WAIMAKARIRI
DISTRICT COUNCIL

Activity Management Plan 2021

Mandeville-Fernside Water Supply Scheme

3 Waters | July 2021

Prepared by

Waimakariri District Council

215 High Street,

Private Bag 1005

Rangiora 7440,

New Zealand

waimakariri.govt.nz

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Document Acceptance

Action	Name		Signed	Date
Prepared by	Colin Roxburgh	Water Asset Manager		17/02/2021
	Simon Collin	Infrastructure Strategy Manager		09/02/2021
	Chris Bacon	Network Planning Team Leader		17/02/2021
Reviewed by	Kalley Simpson	3 Waters Manager		17/02/2021
Approved by	Gerard Cleary	Manager Utilities and Roading		17/02/2021
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1 Executive Summary

The following table provides a summary of the key asset management components that have been assessed for the Mandeville-Fernside Water Supply Scheme. These have been identified through consideration of the levels of service, consents, asset condition, risk analysis, disaster resilience, growth projections, and capacity assessment:

Table 1: Key Asset Management Components

Resource Consents	The scheme continues to comply with its resource consent conditions.
Levels of Service (LoS)	The Mandeville –Fernside water supply scheme meets most of its levels of service. Those that have not been met relate to the aesthetic requirements of the drinking water standards, sampling issues, restricted supplies flow requirements, losses and storage Turbidity requirements of the drinking water standards, which are not mandatory as they are part of aesthetic requirements, were not met for short periods. The LoS target is being adjusted from 2021 forward – see the Overview document A maximum period of time between samples was exceeded in 2019, which affected the bacterial compliance of the scheme. An alert system has been put in place to prevent a re-occurrence Flow for restricted connections does not meet the LoS because of insufficient data, which the restrictor inspection programme will address with time. Implementation of actions within the Water Conservation Strategy is required before the losses LoS can be met. New storage is planned to be constructed in 2021/22
Capacity & Performance	In terms of capacity and performance, a second primary well is planned to assist with redundancy requirements, and an additional reservoir to improve available storage and cater for growth. The scheme is not currently included in the Fire Service Area, and there are currently no plans to alter this.
Asset Condition	The majority of the scheme is in excellent condition, with only minor renewals required over the next 50 years.
Risk Assessment	The risk assessment identified no extreme or high risks associated with the supply.
Disaster Resilience	The Disaster Resilience Assessment indicates the Two Chain Road headworks are at a moderate risk from wildfire, which should be further investigated and mitigated.
	Earthquake resilience assessments for the Tram Road headworks are also required as this is identified as a moderate earthquake hazard.
Growth Projections	The connections served by the scheme are predicted to increase by 63% in the next 50 years. The previous possibility that there could be considerable additional growth from rural residential development has been significantly reduced as it is not intended that the proposed District Plan review will include rural residential zoning in this area

2 Introduction

The purpose of this Activity Management Plan (AMP) is to:

- Provide an overview of the Kaiapoi water supply scheme and the assets that make up the scheme;
- Outline any significant issues associated with the assets, and show how the Council will manage these;

This plan summarises the various components of the Kaiapoi water supply scheme, its condition and performance, and identifies future funding requirements including upgrades where necessary.

The data that has been relied upon to produce this document was taken at the end of the 2019/20 financial year (i.e. 30 June 2020). There are more up to date scheme statistics available on document 121108078783 which is intended to be updated quarterly.

Further details of the asset management practices used by Council to manage this scheme are summarised in the District Water Supply AMP Overview document (200120006283).

Projects identified to improve asset management processes for this scheme will also benefit the performance of other 3 waters schemes and are managed at a District level for efficiency.

Projects are also identified within this AMP that will maintain or improve levels of service.

All figures within this AMP exclude inflation.

3 Related Documents

The following related documents have been used as reference documents or for guidance in the development of some of the sections in this Activity Management Plan

- Waimakariri District Plan
- Population in the Waimakariri District (TRIM 170328030077)
- New Projections for LTP 2021-2031 (TRIM 200908117997
- WDC Asset Management Policy (TRIM 180605062091)
- 2019 Customer satisfaction Survey (TRIM 200313034937)
- Development Contributions Policy 2021/22 (TRIM 200729095963)

4 Scheme Description (What Do We Have?)

The Mandeville-Fernside water supply scheme is a restricted water supply. The primary source is currently a 77 metre deep well on Two Chain Road (Two Chain Road Well No. 2).

This well previously had secure groundwater status, however this was removed following E. coli contamination of the source in 2012.

There is a second well at the primary headworks at Two Chain Road (Two Chain Road Well No.1) however this experiences high turbidity at times, and this is only retained as a backup source, as the turbidity can affect the compliance of the UV system as well as the aesthetic compliance of the water.

Following the E. coli contamination of the primary well in 2012, an investigation into upgrade options was undertaken in order to achieve compliance with the Drinking-water Standards for New Zealand

(DWNSZ). Ultimately, an ultra-violet (UV) disinfection system was installed in 2017 to achieve compliance with both the bacterial and protozoal requirements of the DWSNZ.

The Fernside scheme was also assessed to have a source that does not comply with the DWSNZ. An options assessment and community consultation was carried out, and it was resolved by Council that the Fernside scheme would join with the Mandeville scheme, as means of upgrading the source for Fernside. This was implemented in 2018 by way of construction of a new pipeline to link the schemes, hence the previously separate schemes are now considered as one scheme.

Some key statistics (2019/20 year) of the scheme are shown in Table 2 to 5. The extent of the currently serviced area and comprehensive flow data records are presented in Figure 13 and Figure 17

A schematic view of the principal source, treatment, and distribution system is presented below in Figure 1.

