, the minimum pressure drops, while the maximum pressures increase due to pumping pressure required to supply the additional demand. This results in maximum pressures exceeding 80m CoP within the Onehunga network. To alleviate this, additional reticulation is required to increase the capacity of the network and supply increased demand at the original pumping pressure or, new pressure zones are required to split up the network into zones that operate over a narrow range of pressures.

The high pressures will be addressed as part of the wider Onehunga Zone Master Plan to be prepared by Watercare.

3.9 Staging and Dependencies

Staging of the development was modelled to determine the effect of each stage of the development, and at which stage of the development the precinct upgrades will be required. **Table 10** below illustrates the uplift timing that was utilised for the staged modelling. It was determined that with at least the internal upgrades along Waitangi Road in place for Stages 4, there is no significant impact to the network capacity. Minimum pressures are marginally below CoP limits and head loss are within CoP. By the end of Stage 4 build programme estimated to be October 2025, pressures and head loss limits fall outside CoP. The results of these stages are included in **Appendix K**. Precinct upgrades are therefore required prior to Stage 5 being built.

Table 10: Staged Development Yields

UPLIFT DUE	ORANGA	ORANGA	ORANGA	OUTSIDE ORANGA
MODEL STAGE	KO STAGES	KO UPLIFT*	NON-KO UPLIFT	I11V3 UPLIFT
OCT 21	1	-171	19	498
OCT 22	1, 2	-94	25	664
OCT 23	1, 2, 3	125	31	830
OCT 24	4	313	38	996
OCT 25	5	415	44	1,162
OCT 26	6	786	51	1,328
OCT 27	+7 (ALL KO)	1,067	63	1,494
ULTIMATE (2068)	**ALL KO**	**1,067**	**318**	**8,300**

**Uplift = Built – Demolished (1513 new KO dwellings – 446 existing removed dwellings = 1067)*

The recommended neighbourhood upgrade proposed would therefore require to be implemented, in its entirety, by Oct 2025 prior to build of Stage 5 to ensure minimum pressures and head loss are maintained at all times. In conjunction with the recommended neighbourhood (internal) upgrades, precinct (external) upgrades are also required to be operational at this time.

