15 April 2025

Craig Innes

fyi-request-30457-60a66826@requests.fyi.org.nz

Dear Craig

Request for Information – Local Government Official Information and Meetings Act (LGOIMA) 1987

We refer to your official information request dated 18 March 2025 for:

> *"Please supply the GHD Report on Wainuiomata urban development referred to in Black Creek Combined Report - 22-05-23 (Fig. 1-5)."*

Answer:

This request relates to a report from Wellington Water Limited. They have provided us with the following information:

The planned development zones indicated in Figure 1.5 have been based of the GHD Report – Wainuiomata Growth Catchment Study including PC43 and have been adjusted to the areas with Forecast ID data at the time of the report. These numbers of expected population growth may differ now.

A copy of the GHD Wellington Water Hutt City Three Waters Catchment Growth Study Including Plan Change 43 Phase One: Wainuiomata Catchment Final Summary Report is attached.

We have redacted all contact details and names of certain individuals for privacy purposes as per section 7(2)(a) of the LGOIMA.

If you have any follow-up requests in relation to this report, please contact Wellington Water at:

official.information@wellingtonwater.co.nz

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Please note that this response to your information request may be published on Hutt City Council's website. Please refer to the following link: www.huttcity.govt.nz/council/contactus/make-an-official-information-act-request/proactive-releases

Yours sincerely

Lakna Siriwardena

Legal Operations Advisor

Wellington Water

Hutt City Three Waters Catchment Growth Study Including Plan Change 43

Phase One: Wainuiomata Catchment Final Summary Report - Rev 3

December 2020

Activity	Title	Name	Electronic signature	Date
Prepared by	Water Engineer GHD	[redacted]	[redacted]	11/12/2020
Checked by	Lead Engineer GHD	[redacted]	[redacted]	11/12/2020
Approved by	Project Manager Wellington Water	[redacted]	[redacted]	11/12/2020
Approved for release by	Programme Manager Wellington Water	[redacted]	[redacted]	11/12/2020

Executive summary

HCC has identified Wainuiomata as a potential area for significant population increase over the next 30 years. The predicted growth will put additional strain on the three waters networks already known to have existing issues.

Plan Change 43 (PC 43) would enable intensified growth in existing urban areas. The large greenfield development areas in the north of Wainuiomata are expected to contribute to a significant amount of the forecast population growth. The existing three waters infrastructure in these areas service only a small number of properties. These areas will require significant infrastructure upgrades. Discussion on each of the three waters is provided below with all costs presented as high-level 95th percentile estimates.

Water Infrastructure

Water model development and optioneering for water infrastructure improvements has been completed by Stantec, with support by Wellington Water. By 2050 an additional 8.0 ML of storage volume is required to meet the seismic and operational (peak daily demand) levels of service. Based on the assessment work completed, the preferred location for a new 8.0 ML storage tank is adjacent to Fraser Street. The new reservoir will create a new lower-pressure zone, isolated from the rest of the Wainuiomata network with the high-level cost estimate (for budgeting purposes) being $39.4 M.

Three planning horizons were assessed to calculate the required infrastructure to support levels of service and growth today, by 2033 and by 2050. The costs under these planning horizons include:

- 2020 Planning Horizon –Pipe Network Upgrades: $5.6 M
- 2033 Planning Horizon – Pipe Network Upgrades: $4.2 M
- 2050 Planning Horizon– Pipe Network Upgrades: $13.6 M

In addition to the proposed pipeline upgrades, there is 5.2 kilometres of existing 750 mm bulk water main that is due for renewal. Based on the design completed by MWH (now Stantec) this pipeline is to be replaced with 914 mm OD CLS pipe over three separate sections. The GHD cost estimate for this upgrade is $82.5 M.

The total estimated cost for the water infrastructure upgrades is: **$145.3 M.**

Wastewater Infrastructure

The model development and optioneering for wastewater infrastructure improvements has been completed by Hydraulic Analysis Limited (HAL), with support by Wellington Water.

Two future growth scenarios were originally identified for assessing options, M2L (+20 years) for identifying the likely issues requiring resolution, and maximum probable development (MPD) (+50 years), for ensuring options were sized sufficiently for target levels of service to be met long term.

A longlist of solution sets was assessed using the hydraulic model to review improvements to the level of service. Following this initial analysis, the options were further refined to prioritise cost-effective network improvements which would provide an immediate benefit to the catchment and provide flexibility for accommodating future growth.

The assessment of required wastewater infrastructure improvement options through to 2033 include:

- Wise Park PS Upgrade - $1.2 M (Stage 1)
- Wise Park PS Upgrade - $15.8 M (Stage 2)
- I&I Programme - $40.6 M
- Greenfield Servicing - $4.4 M
- Fraser Storage Tank - $3.2 M
- Main / Rowe Storage Tank - $5.4 M
- Assessment and replacement of Laterals - $19.5 M

For the 50 year growth horizon the additional wastewater infrastructure improvements include the duplication of the gravity line - $5.2 M (from Wainuiomata to Gracefield), further I&I work ($27.6 M) and the upgrade of Wellington Road Pump Station ($0.7 M).

The total estimated cost for the wastewater infrastructure upgrades is: **$123.7 M.**

Stormwater Infrastructure

Flooding has been as issue in Wainuiomata for a number of years. The major channels in the network, Black Creek and Parkway Drain, have insufficient capacity for large sections of the channels. The upstream piped network is undersized in numerous locations such as the area around Parkway Drain and upstream of Mary Crowther Park.

Work was undertaken by Stantec in 2019 and 2020 to investigate flooding issues in the existing catchment. Three large scale upgrade options were considered by Stantec:

- Increase channel capacity in Black Creek
- Large scale detention (five locations proposed)
- Large scale flow diversions parallel to Black Creek and Parkway Drain

A large scale flow diversion was considered less cost effective compared with channel widening and was not considered further.

GHD developed the stormwater hydraulic model to account for the predicted growth through to 2050 and assessed the proposed channel widening and storage options. Following a site visit, GHD considered three of Stantec's large scale detention options and two additional options.

A summary of the preferred options through to 2033 from this assessment (including costs) is listed below:

- New Detention / Wetland - $20 M
- Black Creek Widening (Top Section) - $2.1 M
- Black Creek Widening (Middle Section) - $ 5.6 M
- Black Creek Widening (Lower Section) - $6.8 M
- Parkway Widening - $2.4 M
- Lees /Fraser Pipe Upgrade - $19.3 M
- Upper Fitzherbert Pipe Infrastructure - $7.3 M

In addition to the above options, there is a proposed Waiu Stormwater Upgrade for growth through to 2050, with the cost estimate being $9.1 M.

The calculated increase in channel capacity as a result of the proposed channel improvements is between 52% and 84%

The total estimated cost for the stormwater infrastructure upgrades is: **$72.6 M.**

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1. Introduction

1.1 Background

Hutt City Council (HCC) is responsible for providing three waters infrastructure to support its projected population growth. HCC has identified Wainuiomata as a potential area for significant population increase over the next 30 years. The predicted growth will put additional strain on the three waters networks already known to have existing issues.

Two types of population growth are predicted in Wainuiomata:

- Greenfield development, particularly in large rural areas in the north
- Infill development in existing residential areas

Plan change 43 (PC43) enables two new activity areas to increase urban density in Wainuiomata, which will drive some of the infill development. These include:

- Suburban mixed use activity area
- Medium density residential activity area

Wellington Water has engaged Stantec, HAL and GHD to assess the performance of the existing three waters network in Wainuiomata, the impacts the projected population growth will have on the networks and consider catchment scale options needed to meet the required levels of service and population growth to 2050. Cost estimates were prepared for the preferred three water network improvements to inform Council's Long Term Plan (LTP). Cost estimates have been prepared as follows:

- Level One estimates for significant built infrastructure or earthworks
- Level Two estimates for pipe upgrades or renewals

For further background information and original engagement brief, refer to the Activity Brief confirmed from Wellington Water in Appendix A.

1.2 Existing catchment

Wainuiomata is home to approximately 18,000 residents. The suburb is located east of Petone, and is managed by the Hutt City Council (refer to Figure 1-1).

Figure 1-1: Location of Wainuiomata catchment

The Wainuiomata catchment covers 1700 hectares, with areas varying from densely populated residential sections to the south, to large greenfield areas in the north (refer Figure 1-2).

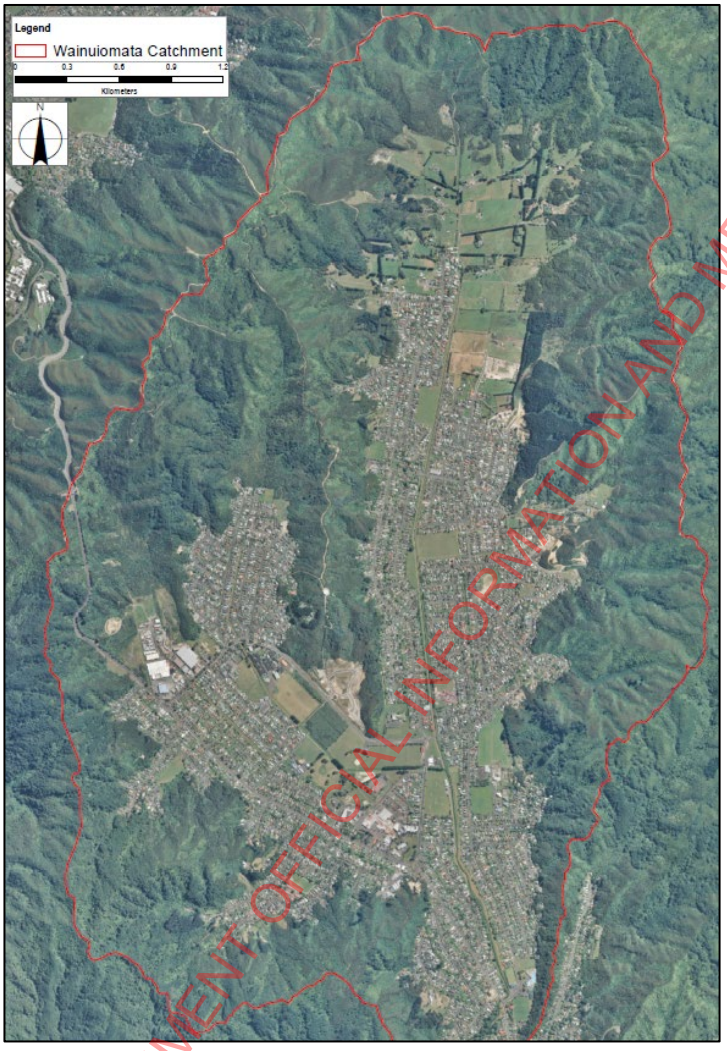


Figure 1-2: Wainuiomata catchment extent

1.3 Purpose of this report

The purpose of this catchment study is to proactively identify upgrades to the three waters networks that are needed to accommodate predicted urban growth in Wainuiomata.

This report will summarise:

- The expected growth
- Key constraints to improving infrastructure
- Preferred options from the optioneering work undertaken by Stantec, HAL and GHD
- Cost estimates for the preferred options to understand the cost of the required infrastructure to meet levels of service and support growth.

This report provides a summary of the optioneering work undertaken by Stantec, HAL and GHD respectively. Full reports are attached in Appendices B – F.

Timing has allowed cost estimates from this study to be made available for input into the Long Term Plan, however this was not originally one of the goals of the study.

1.4 Scope and limitations

The scope of this report is to review the wastewater, stormwater and water supply networks within the Wainuiomata catchment in their current condition and against the forecasted growth. Based on the optioneering work undertaken by Stantec, HAL and GHD, upgrades have been recommended for each network to meet the specified levels of service in the existing scenario as well as allow for future growth. High level cost estimate for these recommendations have been prepared to aid in the decision making process when planning for future growth.

The networks have been assessed based on three planning horizons: 2019/2020 (existing demands scenario for level of service), 2033 and 2050 (as mid and long term growth scenarios).

1.5 Disclaimer

This report has been prepared by GHD for Wellington Water and may only be used and relied on by Wellington Water for the purpose agreed between GHD and the Wellington Water as set out in Section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Wellington Water arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report (section 1.4).

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report and provided by third parties. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Wellington Water and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared the cost estimates ("Cost Estimate") using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD under the guidelines of Wellington Water's cost estimation manual. The Cost Estimate has been prepared for the purpose of Wellington Water's HCC long term planning budget and must not be used for any other purpose.

2. Predicted Growth

To enable development in Wainuiomata the projected population forecasts need to be considered.

Plan Change 43 (PC 43) will enable intensified growth in existing urban areas. In addition to this, there are a number of existing greenfield sites in Wainuiomata which have already submitted development plans, or which Hutt City Council expects to be developed in the next 30 years.

Two types of population growth are predicted:

- Greenfield development, especially in large areas in the north which are currently zoned rural residential
- Infill development in existing residential areas, intensified by PC43

Growth data was provided by the Hutt City Council, estimated by their internal staff based on earlier data from Forecast ID. Wellington Water provided this data to GHD both as a spreadsheet and in ArcGIS online.

Both growth types are forecasted through to 2047, 30 years from when this study began, and have then been extrapolated through to 2050.

2.1 Infill development

Infill development refers to intensification of the existing developed areas of Wainuiomata. PC 43 will help to drive this as it enables additional intensification in the Wainuiomata town centre where land was previously zoned general residential and is now medium density residential (refer Figure 2-1).

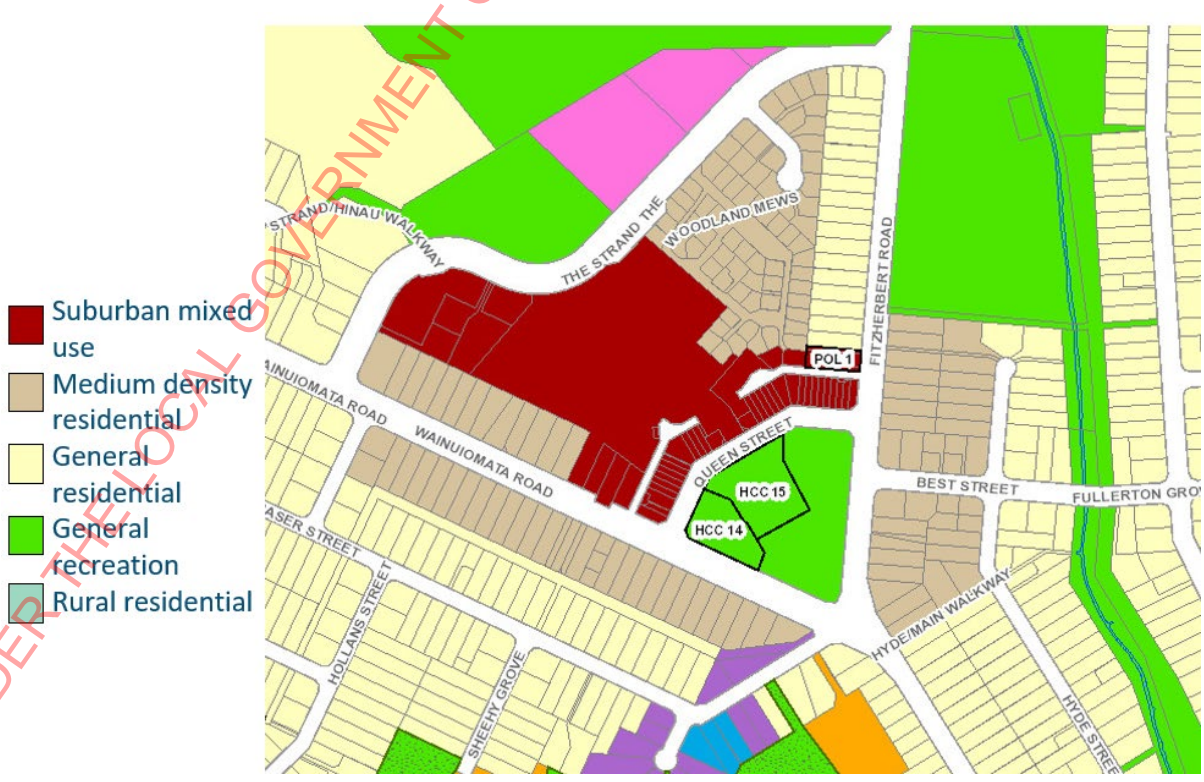


Figure 2-1 New HCC district plan zoning in PC43

Wainuiomata has been split into five population forecast catchments to forecast infill development. These five catchments include: Arakura, Glendale, Parkway, Fernlea and Homedale /Pencarrow (refer to Figure 2-2):

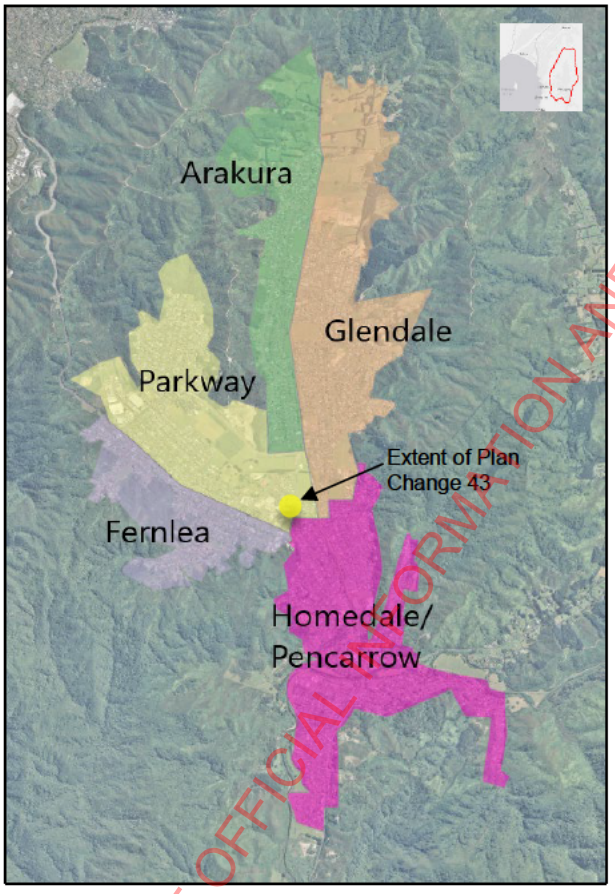


Figure 2-2: Population forecast catchments

Table 2-1 summarises the forecast population growth due to infill development for these five areas. The medium density residential zones created by PC 43 are within the Parkway population forecast catchments.

Table 2-1: Forecasted growth for infill development

	Forecast total population						
Forecast Catchment	**2013**	**2020**	**2023**	**2033**	**2043**	**2047**	**2050***
Arakura	2,511	2,576	2,632	2,888	3,413	3,628	3,627
Fernlea	2,021	2,016	2,027	2,043	2,062	2,078	2,077
Glendale	3,921	4,116	4,603	5,358	6,689	7,280	7,380
Homedale - Pencarrow	6,103	6,282	6,647	6,651	6,743	6,827	6,923
Parkway	3,231	3,520	3,975	4,249	4,233	4,245	4,486
Total	**17,787**	**18,510**	**19,883**	**21,190**	**23,140**	**24,058**	**24,494**

**Linear extrapolation was used for year 2050 population forecast*

2.2 Greenfield development areas

Greenfield development areas are generally undeveloped catchments with the potential to see significant change in the next 30 years. Development in these areas will require the construction of new three waters infrastructure, as well as upgrades to existing networks.

The HCC identified eight potential greenfield development areas in Wainuiomata (refer to Figure 2-3). These areas are geographically located within the infill population forecast catchments, however greenfield population growth has been calculated separately.

Plan Change 43 is not expected to impact these greenfield developments.

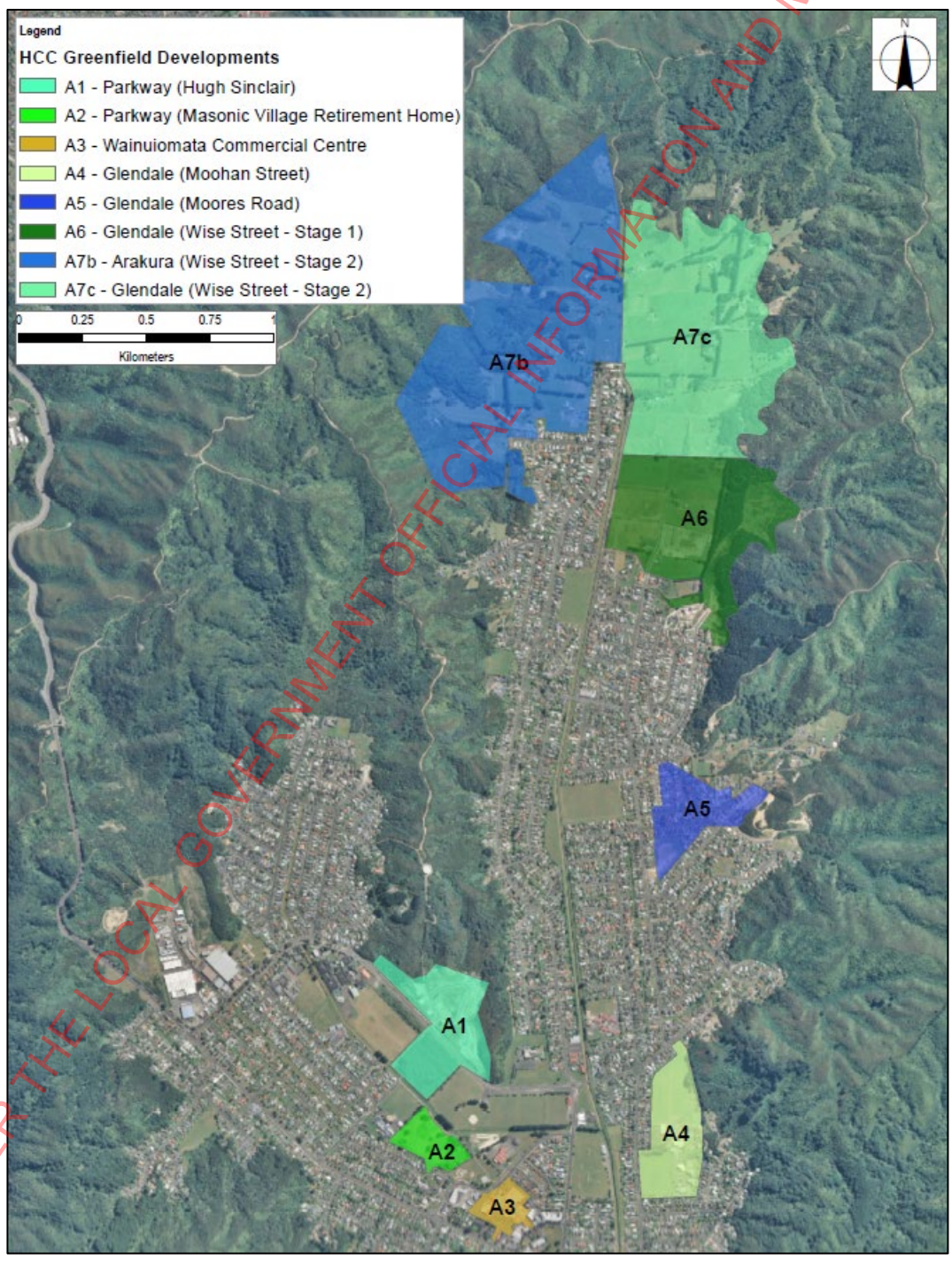


Figure 2-3: Greenfield development areas

Table 2-2 summarises the forecast population growth due to greenfield development.

Table 2-2: Forecasted number of additional dwellings for greenfield development areas

Area ID	Greenfield development area	2020	2033	2050	Total
A1	Parkway (Hugh Sinclair)	50	16	0	66
A2	Parkway (Masonic Village Retirement Home)	50	60	0	110
A3	Wainuiomata Commercial Centre	0	0	0	0
A4	Glendale (Moohan Street)	50	140	0	190
A5	Glendale (Moores Road)	18	0	0	18
A6	Glendale (Wise Street – Stage 1)	0	120	0	120
A7b	Arakura (Wise Street – Stage 2)	0	100	340	440
A7c	Glendale (Wise Street – Stage 2)	0	150	510	660

The area identified as Wise Street Stage 2 (A7b, A7c) has been proposed as a potential area of future greenfield development subject to HCC and community consultation. In these areas, the existing three waters infrastructure currently services only a small number of properties and significant upgrades would be required to allow for future growth.

A7b and A7c are currently zoned rural residential and approval for a change of land use would be required for significant development to occur.

3. Site Constraints

This section details existing site constraints that have a potential impact on the catchment scale options considered.

Geotechnical and contaminated land investigations were outside the scope of this report, however the following high level checks were undertaken.

3.1 Geotechnical

No geotechnical input was included as part of this three waters catchment study. In 2014, GHD conducted a geotechnical assessment of the northern areas designated for development within Wainuiomata as part of a separate project[1]. This report stated that the proposed site was anticipated to be suitable for residential development, subject to the following constraints:

- Possibility of soft compressible and potentially liquefiable subsoils. Specific foundation design may be required in large areas.
- Elevated groundwater levels are considered likely
- Possibility of historical surficial filling
- Slope instability – GHD observed what appeared to be shallow seated slope instability combined with the presence of soil creep with remnants of historic land movement.
- High combined seismic hazard index – high ground shaking (moderate liquefaction), low slope failure
- Flat, low lying and potentially saturated soils. Stormwater design will be an important consideration.

Further geotechnical investigation will be required prior to further development of the options proposed in this report. It is expected that the high groundwater, soft soils and seismic risk will increase the costs of three waters infrastructure upgrades.

3.2 Contaminated land

No contaminated land investigation was included as part of this three waters catchment study, however GHD notes that the Selected Land Use Register (SLUR) identifies two potential areas for contaminated land. Both areas are categorised as having a `Verified History of Hazardous Activity or Industry'. Figure 3-1 shows both areas, each is a collection of smaller sites.

[1] GHD (2014) *Hutt City Council Report for Urban Strategic Development Wainuiomata Area*

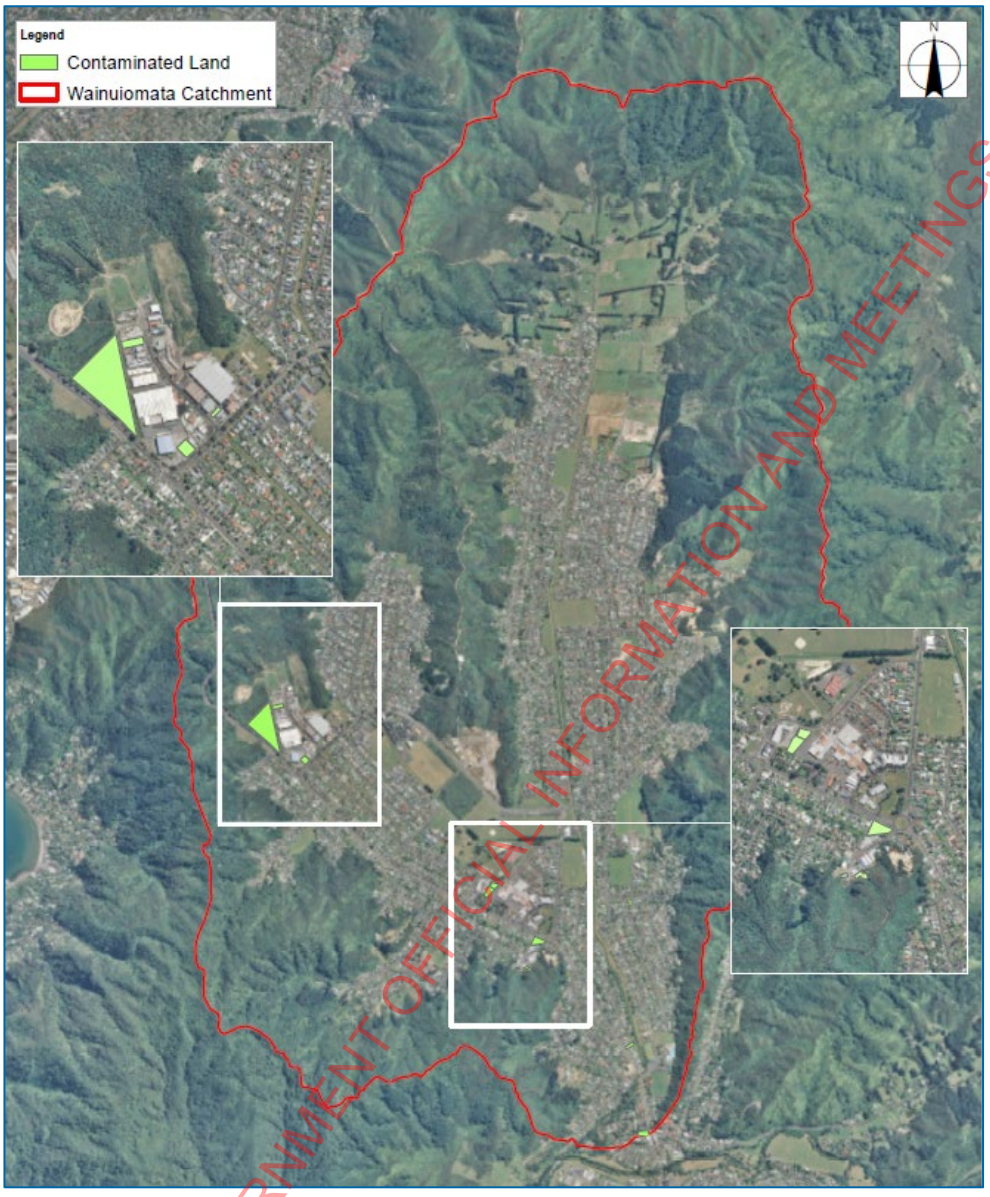


Figure 3-1: SLUR potential areas for contaminated land

These sites are located on private land. The contaminated sites are not expected to have any material effect the three waters upgrades presented in this report. There are no known contaminated sites in the greenfield development areas.