Table 2: Scheme Statistics for 2019/2020

Scheme Parameter	Statistics		Source
	Mandeville	**Fernside**	
Type of Supply	Restricted	Restricted	
Principal Source	Two Chain Road No. 2 (non-secure groundwater)	Primary source relegated to a back-up source following joining with Mandeville.	
Back-up Source	Two Chain Road Well No.1 and Tram Road Well (non-secure groundwater)	Fernside well (non-secure groundwater).	
Treatment	UV treatment, chlorination and pH correction.	Chlorine disinfection and pH correction (only when backup in use)	
Nominal Storage Capacity	Four 30,000 litre tanks - Total 120 m^3	69m^3	
Length of Reticulation	73.0 km	8.1 km	Water Asset Valuation Tables 7-4 and 7-5, pages 53 - 55.
Total Replacement Value	$10.1 mil		
Depreciated Replacement Value	$7.96 mil		
Number of Connections	879	85	Rate strike 2019/20
Number of Rating Charges	1,848	180 units	
Average Daily Flow (5 year average)	1,171 m^3/day	143 m^3/day	Flow Data Analysis – Water
Peak Daily Flow (5 year average)	1,652 m^3 /day	211 m^3/day	
Resource Consent Abstraction Limit (Combined Well No.1 and No. 2)	3,024 m^3/day (expires 22 Dec 2039) combined for both Two Chain Road wells	432 m^3/day (expires 22 April 2034)	CRC990952.1 CRC990925 200409044078
Average Daily Flow per Connection (5 year average)	1,379 L/day/conn.	1,687 L/day/conn.	Flow Data Analysis – Water
Peak Daily Flow per Connection (5 year average)	1,950 L/day/conn.	1,950 L/day/conn.	

Table 3: Water Supply Pipe Data Summary

Water Supply pipe length (m) by diameter and pipe material						
Pipe material	**Pipe Diameter (mm)**					
	< 50	**50**	**100**	**150**	**200**	**Total**
PE	1,361m	33,879m	1,859m	24m	0m	37,122m
PVC	335m	21,964m	14,814m	6,619m	229m	43,961m
Other	17m	0m	0m	0m	0m	17m
Total	**1,713m**	**55,843m**	**16,673m**	**6,643m**	**229m**	**81,101m**

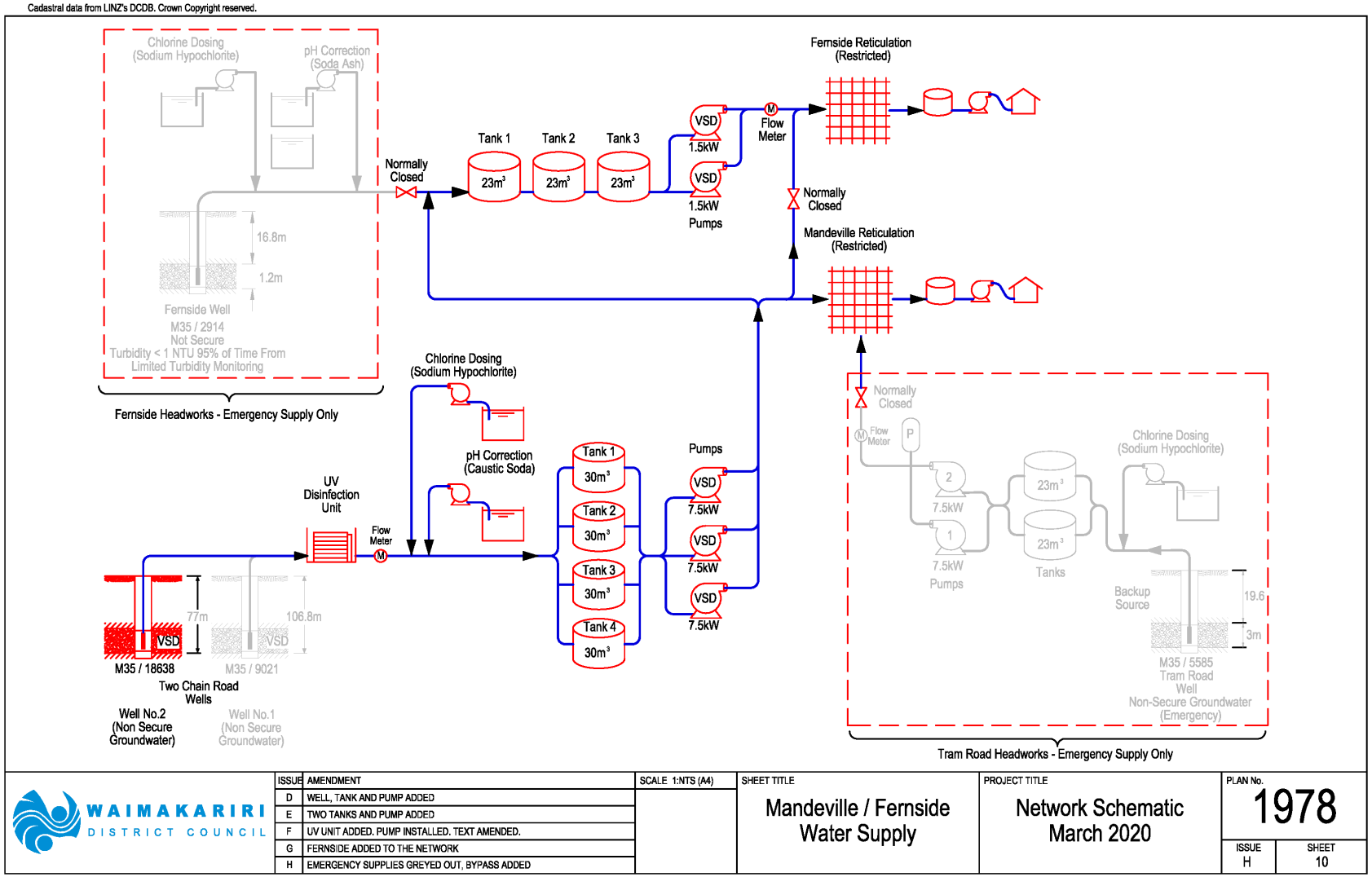
Table 4: Water Supply Valve Data Summary

Water Valves	
Diameter (mm)	**Count**
< 50	6
50	154
100	47
150	8
Total Valves	**215**
Fire Hydrants	**31**

Table 5: Data References

Data Reference	Trim Reference
Flow Data Analysis – Water	121108078783
2020 3 Waters Asset Valuation	200824109857
2020 Water Conservation Strategy	200501050668
2020 50 Year Water and Sewer Growth Forecast	200224024348
2014 Water Safety Plan	141205133567
2014 Water Supply System Assessment	141205133565
2020 Fire Fighting Code of Practice Compliance Update	200904117110

Figure 1: Network Schematic



5 Scheme Management Issues (What Do We Need to Consider?)

There are a number of key aspects to consider when managing a water supply; these include:

- Target & actual levels of service
- Asset condition & criticality
- Capacity & performance of the supply
- Risks associated with the supply
- Growth predictions for the scheme

These issues have been assessed in detail and are explained in the following sections.