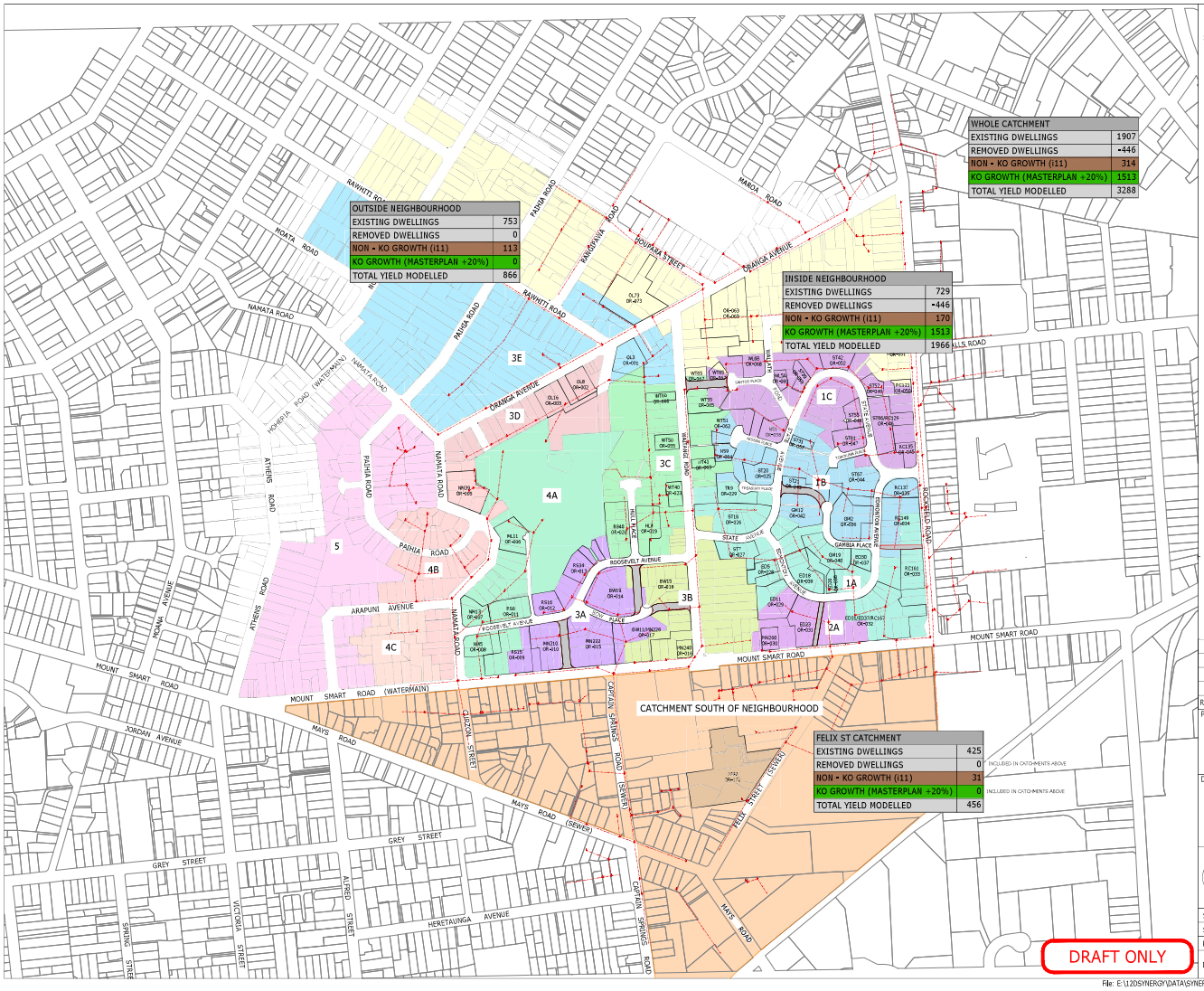
Waitangi Road watermain upgrades are currently in construction phase and expected to be completed during the year 2021, without impacting the results above. Further neighbourhood upgrades will be completed as per currently consented EPA's, with the exception of the watermains described in **Table 7**, where an EPA amendment is required to suit the recommended upgrade described in this report. All neighbourhood upgrades will therefore be in place before demands increase (net-positive 2023).

Based on the current development programme, it can be concluded that Stage 1, 2, 3 and 4 Superlots can be developed and occupied prior to any additional water mains upgrade taking place (Pre October 2025). Any development past Stage 4 will require additional upgrading to be implemented – that is prior to Stage 5 commencing circa Oct'25.

The development of Stages 1-4 superlots are therefore not dependant on any water main upgrades besides the one along Waitangi Road and does not affect any Building or Land Use Consent applications within these stages.

Piritahi has started installing new watermains in Waitangi Road, and the intention is to continue the renewal upgrades until 2023. See **Appendix I** illustrating the preferred staging.

Appendix C: Wastewater Catchment and Yield Plan



NOTES

1. EXTENT OF WORKS AND STAGING BASED ON CAD FILE 190819_IGL_4020_ORANGA_MASTERPLAN_REV N5.

Kāinga Ora Homes and Communities

Piritahi LAYING THE GROUNDWORK

REVISION	DETAILS	BY	DATE
1	FOR INFORMATION	OT	28.10.2020

PROJECT:
ORANGA NEIGHBOURHOOD SEWER CATCHMENT OVERALL PLAN

DESCRIPTION:
SANITARY SEWER SUBCATCHMENT PLANS

SURVEYED	-	-
DESIGNED	-	-
DRAWN	OT	-
CHECKED	-	-
APPROVED	-	-

SCALE	NOT TO SCALE	REVISION
STATUS	FOR INFORMATION	1
PRECINCT	ORANGA	
DWG NO	DLO044-000-1103	

Synergy Version:

Plot Date: 12:31:22 pm,5 February 2021,----

File: E:\12DSYNERGY\DATA\SYNERGYSERVER\3 ORANGA_78\06 DESIGN\CAD\CURRENT\OR-1103.DWG

Appendix D: Candor^3 Memo

Memorandum

Candor³
ENGINEERING FOR LIFE

Date: 04 January 2021 Job No: 1317

To: Ridwan Vorajee (Piritahi)

From: Carl Whitten

Re: Kāinga Ora – Oranga – Wastewater Modelling

This memorandum has been prepared by Candor³ as requested by Piritahi for the purposes of supporting the Neighbourhood Servicing Plan (NSP) for the Kāinga Ora Oranga re-development.