3.3 Freshwater quality and quantity

Wellington Water's goal for healthy urban waters ongoing improvement to the water quality of the region's beaches and coastlines. Community expectations for water quality are also increasing. Wellington Water, on behalf of HCC, needs to demonstrate an improvement to water quality from their networks in order to accommodate discharges from growth.

Black Creek at Moohan Street is a regional water quality site. Under the National Policy Statement for Freshwater Management, this site has an attribute state of E for risk to human health during recreation (measured as E. coli/100mL). E is the worst grade; the National Bottom Line is set at C. The wastewater infrastructure improvements presented in this report put measures in place to improve the water quality of Black Creek to acceptable levels.

Stormwater from this network flows untreated into the streams, rivers and the ocean. As stormwater picks up sediment, contaminants, petrochemicals and heavy metals such as zinc, copper and lead, it can result in harmful water quality where it discharges to streams or coastal

waters. Stormwater from greenfield development in particular, can result in excessive discharges of sediment due to the land use change from vegetation or grass to roads and other hardstand.

Land use and building restrictions that protect overland flow paths from being built over or blocked are also important for protecting people and property. Overland flow paths need to be identified in advance of land development so that they can be maintained when development occurs. Where development already exists there are fewer options for managing overland flow without affecting property.

The stormwater infrastructure improvements presented in this report address the water quality and quantity issues identified above.

3.4 Wetlands

There is a significant natural wetland listed in Schedule F3 of the Natural Resources Plan at the upper end of Waiu Street, named the Gracefield Scrub/Waiau Wetland (refer Figure 3-2).

The presence of this wetland has been assessed in the development of a potential storage option at this location.

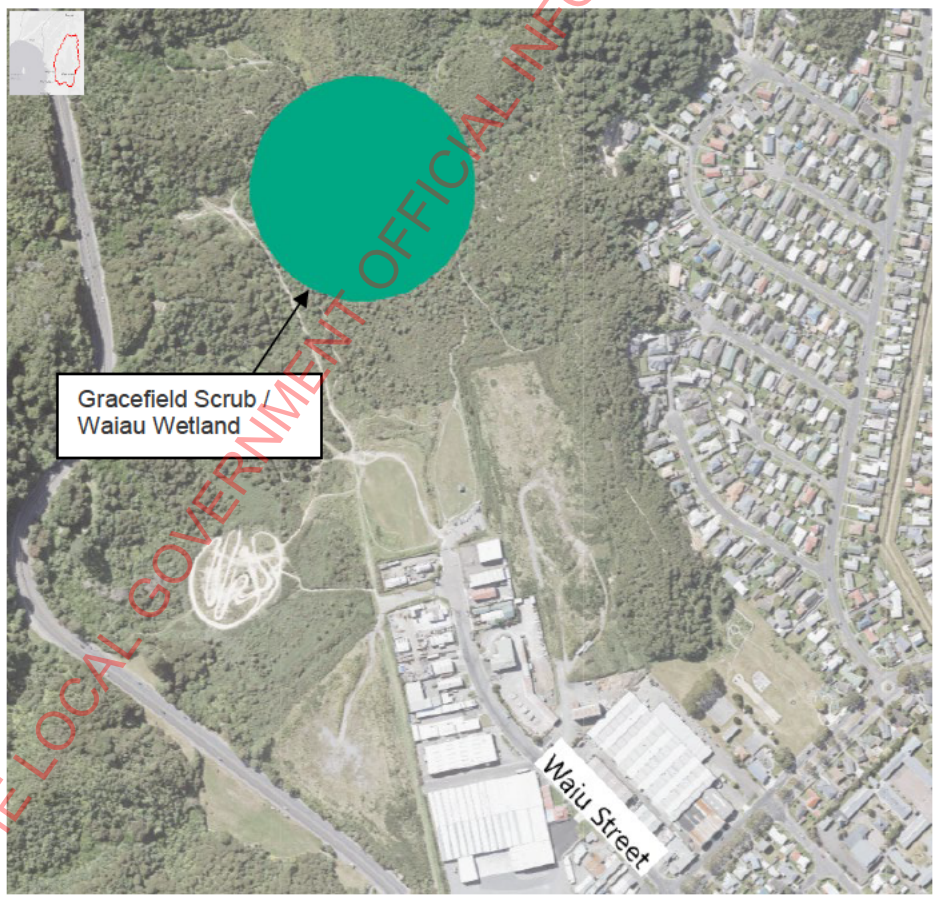


Figure 3-2: Waiu significant natural wetland

3.5 Existing developments

The initial population forecasting was undertaken in 2017 by HCC staff using data from Forecast ID. Optioneering for the three waters networks was undertaken in 2020. In the intervening period, some of the greenfield development areas have already been developed and the local three waters infrastructure to support these developments has been constructed. These areas include:

- A1 – Parkway (Hugh Sinclair) has been developed and houses are currently under construction. This was previously proposed as a possible stormwater storage area.
- A5 – Glendale (Moores Road) is now largely constructed.
- A6 - Glendale (Wise Street – Stage 1) is approximately half developed with further development work in the design phase.

This report recommends a number of upgrades for water supply, wastewater and stormwater upgrades (refer section 9). It is important that the land required for each three water infrastructure improvement presented in this report be earmarked for future three water infrastructure use. This will ensure that opportunities are not lost and that future development does not compromise the catchment scale three waters infrastructure strategy.

3.6 Consent requirements

There are a number of activities associated with infrastructure upgrades, such as earthworks, that may require resource consent from Hutt City Council and/or Greater Wellington Regional Council. These are discussed in further detail in sections 5.6 and 6.5.

4. Cost Estimation Methodology

GHD prepared cost estimates for the proposed three waters upgrades based on the *Wellington Water Cost Estimation Manual (Rev0)* and guidance received from Wellington Water. Base cost estimates were built up using the Wellington Water costing process shown in Figure 4-1. The percentage uplifts for consultant and council costs are as shown in Figure 4-2:

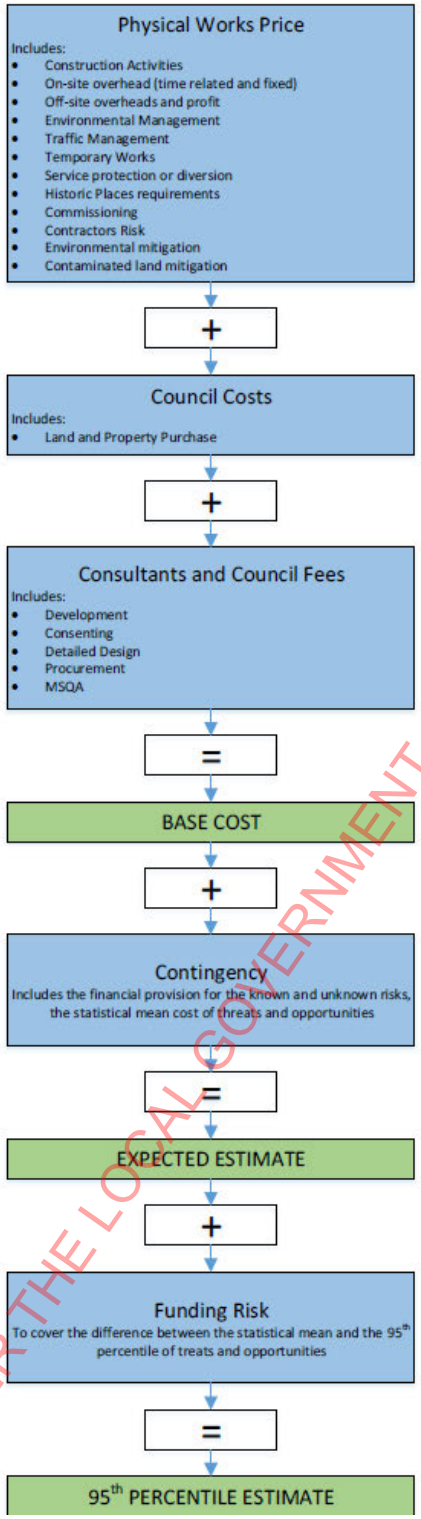


Figure 4-1 Wellington Water costing process

Phase & Task		%
Development		
Consultancy and Council Fees		3%
Site Investigations		
Other Costs (Legal, Land, etc...)		
Total Project Development		
Consenting		
Consultancy and Council Fees		3%
Site Investigations		
Other Costs (Legal, Land, etc...)		
Total Consenting		
Detailed Design		
Consultancy and Council Fees		6%
Site Investigations		
Other Costs (Legal, Land, etc...)		
Total Detailed Design		
Procurement		
Consultancy and Council Fees		1%
Other Costs (Legal, Land, etc...)		
Total Procurement		
Construction		
Consultancy and Council Fees		5%
Land Acqusistion		
Other Costs (Legal, Land, etc...)		
Physical Works		
	Preliminary and General	
	Physical Works - Stormwater	
	Physical Works - Wastewater	
	Physical Works - Potable Water	
Total Construction		
Base Estimate		
	Base Estimate	
	Contingency	
	Expected Estimate	
95th Percentile Estimate		
	Funding Risk	
TOTAL VALUE	**95th Percentile Estimate**	

Figure 4-2 Cost Estimate by Project Phase

For all options that involve pipeline upgrades or renewals as a result of modelling, the estimate is considered a Level Two estimate. All options that included significant built infrastructure or earthworks (new and upgraded pump stations, reservoirs, storage units or stream improvements) are considered Level One estimates due to the potential design changes and higher degree of uncertainty involved.

The following sections detail the methodology and assumptions by project phase for all three waters infrastructure options. Methodology and assumptions specific to water infrastructure are detailed in Section 5.7 and wastewater infrastructure in Section 6.6 and stormwater in Section 7.6.

4.1 Development / Consenting / Detailed Design / Procurement Phases

In line with the *Cost Estimation Manual,* the following allowances for Council and Consultancy costs were applied to each project phase.

Table 4-1 Council and Consultancy Fees

Council and Consultancy Fees by Project Phase	Percentage of Physical Works
Development	3%
Consenting	3%
Detailed Design	6%
Procurement	1%

For options where it was assumed a Notifiable Consent would be required, an allowance of $200,000 to $300,000 was added to cover additional consenting costs.

4.2 Construction Phase

4.2.1 Construction - General

Land Acquisition

Land acquisition costs were determined using the current capital value as of July 31 2020 from the *Hutt City Council Public Viewer*. An additional allowance of 10% was added to the capital value to allow for the council costs and legal fees for property purchase.

Standard Construction Costs

Standard construction items were calculated as an additional percentage of the Physical Works cost, and are shown in Table 4-2.

Table 4-2 Standard Construction Costs

Item	Percentage of Physical Works
Consultancy and Council Fees (MSQA)	5%
Contractors Risk	2%
Preliminary and General (Site establishment, disestablishment, bonds, insurance, as-built drawings)	10%
On-Site and Off-Site Overheads and Profit (applied to pipeline rates only)	15%

On-Site and Off-site Overheads and Profits are applied to pipeline construction and rehabilitation unit rates in the *Wgtn Optimisation Unit Cost Data 2020-Rev11 Spreadsheet,* which was prepared by GHD and issued to Wellington Water on the 19th of May 2020. Within the Unit Cost Spreadsheet, these costs are referred to as On-Costs. For all other items, where rates are estimated from recent tenders (pump stations, reservoirs, CCTV investigation etc.), it is assumed that On-Site and Off-Site Overheads and Profit are included in the tendered rates and no additional allowance is required.

Variable Construction Costs

Variable constructions costs were evaluated based on the location of each proposed infrastructure upgrade. The web GIS application provided by Wellington Water for the Hutt City Three Water Catchment Plan was used to identify contaminated land sites, ecologically sensitive sites, adjacent waterways and liquefaction and geotechnical risks. No site visits or site investigations were undertaken to confirm these conditions. GHD considers the use of this desktop information as sufficient for estimates up to Level 2.

Based on this desktop review, uplifts were applied as an additional percentage of the total physical works, as shown in Table 4-3.

Table 4-3 Variable Construction Costs

	Low		Medium		High	
Item	**Uplift**	**Description**	**Uplift**	**Description**	**Uplift**	**Description**
Traffic Management	3%	Outside Road Reserve	6%	Local Road	10%	Main Road
Environmental Management	1%	Clear of waterways, low geotechnical risk	3%	Adjacent to waterways, moderate geotechnical conditions	4%	Adjacent to sensitive waterways, complex geotechnical conditions
Contaminated Land	0%	None	10%	Moderate Contaminated Area	15%	Extensive Contaminated Area

4.2.2 Physical Works

Physical Works costs are calculated using unit rates from the *Wgtn Optimisation Unit Cost Data 2020-Rev11 Spreadsheet*. The spreadsheet was altered to remove Preliminary and General and Traffic Management uplifts as they have been captured in the cost estimate for each option.

For items not included in the Spreadsheet, rates from recently tendered projects of similar scope were applied.

GHD and Wellington Water considered the use of historical rates and the *Wgtn Optimisation Unit Cost Data 2020-Rev11 Spreadsheet* to be appropriate for estimates up to Level 2.

4.3 95th Percentile Estimates

In line with the Cost Estimation Manual, the 95th Percentile Estimate was calculated by applying the allowances for contingency and funding risk in Table 4-4.

Table 4-4 Contingency and Funding Risk

Estimate Type	Project Contingency	Funding Risk	Other
Level One	40%	60%	
Level Two	20%	30%	

Wellington Water Management Fees are not included in the cost estimates.

4.4 Risks

Level 1 and 2 cost estimates are subject to variation due to a number of risks. Significant risks that could affect the accuracy include:

- The assumed uplift percentages either over or under estimate the actual costs
- Construction cost escalation
- Unexpected land acquisition issues
- Property values do not reflect the actual purchase cost.
- Site constraints that have been overlooked due to option development being on a catchment scale
- Unforeseen ground obstructions
- Unforeseen contaminated land
- Unforeseen geotechnical issues
- The proposed infrastructure sites not available at time of construction requiring new sites and re-design
- Design alterations resulting from new survey information
- Underground infrastructure information resulting in significant design changes
- Inflation and economic factors affecting labour and material costs
- Significant changes over and above the predicted growth figures resulting in a need to upsize the planned infrastructure.

5. Water Infrastructure

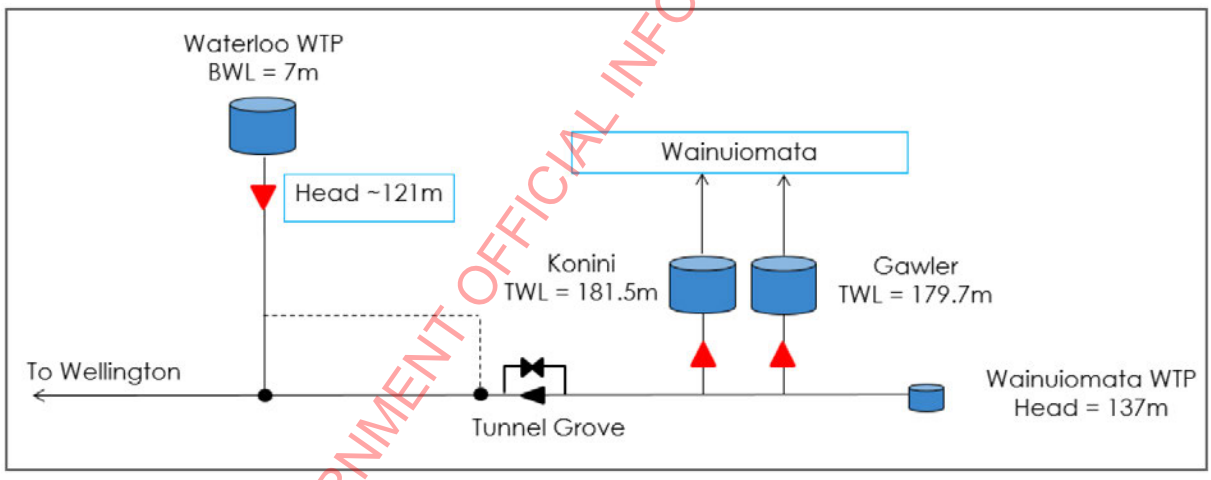
The model development and optioneering for water infrastructure improvements has been completed by Stantec, with support by Wellington Water.

This section is a summary of GHD interpretation of Stantec's findings. For the complete Stantec report refer to Appendix B. Note that this report is at draft status, however Wellington Water has indicated to GHD that it should be considered as if it were final.

5.1 Network configuration

There are two main sources of water in the Wainuiomata network (refer to Figure 5-1):

- Bores in the Lower Hutt CBD pump water from the Waiwhetu Aquifer into the Waterloo Water Treatment Plant (WTP). After treatment, water is conveyed via the bulk network into Wainuiomata.
- Water is conveyed from the Wainuiomata and Orongorongo rivers and three smaller creeks to the Wainuiomata WTP. Water then goes from the treatment plant via the bulk network into the Wainuiomata network.

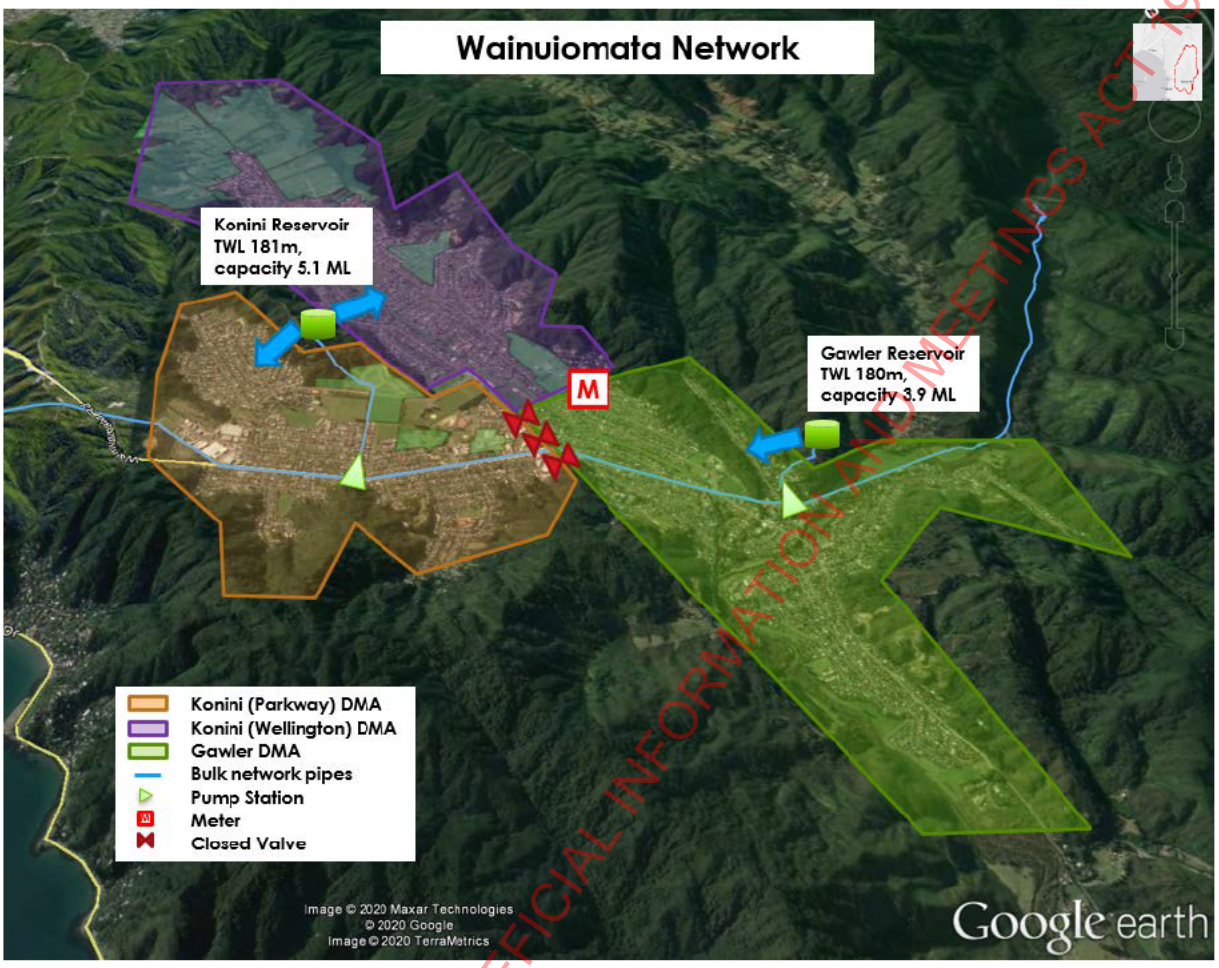


Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-1: Bulk water schematic

Konini reservoir has a capacity of 5.1 ML and Gawler reservoir has a capacity of 3.9 ML. Combined, the reservoirs serve 6,312 customers. 5,974 are residential and the remainder are commercial or industrial customers.

Wainuiomata is composed of three district metering areas (DMA) as shown in Figure 5-2. However, assessing each DMA independently yielded unrealistic demand results, likely due to the interaction of meters and bidirectional water movement. For the purposes of modelling these areas were therefore assessed together.



Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-2: Water network district metering areas

5.2 Levels of service

The Regional Standard for Water Services sets out the specifications used in the Zone Management Plan:

- Minimum pressure at point of supply = 25 m
- Maximum pressure at point of supply = 90 m
- Allowable head losses for a pipeline at design peak demand ≤ 5 m/km
- Reservoirs replenish to at least their starting level over 24 hours
- Reservoirs do not drop below 70% full under normal operating conditions.

Firefighting

Firefighting requirements were taken from the Fire Code SNZ PAS 4509:2008.

A methodology was developed to assign the fire water (FW) classification of the buildings in Wainuiomata. This is outlined below:

- The 'Regional Fire Classification' shapefiles provided by Wellington Water include the fire hazard category (FHC) value of the buildings and the building footprint.
- The fire cell size is conservatively assumed to be the entire footprint of the building.
- With the FHC value and the derived area of the fire cell, the FW class is obtained using Table 1 – Method for determining required water supply classification from the Fire Code.

In summary, for the purpose of outlining network upgrades as part of this master plan:

- The shopping mall and all schools in Wainuiomata should be assumed to require a FW4 flow.
- The highest hazard area is located on Waiu Street and should be considered FW6.

These requirements were assumed to remain valid throughout all planning horizons.

Storage Volume

For operational resilience, 100% of the storage volume should be at least equal to the greater of:

- Peak Day Demand + 20% + Fire Fighting Storage.
- 2 x Average Day Demand, assuming current per-capita consumption.

For seismic resilience, 70% of the storage volume should be sufficient to supply:

- Day 8 to Day 30 (23 days)
  - Public distribution points (20 l/person/day)
  - Category 1 critical users (civil defence centres, major hospitals, lifelines)
- Day 14 to Day 30 (17 days)
  - Category 2 critical users (aged care facilities, medical centres)
- Day 21 to Day 30 (10 days)
  - Category 3 critical users (education)

Storage requirements increase with population and therefore vary across growth models.

5.3 Existing constraints

5.3.1 Pressure

The pressure across the Wainuiomata network is generally high (up to 100m), particularly along the valley floor. According to the hydraulic model, the pressure in the network remains above 45m under current demand conditions. In some areas, the pressure is above 90 m, which is outside the target level of service.

The proposed developments at the northern end of Wainuiomata will generate a significant water flow. The existing water distribution network has insufficient capacity for proposed developments and upgrades will be required to meet the target level of service for pressure.

5.3.2 Storage

Stantec's calculations indicate that there is currently a storage shortfall in Wainuiomata and the shortfall increases as population growth occurs. By 2050 an additional 8.0 ML of storage volume is required to meet the seismic and operational (peak daily demand) levels of service (refer Table 5-1).

Table 5-1: Water storage calculations

		2019	2020	2033	2050
	Sum of Peak Day, m^3/day	6.4	7.9	9.7	13.1
	Sum of total population	18,407	18,510	21,190	24,494
ADD	ADD, m^3/day	5,122	5,139	5,588	6,141
	Required volume 2 x ADD, m^3	10,244	10,278	11,176	12,283
PDD	PDD, m^3/day	6,512	7,305	8,905	12,074
	Max fire class	FW6	FW6	FW6	FW6
	Required volume for fire, m^3	2,160	2,160	2,160	2,160
	Required volume 1.2 x PDD + fire, m^3	9,975	10,926	12,846	16,648
Seismic	Public volume required, m^3/day	368	370	424	490
	Critical user category 1, m^3/day	25.7	25.7	25.7	25.7
	Critical user category 2, m^3/day	0.0	0.0	0.0	0.0
	Critical user category 3, m^3/day	7.8	7.8	7.8	7.8
	Required volume seismic, m^3	13,052	13,120	14,881	17,052
Max required volume, m^3		13,052	13,120	14,881	17,052
Driver		Seismic	Seismic	Seismic	Seismic
Existing Storage, m^3		9,022	9,022	9,022	9,022
Storage Shortfall, m^3 **ML**		4,029 4.1	4,097 4.1	5,858 5.9	8,029 8.0

Source: Stantec (2020) Wainuiomata Zone Management Plan

5.4 Option assessment

Stantec modelled the water network for three planning horizons: 2020, 2033 and 2050. 2020 was modelled to include dwellings constructed in some greenfield sites or recently consented but there was no substantial change from 2019. In addition, it was assumed that the new reservoir would be constructed prior to 2033. The options assessed are discussed in more detail below.

5.4.1 Reservoir Option 1 (PW3)

The main strategic upgrades required are the construction of a new reservoir and reticulation upgrades to supply the greenfield development areas.

Stantec identified eight options for a new reservoir location and discussed these with the Wellington Water Modelling, Operations and Network Engineering Teams.

The new reservoir for Option 1 is referred to as Wainui 3 and its location is shown in Figure 5-3. The reservoir would have a top water level of 160 m, 20 m lower than the existing reservoirs. This will create a new lower-pressure zone, isolated form the rest of the Wainuiomata network. Two emergency PRVs – one on Fitzherbert Road and one on Meremere Street – would be constructed to allow water back into the zone to improve firefighting and add resilience to the network. The main reason for constructing the new reservoir at a lower head is to reduce the existing high pressures in the distribution, reduce leakage, demand, bursts and increase asset life.

Option 1 is the preferred option based on access, slopes and land ownership and this was used by GHD for costing purposes. However, when the design of the new reservoir commences, the proposed reservoir location would need to be assessed further.