5.1 Levels of Service

Table 6 sets out the performance measures and targets specific to the Mandeville-Fernside scheme, and records achievement against targets since 2008.

Mandatory performance measures are measured at the district wide level and are not included in the individual water supply scheme AMPs. They are located in the District Overview Water Supply Activity Management Plan. However there is considerable overlap between the measures at Scheme and District levels. Mandatory measures cover drinking-water standard compliance, water losses, time to respond to faults, and complaints. The scheme LOS measures also include drinking-water standard compliance, water losses and outages, among other measures. However, within the scheme AMP, these are assessed at the scheme level rather than at a district level. These scheme level results then feed into the district level results in the overview document.

None of the WDC targets are planned to change over the 10 year LTP period, so only the one target value has been shown in this document.

Performance in Table 6 is measured against the performance measures set in 2018, as part of the 2018-28 Long Term Plan process. Going forward from 2021 onwards, performance will be against the modified set of performance measures that were presented to the Council's Utilities and Roading Committee in 2020 (refer report 200406043184[v2]), and subsequently approved by Council. These revised levels and targets are detailed in the District Overview Water Supply Activity Management Plan.

Table 6: Elective (non-mandatory) Levels of Service Targets and Performance Measures as Assessed in 2020

**** Note "Y" indicates that the LOS has been met, and "N" indicates it has not been met***

[#] Details of performance measures may have been modified between various revisions of the AMP. The Previous Results reported are as assessed against the most relevant performance measure at the time of assessment.

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results[#]			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
Resource Consents	Consent Breach – Action Required	Number breaches of consent conditions that result in an ECan report that identifies compliance issues.	Nil/yr	Nil	No non-compliance reports from Ecan.	Achieved	NA	Y	Y	Y	Y
DWSNZ	DWSNZ - Aesthetic Compliance	Water supply delivers water that complies to a standard suitable for compliance with the aesthetic requirements of DWSNZ	Complies	Doesn't comply	Some turbidity samples exceeded 2.5 NTU for short periods during backup well operation.	Not achieved	LoS amended from 2021 onwards. Refer Overview document.	Y	Y	Y	Y
	DWSNZ – E. Coli Presence	Number of instances where the presence of E coli was detected at the headworks or within the reticulation	Nil/yr	Nil	No E. coli detected	Achieved	NA	Y	N	Y	Y
	DWSNZ - Protozoa Compliance	Water supply delivers water that achieves a standard suitable for compliance with the health requirements of DWSNZ	Complies	Complies	UV treatment to achieve protozoal compliance. Primary source compliant.	Achieved	NA	Y	N	Y	Y

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
					One day scheme did not comply in 19/20, however this was only during backup well operation.						
	DWSNZ - Sampling Non-compliance	Number of instances where sampling programme did not comply with DWSNZ, as demonstrated by Water Information NZ (WINZ) database	Nil/yr	1	One sample that was programmed was not taken in July 2019, which meant the 'max days between samples' was exceeded.	Not achieved	An alerting system is now set up to ensure that samples that are programmed will not be missed.	Y	Y	N	Y
Water Flow	Flow – Allocated Units	Water flow at the point of supply in Restricted or Semi Restricted schemes, excluding outages, as demonstrated by programmed restrictor audits, that tests restrictors at not less than 5 yearly intervals.	>0.69 L/min/unit	Insuf. Data	Restrictor checks are programmed to be undertaken every 4 years. However, there is currently insufficient data.	Not achieved	Implement Phase 2 of AMIS project, to allow adequate data collection and analysis.	N	-		

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
Water Losses	Water losses as determined by measured or calculated minimum flow	Water losses as determined by measured or calculated minimum flow for On Demand schemes	< 240 litres/ connection/ day	663	Based on weighted average of figures for Mandeville and Fernside. Data as per Water Conservation Strategy (200501050668).	Not achieved	Implement actions as identified in Water Conservation Strategy.	N	Y	Insuf. Data	N
Service Outages	Outages - Events >8 hours	Number of events that cause water not to be available to any connection for >8 hours	Nil/yr	Nil	No events > 8 hours during 19/20 period	Achieved	NA	Y	Insuf. Data	Y	Y
Water Pressure	Pressure - Point of Supply - On Demand	Water pressure at the point of supply in On Demand and Semi-Restricted schemes, excluding outages, as demonstrated by a reticulation model or audits.	>150kPa for 100% of the time	Complies	Validated by water model, running scheme at target demand and ensuring target pressure is achieved.	Achieved	NA	Y	Y	Y	Y
Scheme Capacity	Scheme Capacity - On Demand	Actual peak capacity of the scheme for domestic use - On Demand	>1150 litres/ allocated unit/ day	Complies	Validated by water model, running scheme at target demand and ensuring	Achieved	NA	Y	Y	Y	Y

Section	Level of Service	2018 – 2021 Performance Measure	2018 – 2021 Target	2020				Previous Results#			
				Result	Commentary	Status	Action to Address	2017	2014	2011	2008
					target pressure is achieved.						
Storage Volume	Storage - On Demand	Volume of available and usable storage for On Demand and Semi-Restricted schemes (dependant on source type)	Source and demand dependent	0.8 hours	Deficiency identified.	Not achieved	Capital project planned in 2021/22 to address.	N	-		
Water Usage	Usage - Average Day	Actual usage on average day	Maintain the average daily water use below 100% of the assessed reasonable water use	59%	Refer to Water Conservation Strategy (200501050668)	Achieved	NA	Y	Y	Y	NA
Water Usage	Usage - Peak Day	Actual usage on Peak Day	Reduce the peak daily usage to below 110% of the assessed reasonable water use	64%	Refer to Water Conservation Strategy (200501050668)	Achieved	NA	Y	Y	N	Y

**Previously the Mandeville and Fernside schemes had separate AMPs, when the schemes were separate. The previous results above are carried through from the Mandeville AMP. For previous Fernside results, past Fernside AMPs should be referred to.*

5.2 Asset Condition

The asset condition for the reticulation has been determined based on criteria set out in the International Infrastructure Management Manual (IIMM), published by the Institute of Public Works Engineering Australasia (IPWEA), combined with updated calculations of base lives for the pipeline asset types.