Existing Capacity

The capacity of the sewer network under existing conditions is shown on attached plans **05-SK10 and 11 Rev B**. A Level 1 analysis of the network shows sufficient capacity to convey Peak Wet Weather Flows except for:

1. The 150mm sewer in Mays Road, prior to connecting to Captain Springs Road.
2. The 225mm sewer in Captain Springs Road, from Mays Road to the Trunk main.
3. The 225mm sewer in Mays Road through the industrial area, south of Felix Street.

Future Capacity

The capacity of the sewer network for future stages **(1500ST)** is shown in Figures **05-SK30** and **31 Rev J.** The analysis shows:

1. The exacerbation of the existing capacity issues in the Mays Road and Captain Springs Road sewer.
2. The exacerbation of the 225mm sewer in the industrial area south of Felix Street.
3. Section of 150mm sewer through OR63 over capacity.

Design details:

- Occupancy rate - 3 persons per dwelling
- Design flow – 180 L/p/day
- PDWF peak factor – 3.0
- PWWF peak factor – 6.7
- Commercial and Industrial – Gross Floor Area Estimate

EPA was granted for the Captain Springs / Mays Road wastewater upgrades but have since been put on hold by Watercare due to budget constraints.

Carl Whitten
Civil Engineer
carl.whitten@candor3.co.nz
021 270 9965

Appendix E: Candor^3 Wastewater Capacity Modelling

REV	DESCRIPTION	BY	APPVD	DATE
A	UPDATED DWELLING NUMBERS AND SEWER GRADES FROM SURVEY	AF	CW	07/20
B	UPDATED DWELLING NUMBERS AND SEWER GRADES FROM WSL MODEL DATA	AF	CW	07/20

Candor3 ENGINEERING FOR LIFE

PROJECT

ORANGA HEADWORKS
SANITARY SEWER
EXISTING CAPACITY ANALYSIS (1 OF 2)

CLIENT

Kāinga Ora
Homes and Communities

PURPOSE

FOR INFORMATION

DESIGN AF	APPROVED	SCALE
DRAWN AF	BY CW	1:4000 @ A3
CHECK CW	DATE 30 AUG 2018	

PROJECT NO.	PROJECT	REV.
1317	05-SK10	B

1. KAINANGA ORA DEVELOPMENT LOCATION, STAGING AND DWELLINGS FROM THE NS MASTERPLAN.

2. IN THE LAND BETWEEN MT SMART RD, ORANGA AVE, ROCKFIELD RD AND NAMATA RD an additional 290 dwellings (i.e. ABOVE THE NS MASTERPLAN) AS GROWTH OTHER THAN KAINANGA ORA OR TO PERMIT FLEXIBILITY OF THE KAINANGA ORA DEVELOPMENT.

3. AN ALLOWANCE OF 1.5% ANNUAL GROWTH FOR RESIDENTIAL AREAS IN THE WASTEWATER CATCHMENT OUTSIDE OF THE LAND BOUND BY MT SMART RD, ORANGA AVE, ROCKFIELD RD AND NAMATA RD HAS BEEN ALLOWED FOR.

4. ALL DWELLINGS ARE ASSUMEDTO BE 2-4 BEDROOMS (I.E. 3 OCCUPANTS).

5. DEMANDS HAVE BEEN CALCULATED FROM THE WASTERCARE CODE OF PRACTICE FOR LAND DEVELOPMENT CHAPTER 5 REV 2.2.

6. PIPE CAPACITY CALCULATED USING MANNINGS FORMULA, n =0.013.

7. PIPE GRADES CALCULATED FROM WSL GIS, WSL NETWORK MODEL OR SITE SURVEY. WHERE NO INFORMATION IS AVAILABLE THE MINIMUM GRADE (PER WSL COP) HAS BEEN ADOPTED.