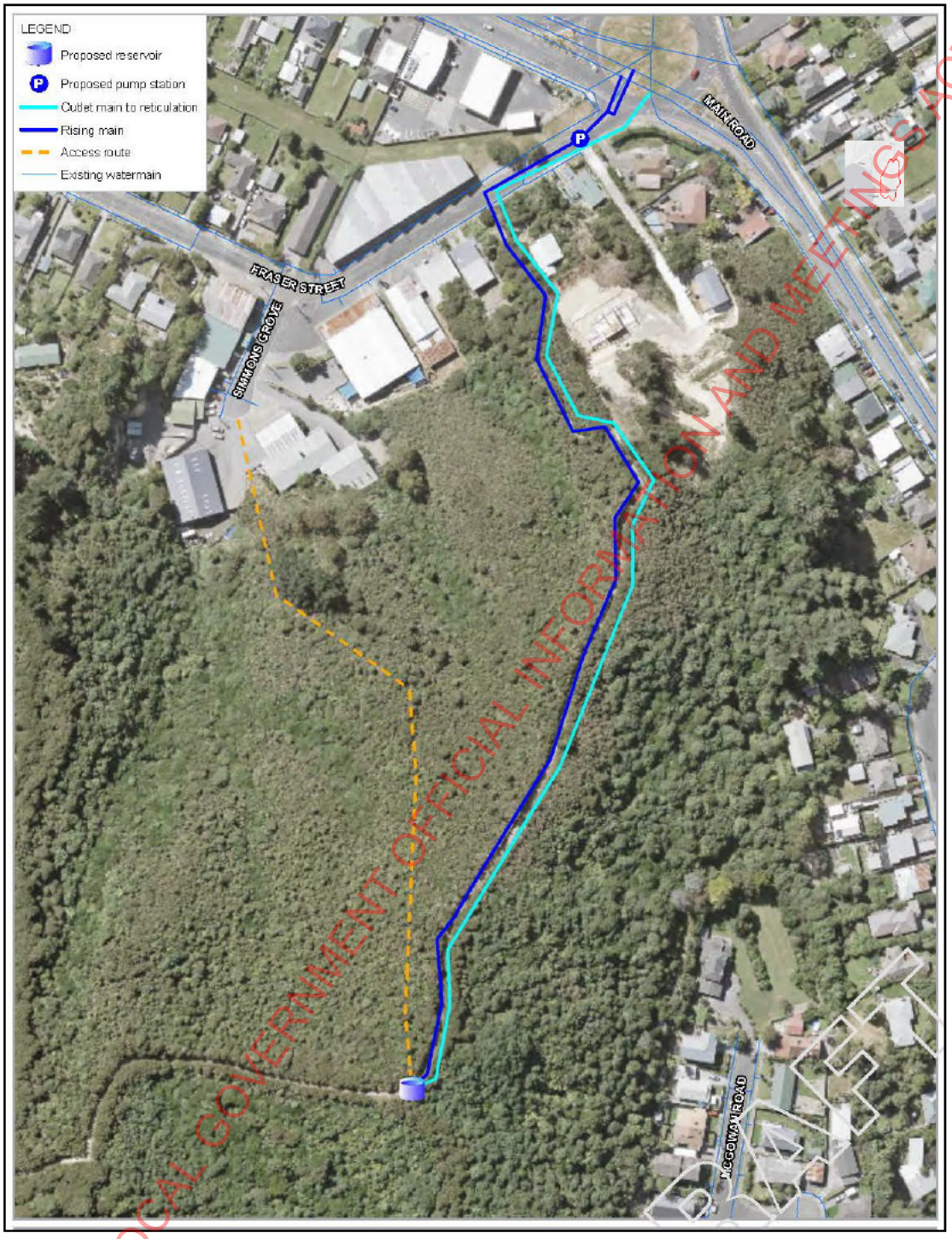
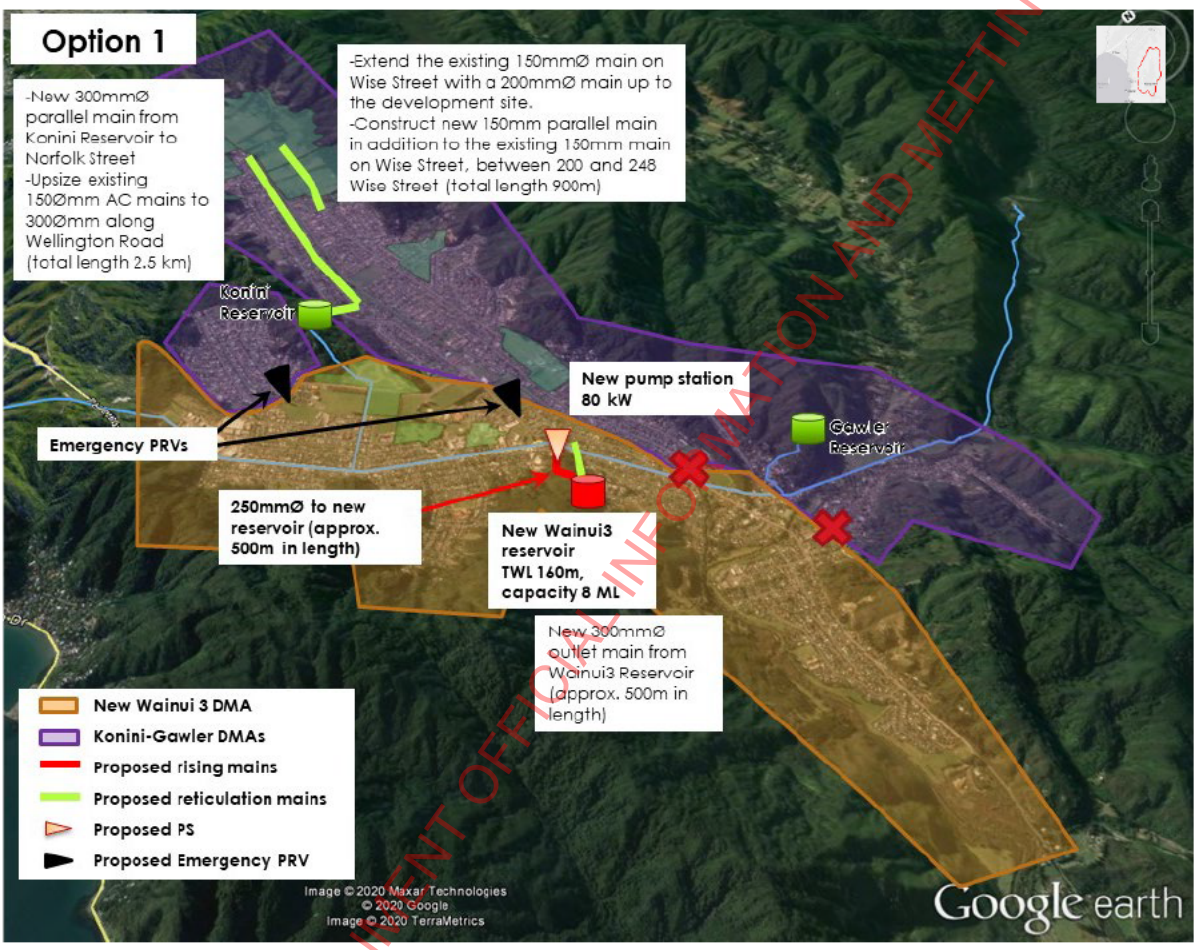


Figure 5-3 Option 1 reservoir site

The new Wainui 3 Reservoir will be supplied from the bulk network via a new dedicated pump station. A new 300 mm diameter discharge main from the reservoir will connect into the reticulation. The new reservoir will mainly supply the central area of Wainuiomata and the existing Konini reservoir will mainly supply the new greenfield areas to the north.

For the purposes of modelling, Stantec assumed that the reservoir would be built to its full capacity of 8 ML by 2033. However, the reservoir could be built in stages as an opportunity to defer the cost and minimise the risk of oversizing it.

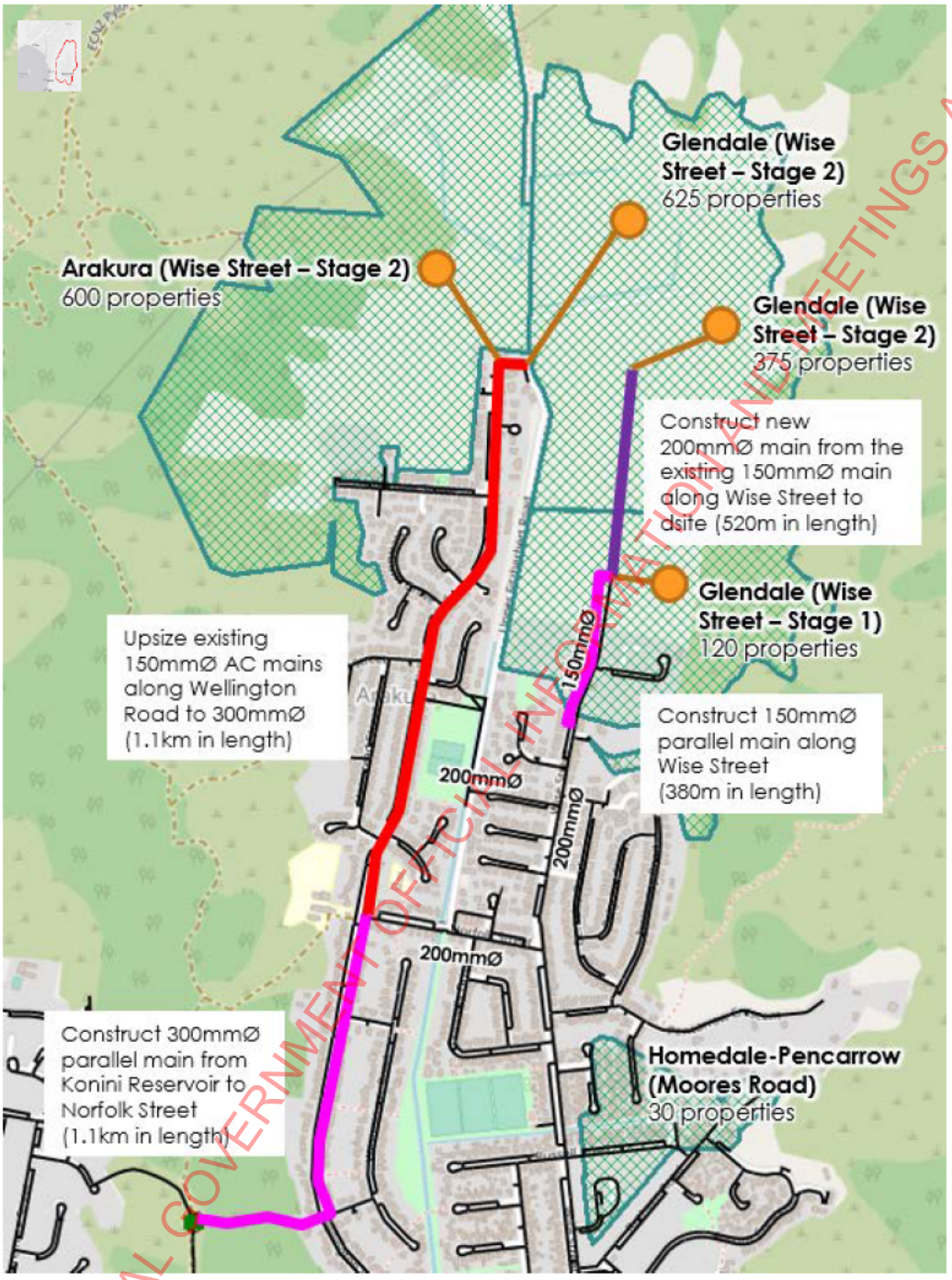
A section of reticulation mains along Wellington Road will need to be upgraded as the existing asset does not have the capacity to accommodate the significant increase in demand in the northern end of the network due to the development sites. A new parallel outlet main from the Konini Reservoir to Wellington Road is also required. These upgrades are shown in Figure 5-4.



Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-4: Option 1 Strategic and local upgrades

Additional upgrades are also required along Wise Street (see Figure 5-5) and described below as part of the local upgrades for each planning horizon. These will need to be constructed between 2033 and 2050.

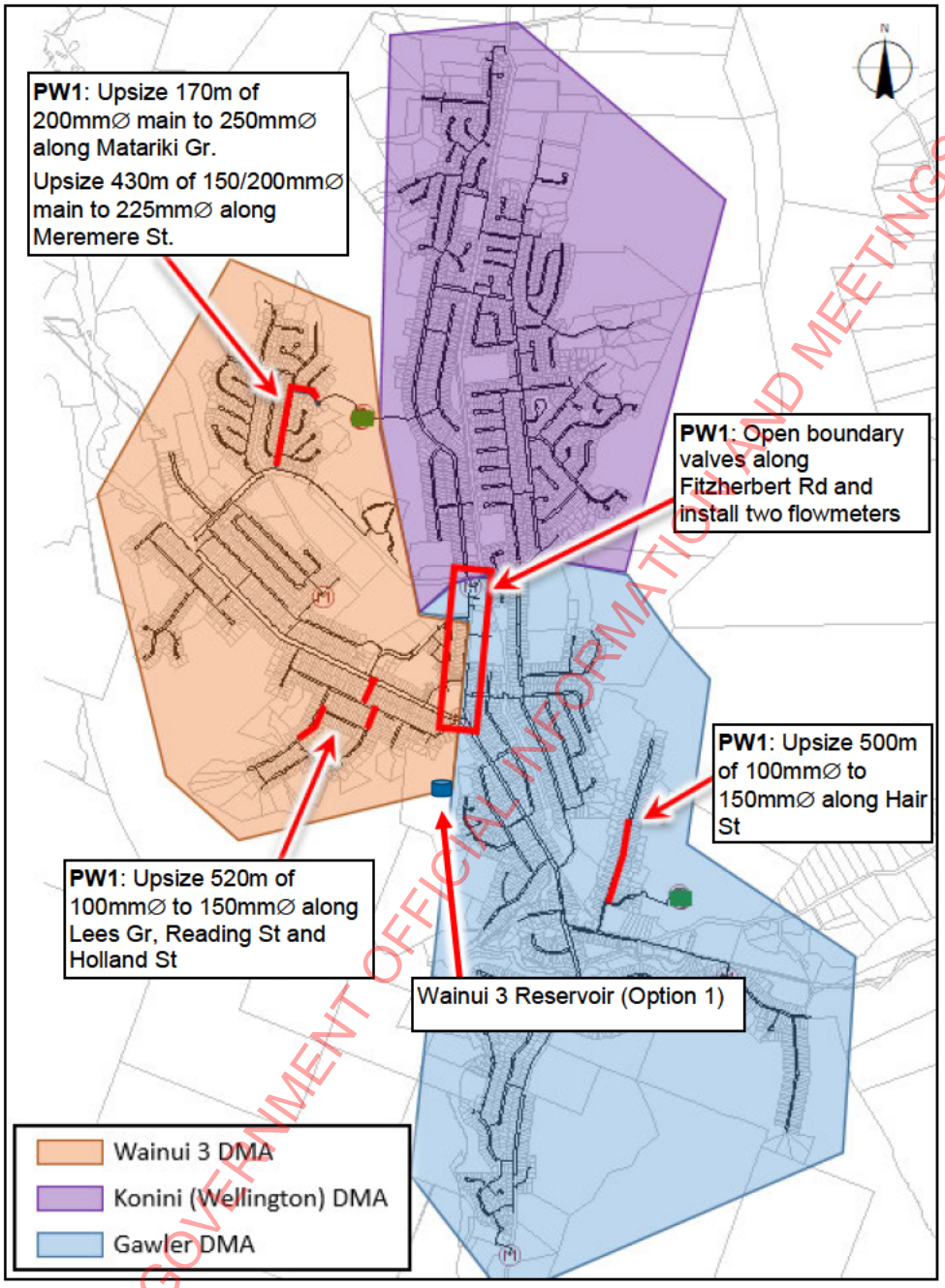


Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-5: Option 1 reservoir reticulation mains upgrade

5.4.2 2019/2020 Planning Horizon (PW1)

The 2020 planning horizon considers the existing network with no growth. The network currently meets the levels of service required for pressure at the point of supply to properties. However, there are some locations where the firefighting flows are insufficient so four local upgrades have been proposed to address this. These are shown in Figure 5-6.



Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-6: 2019 Planning horizon upgrades

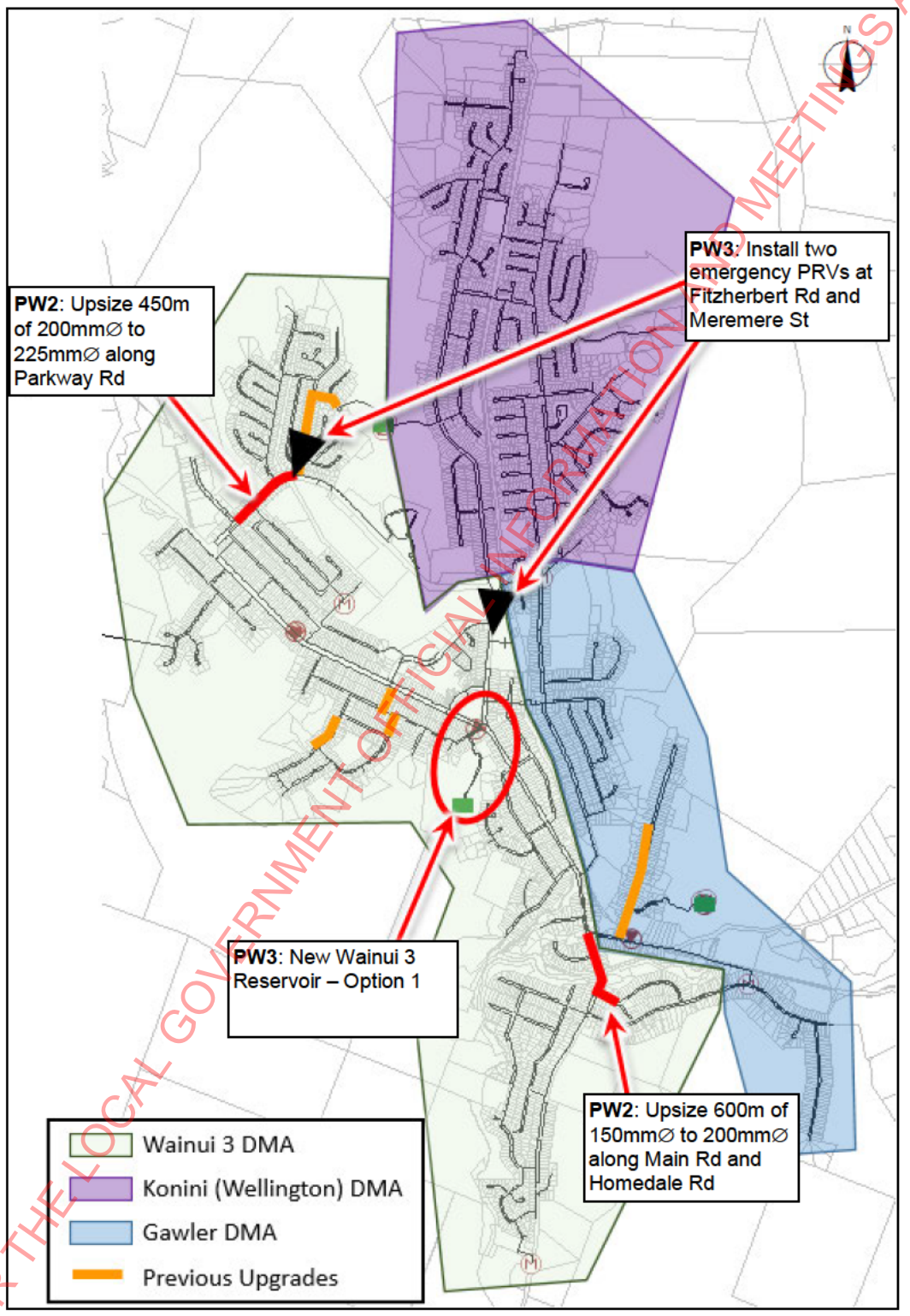
5.4.3 2033 Planning Horizon (PW2 and PW3)

The 2033 planning horizon considers the infrastructure required for growth up to 2033. As growth is continuous between 2020 and 2033, infrastructure may be required earlier than 2033. For this planning horizon, it is assumed that the Wainui 3 reservoir has been constructed.

Modelling results show that the pressures across the network in the 2033 horizon still meet the level of service requirements for minimum pressure. The new lower-pressure zone created by the Wainui 3 reservoir reduces the overall demand on each existing reservoir.

Although the minimum pressure at the point of supply in this new pressure zone is above 25 metres, the pressure in some properties where the floor level is higher than their point of supply drops can be as low as 22 metres. There is no minimum pressure requirement for pressure at properties in the Regional Standard for Water Services so no pipe upgrades have been proposed to correct this.

The lower-pressure zone affects the firefighting capacity in the zone. Two upgrades have been proposed to address firefighting capacity for Waiu Street and Wainuiomata Primary School. These are shown in Figure 5-7 below.



Source: Stantec (2020) Wainuiomata Zone Management Plan

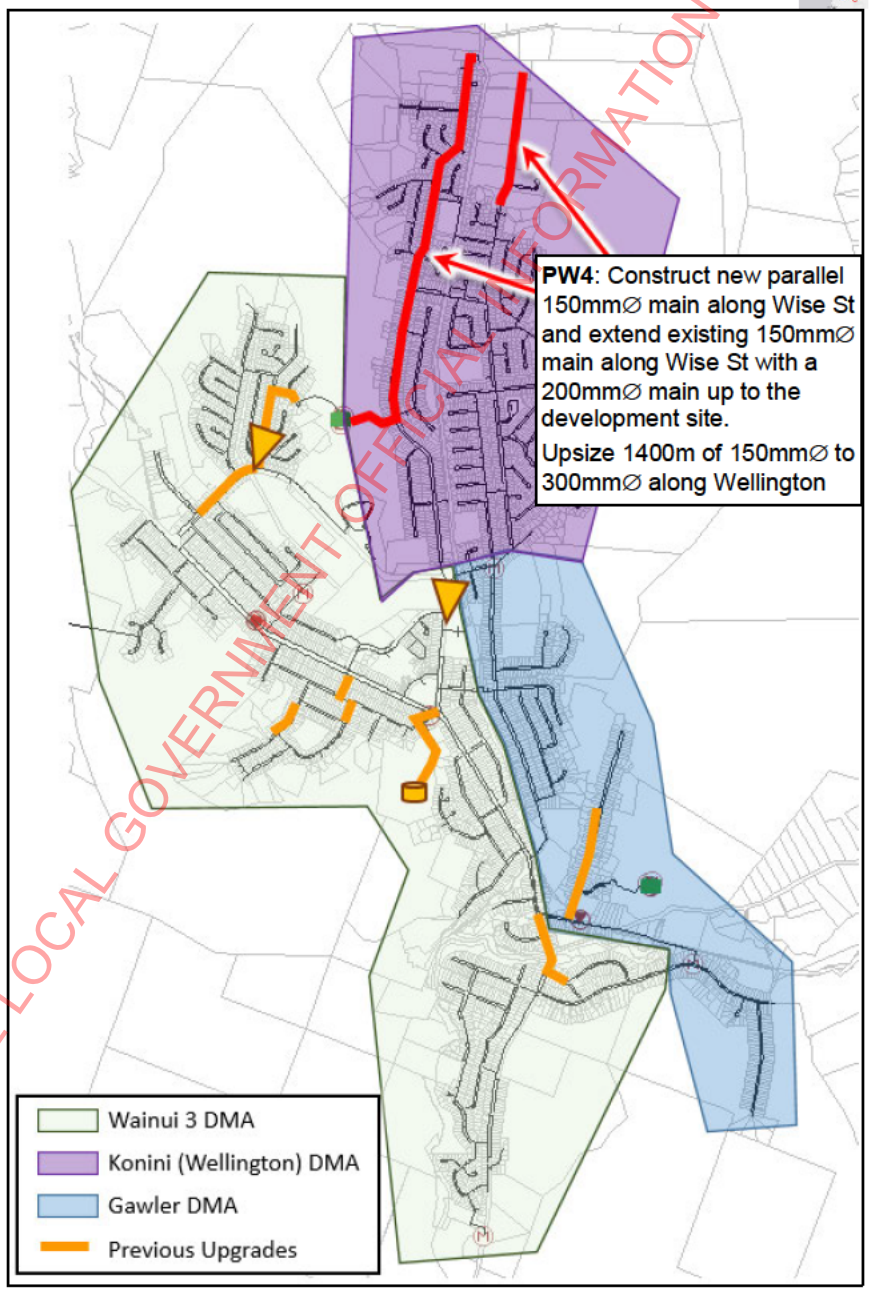
Figure 5-7: 2033 Planning horizon upgrades

5.4.4 2050 Planning Horizon (PW4)

The 2050 planning horizon considers the infrastructure required for growth up to 2050. As growth is continuous between 2033 and 2050, infrastructure may be required earlier than 2050. In the 2050 planning horizon, all proposed greenfield sites under this study are assumed to be developed to their maximum capacity. Modelling shows that the pressure in the northern end of Wainuiomata drops to below 25 m due to a significant increase in demand.

Four upgrades have been proposed to meet the levels of service, these are shown in Figure 5-8.

Note that it is recommended to create a loop between the end of Wellington Road and the north of Wise Street but this has not been included in the recommendations as there are still unknowns regarding easements or a service plan for the proposed developme



Source: Stantec (2020) Wainuiomata Zone Management Plan

Figure 5-8: 2050 Planning horizon upgrades

5.5 Additional considerations

Following the completion of the Wainuiomata Zone Management Plan by Stantec, GHD has held discussions with Wellington Water and Stantec regarding the potential construction of the 8 ML new reservoir as a two-tank solution (4 ML per tank). Each of the tanks would not be constructed at the same time and instead, could be constructed as needed based on network demand. The main disadvantages with this approach are the higher overall construction costs and the space limitations with two smaller tanks having a much larger footprint compared with one tank. For these reasons, the preference is to construct the new reservoir as a single 8 ML new tank.

5.6 Consent Considerations

GHD's Planning Team has completed a high-level planning assessment of the proposed water infrastructure options. This assessment is included as Appendix G, and is summarised below.

Each option was assessed against the relevant provisions of the following plans:

- Hutt City Council District Plan
- Greater Wellington Regional Council (GWRC) Proposed Natural Resources Plan (PNRP)(Decisions Version)
- GWRC Regional Air Quality Management Plan for the Wellington Region (Air plan)
- GWRC Regional Soil Plan for the Wellington Region (Soil plan)
- GWRC Regional Plan for Discharge to Land for the Wellington Region (Discharges to land plan)
- GWRC Regional Freshwater Plan for the Wellington Region (Water plan).

This assessment was completed based on a new 8ML water reservoir placed in the East Harbour Regional Park on the hill above Fraser Street with new rising main. Access path from Simmons Grove to site of new reservoir.

HCC: New pipe for rising main and main pipe is a permitted activity from HCC subject to complying with earthworks conditions. However due to high likelihood of exceeding HCC conditions for earthworks during new pipelines construction, it is expected that these works will fall under a separate discretionary activity (HCC Rule 13.3.1.15)

GWRC: No rules limiting network utilities as trenching for pipeline placement is specifically excluded from earthworks definitions.

Earthworks are of an unknown quantity and location. Earthworks would be permitted under R99 if they are less than 3,000 m^2, but if they cannot comply with this standard would default to a discretionary activity under R101.

5.7 Costing

A cost estimate has been prepared in accordance with the Wellington Water Cost Estimation Manual, as shown in Table 5-2. Refer to Appendix H for a full cost breakdown. In addition to the assumptions detailed in Section 4, the following assumptions were made for the Network Upgrades and New Reservoir and Pump Station:

5.7.1 Network Upgrades

Network Upgrades (PW1, PW2 and PW4) were calculated as Level 2 estimates. PE100 PN16 was assumed as the default material with an average depth to invert of 1.5 metres installed with trench and lay methodology. An allowance for reinstatement of driveways, footpaths and

carriageways was included in the unit rate. For costing purposes, it was assumed that upsizing of existing mains was equivalent to the construction of new mains.

Other ancillary items (PRVs and flowmeters) were estimated at $150,000 each based on previous projects.

5.7.2 New Reservoir and Pump Station (PW3)

Option PW3 (referred to in Stantec report as Option 1) was calculated as a Level 1 estimate. As the preferred location may not be suitable or available in the future, a provisional item was added within the Physical Works costs to allow for additional pipework and network upgrades which may be required at another location.