The IIMM sets out criteria for converting remaining useful life as a percentage to a Condition Grade from 1 (Very Poor) to 5 (Very Good). This is a relatively simple conversion. However the process for determining the base lives, which in turn gives the condition grading is more complex. The details of this process are outlined in the Water Overview AMP. The following expected asset lives have been adopted:

Table 7: Adopted Reticulation Asset Base Lives for Pressure Pipes

Pipe Category and Definition	Calculated Asset Life (years)
PVC Modern (PVC pipe installed post 1997)	100
PVC Old (PVC pipe installed prior to 1997)	60
PE Modern (PE pipe installed post 1990)	100
PE Old (PE pipe installed prior to 1990).	35
AC Small (AC pipe with diameter < 100mm)	55
AC Medium (AC pipe with diameter 100mm to 150mm)	60
AC Large (AC pipe with diameter >= 200mm)	90

Asset Condition Calculation

With the asset base lives calculated as per the process described above, and the condition defined as a function of remaining useful life, the remaining data required to calculate the condition of each asset is the year of installation of the asset. This information is held for each asset within the Council's TechOne asset database. Thus, through a combination of expected asset life, year of installation, remaining useful life of asset, the condition grade for each asset is able to be assigned.

Figure 2 below has been generated using the above process, to show the assessed condition of all the pipe assets on the scheme. Also included within this is the pipe burst data held against each asset.

Figure 3 shows this same information graphically, and also includes headworks assets, and Table 8 presents this information is tabular format.

It is noted that "Headworks" is inclusive of all above ground assets associated with the water supply scheme (e.g. reservoirs, buildings, pump sets). "Reticulation" covers the remainder of the assets, which are typically below ground pipework related assets.