8. % FULL CALCULATED AS FLOWRATE / PIPE FULL FLOW RATE

REV	DESCRIPTION	BY	APPVD	DATE
A	UPDATED DWELLING NUMBERS AND SEWER GRADES FROM SURVEY	AF	CW	07/20
B	UPDATED DWELLING NUMBERS AND SEWER GRADES FROM WSL MOCEL DATA	AF	CW	07/20

Candor3 ENGINEERING FOR LIFE

PROJECT

ORANGA HEADWORKS
SANITARY SEWER
EXISTING CAPACITY ANALYSIS (2 OF 2)

CLIENT

Kāinga Ora Homes and Communities

PURPOSE: FOR INFORMATION

DESIGN AF	APPROVED	SCALE
DRAWN AF	BY CW	1:4000 @ A3
CHECK CW	DATE 30 AUG 2018	

PROJECT NO. 1317 | PROJECT 05-SK11 | REV. B

REV	DESCRIPTION	BY	APPVD	DATE
D	UPDATED TABLE AND CATCHMENT BOUNDARY	AF	CW	28-10-20
E	FELIX ST	AF	CW	2-11-20
F	NM13, ST16, NS1, ST42, RC135, RC161 INCREASED YIELD	AF	CW	16-11-20
G	1707 KAINGA ORA DWELLINGS	AF	CW	04-12-20
H	ADDITIONAL SURVEY DATA FOR OR63	AF	CW	11-12-20
I	TO STAGE 3, INCRESED KO YIELD, NO i11	AF	CW	16-12-20
J	MASTERPLAN + 20% + i11	LV	CW	04-02-21
K	ADDITIONAL SURVEY DETAIL	AF	CW	01-03-21

Candor3 ENGINEERING FOR LIFE

PROJECT
ORANGA HEADWORKS
SANITARY SEWER
MASTERPLAN + 20% + i11 STRESS TEST

CLIENT
Kāinga Ora Homes and Communities

PURPOSE
FOR INFORMATION

DESIGN AF	APPROVED	SCALE
DRAWN AF	BY CW	1:4000 @ A3
CHECK CW	DATE 30 AUG 2018	

PROJECT NO. 1317 | PROJECT NO. 05-SK30 | REV. K

REV	DESCRIPTION	BY	APPVD	DATE
C	ADDED 28 DW + 9 EMPL GROWTH SOUTH OF MT SMART RD	AF	CW	23-10-20
D	UPDATED TABLE AND CATCHMENT BOUNDARY	AF	CW	28-10-20
E	FELIX ST	AF	CW	2-11-20
F	NM13, ST16, NS1, ST42, RC135, RC161 INCREASED YIELD	AF	CW	16-11-20
G	1707 KAINGA ORA DWELLINGS	AF	CW	04-12-20
H	ADDITIONAL SURVEY DATA FOR OR63	AF	CW	11-12-20
I	TO STAGE 3, INCRESED KO YIELD, NO i11	AF	CW	11-12-20
J	MASTERPLAN + 20% + i11	LV	CW	04-02-21
K	ADDITIONAL SURVEY DETAIL	AF	CW	01-03-21