For reservoir costing purposes, Three Waters Ltd. Consulting have developed a formula for construction costs based on volume. The formula was developed from historical reservoir projects. GHD have reviewed the formula and out-turn rates to historical rates and consider it appropriate for this Level 1 cost estimate. The formula is:

$$\textit{Contractor Cost Estimate (\$million)} = 2.37 \times \textit{capacity (MLD)}^{0.55}$$

For costing of the new pump station, the Stantec report *Wainuiomata Zone Management Plan* used the *2010 Watercare Update of Unit Rate Cost Model* to derive an estimate of $600,000 for the physical works cost for a new pump station with an 80 kw pump. GHD have reviewed this cost against other historical projects and consider it to be a valid estimate.

Cost estimation for the reservoir access track is based on the assumption of a 160 m long, 4.5m wide chipseal road.

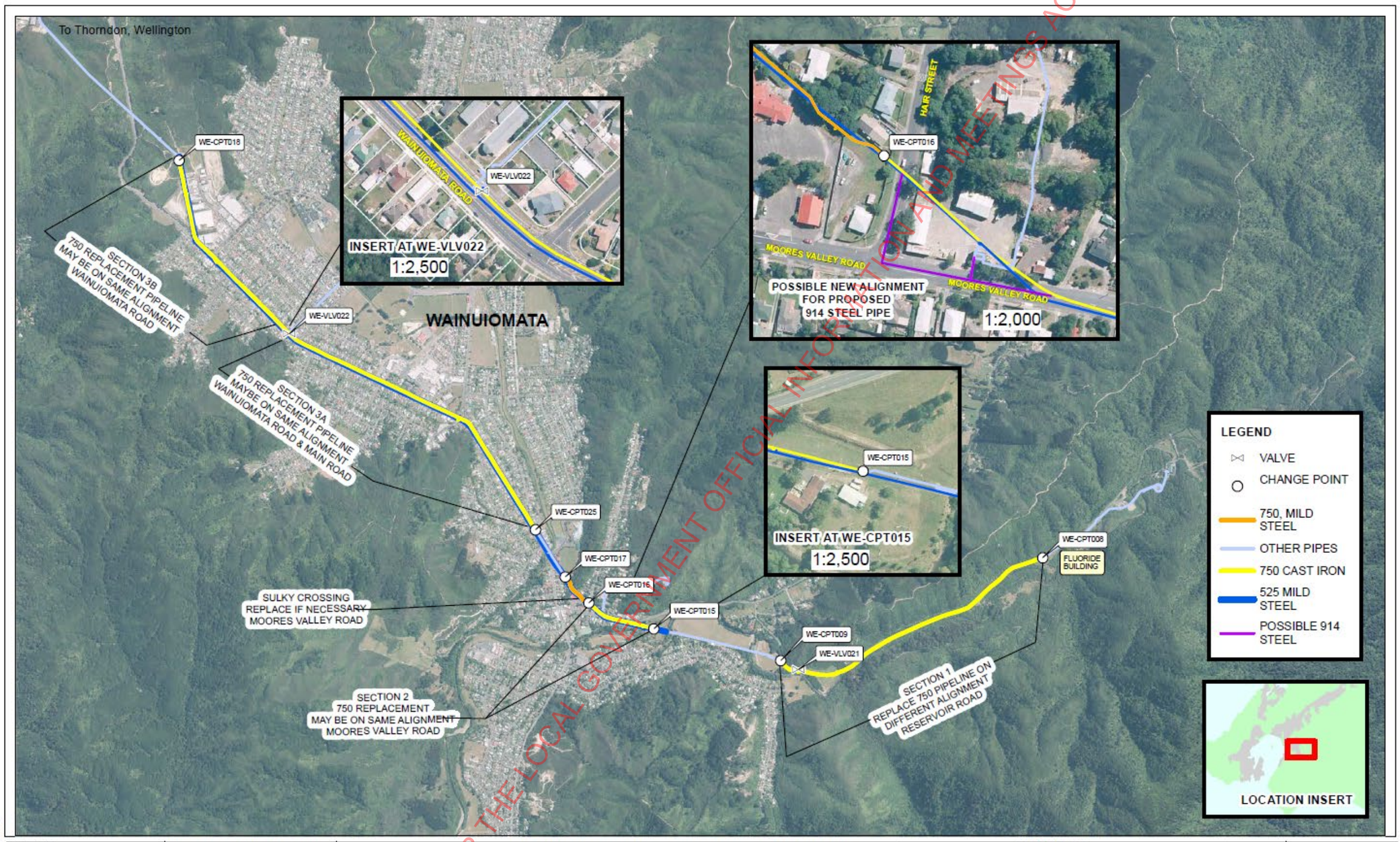
5.8 Further upgrades considered

In 2016, MWH (now Stantec) was engaged by Wellington Water to complete a design for the replacement of the Wainuiomata 750 cast iron (CI) pipe (see Appendix C). The design comprised replacement of the existing 750 CI bulk main with approximately 5,195 m of 914 mm OD CLS pipe over three separate sections (refer to Figure 5-9).

Following a meeting with Wellington Water on 14 September 2020, Wellington Water requested that GHD prepare a cost estimate for this pipe replacement. The three separate sections are described as PW5, PW6 and PW7 as follows:

- PW5: Offline replacement of Section 1 (along Reservoir Road).
- PW6: Offline / online replacement of Section 2 (Moores Valley Road / Hair Street). This includes a new alignment at the Moores Valley Rd / Hair Street intersection to remove the pipe from private land and facilitate relocation of the motorised line valve. A section of the Orongorongo - Karori (OK) main is to be abandoned.
- PW7: Online replacement of Section 3a (Main Road / Wainuiomata Road). The existing steel connection pipework to Wainuiomata PS No. 1 is to be retained. Online / offline replacement of Section 3b (Wainuiomata Road).

Note that the cost of upgrading the bulk water main is not a direct cost for HCC as it is owned by Greater Wellington Regional Council (GWRC).



DATA STATEMENT

Cadastral information derived from Land Information New Zealand's Landonline Cadastral Database. CROWN COPYRIGHT RESERVED.

Property boundaries may not be survey-accurate, and can only be verified by a licensed cadastral surveyor.

Assets, contours, water and drainage information shown is approximate and must not be used for detailed engineering design.

Other data has been compiled from a variety of sources and its accuracy may vary.

Wellington Water cannot guarantee the completeness of the information displayed.

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This map is drawn on the New Zealand Transverse Mercator projection, using New Zealand Geodetic Datum 2000.

WELLINGTON WATER LIMITED INFORMATION DIRECTORATE		
DESIGN	COMPILED	05/10/15
DRAWN	MICHELLE MAWSON	08/10/15
CHECKED		
RECOMMENDED		
APPROVED	JOHN DUGGAN	09/10/15

Wellington Water

greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao

WAINUIOMATA TO THORNDON PIPELINE

WAINUIOMATA 750mm CAST IRON PIPELINE PROPOSED REPLACEMENT SITE LOCATION LAYOUT AND ENLARGED INSET

AMENDMENTS

Amendment Detail	DWN	CHK	Date

0 0.2 0.4 0.8 1.2 1.6 Kilometers

N

SCALE 1:20,000

File: B/40/19/01

NOTE: +/- 20m

Drawing Number A3-10640/02-BS

Printed Date: 13/10/2015 Time: 7:42:10 a.m. User Name: mawsonm

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Figure 5-9 Proposed Wainuiomata 750 mm CI pipeline replacement

A summary of the cost estimates for each option is presented below.

Table 5-2: Water infrastructure upgrades cost estimate

Project Estimate - Potable Water

Project Name: Hutt City Catchment Plan - 3Waters Assessment for PC43 Phase 1 - Wainuiomata
Project Phase: Study/Report
Base Date of Estimate: Sep-20

		2020 Planning Horizon	2033 Planning Horizon	2033 Planning Horizon	2050 Planning Horizon			
Phase & Task	%	PW1-Local Upgrade-Fire	PW2-Local Upgrade-Fire	PW3-Strategic Upgrade-Option 1	PW4-Local Upgrade-Pressure	PW5-Section 1 Bulk Watermain - Reservoir Road	PW6-Section 2 Bulk Watermain - Moores Valley	PW7-Section 3 Bulk Watermain - Wainuiomata
Development								
Consultancy and Council Fees	3%	$79,000	$60,000	$382,000	$196,000	$373,000	$92,000	$650,000
Site Investigations								
Other Costs (Legal, Land, etc...)								
Total Project Development		$79,000	$60,000	$382,000	$196,000	$373,000	$92,000	$650,000
Consenting								
Consultancy and Council Fees	3%	$79,000	$60,000	$382,000	$196,000	$373,000	$92,000	$650,000
Site Investigations								
Other Costs (Legal, Land, etc...)								
Total Consenting		$79,000	$60,000	$382,000	$196,000	$373,000	$92,000	$650,000
Detailed Design								
Consultancy and Council Fees	6%	$157,000	$120,000	$764,000	$391,000	$745,000	$184,000	$1,300,000
Site Investigations								
Other Costs (Legal, Land, etc...)								
Total Detailed Design		$157,000	$120,000	$764,000	$391,000	$745,000	$184,000	$1,300,000
Procurement								
Consultancy and Council Fees	1%	$26,000	$20,000	$127,000	$65,000	$124,000	$31,000	$217,000
Other Costs (Legal, Land, etc...)								
Total Procurement		$26,000	$20,000	$127,000	$65,000	$124,000	$31,000	$217,000
Construction								
Consultancy and Council Fees	5%	$131,000	$100,000	$636,000	$326,000	$621,000	$154,000	$1,083,000
Land Acqusistion				$534,000				
Other Costs (Legal, Land, etc...)								
Physical Works								
Preliminary and General		$471,000	$360,000	$2,036,000	$1,044,000	$2,609,000	$768,000	$5,632,000
Physical Works - Stormwater								
Physical Works - Wastewater								
Physical Works - Potable Water		$2,618,000	$1,999,000	$12,727,000	$6,524,000	$12,422,000	$3,072,000	$21,663,000
Total Construction		$3,220,000	$2,459,000	$15,934,000	$7,894,000	$15,651,000	$3,993,000	$28,378,000
Base Estimate								
Base Estimate		$3,561,000	$2,719,000	$17,588,000	$8,742,000	$17,266,000	$4,393,000	$31,194,000
Contingency		$712,000	$544,000	$7,035,000	$1,748,000	$3,453,000	$879,000	$6,239,000
Expected Estimate		$4,273,000	$3,263,000	$24,623,000	$10,490,000	$20,719,000	$5,271,000	$37,433,000
95th Percentile Estimate								
Funding Risk		$1,282,000	$979,000	$14,774,000	$3,147,000	$6,216,000	$1,581,000	$11,230,000
TOTAL VALUE	**95th Percentile Estimate**	**$5,555,000**	**$4,241,000**	**$39,397,000**	**$13,637,000**	**$26,935,000**	**$6,853,000**	**$48,663,000**

5.9 Preferred options

The recommended upgrades, including the strategic reservoir upgrade, are summarised in Table 5-3.

Table 5-3 Summary of water infrastructure preferred options

Note: Option Reference uses GHD naming conventions. Option Reference from Stantec is listed in brackets.

Planning Horizon	Option Ref	Upgrade Type	Upgrade Name	Description
2020	PW1 (W_UPG-F1)	Local - Fire	Boundary valves along Fitzherbert Road.	Open boundary valves along Fitzherbert Road. Install 2 flowmeters: on the 200mmØ along Fitzherbert Road and on the 300mmØ along Main Road.
2020	PW1 (W_UPG-F2)	Local - Fire	Waiu Street	Upsize existing 200mmØ main to 250mmØ along Matariki Grove between Meremere Street and 18 Matariki Grove (170m in length). Upsize existing 150/200mmØ along Meremere Street between Matariki Grove and Parkway Road to 225mmØ (430m in length)
2020	PW1 (W_UPG-F3)	Local - Fire	Fernlea School and Community Emergency Hub	Upsize existing 100mmØ to 150mmØ: -along Lees Grove between Hay Street and Holland Street (230m in length), -along Reading Street between Wainuiomata Road and Fraser Street (160m in length), and -along Holland Street between Fraser Street and Hay Street (130m in length)
2020	PW1 (W_UPG-F4)	Local - Fire	Hair Street	Upsize existing 100mmØ to 150mmØ from Gawler Grove to 77 Hair Street (500m in length)
2033	PW2 (W_UPG-F5)	Local - Fire	Waiu Street	Upsize existing 200mmØ along Parkway Road between Meremere Street and Waiu Street to 225mmØ (450m in length)
2033	PW2 (W_UPG-F6)	Local - Fire	Wainuiomata Primary School	Upsize existing 150mmØ along Main Road and Homedale Road from Moores Valley Road to Poole Crescent to 200mmØ (600m in length)
2033	PW3 (W_UPG-S1)	Strategic	New Wainui 3 Reservoir - Option 1	Construct new Wainui 3 Reservoir (Fernlea Site), 8 ML, 160m TWL
2033	PW3 (W_UPG-S2)	Strategic		Construct pump station from bulk network to Wainui 3 Reservoir, 80 kW
2033	PW3 (W_UPG-S3)	Strategic		Construct rising main along Fraser Street from Main Road to Wainui 3 Reservoir (500m in length)
2033	PW3 (W_UPG-S4)	Strategic		Construct discharge main from Wainui 3 Reservoir to reticulation along Main Road (500m in length)
2033	PW3 (W_UPG-S5)	Strategic		Install emergency PRV on the 200mmØ along Fitzherbert Road Install emergency PRV on the proposed 225mmØ upsized main along Meremere Street
2050	PW4 (W_UPG-P1)	Local - Pressure		Construct 300mmØ parallel main from Konini Reservoir to Dublin Street (330m in length). Construct 300mmØ parallel main along Wellington Road from Dublin Street to Norfolk Street (730m in length)
2050	PW4 (W_UPG-P1)	Local - Pressure		Extend the existing 150mmØ main on Wise Street with a 200mmØ main up to the development site. (520m in length)
2050	PW4 (W_UPG-P1)	Local - Pressure		Construct new 150mm parallel main in addition to the existing 150mm main on Wise Street, between 200 and 248 Wise Street. (380m in length)
2050	PW4 (W_UPG-P2)	Local - Pressure		Upsize existing 150mmØ mains to 300mmØ along Wellington Road from Norfolk Street to 355 Wellington Road (1400m in length)

Source: Stantec (2020) Wainuiomata Zone Management Plan (modified).

6. Wastewater Infrastructure

The model development and optioneering for wastewater infrastructure improvements has been completed by Hydraulic Analysis Limited (HAL), with support by Wellington Water.

This section is a summary of GHD interpretation of HAL's findings with cost estimation provided by GHD. For the complete report by HAL refer to Appendix D.

6.1 Network configuration

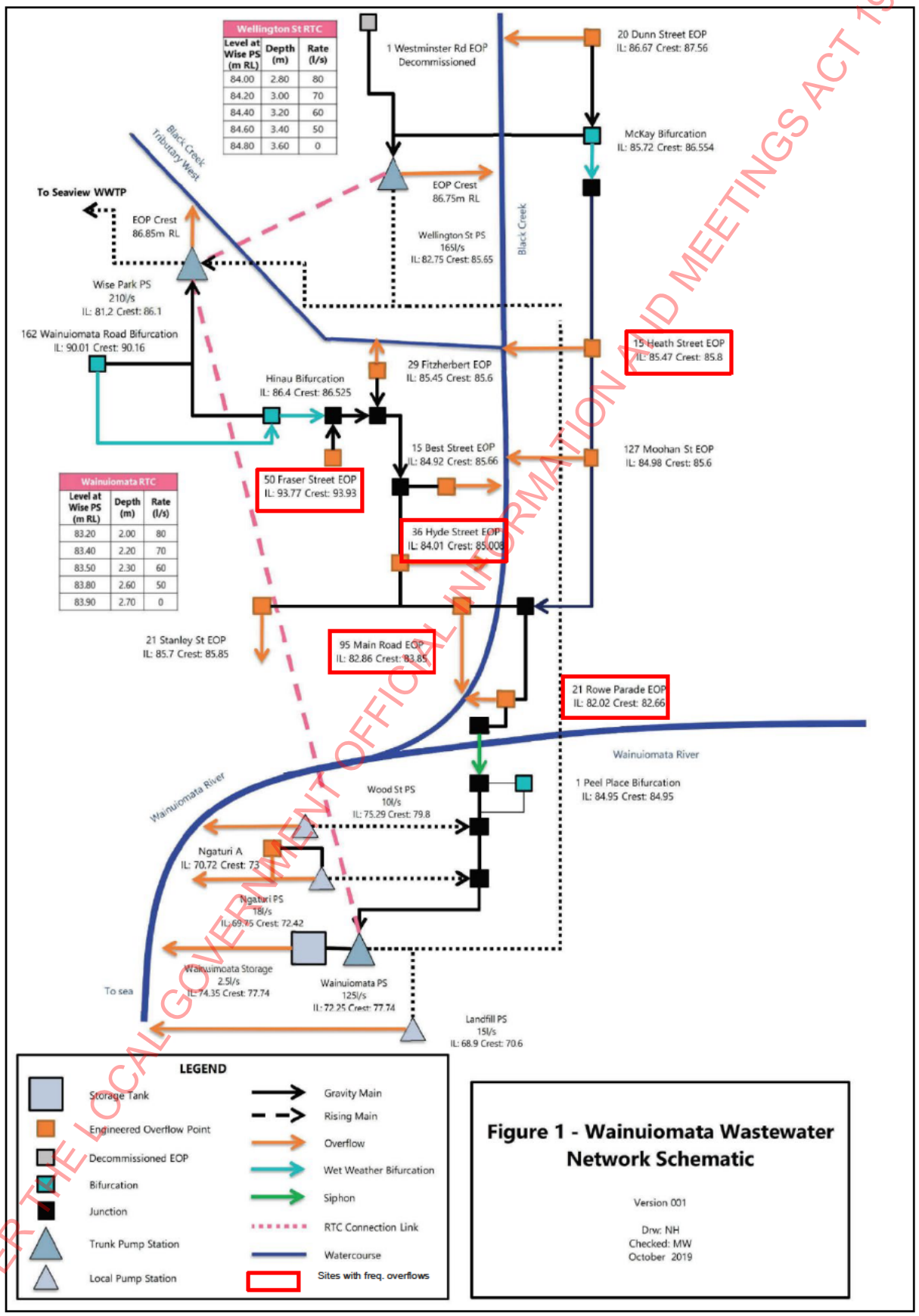
The existing Wainuiomata wastewater catchment covers approximately 600 ha of predominantly residential land use. The network consists of six pump stations (with associated constructed overflow points), ten network Engineered Overflow Points (EOPs), and four bifurcations.

Within this catchment, there are three key Pump Stations (PS), which form the 'Wainuiomata Triangle':

- Wise Park
- Wellington Rd
- Wainuiomata

Two northern areas drain directly to the Wise Park and Wellington Rd pump stations, however, these both have wet weather flows diversions to the south and the remainder of the catchment drains directly to the Wainuiomata Pump Station. Both the Wellington Rd and Wainuiomata pump stations convey flows to the Wise Park PS.

The Wise Park PS is the terminal point from which the entire Wainuiomata catchment is pumped to the Seaview Wastewater Treatment Plant.



Source: HAL (2020) Wainuiomata Options Assessment

Figure 6-1: Wastewater network schematic

6.2 Levels of service

As advised by Wellington Water, the target Levels of Service to be initially applied to this study are:

- Uncontrolled overflows to not exceed a one spill per year wet weather overflow frequency
- Overflows at constructed locations to not exceed an average of two spills per year wet weather overflow frequency.

It should be noted that wastewater overflows result in not meeting the healthy urban water outcomes that Wellington Water is working towards. These Levels of Service are minimums and may change in future.

6.3 Existing constraints

Wise Park has a current pass forward capacity of 210 l/s, and it operates as a significant constraint upon the network. Whilst it is not predicted to spill, this is because as water levels at the pump station rise, the Wainuiomata and Wellington Road pump stations progressively shut down through the RTC operation to minimise the risk of wet weather overflows at this location.

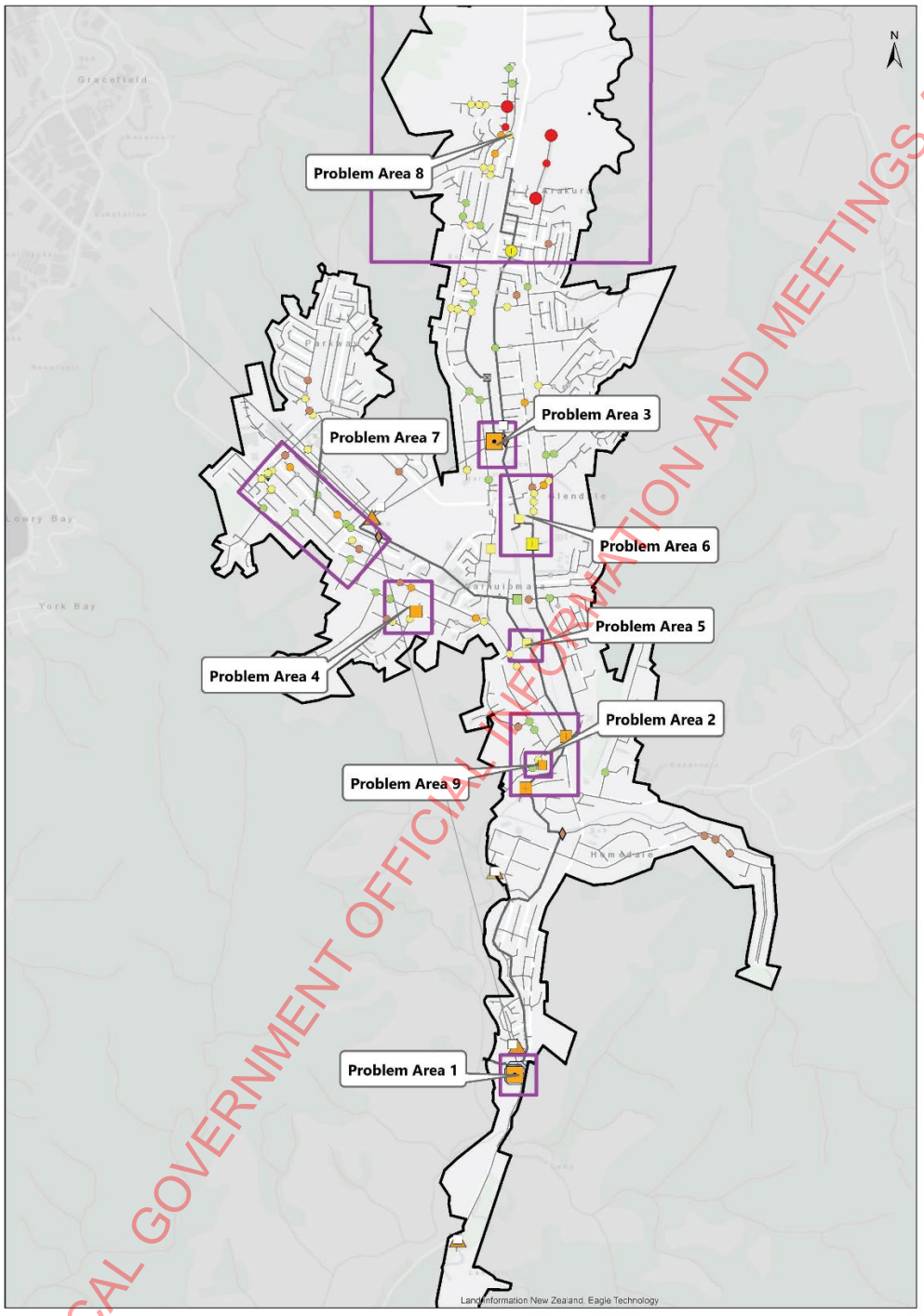
This section below shows the identified problem areas from the various analyses of the Wainuiomata wastewater network, note these are for reference and do not indicate priority. This figure represents the MPD scenario (+50 year) without deterioration. For further information about the problem areas, refer to the full HAL report.

The two main types of issues are:

- Engineered overflow point not meeting the level of service
- Frequent, uncontrolled wet weather overflows

The Seaview Wastewater Treatment Plant (WWTP) receives flow from Upper and Lower Hutt as well as Wainuiomata. Passing forward additional flows from Wainuiomata will increase the frequency and volume of wet weather overflows from the plant. However, these overflows are fully treated prior to discharge into the inner harbour.

A strategic wastewater model for the Seaview WWTP and its catchment is currently under development.



Source: HAL (2020) Wainuiomata Options Assessment

Figure 6-2 Wastewater problem areas (maximum probable development scenario)

6.4 Option assessment

HAL identified two future growth scenarios for assessing options:

- M2L (+20 years) for identifying the likely issues requiring resolution (assessed as part of the 2033 growth scenario)
- Maximum probable development (MPD) (+50 years), for ensuring options were sized sufficiently for target levels of service to be met long term (assessed as part of the 2050 growth scenario)

The results indicated that the development in the northern greenfield area was the primary difference in the number of issue locations between the M2L and MPD scenarios. Therefore the MPD scenario was used to assess the performance of different options considered.

To assess the performance of the existing network, the M2L scenario was adapted with no allowance for population growth. This was also used to isolate the cost of growth.

The following classes of mitigation were considered:

- System optimisation
- Conveyance
- Storage
- Treatment and discharge
- Inflow and infiltration

A longlist of solution sets was assessed using the hydraulic model to review improvements to the level of service. Following this initial analysis, the options were further refined by HAL to prioritise cost-effective network improvements which would provide an immediate benefit to the catchment and provide flexibility for accommodating future growth.

6.4.1 Wise Park PS (WW1 and WW2)

The initial screening of options assumed a pass forward of 300 L/s for the Wise Park PS. The 10-yr Option Performance Results indicate that this is just achieving the target LoS at Wainuiomata PS in the MPD scenario but with average annual volumes spilled in the order of 9 ML / year, whilst Wellington Rd PS is spilling more than two times per year on average. In practice, the uncertainty associated with the future performance is considerable, especially with respect to I&I and future growth.

Increasing the capacity of Wise Park Pump Station is considered to provide significant improvement in the network however until upgrades to the gravity network in Gracefield and the Seaview Treatment plant are completed, the upgrades to the Wise Park pump stations are not recommended.

Figure 6-3 shows the location of the proposed rising main upgrade (completed after capacity improvements at Seaview Treatment Plant).