Figure 2: Pipe Condition Assessment Plan

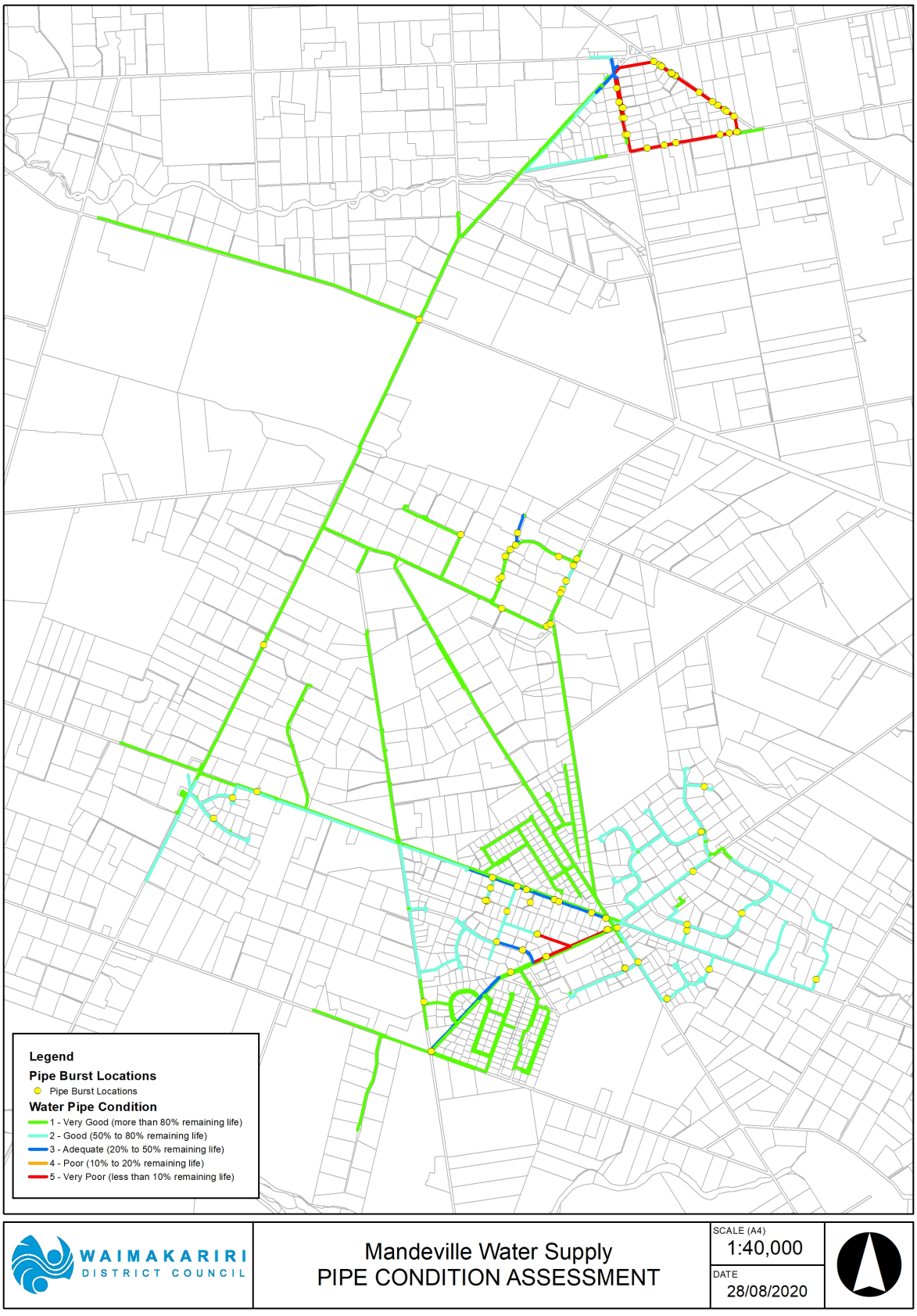


Figure 3: Asset Condition Summary

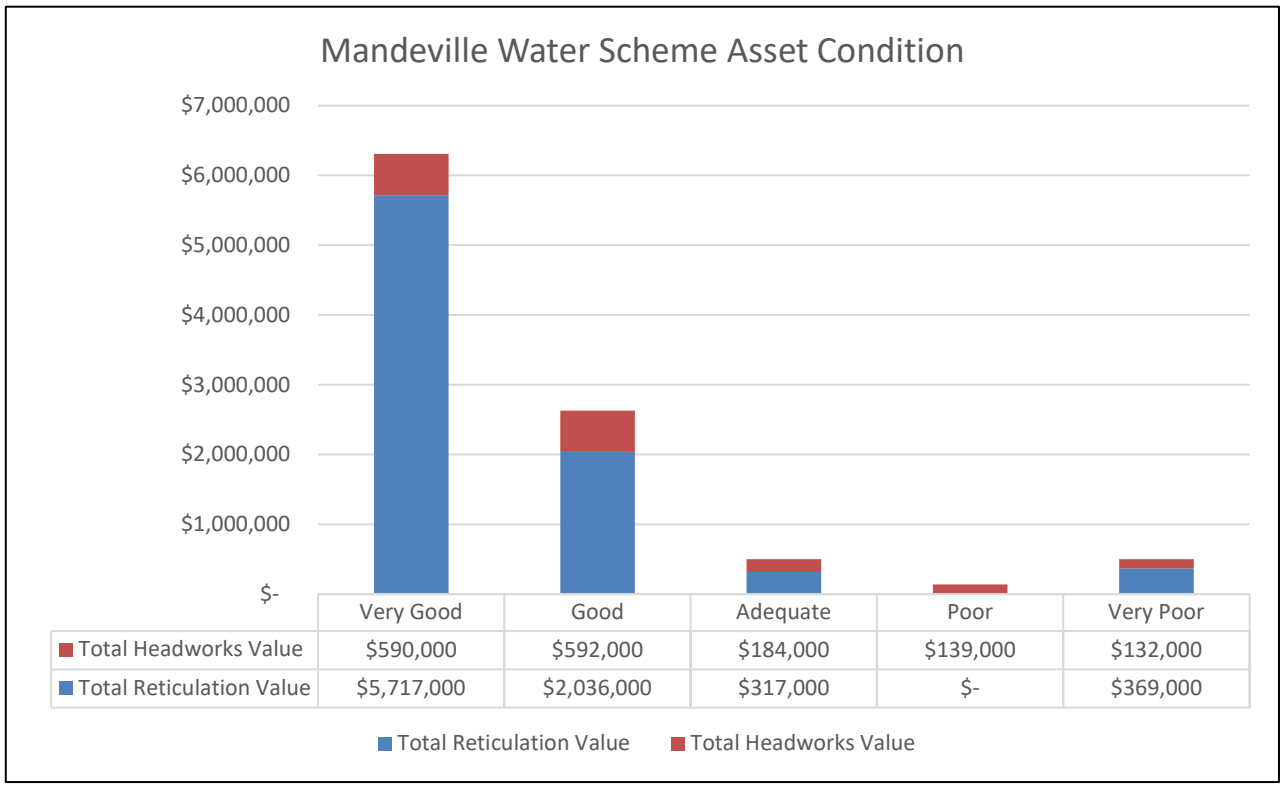


Table 8: Pipe Condition Summary

Condition Grade	Definition	Pipeline Quantity	Total Reticulation Value	Total Headworks Value	Total Value
1	Very Good *More than 80% of life remaining*	50.1 km *62%*	$ 5,717,000 *68%*	$ 590,000 *36%*	$ 6,307,000 *63%*
2	Good *Between 50% and 80% of life remaining*	23.2 km *29%*	$ 2,036,000 *24%*	$ 592,000 *36%*	$ 2,628,000 *26%*
3	Adequate *Between 20% and 50% of life remaining*	3.4 km *4%*	$ 317,000 *4%*	$ 184,000 *11%*	$ 501,000 *5%*
4	Poor *Between 10% and 20% of life remaining*	0.0 km *0%*	$ - *0%*	$ 139,000 *8%*	$ 139,000 *1%*
5	Very Poor *Less than 10% of life remaining*	4.4 km *5%*	$ 369,000 *4%*	$ 132,000 *8%*	$ 501,000 *5%*
Total		**81.1 km**	**$ 8,439,000**	**$ 1,637,000**	**$ 10,076,000**