Candor3 ENGINEERING FOR LIFE

PROJECT

ORANGA HEADWORKS
SANITARY SEWER
MASTERPLAN + 20% + i11 STRESS TEST

CLIENT

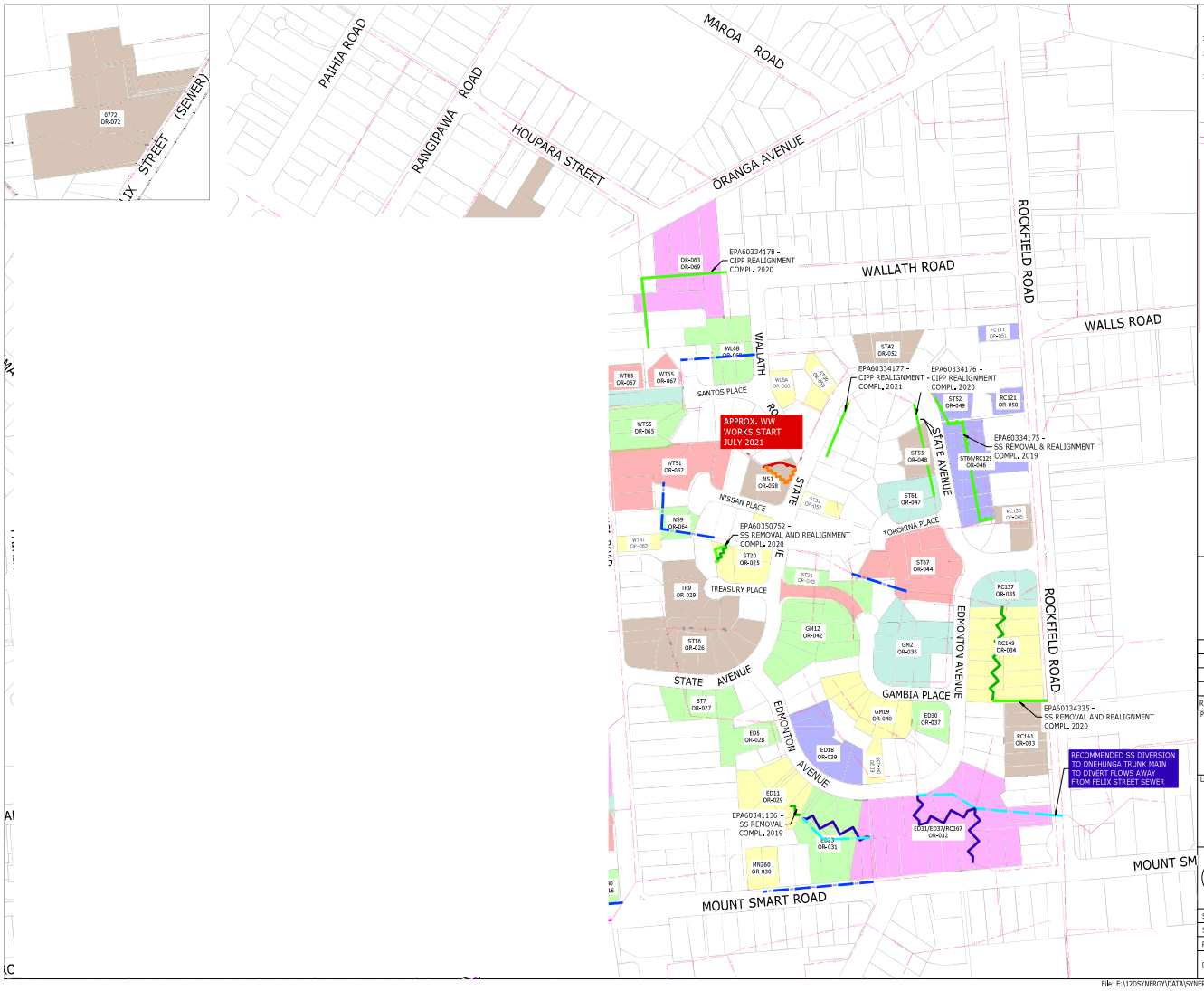
Kāinga Ora Homes and Communities

PURPOSE: FOR INFORMATION

DESIGN AF	APPROVED	SCALE
DRAWN AF	BY CW	1:4000 @ A3
CHECK CW	DATE 30 AUG 2018	

PROJECT NO. 1317 | PROJECT NO. 05-SK31 | REV. K

Appendix F: Wastewater Overall Infrastructure Upgrade Plans



NOTES

1. EXTENT OF WORKS AND STAGING BASED ON CAD FILE 190819_IGL_4020_ORANGA_MASTERPLAN_REV NS.
2. PROPOSED EPA ALIGNMENTS SHOWN HERE ARE APPROXIMATE. PLEASE REFER TO APPROVED EPA PLANS FOR FURTHER INFORMATION.
3. PROPOSED BUILDING FOOTPRINT HAVE BEEN TAKEN INTO ACCOUNT USING THE ABOVE MASTERPLAN IN PLANNING FUTURE CONCEPTUAL WORKS.