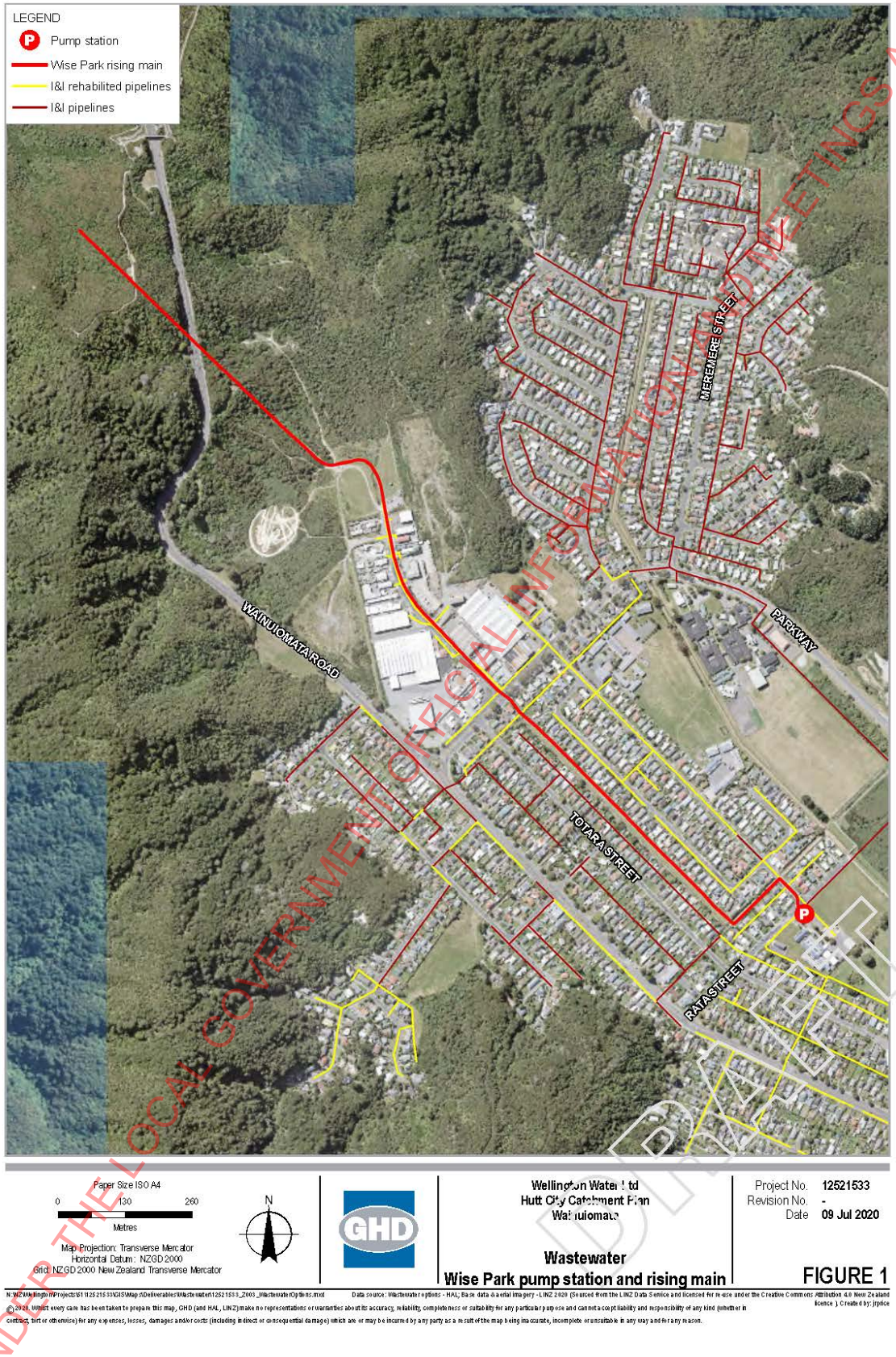


Figure 6-3 Wise Park Pump Station and Rising Main

6.4.2 Inflow and Infiltration (WW3, WW4, WW5 and WW9)

It is not considered that I&I remediation work is cost effective across the entire Wainuiomata catchment. HAL identified three areas where I&I remediation is not the preferred solution:

1. I&I has not been recommended for the Parenga subcatchments draining to the Wainuiomata Pump Station. The existing calibrated model had relatively low levels of I&I in this area, and releasing the throttle at Wise Park WWPS is a preferred option for mitigating wet weather overflows. However, this area was not directly gauged, so there is inherently less confidence in the accuracy of the calibration. It is possible that I&I in the catchment may be required to supplement other options.
2. I&I is not preferred upstream of Wellington Rd, as providing additional conveyance capacity is the preferred alternative.
3. Areas where I&I programmes have already been completed (10,768 m)

Instead, a targeted I&I programme is recommended (refer Figure 6-4), covering a total of 40,460 m.

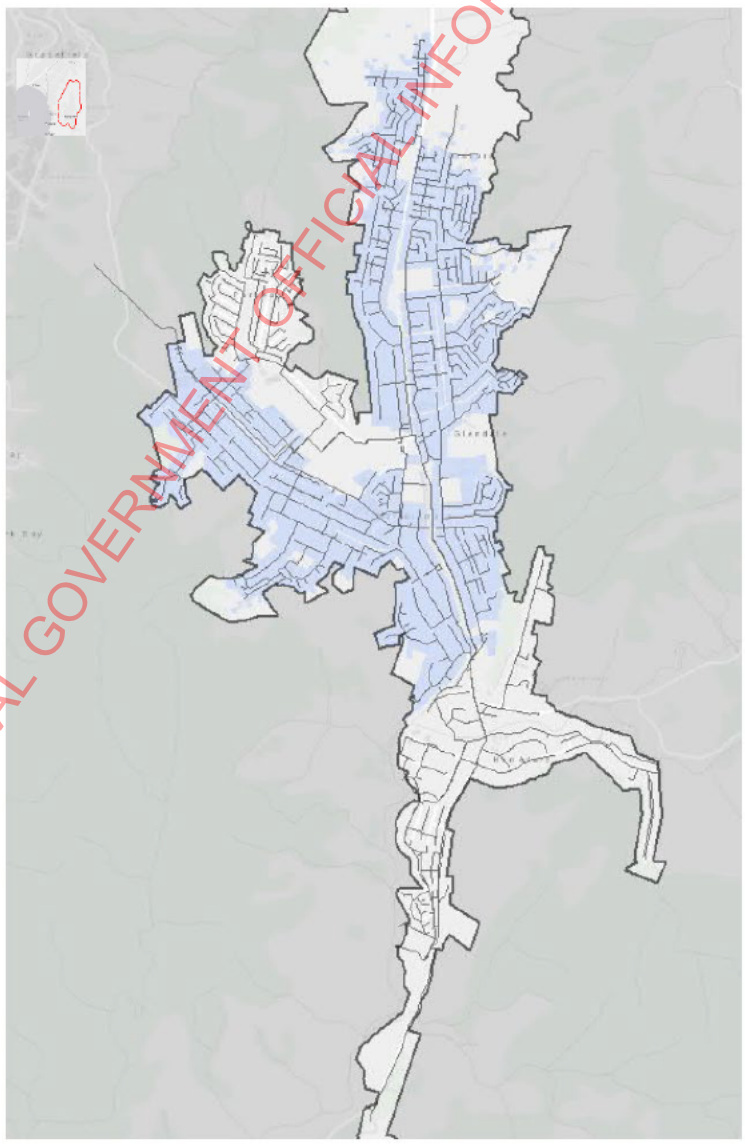
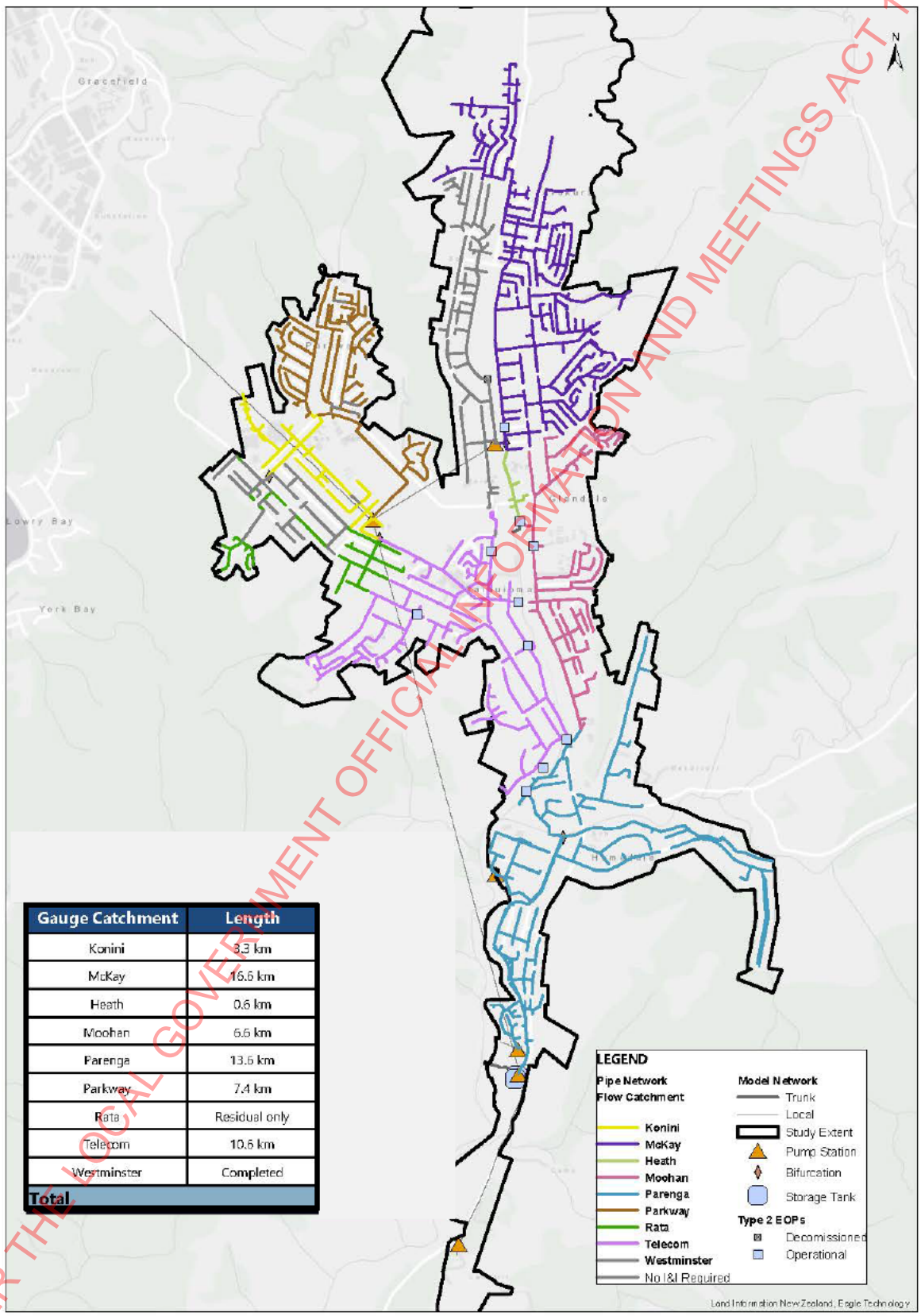


Figure 6-4 Targeted I&I extents



Gauge Catchment	Length
Konini	3.3 km
McKay	16.6 km
Heath	0.6 km
Moohan	6.6 km
Parenga	13.6 km
Parkway	7.4 km
Rata	Residual only
Telecom	10.6 km
Westminster	Completed
Total	

Figure 6-5 Wainuiomata inflow and infiltration catchments

Within the targeted programme, it is recommended that I&I is prioritised as follows (refer to Figure 6-5 for I&I catchment locations):

1. Upstream of Heath and Moohan EOPs to address wet weather overflows at these EOPs and confirmed uncontrolled overflows in the local network.
2. Within the Telecom catchment for addressing the Hyde St EOP (and mitigating overflows risks at other EOP locations). This will also reduce wet weather flows at the Main Rd and Rowe Pde EOPs.
3. Konini catchment I&I to reduce load to the Wise Park PS and risk of uncontrolled overflows.
4. Completion of the Rata catchment (partially completed prior to this study) to reduce load to the Wise Park PS and risk of uncontrolled overflows.
5. Remainder of the Moohan catchment (areas of Moohan catchment not completed as part of priority area 1) to mitigate inflows into the Main Rd and Rowe Parade EOPs. Staging is to be confirmed with success of the upstream I&I within this catchment and Main Rd and Rowe Pde storage programming / sizing, and may need to be re-prioritised.

These areas form the extents of the prioritised I&I works, covering a total of 23,990 m. Figure 6-6 shows the prioritised I&I areas.

Cost estimates have been prepared for three I&I scenarios:

- WW3 - Prioritised (23,887m) – to be completed first, a subset of the targeted areas
- WW4 - Targeted (16,573m) – Remainder of targeted areas, after prioritised subset (23,887m) has been completed. Full targeted area is 40,460m.
- WW5 - Entire catchment (61,170 m) – not a recommended option but presented for comparison. 61,170m is 80% of the full catchment area (76,458m). This does not include the 10,768m that has been rehabilitated prior to 2020.

In addition, inflow and infiltration rehabilitation of the private network was requested by Wellington Water. This is costed in Option WW9. The total length of private laterals was calculated from the total number of properties within Wainuiomata (6673 according to the LINZ database) and an average lateral length of 20 metres (based on distance from the centre of the road to the building footprint). Note that the cost of I&I work on private laterals is not a direct cost for HCC as they are privately owned.

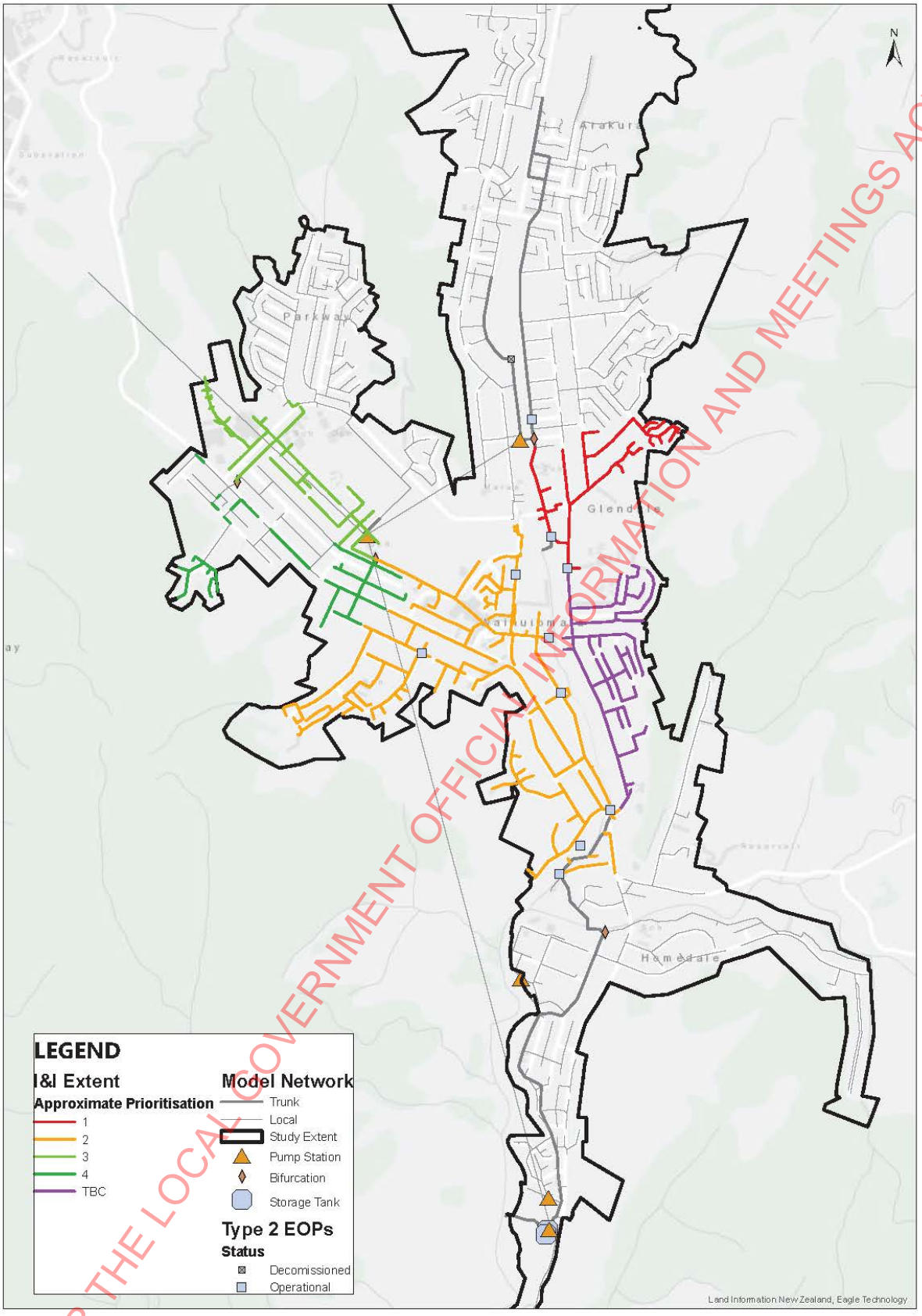


Figure 6-6 Prioritised I&I extents

6.4.3 Northern Greenfield Servicing (WW6)

The proposed new pump station and rising main to service the northern greenfield development is shown in Figure 6-7.

Figure 6-7 Northern greenfield PS and rising main route

6.4.4 Fraser Street EOP (WW7)

It is considered unlikely that property purchase would be desirable for a storage tank, so it is recommended that a storage facility in the reserve is considered. With an I&I programme a storage volume of 150 m^3 is expected to be sufficient to achieve the desired LOS. However the effectiveness of I&I is at this point uncertain. A size of storage tank should be determined after a new analysis of I&I effectiveness is conducted in the next 3 to 5 years.

A possible layout has been shown in Figure 6-8, which will provide a storage volume of 300 to 400 m^3. Further investigation into the existing services in this area is required to confirm the feasibility of this option.

Figure 6-8 Potential storage location for Fraser Street EOP

6.4.5 Main Road and Rowe Parade EOPs (WW8)

A combined storage facility has been proposed as a more conservative approach for costing as it is larger and therefore likely to be more expensive. The preferred approach is likely to be informed by what can be cost-effectively constructed at the site and the extent of I&I required upstream to achieve and maintain levels of service.

A potential location for the combined tank is shown in Figure 6-9. This option will require a gravity fill and pump return configuration.

Figure 6-9: Main Road/Rowe Parade combined storage tank location

6.4.6 Wellington Street PS (WW10)

Once additional capacity is provided through the ultimate future upgrade at Wise Park Pump Station, increasing the capacity of the Wellington St PS is preferred as more cost-effective option over Inflow and Infiltration programme in the upstream catchment.

Without any allowance for the greenfield developments, Wellington Rd PS is simulated to meet the target LOS over the medium term (+20-year) horizon, assuming the 300 L/s capacity upgrade of the Wise Park PS is feasible.

This option has been costed by GHD to meet the 2050 growth horizon. As previously discussed, the effectiveness of I&I is at this point uncertain. The need for the Wellington Road Pump Station upgrade is dependent on the effectiveness of the storage tanks and I&I programme.

6.4.7 Moores Valley – potential future development

This area currently relies upon septic tanks. Whilst it is not zoned for residential development, there may be a push in the future to replace the on-site disposal. Future consideration should be given to servicing this area if re-zoned. This area was not re-zoned as part of PC 43 and has not been highlighted by HCC as an area of significant population growth so it was not considered as part of the scope of this study.

6.5 Consent Considerations

GHD's Planning Team has completed a high-level planning assessment of the proposed wastewater infrastructure options. This assessment is included in this report as Appendix G, and is summarised below.

Each option was assessed against the relevant provisions of the following plans:

- Hutt City Council District Plan
- Greater Wellington Regional Council (GWRC) Proposed Natural Resources Plan (PNRP)(Decisions Version)
- GWRC Regional Air Quality Management Plan for the Wellington Region (Air plan)
- GWRC Regional Soil Plan for the Wellington Region (Soil plan)
- GWRC Regional Plan for Discharge to Land for the Wellington Region (Discharges to land plan)
- GWRC Regional Freshwater Plan for the Wellington Region (Water plan)

6.5.1 Inflow and Infiltration

No additional consents are required – can proceed on a permitted basis as maintenance of existing network under both the HCC District Plan and GWRC pNRP.

Earthworks is excluded due to the definitions of the GWRC PNRP.

6.5.2 New Pump Station for Greenfield Developments

HCC: Subdivision may be required to take land for network utility purposes if it cannot fit in an area already set aside for such purposes, such as the road reserve. The rising main to the existing pump station would be able to be constructed as a permitted activity.

6.5.3 Wise Park Pump Station

No consents required by HCC or GWRC for upgrades to the existing pump station provided there is no material change in the existing footprint or effects on the environment.

6.5.4 Fraser Street Storage

GWRC: If in situ oversized pipes is the preferred method earthworks is excluded due to the earthworks definition of the GWRC PNRP.

HCC: Assessment against rule 13.3.1.6 required as there may be instances where the pipeline will not comply with permitted activity conditions for a variety of reasons.

6.5.5 Main Road and Rowe Parade Storage

GWRC: If in situ oversized pipes is the preferred method earthworks is excluded due to the definitions of the GWRC PNRP.

HCC: Assessment against rule 13.3.1.6 is required as there may be instances where the pipeline will not comply with permitted activity conditions for a variety of reasons.

6.6 Costing

A cost estimate has been prepared in accordance with the Wellington Water Cost Estimation Manual, see Table 6-1. Refer to Appendix H for a full cost breakdown. In addition to the assumptions detailed in Section 4, a number of assumptions were made for the wastewater upgrades as follows:

6.6.1 Pump Stations

Pump Station Upgrades

Options WW1 and WW2 incorporate upgrades to existing Pump Stations. Upgrade costs were estimated using the Optimisation Cost Data for upgraded pump stations contained in the *Wgtn Optimisation Unit Cost Data 2020-Rev11 Spreadsheet*. The original pump station upgrade spreadsheet included a 20% allowance for Preliminary and General items. This was removed as the revised cost estimation methodology applied Preliminary and General costs to the option as a whole, not to the individual components. In addition, the original pump station upgrade spreadsheet had been based on 95th percentile rates. To amend these to base estimates, GHD has recommended that a calibration factor of 0.7 be applied to the pump station upgrade costs. In addition, as this portion of the spreadsheet was based on the Christchurch market in 2017, an allowance of 20% was added to account for inflation.

The optimisation spreadsheet assumes that building and civil structures remain unchanged, electrical and pump components are upgraded and that the pump station remains operational during the upgrade (requiring temporary works, bypass pumping etc.). Upgraded Pump Stations were calculated as Level 1 estimates.

New Pump Stations

Option WW6 requires the construction of a new pump station. Costs were estimated using data from the 2017/2018 PCC WW NIP Study included in the *Wgtn Optimisation Unit Cost Data 2020-Rev11 Spreadsheet*. The original spreadsheet for new pump stations included an allowance for Traffic Management and Preliminary and General items. This was removed as the revised cost estimation methodology applied Traffic Management and Preliminary and General costs to the option as a whole, not to the individual components. An allowance of 20% was added to account for inflation. The NIP Study assumed a dry well-wet well configuration, duty/standby operation, roof slab at ground level and pump house structure, gantry crane and lay down areas below ground. No allowance for contingency and funding risk was included for this option as it is expected that this will be funded by developer contributions.

6.6.2 Inflow and Infiltration

For Inflow and Infiltration rehabilitation of the public network (WW3, WW4 and WW5), CIPP relining was assumed for costing purposes. The unit rate for CIPP relining includes an allowance for lateral opening and reconnection on rehabilitated pipelines. An additional allowance was made for CCTV or other investigation of 20 km of the network to further refine renewal locations.

For inflow and infiltration rehabilitation of the private network (WW9), it was assumed that 80% of laterals would be rehabilitated. Laterals were assumed to be 100 mm in diameter and rehabilitated by CIPP relining. An allowance was made for CCTV investigation of all private laterals in Wainuiomata.

All inflow and infiltration options were calculated as Level 1 estimate due to uncertainties in the location and extent of rehabilitation required.

6.6.3 Network Upgrades

Options WW2 and WW6 incorporate network upgrades. Trenched installation was assumed as the default methodology. For costing purposes, upsizing of existing pipelines was assumed to be equivalent to the cost of new pipelines. As both of these options also include pump stations, they were calculated as Level 1 estimates.

6.6.4 Storage

Options WW7 and WW8 require the construction of storage. For both locations, it was assumed that the most cost-effective option would be 2.1 metre diameter concrete pipes located in council-owned land (berm or reserve). Both options include an additional allowance within the physical works cost for pipe connections, overflow pipework and pumped output. As with other pipeline upgrades, these were calculated as Level 2 estimates.

Due to the depth of these pipes and the generally shallow groundwater in Wainuiomata, the unit rate was increased to allow for well point dewatering.

6.7 Further options considered

The preferred options include upgrade of the rising main from Wise Street Pump Station (WW1 and WW2), however no changes were proposed to the existing gravity sewer into Lower Hutt. The GIS indicates that this sewer varies from 300 mm to 375 mm. There is some uncertainty associated with this asset.

Following a meeting with Wellington Water on 14 September 2020, Wellington Water requested that GHD prepare a cost estimate for a possible upgrade of the gravity main between Wainuiomata and Gracefield. For the purposes of costing, the assumption has been made that a second, 1210 m long, 355 mmOD PE gravity pipe, would be added in the same tunnel as the existing pipe. This is based on the assumption that there is space in the existing tunnel for a second pipe, which is currently an unknown. No modelling has been undertaken for this pipe.

The location of this proposed upgrade is shown in Figure 6-10. This item has been costed as WW11.

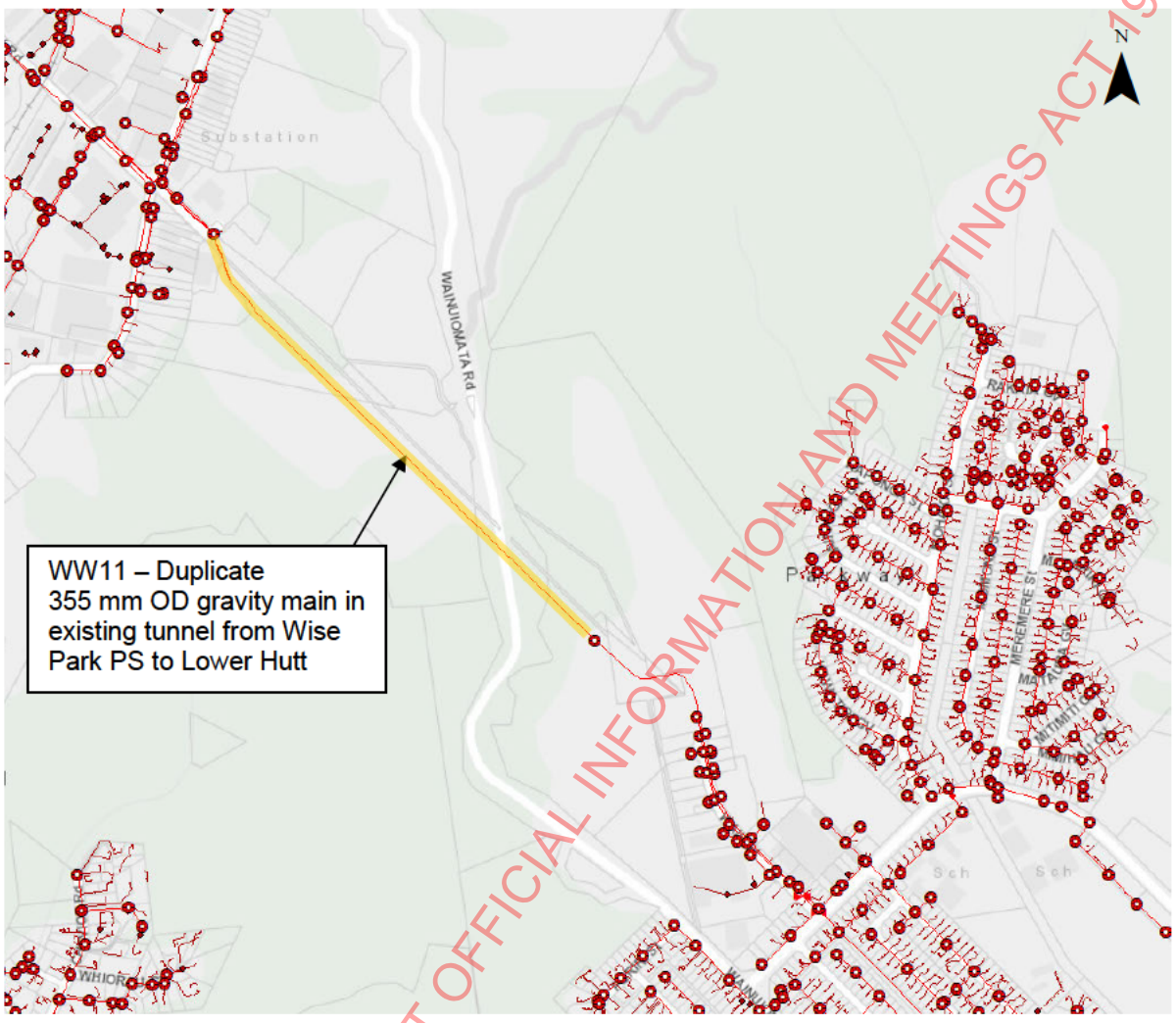


Figure 6-10 Location of proposed duplicate wastewater gravity main

Table 6-1: Wastewater infrastructure upgrades cost estimate

Project Estimate - Wastewater

Project Name: Hutt City Catchment Plan - 3Waters Assessment for PC43 Phase 1 - Wainuiomata
Project Phase: Study/Report
Base Date of Estimate: Sep-20