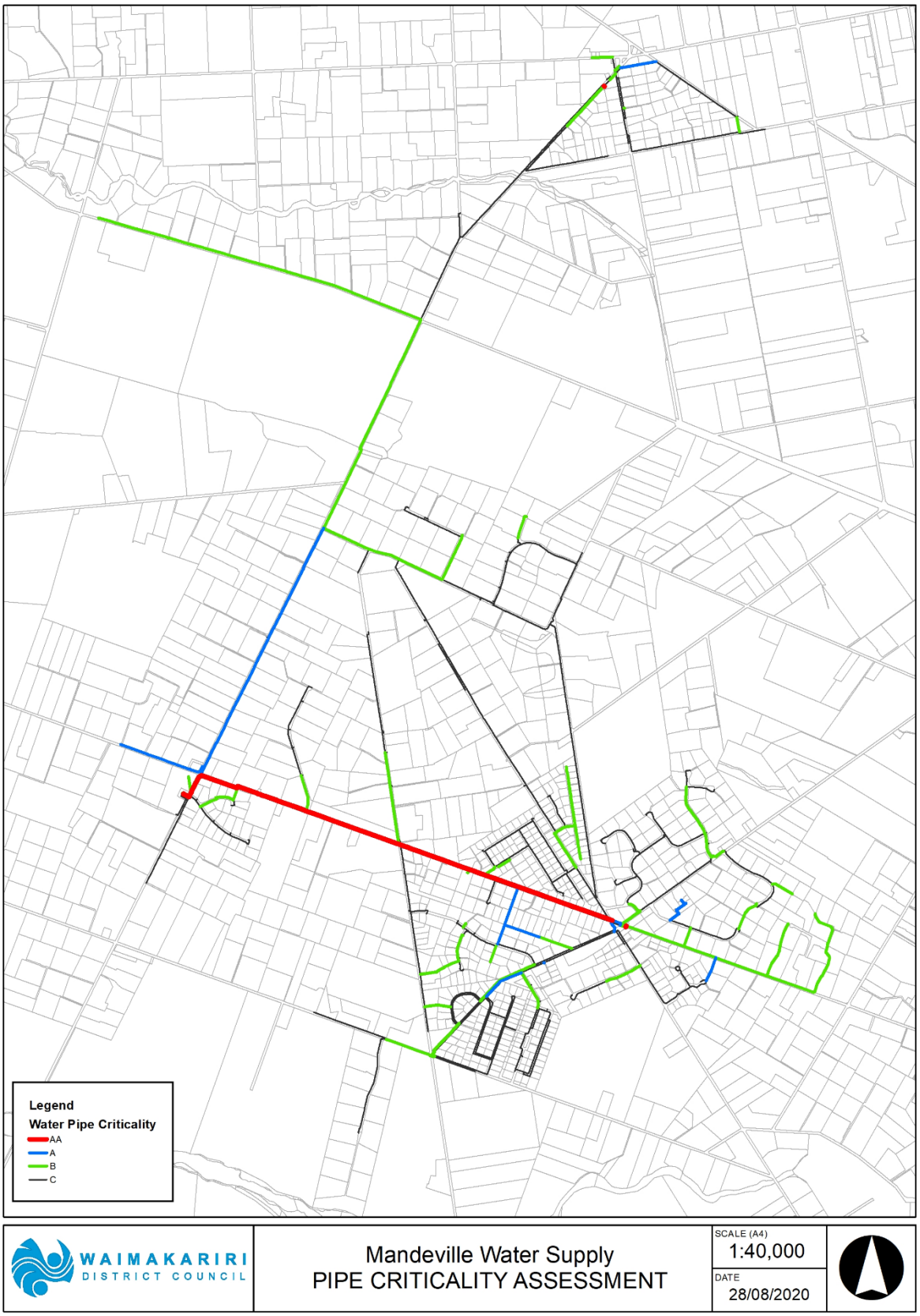
5.3 Asset Criticality

Asset criticality provides an indication of the importance of an individual asset and the corresponding impact on the service delivery should the asset fail for any reason. Criticality is used in risk based investment decisions to help decide when an asset should be replaced to avoid the consequences of failure. The Council has developed an assessment process which scores assets from most critical 'AA' to least critical 'C'. Further details of the criticality assessment methodology is covered in the WS Overview AMP.

The pipe criticality scoring process has been significantly improved through automation and dynamic links to GIS data layers for this AMP.

Figure 4 provides a spatial view of asset criticality for the scheme.

Figure 4: Pipe and Facilities Criticality



5.4 Risk Assessment

An Operational Risk Assessment was first undertaken for the Mandeville-Fernside Water Supply Scheme in 2004, and it has been regularly updated since that time. It was last updated for the 2015 AMP review. Reviews have revealed no extreme or high risks for the Mandeville-Fernside water supply scheme.

The District Wide Overview details the risk events considered and includes a summary of the risk assessment results for all the water supply schemes and is useful in indicating overall water supply network priorities.

Table 9 below shows a summary of the number of events at each level of risk for the Mandeville-Fernside water supply scheme.

Table 9: Number of Events per Level of Risk

Risk Level	2004	2008	2011	2014
Extreme risks	0	0	0	0
High risks	0	0	0	0
Moderate risks	17	15	16	15
Low risks	26	31	34	35
Not applicable	12	9	8	8
Total	55	55	58	58

There are no high or extreme risks for this scheme.

District wide, moderate risks are being deferred until extreme and high risks have been addressed.

5.5 Water Safety Plan

Mandeville-Fernside has an approved Water Safety Plan (WSP). This provides a summary of how the scheme is operated, undertakes a risk assessment for the scheme, identifies preventative measures, and recommends any upgrades to address unacceptable risks. Under the Health Act, these are required to be renewed every 5 years. The Mandeville-Fernside WSP was last approved in 2018, which means it will be due for renewal next in 2023.

Budgetary requirements arising from the plan are incorporated into the draft LTP.

When the Water Services Bill comes into effect, which is expected to be in mid-2021, the requirement for WSPs to be produced will be transferred from the Health Act to the Water Services Bill. The plans will then be submitted to Taumata Arowai, rather than the current Drinking-water Assessors which operate under the Ministry of Health.

5.6 Disaster Resilience Assessment

The 2009 Disaster Resilience Assessment (DRA) is a desk top study that primarily considered the risks to above ground structures presented by natural hazard events to above ground assets across all Council operated 3 Waters schemes. The original assessment was updated in 2012 using revised hazard and asset behaviour information captured during the 2010-11 Canterbury earthquake sequence.

Risk from earthquake events that could induce liquefaction, on brittle pipes (AC and earthenware) is managed using a reticulation vulnerability score. This is used as an input to the risk based renewals assessment.

Above Ground Facilities

The above ground facilities were assessed for risk of failure against 13 natural and 2 manmade hazard scenarios. The following risk profile (Table 10) reflects the likelihood of the event occurring and the consequence on the community of the facility failing. Hazards classified as having 'No Known Risk' have been omitted from the table.

Table 10: Risks to Above Ground Facilities

Threat	Tram Rd Headworks	Two Chain Rd Headworks
100 yr Local Flooding	L	L
475 yr Earthquake Induced Slope Hazard	L	L
Earthquake (50 yr)	M	L
Earthquake (150 yr)	L	L
Earthquake (475 yr)	L	L
Wildfire (threat based)	L	M
Snow (150 yr)	L	L
Wind (150 yr)	L	L
Lightning (100 yr)	L	L
Pandemic (50 yr)	M	M
Terrorism (100 yr)	L	M
E = Extreme, H = High, M = Moderate, L = Low		

The scheme is located outside the zone of potential liquefaction thereby reducing possible impact and asset damage from an earthquake event.