LEGEND

- EXISTING BOUNDARIES
- EXISTING SEWER LINE (GIS)

TOC10 (STAGE 1 & 2) WW WORKS
- NEW INFRASTRUCTURE
- REMOVED INFRASTRUCTURE

TOC30 (STAGE 3) WW WORKS
- PROPOSED NEW SEWER LINE
- PROPOSED SEWER LINE TO BE REMOVED

FUTURE CONCEPTUAL WW WORKS
- FUTURE SEWER DIVERSION
- FUTURE SEWER REMOVAL
- FUTURE SEWER RENEWAL
- RECOMMENDED SEWER UPGRADE REQUIRED BY 2024

Kāinga Ora Homes and Communities
Piritahi LAYING THE GROUNDWORK

1	FOR INFORMATION	NGH	15.03.2021
REVISION DETAILS		BY	DATE

PROJECT:
ŌRANGA DEVELOPMENT

DESCRIPTION:
SEWER OVERALL INFRASTRUCTURE UPGRADES SHEET 1 OF 2

SURVEYED	-	-
DESIGNED	-	-
DRAWN	OT	05.02.2021
CHECKED	RDH	05.02.2021
APPROVED	NGH	05.02.2021
SCALE	NOT TO SCALE	REVISION
STATUS	FOR INFORMATION	1
PRECINCT	ORANGA	
DWG NO	OR-000-1104b	

Synergy Version:
Plot Date: 10:22:12 am,15 March 2021,----
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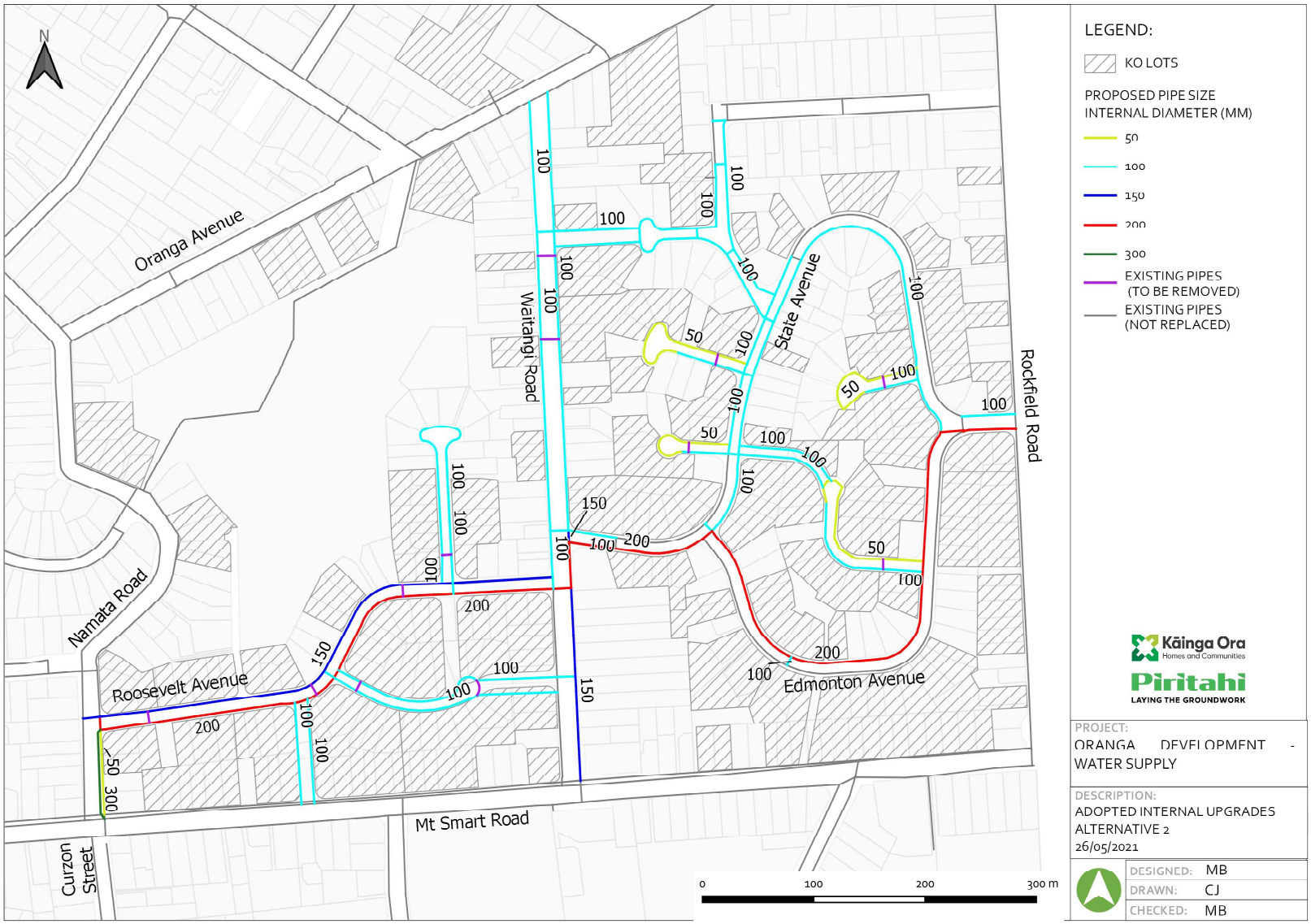
Appendix I: Neighbourhood Watermain Overall Upgrade Plan