Phase & Task	%	WW1 - Wise St PS 1	WW2 - Wise St PS 2	WW3 - Priortized I&I (23km)	WW4 - Targeted I&I (16km)	WW5 - Catchment Wide I&I (61km)	WW6 - NGreenfield Servicing	WW7-Fraser St EOP Storage	WW8 - Main Road EOP Storage	WW9 - Private Lateral I&I	WW10 - Wellington Rd PS Upgrade	WW11 - Duplicate Gravity Main in Tunnel
Development												
Consultancy and Council Fees	3%	$12,000	$151,000	$397,000	$270,000	$1,014,000	$96,000	$51,000	$60,000	$274,000	$10,000	$75,000
Site Investigations												
Other Costs (Legal, Land, etc...)												
Total Project Development		$12,000	$151,000	$397,000	$270,000	$1,014,000	$96,000	$51,000	$60,000	$274,000	$10,000	$75,000
Consenting												
Consultancy and Council Fees	3%	$12,000	$151,000	$397,000	$270,000	$1,014,000	$96,000	$51,000	$60,000	$274,000	$10,000	$75,000
Site Investigations												
Other Costs (Legal, Land, etc...)												
Total Consenting		$12,000	$151,000	$397,000	$270,000	$1,014,000	$96,000	$51,000	$60,000	$274,000	$10,000	$75,000
Detailed Design												
Consultancy and Council Fees	6%	$24,000	$302,000	$793,000	$539,000	$2,028,000	$192,000	$102,000	$120,000	$548,000	$21,000	$150,000
Site Investigations												
Other Costs (Legal, Land, etc...)												
Total Detailed Design		$24,000	$302,000	$793,000	$539,000	$2,028,000	$192,000	$102,000	$120,000	$548,000	$21,000	$150,000
Procurement												
Consultancy and Council Fees	1%	$4,000	$50,000	$132,000	$90,000	$338,000	$32,000	$17,000	$20,000	$91,000	$3,000	$25,000
Other Costs (Legal, Land, etc...)												
Total Procurement		$4,000	$50,000	$132,000	$90,000	$338,000	$32,000	$17,000	$20,000	$91,000	$3,000	$25,000
Construction												
Consultancy and Council Fees	5%	$20,000	$251,000	$661,000	$449,000	$1,690,000	$160,000	$85,000	$100,000	$456,000	$17,000	$125,000
Land Acqusistion												
Other Costs (Legal, Land, etc...)												
Physical Works												
Preliminary and General		$75,000	$1,106,000	$2,512,000	$1,708,000	$6,422,000	$608,000	$306,000	$361,000	$1,735,000	$66,000	$400,000
Physical Works - Stormwater												
Physical Works - Wastewater		$394,000	$5,029,000	$13,223,000	$8,987,000	$33,799,000	$3,198,000	$1,700,000	$2,006,000	$9,129,000	$346,000	$2,502,000
Physical Works - Potable Water												
Total Construction		$489,000	$6,386,000	$16,396,000	$11,144,000	$41,911,000	$3,965,000	$2,091,000	$2,467,000	$11,320,000	$429,000	$3,027,000
Base Estimate												
Base Estimate		$540,000	$7,040,000	$18,115,000	$12,313,000	$46,305,000	$4,381,000	$2,312,000	$2,728,000	$12,507,000	$473,000	$3,353,000
Contingency		$216,000	$2,816,000	$7,246,000	$4,925,000	$9,261,000	0	$462,000	$546,000	$2,501,000	$95,000	$671,000
Expected Estimate		$756,000	$9,856,000	$25,361,000	$17,238,000	$55,565,000	$4,381,000	$2,774,000	$3,274,000	$15,008,000	$568,000	$4,023,000
95th Percentile Estimate												
Funding Risk		$454,000	$5,914,000	$15,217,000	$10,343,000	$16,670,000	0	$832,000	$982,000	$4,503,000	$170,000	$1,207,000
TOTAL VALUE	**95th Percentile Estimate**	**$1,210,000**	**$15,770,000**	**$40,578,000**	**$27,580,000**	**$72,235,000**	**$4,381,000**	**$3,607,000**	**$4,256,000**	**$19,511,000**	**$739,000**	**$5,230,000**

6.8 Preferred options

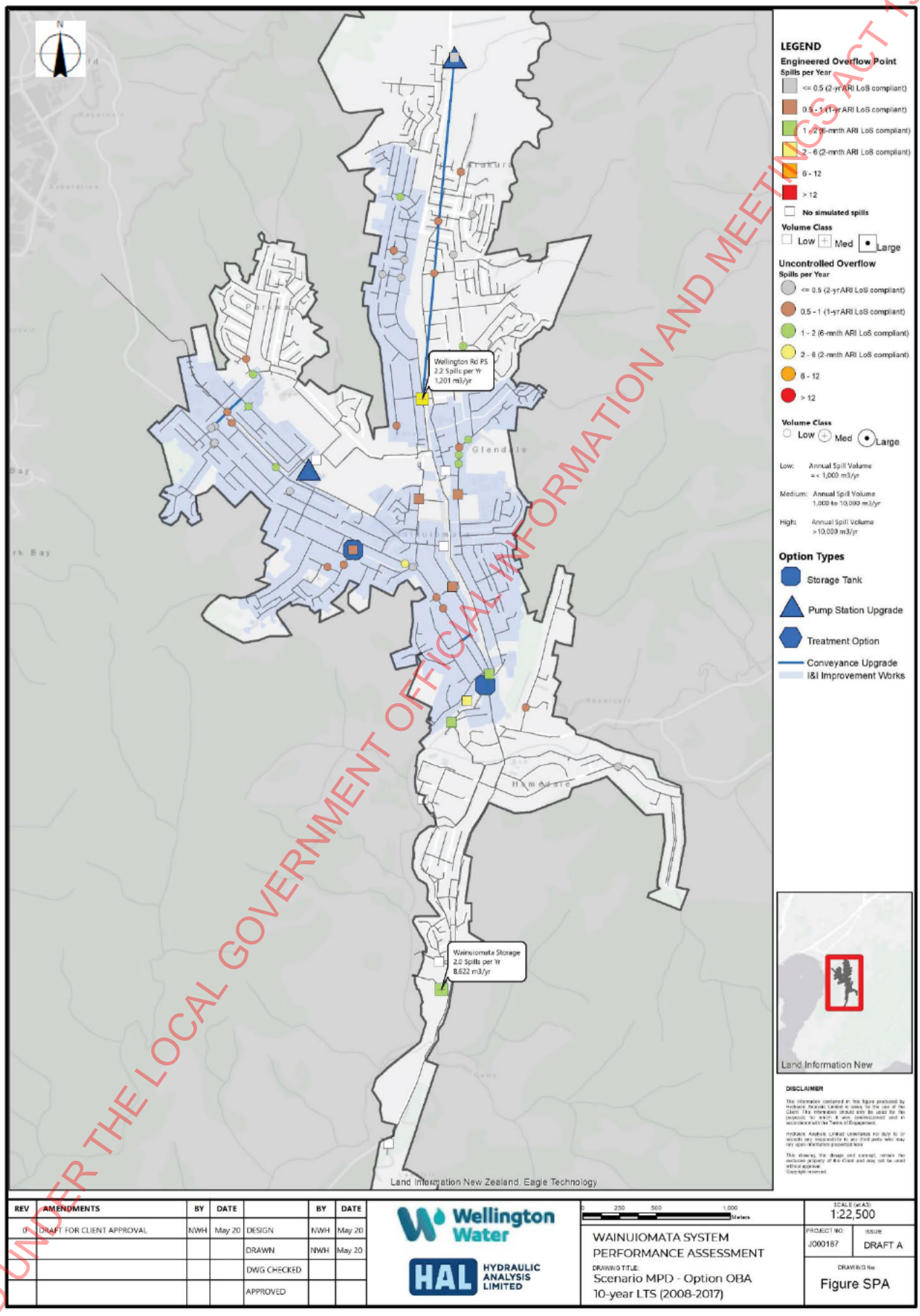
Two refined solution sets were chosen from the longlist, an interim upgrade and a future state upgrade. GHD has split the interim upgrade further into the 2020 and the 2033 planning horizons based on whether the issues being resolved are within the current network or due to growth (as per Table Table 8-2 at the end of this report).

These are summarised in Table 6-2 and shown in Figure 6-11 and Figure 6-12. Costs have been added by GHD.

Table 6-2: Summary of wastewater infrastructure preferred options

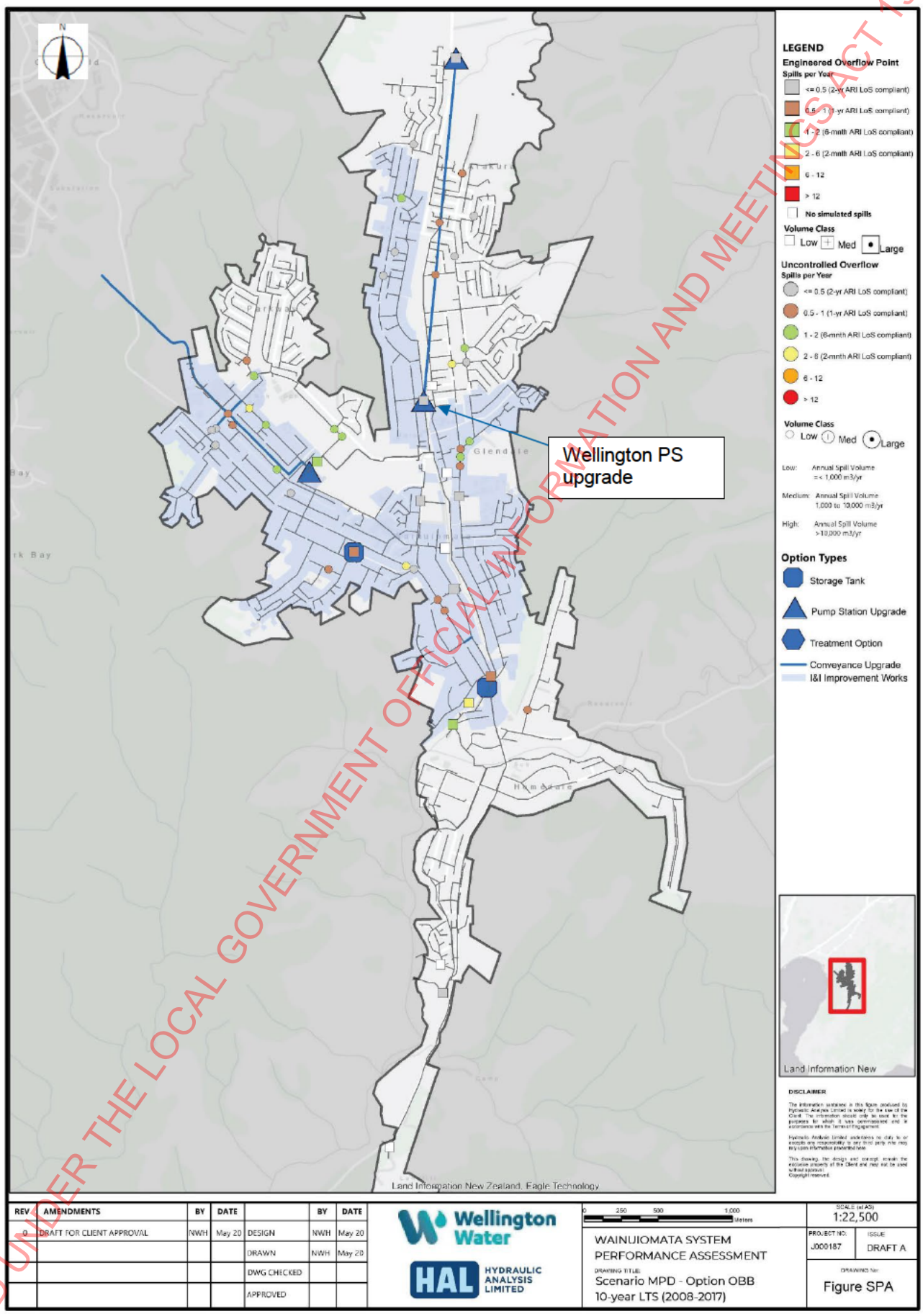
Solution set component	Interim upgrade 2020 planning horizon	Estimated cost	Interim upgrade 2033 planning horizon	Estimated cost	Future state upgrade 2050 planning horizon	Estimated cost
Wise Park PS	WW1 - Wise Park stage 1 upgrade within existing rising main capacity (assumed up to ~300 l/s)	$1,210,000			WW2 - Wise Park stage 2 upgrade and new rising main upgrade (1.56 km) (assumed up to ~400 l/s)	$15,770,000
I&I programme	WW3 - 23,887 m of sewer rehab (prioritised works)	$40,578,000			WW4 – 16,573 m of sewer rehab (targeted works). Assumes prioritized works (WW3) completed.	$27,580,000
Greenfield Servicing			WW6 - 40 l/s pump station and 2.4 km rising main direct to Wellington PS	$4,381,000	-	-
Fraser EOP	WW7 - 150 m3 storage facility	$3,607,000			-	-
Main/Rowe EOPs	WW8 - 500 m3 storage facility	$4,256,000			-	-
Wellington St PS					WW10 - Pump upgrade to ~225 l/s (if needed)	$739,000
Private Lateral I&I	WW9 - Assessment and replacement of Laterals	$19,511,000				

Source: HAL (2020) Wainuiomata Options Assessment, costs added by GHD



Source: HAL (2020) Wainuiomata Options Assessment

Figure 6-11: Interim option upgrade suite



Source: HAL (2020) Wainuiomata Options Assessment

Figure 6-12: Final state option upgrade suite (for future 2050 growth)

7. Stormwater Infrastructure

7.1 Network configuration

The existing Wainuiomata catchment is primarily drained by Black Creek, which is a highly modified channel running from north to south through the catchment. The western areas of Wainuiomata drain to Parkway Drain before connecting to Black Creek downstream of the Nelson Crescent bridge.

Black Creek ultimately drains to the Wainuiomata River to the south (refer to Figure 7-1).

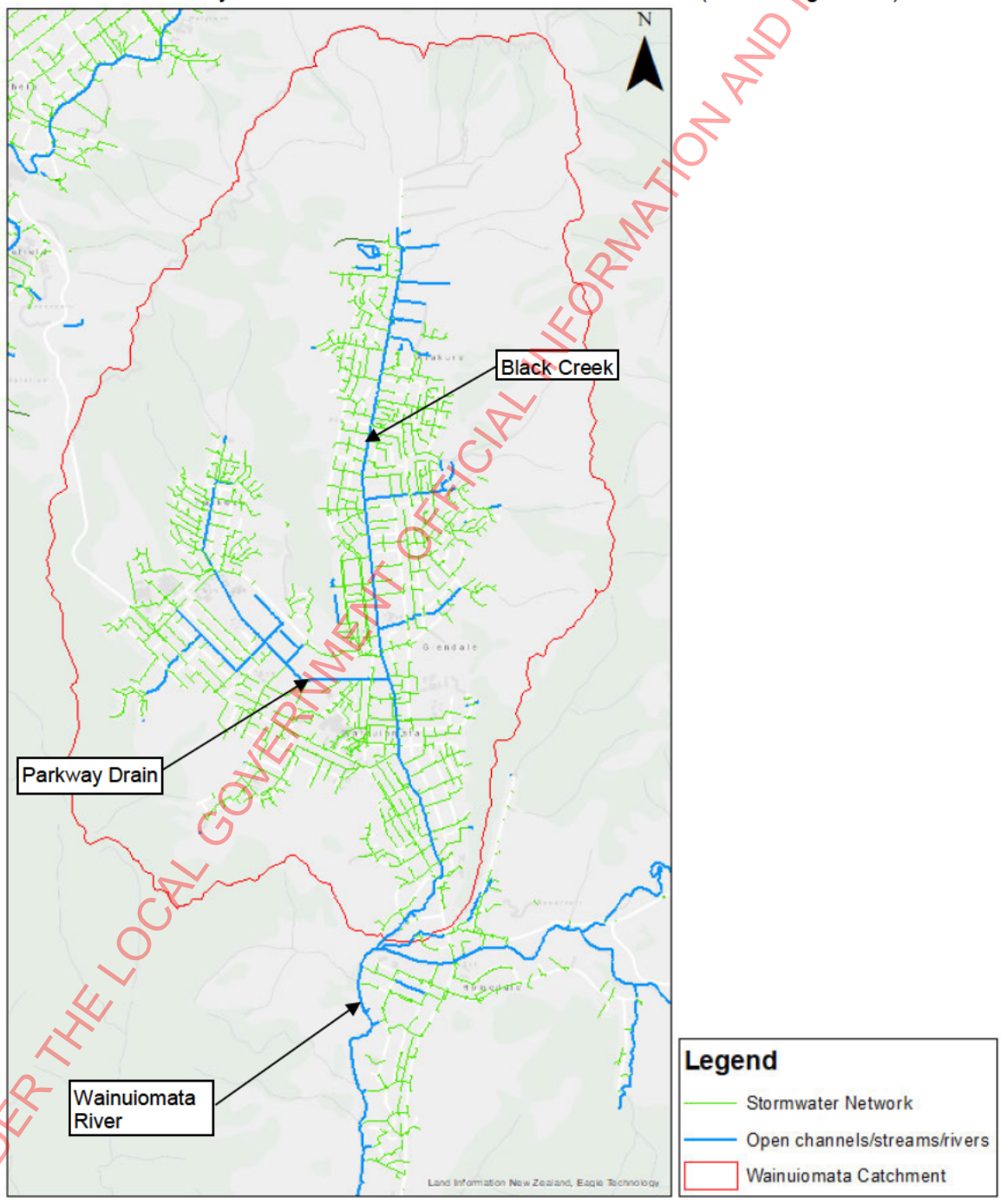


Figure 7-1 Wainuiomata existing stormwater network

7.2 Levels of service

The stormwater Levels of Service for the HCC Catchment Plan in Wainuiomata are in accordance with the activity brief as follows:

- Safe access to and protection from flooding of habitable floors in the 100-year flood event that includes the predicted impact of climate change.
- Safe access to and protection from flooding for Commercial/Businesses in the 10-year flood event.
- Attenuation of increased post-development runoff as a result of new developments in Greenfield areas will be required, as well as assessing their potential impact to the capacity of existing stormwater piped networks during a 10-year flood event.

For the purposes of this catchment scale modelling, it is assumed that a building floor level is 400 mm above ground level.

In addition to flood protection, water quality considerations need to include the effects of existing and future stormwater networks discharging into the receiving environment. These must be managed in accordance with the Wellington Water Stormwater Management Strategy for this catchment as well as Greater Wellington Regional Council guidelines.

7.3 Existing constraints

Flooding has been an issue in Wainuiomata for many years. Black Creek is a highly modified channel which was originally designed to convey a 1 in 50 year average recurrence interval (ARI) storm event. However, a hydraulic study undertaken in 2004/2005[2] found that much of the channel had less than a 1 in 30 year ARI capacity.

Source: Diana Isaac and Mike Prasad, Capacity (September 2010), *Black Creek Upgrade Project Wainuiomata*, PowerPoint presentation

Figure 7-2 Flooding at Nelson Crescent Bridge 1977

[2] Diana Isaac and Mike Prasad, Capacity (September 2010), *Black Creek Upgrade Project Wainuiomata*, PowerPoint presentation

Wellington Water engaged Stantec to review the existing Wainuiomata stormwater model to understand the causes of flooding. Stantec identified that flooding in the network is a result of three key issues:

7.3.1 Undersized channels

The major channels in the network, Black Creek and Parkway Drain, have insufficient capacity for large sections of the channels. The previous channel upgrades did not go far enough to resolve all of the problems associated with insufficient channel capacity.

7.3.2 Undersized pipe network

The upstream piped network is undersized in numerous locations such as the area around Parkway Drain and upstream of Mary Crowther Park. A number of open channels in the network which drain to Black Creek and Parkway Drain have road crossings with undersized culverts.

7.3.3 Backwater effects

Flow from the network and from overland is unable to enter the channel network at key locations due to backwater effects. For example, this occurs at multiple locations along the western side of Black Creek and around Mohaka St and Parkway Drain.

7.4 Option assessment

Work was undertaken by Stantec in 2019 and 2020 to investigate flooding issues in the existing catchment. On the 10 March 2020 a workshop was held between Stantec, Wellington Water and GHD to discuss stormwater modelling works completed to date. The outcomes of this workshop were summarised in a Wainuiomata Optioneering Phase 1 Memo by Stantec on 30 April 2020. This memo is included as Appendix E of this report.

Following this memo, additional work was undertaken to develop some of the options further. The interim results of this additional work were presented to Wellington Water and GHD on 21 June 2020 (The presentation is included in Appendix E.)

Three large scale upgrade options were considered by Stantec:

- Increase channel capacity in Black Creek
- Large scale detention (five locations proposed)
- Large scale flow diversions parallel to Black Creek and Parkway Drain

Following the presentation on 21 June 2020, GHD completed site investigations on 22 June 2020 to assess the feasibility and limitations with each of the potential options. Following this, GHD developed a longlist of feasible options, which included five detention storage options and four sections of channel improvements. These options were tested using the stormwater model to assess how they affected the catchment levels of service. For the assessment of each option refer to Appendix F.

The preferred options are discussed below.

7.4.1 New detention/wetland (SW3)

Upper Fitzherbert is in the northern greenfield development area and is currently farmland and lifestyle blocks (refer Figure 7-3). This area provides the most opportunity for stormwater storage, as it is largely undeveloped.

Wellington Water has noted that there are 30-40 landowners in this area. This could make it difficult to confirm a final storage location as it may serve a large area but only cover two or

three land parcels. One option would be for Hutt City Council to acquire the land needed to create a regional stormwater treatment and storage solution.

The proposal for Option C is to create an on-line treatment wetland, which will also provide a storage area adjacent to the wetland. There is a desire for all new greenfield runoff to be treated and this wetland would provide water quality treatment for most of the runoff from the northern greenfield area to be developed, including from new streets. This would require excavating the existing ground level by an average of 1.5 m for an area of approximately 10,000 m^2.

Figure 7-3 Black Creek at Upper Fitzherbert

The water storage volume in a 1% AEP event is about 13 ML.

The preferred location for the wetland / storage area is shown in Figure 7-4. This location is well suited for the new wetland with a low and continuous base flow.

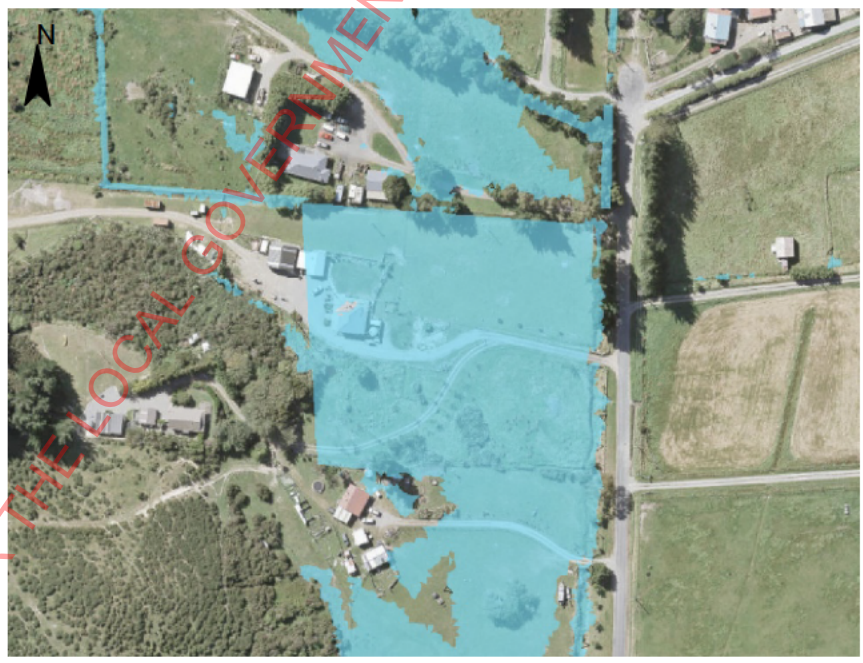


Figure 7-4 Storage C at Upper Fitzherbert (1% AEP + 20% CC storm event) (location indicative only)

7.4.2 Black Creek Widening - Top Section (SW4)

From the end of Wellington Road to the northern end of Upper Fitzherbert Road, Black Creek becomes narrower and significantly more vegetated (refer to Figure 7-5).

Figure 7-5 Black Creek near the northern end of Upper Fitzherbert Road

Based on site observations, GHD has proposed the following cross section (refer to Figure 7-6 as being achievable for widening the stream in this area without a significant impact on the adjacent properties and trees. An estimated 2,100 m^3 of material would need to be removed for this option.

It should be noted that the proposed wetland (SW3) is adjacent to this section and would be connected to the stream in this area.

The proposed channel improvements have been modelled with the results of the modelling work presented in Section 8.

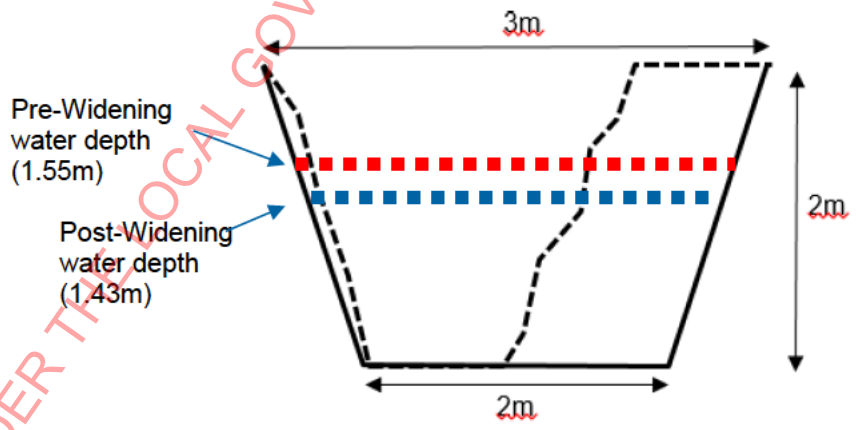


Figure 7-6 Sketch of proposed stream widening between Wellington Road and Upper Fitzherbert Road

7.4.3 Black Creek Widening - Middle Section (SW5)

The section upstream of Norfolk Street bridge (up to Wellington Road) is roughly trapezoidal and in some areas the banks have slumped into the stream (refer to Figure 7-7). In some locations this is undermining Upper Fitzherbert Road which runs parallel and very close to the creek. There is a proposal to replace Upper Fitzherbert Road with a loop road connecting Wise Street and Wellington Road. This would enable Upper Fitzherbert Road to be removed to provide space for the stream. The remaining width could be used as a pedestrian/cycle way and/or a services route.

Figure 7-7 Black Creek looking upstream from Norfolk Street bridge

GHD proposes to widen the stream here so that it has a cross-sectional area of 15 m^2. This is approximately the same cross-sectional area as underneath Norfolk Street bridge (refer to Figure 7-8). An estimated 5,600 m^3 of material would need to be removed for this option.

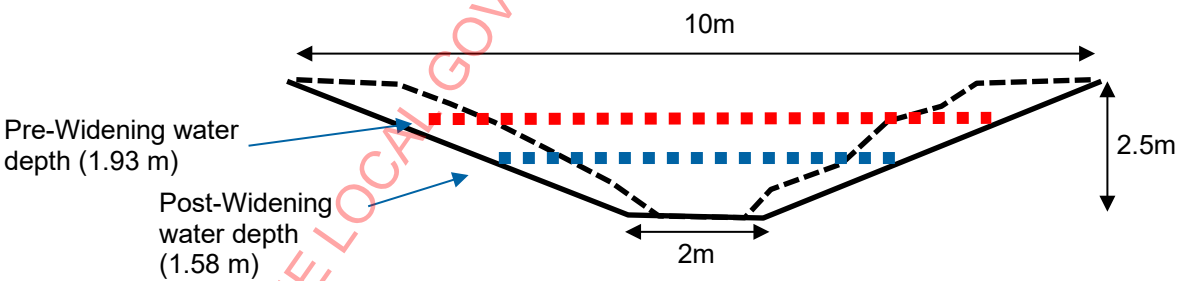


Figure 7-8 Sketch of proposed stream widening between Norfolk Street and Wellington Road

Figure 7-9 Norfolk Street bridge

The Norfolk Street bridge abutments are vertical concrete walls (refer to Figure 7-9). The proposed improvement works at this bridge is limited to soil removal as part of the stream widening works. The design of improvement works would need to consider scour and whether armouring of the existing abutments would be required following soil removal.