The low earthquake resilience of the Tram Road Headworks as a wooden framed colour steel clad structure has resulted in a moderate earthquake risk.

The wildfire and terrorism risk to the Two Chain Road Headworks is considered sufficient to warrant further investigations to increase resilience.

The Councils response to these risks is being managed at a district level via the DRA Action Plan and related projects. Refer to the District level AMP for details. Since there is some overlap of the DRA and Operational Risk Assessment, a review and integration of the risk assessment methodologies is planned, prior to risk assessments next being carried out.

5.7 Growth Projections

Situation

The Mandeville-Fernside water supply scheme is projected to experience steady growth for a considerable period. This will involve extensions to the existing supply areas to service residential lot sizes ranging from 1 to 4 ha, and also as infill converting rural lots to smaller rural residential lots. In 2017 the Fernside and Mandeville schemes were joined.

The overall district population growth scenario used for the 2021 AMP update was supplied by Council's Development Planning Unit, broken into towns and rural areas. Water supply growth projections were calculated using the New Projections for LTP 2021-2031 (TRIM 200908117997), which was the basis for infrastructure planning.

Due to issues that have occurred with the Census 2018, the population projections that would normally be used as a basis for updating the work previously developed by the Council's Development Planning Unit have not been released by Stats NZ in time for the development of this assessment.

However, based on the historical growth patterns of new dwelling Building Consents over the last three years (636 in 2017/18, 661 in 2018/19 and 615 in 2019/20), the projections used for the previous LTP/infrastructure strategy remain valid to be used for infrastructure planning. As the timeframe for this infrastructure planning is for the thirty years between 2021 to 2051, the previous population projections have been extended out a further three years, as documented in New Projections for LTP 2021-2031 (TRIM200908117997)

It is important to provide a brief comment on COVID19 and the impact it could have on population projections. At the time of writing this paragraph (August 2020), New Zealand is currently in Level 3 restrictions in Auckland and Level 2 restrictions in the remainder of the country. While international migration is currently low arising from the COVID19 travel restrictions, a significant number of New Zealanders are returning home due to the impact of COVID19 on overseas countries. This has contributed to a high level of population growth nationally over the last six months, which has had a flow on effect to growth in the Greater Christchurch and Waimakariri Districts. How long this might continue for and when international migration (from other countries) might return to pre COVID levels is still to be determined. However the existing population projections remained the most appropriate to use for infrastructure planning at this time.

Demand

Demand on the Mandeville-Fernside water supply scheme is expected to increase by 17%, by the end of the 2021-31 Long Term Plan (LTP) period.

This projection is based on 161 new dwellings and connections being established from 2019/20 to 2030/31, identified in the 2020 50 Year Water and Sewer Growth Forecast Report (TRIM reference number 200224024348).

The number of restricted connections will be increased by an average of 15 per year during the 2021-31 LTP period to accommodate this demand. Demand beyond the 2021-31 LTP period (to 2070/71) is forecast to transition to a slightly lower growth profile resulting in an average of 11 new connections per year (Table 11).

Table 11: Growth Projections

Mandeville-Fernside	Rates Strike July 2019	Years 1 - 3	Years 4 - 10	Years 11 - 20	Years 21 - 30	Years 31 - 50
	2019/20	2021/22 to 2023/24	2024/25 to 2030/31	2031/32 to 2040/41	2041-42 to 2050/51	2051/52 to 2070/71
Projected Connections	952	1,019	1,113	1,241	1,352	1,552
Projected Rating Units	2,012	2,146	2,334	2,589	2,812	3,213
Projected increase in Connections		7%	17%	30%	42%	63%
Projected Average Daily Flow (m3/day)	1,319	1,407	1,529	1,694	1,839	2,100
Projected Peak Daily Flow (m3/day)	1,801	1,956	2,171	2,465	2,721	3,182

Note that the time frames have been chosen to reflect the periods 3, 10, 20 and 30 years from the AMP release date, however due to the time it takes to complete the analysis the base rates strike data used was from 2019/20.

Longer term, connections are projected to increase by 63%. This long term projection is similar to the 2017 growth projection, 67% (used for the 2017 AMP). Both projections utilised the best data and information available to project the connections for the water schemes at the time. The base population projections given to PDU for 2019 infrastructure planning were more area specific than the 2017 projections (separating the Mandeville area into residential and rural), and has given a better projection for the Mandeville-Fernside scheme.

Water use predictions for the Mandeville-Fernside water supply scheme have been based on the standard assumption used when modelling the future water demands within the water distribution models, average and peak daily water use per day of 1,000 litres and 2,500 litres respectively (including losses).

Projections

Figure 5 and Figure 6 present the projected growth and corresponding demand trends for the Mandeville-Fernside-Fernside Water Supply Scheme.