LEGEND:

- KO LOTS
- PROPOSED PIPE SIZE INTERNAL DIAMETER (MM)
  - 50
  - 100
  - 150
  - 200
  - 300
- EXISTING PIPES (TO BE REMOVED)
- EXISTING PIPES (NOT REPLACED)

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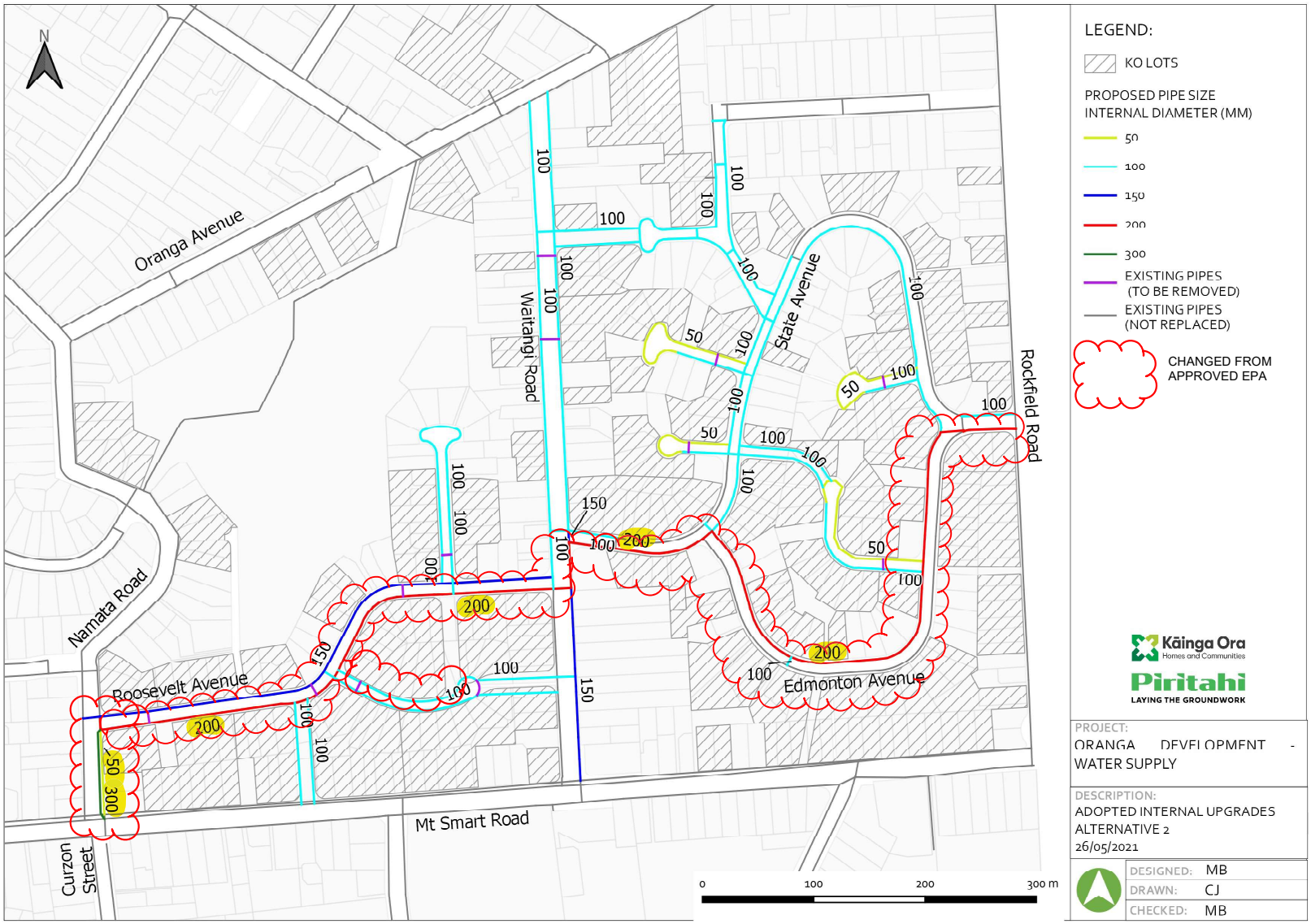
Piritahi LAYING THE GROUNDWORK