7.4.4 Black Creek Widening - Lower Section (SW6)

The Nelson Crescent Bridge is at the upstream boundary of the previous channel widening works. The downstream section has already been widened on the true left hand side. These historical works did not affect the stream bed with the increased capacity created using a terraced approach (refer to Figure 7-10).

Figure 7-10 Historic Channel Improvements on left hand bank (Photo taken from Nelson Crescent Bridge looking downstream)

When the channel flows increase, the flow will spill into the terraced portion of the channel, increasing the overall carrying capacity. The channel is roughly trapezoidal with flat, grassed banks on either side. There is public access to the banks but no formed paths.

The section of channel between Nelson Crescent and Norfolk Street (refer to Figure 7-11) was not included in the previous stages of channel improvements and it is recommended that a similar channel widening approach is applied to this section.

Figure 7-11 Black Creek looking upstream from Nelson Crescent Bridge

Based on the available space, GHD proposes to widen Black Creek in this section by 2 m on the true left hand side. The widening will be from approximately 1 m above bed level so that the low flow channel is unaffected (refer Figure 7-12). An estimated 5,100 m^3 of material would need to be removed for this option.

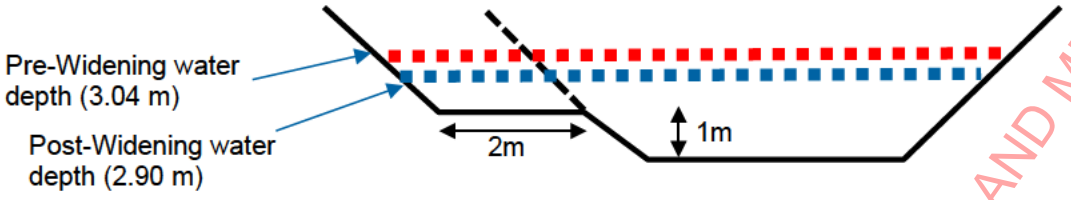


Figure 7-12 Sketch of proposed stream widening from Nelson Cres to Norfolk St, looking downstream

Nelson Crescent Bridge

The stream cross section at Nelson Crescent Bridge is currently trapezoidal below the bridge structure (refer to Figure 7-13).

Figure 7-13 Nelson Crescent Bridge

Once the channel is widened upstream of Nelson Crescent Bridge, the bridge will become a restriction for flood flows. To mitigate this, GHD proposes to increase the cross sectional area below the bridge, without increasing the total span of the structure. Gabion baskets would be used to increase the side slopes and widen the base of the stream under the bridge (refer to Figure 7-14). This option would require geotechnical investigation into the existing bridge abutment.

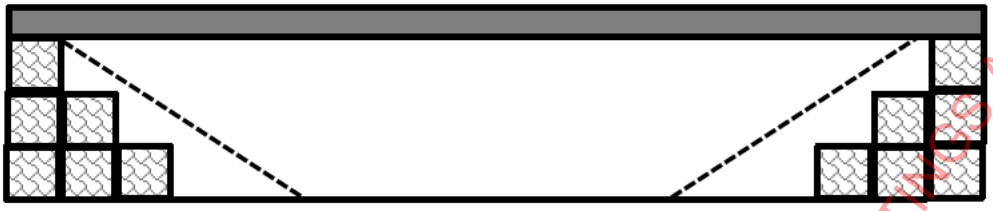


Figure 7-14 Sketch of proposed cross section widening under Nelson Crescent Bridge

7.4.5 Parkway Widening (SW7)

The proposed Parkway improvements include weir removal and channel widening.

There is an existing weir located in the Parkway drain behind 44 Mohaka Street (refer to Figure 7-15). GHD is not aware of the reason for this weir. This weir creates flow contraction in the drain and it is proposed that this weir is removed. The model was updated by removing this weir and modifying the channel profile immediately upstream and downstream on the weir to improve flow hydraulics. Based on the results of the model outputs, the localised flooding upstream of the weir is mitigated by the removal of the weir however further investigations are necessary in the design phase to fully understand the downstream impacts of removing the weir.

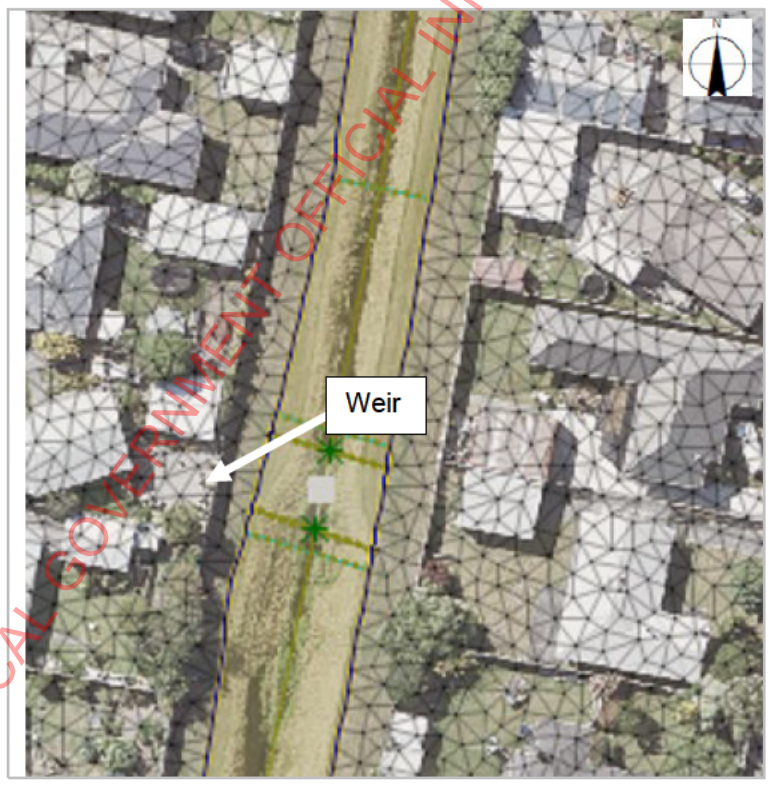


Figure 7-15 Model development with weir location identified

Parkway Drain is another open channel and is a tributary of Black Creek. The existing Parkway Drain between the Black Creek confluence and the Konini Street Drain was widened between 2005 to 2007. It is proposed that channel widening works continue upstream of the Konini Street drain to increase the capacity of Parkway drain between Rata Street and Wainuiomata High School (refer to Figure 7-16).

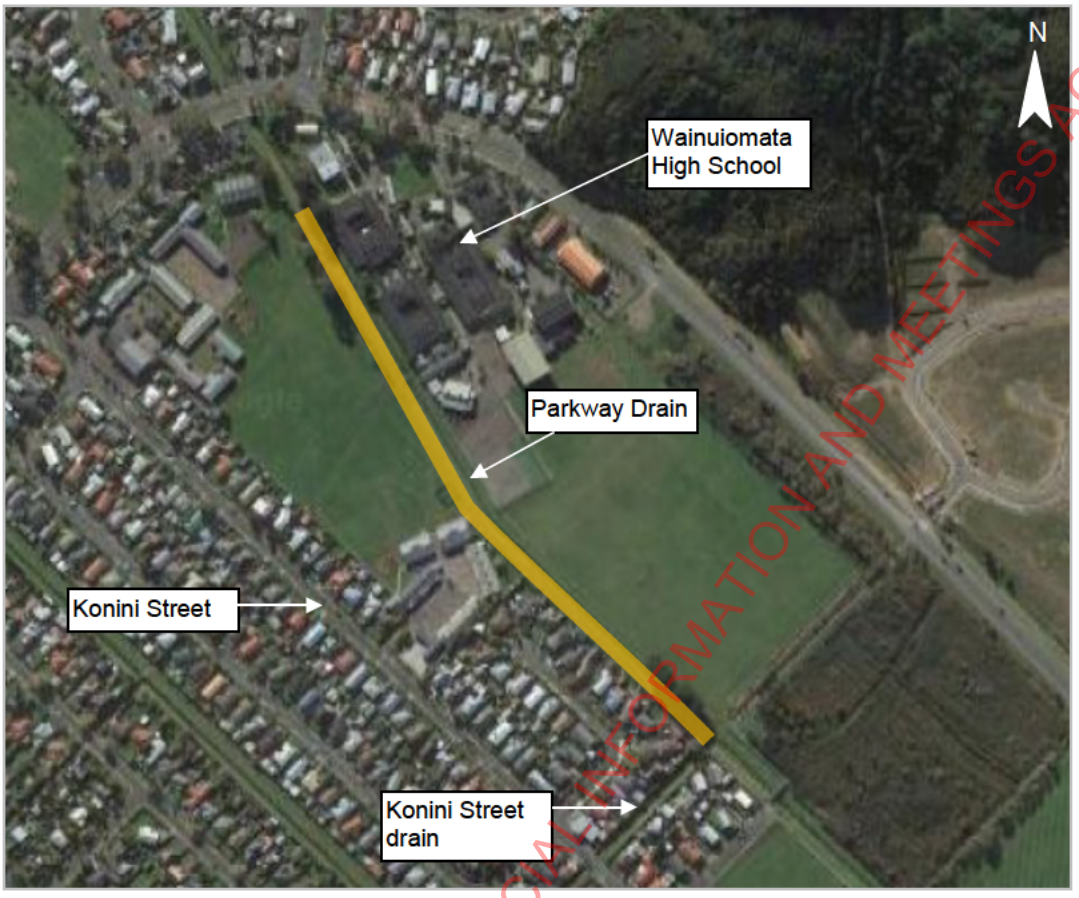


Figure 7-16 Extent of proposed Parkway drain widening (shown in orange)

The proposed widening does not change the width or depth of the channel. Instead the channel profile is proposed to be 'smoothed out' to increase its capacity. The improved channel profile is shown in Figure 7-17. An estimated 1,500 m^3 of material would need to be removed for this option.

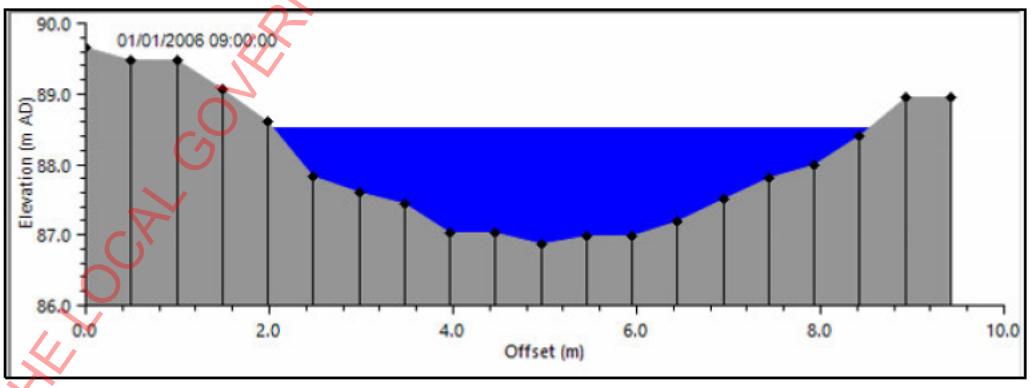


Figure 7-17 Typical channel modifications for Parkway Drain

7.5 Consent considerations

GHD's Planning Team has completed a high-level planning assessment of the proposed stormwater infrastructure options. This assessment is included in this report as Appendix G, and is summarised below.

Each option was assessed against the relevant provisions of the following plans:

- Hutt City Council District Plan
- Greater Wellington Regional Council (GWRC) Proposed Natural Resources Plan (PNRP)(Decisions Version)
- GWRC Regional Air Quality Management Plan for the Wellington Region (Air plan)
- GWRC Regional Soil Plan for the Wellington Region (Soil plan)
- GWRC Regional Plan for Discharge to Land for the Wellington Region (Discharges to land plan)
- GWRC Regional Freshwater Plan for the Wellington Region (Water plan)

7.5.1 Storage Option A (Upper Waiu Street)

HCC: Permission would be needed from GWRC for works as area is currently designated for a water supply pipeline

GWRC: Current uncertainty as to what works will be required in the stream as part of stopbank construction, which may trigger additional consent requirements. The NES Freshwater applies in addition to GWRC plans and operative rules, if the works and associated discharges are within 100m of a recognised wetland (Waiau Wetland/Gracefield Scrub).

7.5.2 Storage Option B (Upper Mohaka Street)

HCC: The network utility rules cannot be complied with as the size of the stopbank along with the amount of earthworks required are larger than the permitted standards allow.

GWRC: Volume of earthworks required over the land cannot comply with permitted activity standards of rule R99 of the PNRP. Damming and diversion of water would require resource consent pursuant to rule R135 of the PNRP, As well as Rule 16 of the Water Plan.

7.5.3 Storage Option C (Upper Fitzherbert)

HCC: Proposed option is to create a wetland, or series of wetland areas, along with storage areas, as attenuation for stormwater in high flow events. Such wetlands are not considered by the network utilities section of the plan and the Rule 13.3.1.15 would be applied. SNR58 is not specifically mentioned within 14E 2.2(b), therefore the generic Chapter 14E rules apply.

GWRC: Consent would be required for a variety of activities. The uncertainty of the alignment and specific treatment of storage options means that the assessment is necessarily uncertain and broad. Consent would likely be required as a Discretionary Activity. Volume of earthworks cannot comply with permitted activity conditions of rule R99 therefore R101 applies.

7.5.4 Black Creek Channel Widening (all sections)

HCC: Earthworks along Black Creek is considered a network utility as works are undertaken by a network utility operator for the purpose of drainage. The permitted activity standards for earthworks cannot be met so Rule 13.3.1.6 applies.

GWRC: Works cannot comply with permitted activity standards of rule R99 as they are within 5m of the bed of a river thererefore rule R101 applies.

No relevant rules for the widening of the channel apply so rule R129 applies to activities occurring in the beds of rivers.

7.5.5 Parkway Drain Channel Widening

HCC: Earthworks along the Parkway drain are considered a network utility as works are undertaken by a network utility operator for the purpose of drainage. The permitted activity standards for earthworks cannot be met so Rule 13.3.1.6 applies.

GWRC: Works within the bed of a river require resource consent, pursuant to rule R101 and R129 of the PNRP as well as rule 49 of the Water Plan. Resource consent is not needed under the NES Freshwater as modification of the weir is covered by regulation 72 as a permitted activity.

7.6 Costing

Cost estimates were prepared for each of the short-listed stormwater infrastructure options. Refer to Table 7-4 for the summary table and Appendix H for the cost breakdown.

The methodology and assumptions specific to the short-listed stormwater options is detailed below.

7.6.1 Storage Areas

Rates for individual components of storage areas were taken from historical projects including tendered rates for the *Porirua Central Stormwater Upgrade – Stage 1* project. This project was tendered in December 2019 and includes a wetland and flood protection walls in urban reserves and residential areas. It is assumed that the location and design criteria applied in Porirua would be similar to those for the proposed Wainuiomata storage areas.

For each proposed storage area, an allowance was made for tree and building removal based on features visible in aerial photographs. Re-vegetation costs varied according to the storage area components. Bunds/stopbanks were assumed to require grass revegetation across the entire surface area. Attenuation areas were assumed to require plantings over 20% of the area while wetlands were assumed to require planting over 100% of the area. An allowance was also made for wetland planting maintenance over a 24-month period following construction.

Property purchase was based on property values from QV with a 10% additional allowance for negotiations and legal fees.

Flood protection bunds/stopbanks were assumed to be constructed with imported fill (AP40), strengthened with HDPE Liner, geogrid and permathene and overlain with 150 mm of topsoil. If excavation was required for construction of an adjacent attenuation area, it was assumed that this could be reused for fill and no topsoil would be required.

Site specific components (inlet and outlet structures, wetland lining etc.) are detailed in the cost estimate for each storage option (see Appendix H).

7.6.2 Channel Improvements

For proposed channel works, an allowance was made for large tree removal based on tree cover visible in aerial photographs. Geotextile lining was assumed to be required for all of the excavated area and planting for 20% of the excavated area. Hydroseeding of all disturbed banks 1 metre above the stream invert was included in cost estimates.

Channel locations were reviewed to determine accessibility for large plant. Where required, an allowance was made for construction of a 3 metre temporary access road on one side of the channel. For channel upgrades along Upper Fitzherbert Road from Norfolk St to Wellington Rd,

Wellington Water advised that the existing road may be decommissioned. The cost estimate for this option includes removal of pavement and grass reinstatement across a 5m width.

7.6.3 Stormwater Network

For options including renewal of existing stormwater pipelines, the cost of renewal is a Level 2 estimate and assumed to be equivalent to the trench and lay rate for new pipelines. Where the alignment was within 3 metres of existing buildings, an allowance was included for structural support and underpinning.

7.7 Further options considered

Subsequent to the channel widening and storage option assessment, GHD considered pipe upgrade options. These options are conceptual only and have not been hydraulically modelled. The three options are discussed below.

7.7.1 Waiu Street stormwater upgrade (SW8)

The following pipe upgrades at Waiu Street are proposed to address capacity issues (refer Table 7-1 and Figure 7-18).

Table 7-1 Proposed Waiu Street stormwater pipe upgrades

Existing pipe size	Proposed pipe size	Approximate length
1200 mm	1500 mm	141 m
1500 mm	1950 mm	445 m

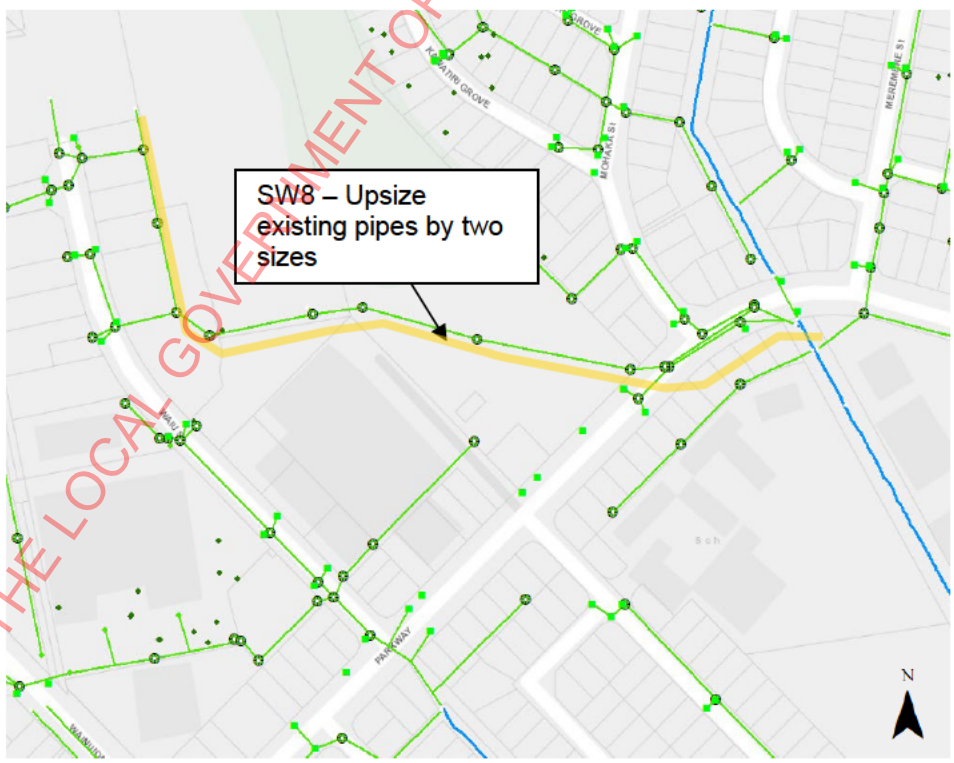


Figure 7-18 Location of Waiu Street stormwater pipe upgrades

7.7.2 Lees/Fraser Street stormwater upgrade (SW9)

The following pipe upgrades at Lees Street and Fraser Street are proposed to address capacity issues (refer Table 7-2 and Figure 7-19).

Table 7-2 Proposed Lees/Fraser Street stormwater pipe upgrades

Existing pipe size	Proposed pipe size	Approximate length
450 mm	600 mm	400 m
900 mm	1050 mm	144 m
1050 mm	1350 mm	300 m
1200 mm	1500 mm	365 m
1350 mm	1800 mm	485 m

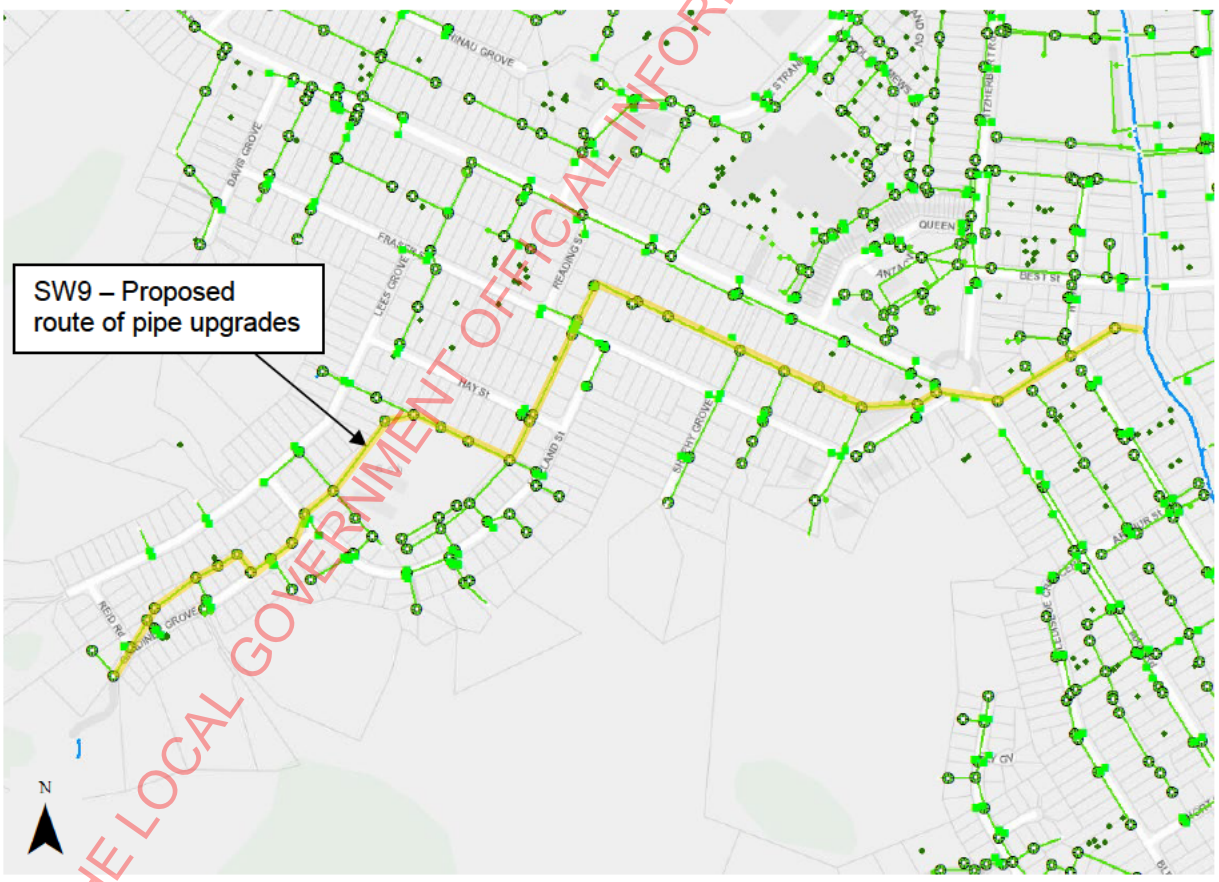


Figure 7-19 Location of Lees/Fraser Street stormwater pipe upgrades

7.7.3 Upper Fitzherbert stormwater network (SW10)

The greenfield developments around Upper Fitzherbert Road will require a new stormwater trunk network to direct the runoff into the proposed detention/wetland (SW3). This has been costed based on the sizes and pipe locations shown in Table 7-3 and Figure 7-20. The final location and extent of this trunk network will vary based on the proposed development layout.

Table 7-3 Proposed Upper Fitzherbert stormwater network

Proposed pipe size	Approximate length
450 mm	300 m
525 mm	1090 m
600 mm	470 m
750 mm	140 m

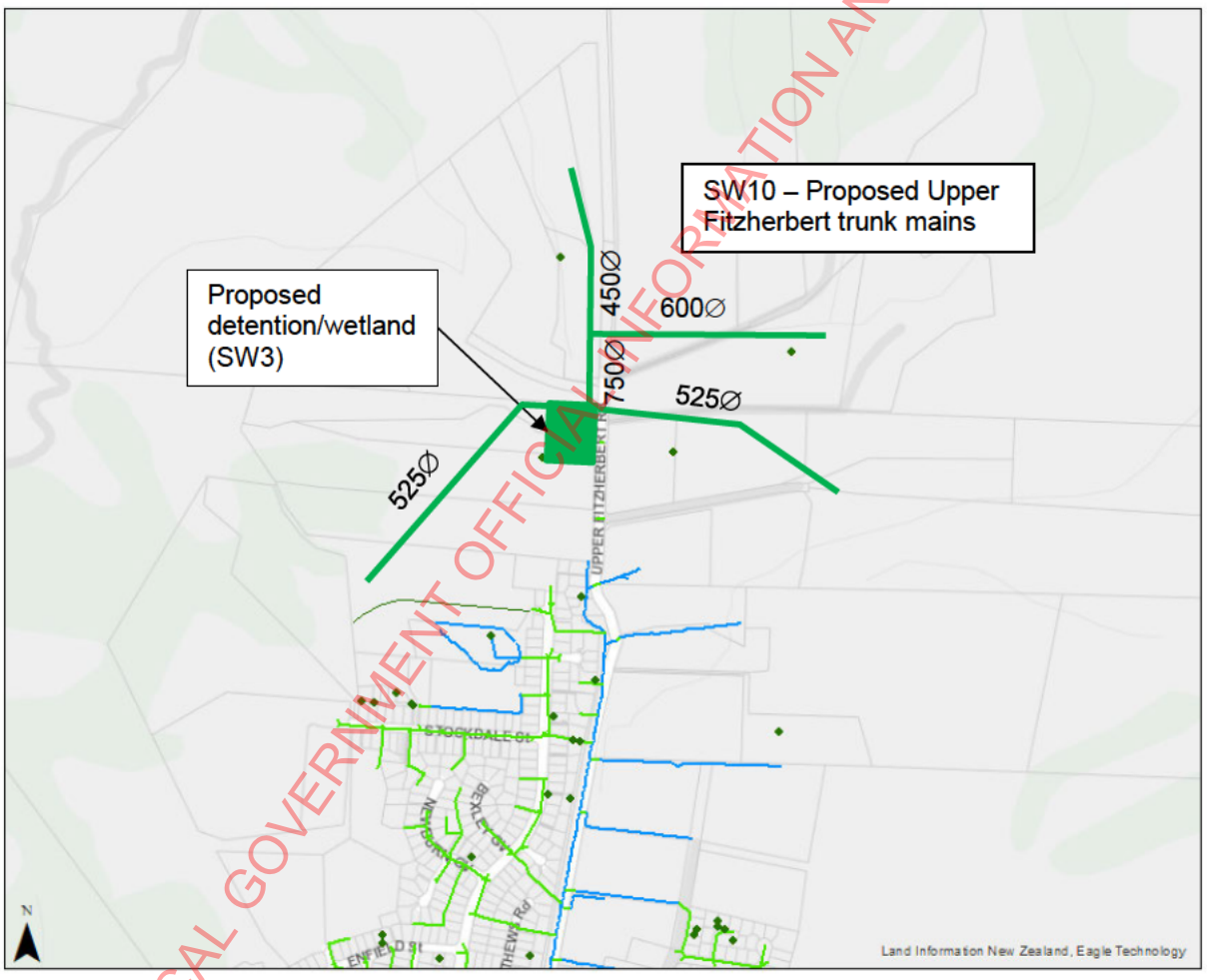


Figure 7-20 Indicative location of proposed Upper Fitzherbert stormwater network (for costing purposes)

A summary of the short-listed options is shown below.

Table 7-4 Stormwater infrastructure upgrades cost estimate (short-listed options)

Project Estimate - Storm Water

Project Name: Hutt City Catchment Plan - 3Waters Assessment for PC43 Phase 1 - Wainuiomata
Project Phase: Study/Report
Base Date of Estimate: Sep-20

Phase & Task	%	SW1 - Storage A: Upper Waiu St	SW2 - Storage B: Upper Mohaka	SW3 - Storage C: Upper Fitzherbert Wetland	SW4 - Black Creek A: Wellington Rd to Upper Fitzherbert	SW5 - Black Creek B: Norfolk St to Wellington Rd	SW6 - Black Creek C: Nelson Cresc to Norfolk St and Nelson Cresc Bridge	SW7 - Parkway Drain Improvements	SW8 - Waiu St Stormwater Upgrade	SW9 - Lees/Fraser St SW Upgrade	SW10 - Upper Fitzherbert SW Network
Development											
Consultancy and Council Fees	3%	$15,000	$49,000	$162,000	$16,000	$51,000	$62,000	$19,000	$129,000	$273,000	$102,000
Site Investigations											
Other Costs (Legal, Land, etc...)											
Total Project Development		$15,000	$49,000	$162,000	$16,000	$51,000	$62,000	$19,000	$129,000	$273,000	$102,000
Consenting											
Consultancy and Council Fees	3%	$15,000	$49,000	$162,000	$16,000	$51,000	$62,000	$19,000	$129,000	$273,000	$102,000
Site Investigations											
Other Costs (Legal, Land, etc...)		$300,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000			
Total Consenting		$315,000	$249,000	$362,000	$216,000	$251,000	$262,000	$219,000	$129,000	$273,000	$102,000
Detailed Design											
Consultancy and Council Fees	6%	$30,000	$97,000	$324,000	$31,000	$101,000	$125,000	$38,000	$258,000	$545,000	$204,000
Site Investigations											
Other Costs (Legal, Land, etc...)											
Total Detailed Design		$30,000	$97,000	$324,000	$31,000	$101,000	$125,000	$38,000	$258,000	$545,000	$204,000
Procurement											
Consultancy and Council Fees	1%	$5,000	$16,000	$54,000	$5,000	$17,000	$21,000	$6,000	$43,000	$91,000	$34,000
Other Costs (Legal, Land, etc...)											
Total Procurement		$5,000	$16,000	$54,000	$5,000	$17,000	$21,000	$6,000	$43,000	$91,000	$34,000
Construction											
Consultancy and Council Fees	5%	$25,000	$81,000	$270,000	$26,000	$84,000	$104,000	$32,000	$215,000	$454,000	$170,000
Land Acqusistion			$1,320,000	$1,397,000							
Other Costs (Legal, Land, etc...)											
Physical Works											
Preliminary and General		$96,000	$292,000	$971,000	$100,000	$321,000	$396,000	$120,000	$775,000	$1,636,000	$645,000
Physical Works - Stormwater		$503,000	$1,625,000	$5,394,000	$525,000	$1,687,000	$2,083,000	$633,000	$4,305,000	$9,086,000	$3,394,000
Physical Works - Wastewater											
Physical Works - Potable Water											
Total Construction		$623,000	$3,319,000	$8,032,000	$651,000	$2,092,000	$2,582,000	$785,000	$5,295,000	$11,176,000	$4,209,000
Base Estimate											
Base Estimate		$989,000	$3,730,000	$8,933,000	$919,000	$2,511,000	$3,053,000	$1,067,000	$5,854,000	$12,357,000	$4,650,000
Contingency		$396,000	$1,492,000	$3,573,000	$368,000	$1,004,000	$1,221,000	$427,000	$1,171,000	$2,471,000	$930,000
Expected Estimate		$1,384,000	$5,222,000	$12,507,000	$1,287,000	$3,516,000	$4,274,000	$1,494,000	$7,025,000	$14,829,000	$5,581,000
95th Percentile Estimate											
Funding Risk		$831,000	$3,133,000	$7,504,000	$772,000	$2,109,000	$2,565,000	$896,000	$2,108,000	$4,449,000	$1,674,000
TOTAL VALUE	**95th Percentile Estimate**	**$2,215,000**	**$8,355,000**	**$20,011,000**	**$2,058,000**	**$5,625,000**	**$6,839,000**	**$2,390,000**	**$9,133,000**	**$19,277,000**	**$7,255,000**

7.8 Preferred options

Based on the analysis of the stormwater model, some of the options for stormwater detention had minimal impact on reducing downstream flooding, which is largely related to local catchment capacity issues downstream of the Black Creek / Parkway confluence. Two of the options were discounted early on for this reason.

Two of the detention storage options (SW1 and SW2) were not recommended as the total storage volume available was relatively small and therefore of limited benefit for large storm events. In general, stream widening was found to be more effective at achieving the desired levels of service. Further detail regarding these two excluded options is included in GHD's Stormwater Assessment Report in Appendix F.

The recommended detention storage and stream widening works are summarised in Table 7-5.

Table 7-5 Summary of stormwater infrastructure preferred options

Ref	Option	Description	Estimated cost	Planning horizon
SW3	New Detention / Wetland	New wetland and detention storage next to Upper Fitzherbert Road (13 ML)	$20 M	2033
SW4	Black Creek Widening (Top Section)	Widening of Black Creek from Wellington Road to Upper Fitzherbert (316 m)	$2.1 M	2020
SW5	Black Creek Widening (Middle Section)	Widening of Black Creek from Norfolk Street to Wellington Road (1190 m)	$5.6 M	2020
SW6	Black Creek Widening (Lower Section)	Widening of Black Creek from Nelson Crescent to Norfolk Street (1500 m)	$6.8 M	2020
SW7	Parkway Widening	Widening of Parkway Drain from Rata Street to Wainuiomata High School + Weir removal (595 m)	$2.4 M	2020

The location of the proposed wetland/storage area and the locations of the proposed channel widening works are shown in Figure 7-21 and Figure 7-22.

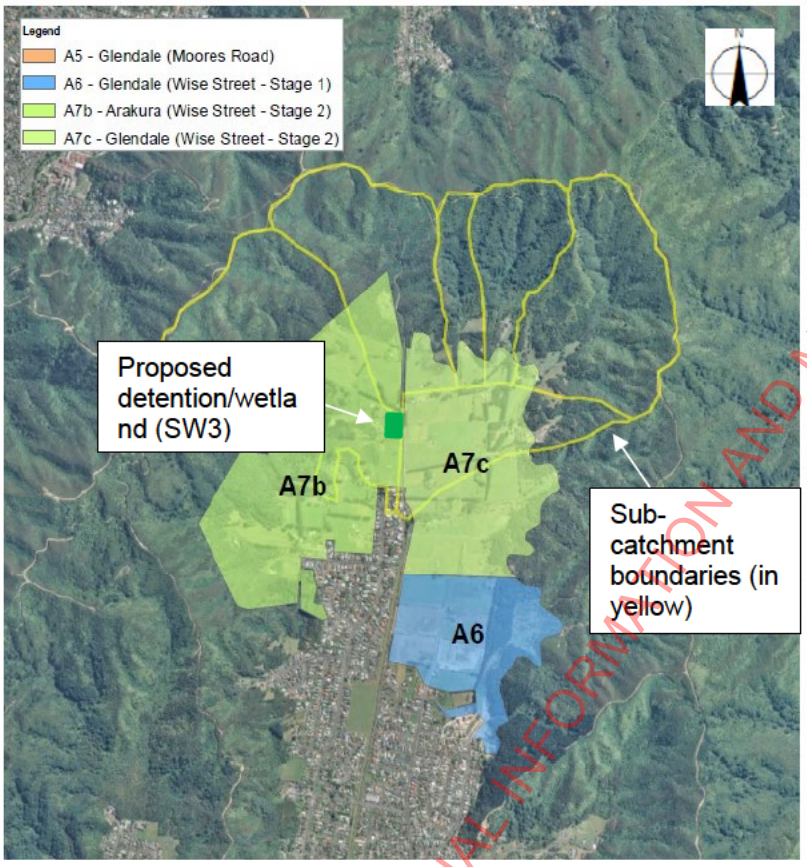


Figure 7-21 Location of proposed detention/wetland

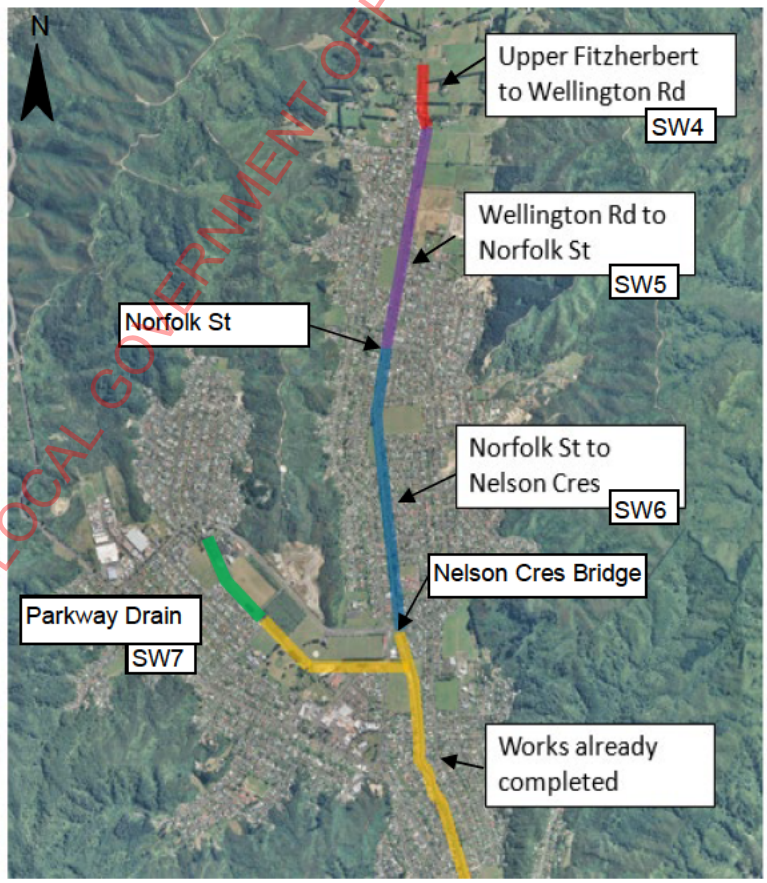


Figure 7-22 Wainuiomata channel locations

7.9 Model results for the proposed options

7.9.1 Wetland (SW3)

Based on the existing state and outputs from the model, the peak flow rate entering Black Creek at Upper Fitzherbert Road is 24.6 m^3/s for a 1 in 100 year event + climate change.

Following the completion of the northern development (Wise Street – Stage 2), the peak flow rate entering Black Creek at Upper Fitzherbert Road is 41.6 m^3/s based on a 1 in 100 year event + climate change. The increase in peak flowrate due to this development is 17 m^3/s.

Based on GHD's assessment, the total volume of runoff that needs to be stored in order to enable the Wise Street – Stage 2 development and maintain the existing peak flow rate of 24.6 m^3/s is approximately 11,000 m^3.

As detailed in Section 6.8, the proposed storage volume is approximately 13,000 m^3. It is recommended that the total storage area for the new wetland/storage (SW3) be at least 11,000 m^3. This storage volume is considered sufficient to prevent any increase in peak downstream channel flows as a result of the Wise Street – Stage 2 development.

It is important to note that this assessment only considers the peak flow and does not consider the increase in total runoff volumes as a result of the developments.

7.9.2 Channel Improvements (SW4, SW5, SW6 and SW7)

The calculated increase in channel capacity as a result of the proposed channel improvements is between 52% and 84% (Refer to Table 7-6).

Table 7-6 Increase in Channel Capacity

Channel Reach	Channel Capacity – Existing State	Channel Capacity – After Channel Improvements	Increase in Channel Capacity – Due to proposed Improvements
Black Creek -SW4	7.9 m^3/s	13.9 m^3/s	6 m^3/s (76%)
Black Creek -SW5	50.0 m^3/s	75.8 m^3/s	25.8 m^3/s (52%)
Black Creek -SW6	54.5 m^3/s	83.6 m^3/s	29.1 m^3/s (53%)
Parkway SW7	8.1 m^3/s	14.9 m^3/s	6.8 m^3/s (84%)

Black Creek Channel Improvements from Wellington Rd to Upper Fitzherbert

The proposed channel upgrade will increase the capacity by 6 m^3/s for this channel reach with the catchment growth (from SW4) taking up 1.4 m^3/s (23%) of this increased capacity.

Black Creek Channel Improvements Norfolk to Wellington Road

The proposed channel upgrade will increase the capacity by 25.8 m^3/s for this channel reach with the catchment growth (from SW4 and SW5) taking up 10.3 m^3/s (40%) of this increased capacity.

Black Creek Channel Improvements Nelson Crescent to Norfolk

The proposed channel upgrade will increase the capacity by 29.1 m^3/s for this channel reach with the catchment growth (from SW4, SW5 and SW6) taking up 11.3 m^3/s (39%) of this increased capacity.

Parkway Drain Channel Improvements Rata Street to Manutuku

The proposed channel upgrade will increase the capacity by 6.8 m^3/s for this channel reach with the catchment growth (SW7) taking up.0.8 m^3/s (12%) of this increased capacity.

8. Timing

The proposed water infrastructure improvement projects including proposed timing is tabulated in Table 8-1.

Table 8-1 Proposed Water Infrastructure Projects including proposed timing

Upgrade Type	Next 10 Year LTP (to serve population growth to 2033)	2020 Cost Estimate (Level of Service)	2033 Growth Cost Estimates	2033 to 2050 Upgrades	2050 Growth Cost Estimates	Timing
Local Upgrades - Insufficient Fire Flow	Includes 2020 Upgrades (PW1) and 2033 Upgrades (PW2)	$5,555,000	$4,241,000			2020 Upgrades to be completed in the first 5 years to meet issues with current levels of service. 2033 upgrades to be completed from Year 5 to Year 10 to meet 2033 growth
New Reservoir	New Wainui Reservoir (Fernlea Site) including new pump station, access track, delivery main and discharge main (PW3)	$19,698,500	$19,698,500			Half of the storage requirements (4 ML) for the new reservoir is required to meet the existing levels of service and increase the Wainui storage volumes from 9 ML to 13 ML. An additional 4 ML is required by 2050 to increase the Wainui storage volumes for growth from 13 ML to 17 ML. However the reservoir needs to be constructed as a single project (8 ML by 2033). Note that the water reservoir will be more of a priority if the Wise Street greenfield development goes ahead.
Local Upgrades - Insufficient Pressure				Pipeline upsizing to allow for management of pressures due to increased demand (PW4)	$13,637,000	Required to meet 2050 growth
Bulk Water Main Upgrade	New 914mm OD CLS pipe to replace 750 mm bulk watermain, includes: Section 1 - 1643 m (PW5) Section 2 - 442 m (PW6) Section 3 - 3117 m (PW7)	$82,451,000				Works as per MWH (now Stantec) report with Section 3 completed first, then Section 2 followed by Section 1. As per the MWH report, this project is needed due to existing assets being at the end of their design life. Note that the cost of the bulk water main upgrade is not a direct cost for HCC as it is owned by GWRC.
	Subtotal	$107,704,500	$23,939,500		$13,637,000	
	TOTAL				**$145,281,000**	

The proposed wastewater infrastructure improvement projects including proposed timing is tabulated in Table 8-2.

Table 8-2 Proposed Wastewater Infrastructure Projects including proposed timing

Upgrade Type	Next 10 Year LTP (to serve population growth to 2033)	2020 Cost Estimate (Level of Service)	2033 Growth Cost Estimates	2033 to 2050 Upgrades	2050 Growth Cost Estimates	Timing
Wise Park Pump Station	Includes Wise Park Stage 1 upgrade - Pump Upgrade and internal pump station upgrade (WW1) and Stage 2 upgrade of existing rising main capacity to 400 l/s (WW2)	$1,210,000	$15,770,000	Wise park Stage 3 Upgrade which includes the duplication of the gravity main in the tunnel (WW11)	$5,230,000	The initial upgrade of the pump station (Stage 1) is to mitigate some of the existing catchment overflow issues however Stage 1 is to only proceed following the upgrade of Seaview Treatment Plant. Stage 1 and Stage 2 will be implemented towards the end of the first 13 year band following the completion of the Seaview Treatment Plant Upgrade. Stage 2 is to accommodate 2033 growth. From Year 2033 to 2050 Stage 3 will take place which will increase carrying capacity further (to serve the 2050 growth scenario).
I&I Programme	Priortized investigation of 23,900 m of Council wastewater network and rehabilitation as needed (WW3)	$30,434,000	$10,144,000	Targeted investigation of 16,000 m of Council wastewater network and rehabilitation as needed (WW4)	$27,580,000	I&I works to be implemented in the first 10 years of the 2033 growth scenario (Stage 1). The $40,578,000 for the prioritised works has been split with 75% attributed to existing LOS and 25% attributed to growth (to offset additional wastewater flows). Further analysis is needed to confirm the appropriate split. The targeted programme targets additional areas starting in 2033 (Stage 2). The 3rd Stage is the Catchment wide I&I investigation (WW5) which is not considered required for the growth through to 2050 and has not been included.
Greenfield servicing	40l/s pump station and 2.4Km rising main to Wellington Rd PS (WW6)		$4,381,000			Assumed that the Greenfield servicing will need to be completed within the next 5 years
Fraser EOP	Storage pipeline - 150 m3 storage (WW7)	$3,607,000				This project considered to commence after the initial I&I works. Construction between 2025 and 2030 with this storage tank considered necessary to meet existing LOS and prevent existing overflows. Investigations and design could commence between 2023 - 2025 (I&I should be re-assessed in this period as well to refine the storage requirements) to re-confirm storage sizing, and construction to commence by 2025
Main/Rowe EOPs	Storage pipeline – 500 m3 storage (WW8)	$4,256,000				This project considered to commence after the initial I&I works, between 2025 and 2030 with this storage tank considered necessary to meet existing LOS and prevent existing overflows. Investigations and design could commence between 2023 - 2025 (I&I should be re-assessed in this period as well to refine the storage requirements) to re-confirm storage sizing and construction to commence by 2025
Private laterals I&I	Assessment and replacement of laterals (WW9)	$19,511,000				This project carried out in conjunction with the I&I works to investigate and repair private laterals. Works relate to existing infrastructure with rehabilitation for existing defects. Note that the cost of I&I work on private laterals is not a direct cost for HCC as they are privately owned.
Wellington Rd PS	Wellington Road PS upgrade - Pumps and internal pipework			PS upgrade to ~225 l/s (following Wise Park Upgrade)	$739,000	This project will proceed if needed after 2033, depending on the outcome of the I&I, storage and Wise Park PS works.
	Subtotal	$59,018,000	$30,295,000		$33,549,000	
	TOTAL				**$122,862,000**	

The proposed stormwater infrastructure improvement projects including proposed timing is tabulated in Table 8-3.

Table 8-3 Proposed Stormwater Infrastructure Projects including proposed timing

Upgrade Type	Next 10 Year LTP (to serve population growth to 2033)	2020 Cost Estimate (Level of Service)	2033 Growth Cost Estimates	2033 to 2050 Upgrades	2050 Growth Cost Estimates	Timing
Storage C : Upper Fitzherbert Wetland and Storage Area	1.05 hectare wetland and 13,000 m3 storage area to support the northern development (SW3)		$20,011,000			Storage area is required to prevent any increase in peak flow rates as a result of the predicted northern development. Option includes a wetland to manage water quality. The planning and land acquisition needs to start immediately in order to secure a site prior to development
Black Creek Channel Improvements - A	Wellington Road to Upper Fitzherbert Channel widening - 332 m (SW4)	$1,584,660	$473,340			Majority of works required to mitigate existing capacity issues with 23% ($473,340.00) of increased capacity taken up by catchment growth
Black Creek Channel Improvements - B	Norfolk Street to Wellington Road Channel widening - 1190 m (SW5)	$3,375,000	$2,250,000			Majority of works required to mitigate existing capacity issues with 40% ($2,250,000) of increased capacity taken up by catchment growth
Black Creek Channel Improvements - C	Nelson Crescent to Norfolk Street Channel widening - 1500 m including Nelson Bridge Channel Improvements (SW6)	$4,171,790	$2,667,210			Majority of works required to mitigate existing capacity issues with 39% ($2,667,210) of increased capacity taken up by catchment growth
Parkway Drain Improvements	Parkway Drain improvements - 595 m (SW7)	$2,103,200	$286,800			Majority of works required to mitigate existing capacity issues with 12% ($286,800) of increased capacity taken up by catchment growth
Waiu Stormwater Upgrade				Upsize existing SW pipes along Waiu Street - 586 m (SW8)	$9,133,000	Upgrade required under the 2050 growth scenario
Lees/Fraser St SW Upgrade	Upsize existing SW pipes along Lees/Fraser Street - 1694 m (SW9)	$19,277,000				Works to mitigate existing flooding issues
Upper Fitzherbert SW Network	New Stormwater Network for development in Upper Fitzherbert. Drains to proposed wetland - 2,000 m (SW10)		$7,255,000			Trunk stormwater infrastructure through the northern developments to be constructed as part of the new wetland works
	Subtotal	$30,511,650	$32,943,350		$9,133,000	
	TOTAL				**$72,588,000**	

9. Conclusion

The water, wastewater and stormwater infrastructure in Wainuiomata does not currently meet the required levels of service. There are undeveloped areas of Wainuiomata with significant growth forecasted, particularly in the northern part of Wainuiomata. Development in Wainuiomata will require the construction of new three waters infrastructure, as well as upgrades to existing networks. The predicted growth will place significant strain on the existing infrastructure if no improvement works are completed in advance of this growth.

The northern end of Wainuiomata is zoned for residential development and a servicing strategy for this area is recommended to be undertaken as soon as possible.

The catchment planning assessment in this report identifies the required infrastructure upgrades needed to meet the existing levels of service, as well as the new infrastructure needed to enable growth. The upgrades required for water, wastewater and stormwater infrastructure are discussed below.

Water

The current water storage capacity in Wainuiomata is 8 ML. An additional 4 ML of storage is needed to meet the existing levels of service with an additional 4 ML needed based on the predicted growth by 2050.

It is recommended that, as soon as possible, Wellington Water undertakes a preliminary investigation to confirm the location of the proposed Wainui 3 Reservoir and commence land acquisition as needed for the new 8 ML tank. The location of this reservoir and its final elevation have an impact on most of the other recommended pipe upgrades.

Further detailed investigations should be completed to confirm fire flow requirements. Physical multi-hydrant flow tests should be conducted to confirm available fire flow capacity prior to capital investments.

The total cost to meet the target Levels of Service and support growth is estimated to be in the order of **$145 million dollars** (95th percentile estimate). Approximately $33 million dollars (95th percentile estimate) of this cost is directly required to service the northern greenfield area currently zoned rural residential.

Wastewater

For the wastewater assessment, a range of options were considered for addressing wet weather overflows within the catchment and to allow for future growth. Wellington Water has an objective of supporting growth without adverse environmental impacts.

This report has identified that there is no available capacity in the downstream wastewater system for additional development. Significant additional infrastructure and improvements to existing downstream infrastructure within the Wainuiomata catchment will be required to accommodate new development without significant adverse environmental effects.

The Seaview Wastewater Treatment Plant receives flow from both the Upper and Lower Hutt wastewater networks as well as Wainuiomata. Passing forward additional flows from Wainuiomata due to increased growth will increase the frequency and volume of wet weather overflows from the plant. The proposed strategy is to target the reduction in catchment flows by reducing wastewater inflow and infiltration (I&I).

The existing pipe network will be rehabilitated as part of the proposed I&I works and increase the capacity of the network to support growth. As noted by Hydraulic Analysis Limited, approximately half of the service faults (and associated I/I loads) can be expected to be found

within the private network and private laterals. It is recommended that Wellington Water assess the required policy changes needed to enable the investigation and replacement of private wastewater laterals.

It is proposed that the Fraser Storage Tank and the Main / Rowe Storage Tank be constructed in the Year 2025. At this time the effectiveness of the I&I work can be assessed and the proposed size of the storage tanks rechecked. Following the completion of the Seaview Treatment Plant upgrade, it is recommended the Wise Park Pump Station upgrade be completed to allow for increased pumping.

The previous flow monitoring programme was completed in 2011 and a new study would help capture some of the network changes and performance changes that have occurred in the last 9 years.

The total cost to meet the target Levels of Service and growth is estimated to be in the order of **$123 million dollars** (95th percentile estimate). Approximately $5.1 million dollars (95th percentile estimate) of this cost is directly required to service the northern greenfield area currently zoned rural residential.

Stormwater

During significant rainfall events there is extensive flooding throughout Wainuiomata, particularly in the low-lying areas and adjacent to the open channel sections. The flooding can be attributed to network capacity issues, open channel capacity issues, restricted overland flow paths and the restricted intake capacity of sumps and inlets.

The two main open channels in Wainuiomata are Black Creek and Parkway Drain. Increasing the capacity of these two channels is considered the most effective means of improving the overall capacity of the network.

Historically the Black Creek Channel has been widened as far north as Nelson Crescent Bridge and Parkway Drain has been widened as far west as Rata Street. It is recommended that Black Creek is widened between Nelson Crescent Bridge and the end of Upper Fitzherbert Road (by the northern greenfield development area). This will increase the capacity of Black Creek by between 52 and 76%. It is also recommended that the Parkway Drain is widened between Rata Street and Parkway. This will increase the capacity of Parkway Drain by approximately 84%

GHD also recommends the construction of a wetland and a 13 ML storage area at the end of Upper Fitzherbert Road. This wetland and storage area are considered sufficient in size to prevent any increase in peak downstream channel flows as a result of the northern greenfield development and will mitigate the effects of a deterioration in water quality as a result of this development. Based on the proposed location for the wetland and storage area, three farming properties would need to be acquired. It is recommended that the negotiation for this land acquisition commence as soon as possible to avoid the risk that this land is acquired by developers. It is proposed that this wetland and storage area be initially funded by HCC with the full cost of the wetland and storage area recovered through development contributions. Without a centralised storage area and wetland, it is expected that individual developers may look to construct their own storage areas in order to achieve stormwater neutrality. This is expected to place a maintenance burden on Hutt City Council and is not recommended.

The total cost to meet the target Levels of Service and growth is estimated to be in the order of **$72 million dollars** (95th percentile estimate). Approximately $29 million dollars (95th percentile estimate) of this cost is directly required to service the northern greenfield area currently zoned rural residential.

10. Recommendations

- Set aside funding in HCC's LTP for the water infrastructure improvements as per Table 8-1 and commence the construction of the proposed 2020 water infrastructure projects
- Set aside funding in HCC's LTP for the wastewater infrastructure improvements as per Table 8-2 and commence the construction of the proposed 2020 wastewater infrastructure projects
- Set aside funding in HCC's LTP for the stormwater infrastructure improvements as per Table 8-3 and commence the construction of the proposed 2020 stormwater infrastructure projects
- Develop a servicing strategy for the northern greenfield area
- Development in the northern greenfield area does not proceed ahead of the proposed 2020 wastewater infrastructure improvements measures
- Further model analysis be completed to confirm the required contribution by developers to the I&I reduction programme
- As soon as possible Wellington Water undertakes a preliminary investigation to confirm the final location of the proposed Wainui 3 Reservoir and commence land acquisition as needed
- The negotiation for the acquisition of land needed for the Upper Fitzherbert wetland and storage area commence as soon as possible
- Commence design of the Black Creek channel widening within the next 10 years to allow for growth and meet levels of service
- The Wainuiomata wastewater catchment be considered for a new flow monitoring programme
- Assess the required Council policy changes or potential cost share arrangement that could be developed to enable Wellington Water to complete an investigation and rehabilitation of private wastewater laterals
- Further detailed investigations completed to confirm fire flow requirements. Physical multi-hydrant flow tests should be conducted to confirm available fire flow capacity prior to capital investments.

Appendices

Appendix A – Activity Brief

Appendix B – Water Zone Management Plan (Stantec)

Appendix C – Wainuiomata 750 CI Pipe Replacement Preliminary Design Report (MWH)

Appendix D – Wainuiomata Options Assessment (HAL)

Wastewater Optioneering Report

Appendix E – Wainuiomata Optioneering Phase 1 – Memo and Presentation (Stantec)

Stormwater Optioneering Report – Stage 1

Appendix F – Wainuiomata Stormwater Options Assessment (GHD)

Stormwater Optioneering Report – Rev 2

Appendix G – GHD High Level Planning Assessment

Appendix H – GHD Cost Estimates

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		Name	Signature	Name	Signature	Date
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Rev 2		[redacted]		[redacted]		
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