PROJECT:
ORANGA DEVELOPMENT - WATER SUPPLY

DESCRIPTION:
ADOPTED INTERNAL UPGRADES ALTERNATIVE 2
26/05/2021

DESIGNED:	MB
DRAWN:	CJ
CHECKED:	MB



LEGEND:

- KO LOTS
- PROPOSED PIPE SIZE INTERNAL DIAMETER (MM)
  - 50
  - 100
  - 150
  - 200
  - 300
- EXISTING PIPES (TO BE REMOVED)
- EXISTING PIPES (NOT REPLACED)
- CHANGED FROM APPROVED EPA

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Piritahi LAYING THE GROUNDWORK

PROJECT:
ORANGA DEVELOPMENT - WATER SUPPLY

DESCRIPTION:
ADOPTED INTERNAL UPGRADES ALTERNATIVE 2
26/05/2021

DESIGNED:	MB
DRAWN:	CJ
CHECKED:	MB

NOTES

1. EXTENT OF WORKS AND STAGING BASED ON CAD FILE 190819_IGI_4020_ORANGA_MASTERPLAN_REV N5,
2. PROPOSED EPA ALIGNMENTS SHOWN HERE ARE APPROXIMATE. PLEASE REFER TO APPROVED EPA PLANS FOR FURTHER INFORMATION.

LEGEND

EXISTING BOUNDARIES

EXISTING WATERMAIN (GIS)

LEGEND - WATERMAIN UPGRADE STAGING

- WATERMAIN UPGRADES COMPL. 2021
- WATERMAIN UPGRADES COMPL. 2022
- WATERMAIN UPGRADES COMPL. 2023

LEGEND - WATERMAIN UPGRADE PROPOSALS

- DIAMETER INCREASE
- LIKE FOR LIKE REPLACEMENT
- NEW PIPE
- OPPORTUNITY FOR RENEWAL
- REMOVED

Kāinga Ora Homes and Communities

Piritahi LAYING THE GROUNDWORK

1	FOR INFORMATION	NGH	26.02.2021
REVISION DETAILS		BY	DATE

PROJECT:

ŌRANGA DEVELOPMENT

DESCRIPTION:

WATERMAIN OVERALL INFRASTRUCTURE UPGRADES ALTERNATIVE UPGRADE 2

	SURVEYED	-	-
	DESIGNED	-	-
	DRAWN	OT	05.02.2021
	CHECKED	RDH	05.02.2021
	APPROVED	NGH	05.02.2021
SCALE	NOT TO SCALE		REVISION
STATUS	FOR INFORMATION		1
PRECINCT	ŌRANGA		
DWG NO	OR-000-1104a		

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Synergy Version:

Plot Date: 2:24:22 pm,26 February 2021,-----