Figure 5: Population Projections

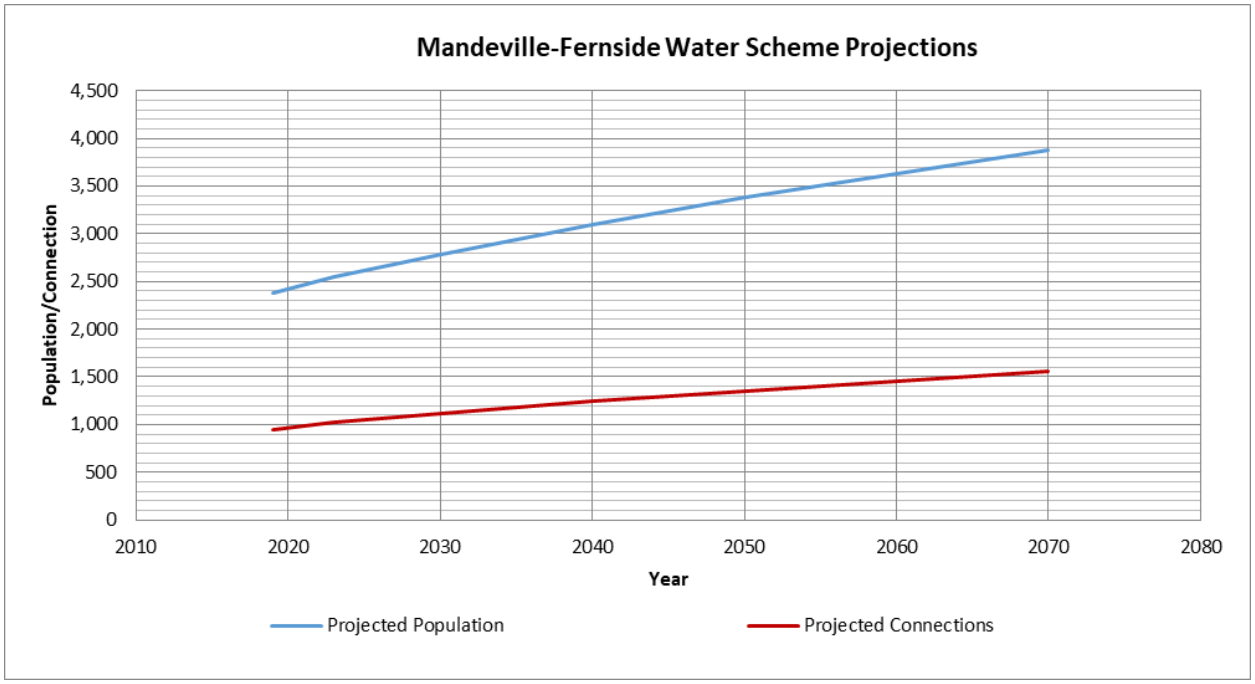
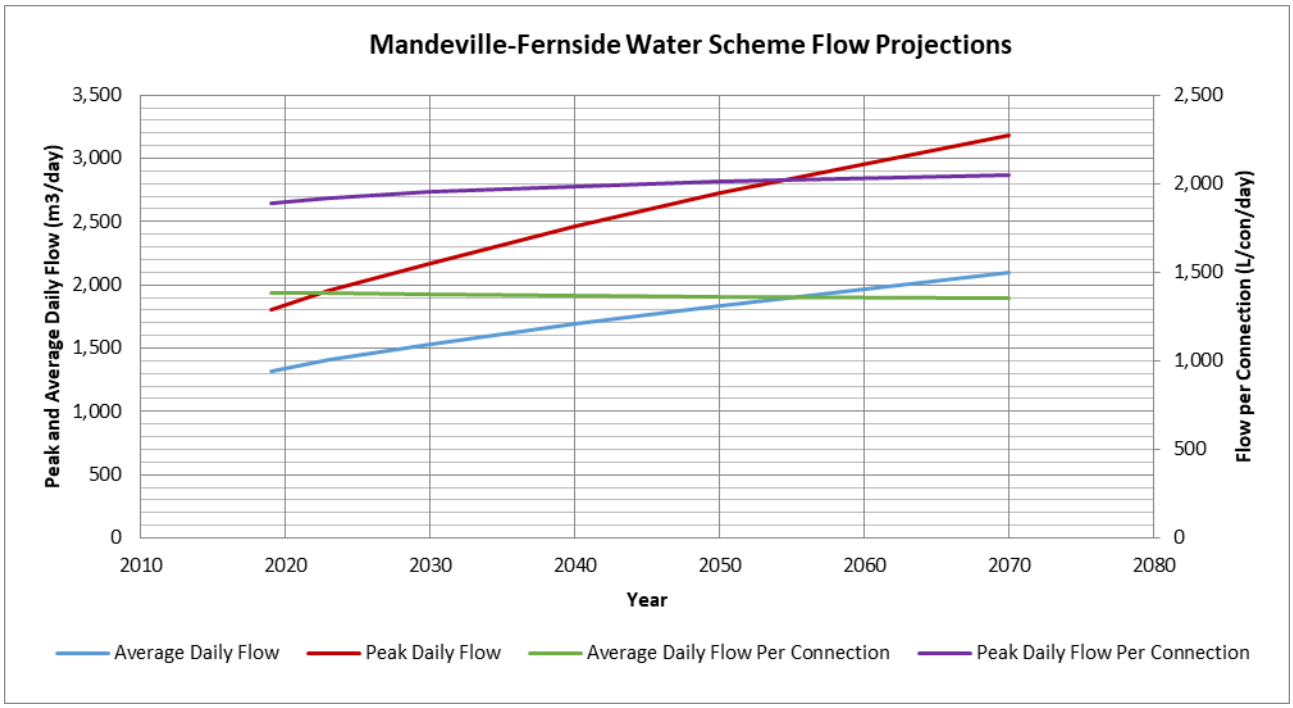


Figure 6: Flow Projections



5.8 Capacity & Performance

This section of the AMP considers the capacity and performance of the Mandeville-Fernside Water Supply, both given the current demand, and also taking into account the forecast growth. The specific aspects of the scheme that have been considered are the source, treatment, storage, headworks, and reticulation system. These are discussed in more detail in the following sub-

sections. All of the upgrades mentioned in the following sections necessary to maintain capacity for growth have been included in the Long Term Plan budgets.

Source

The Mandeville-Fernside Water Supply Scheme draws water from the following sources (Table 12).

Table 12: Scheme Sources

Well name	Well No.	Diameter (mm)	Depth (m)
Two Chain Road No. 1	M35/9021	300	106.8
Two Chain Road No. 2	M35/18638	300	77
Tram Road	M35/5585	200	22.6

The resource consent (CRC990952.1) conditions for the Two Chain Road Well No. 1 and Well No.2 limit the allowable abstraction to 1,103,760 cubic metres per year (or 3,024 m3 per day) at a maximum rate of 35.0 L/s.

The Two Chain Road No. 2 well is the primary source with a pump capacity of about 25 L/s. This is a measured flow based on flowmeter readings. This well yielded 26 l/s in the drawdown test.

Two Chain Road Well No. 1 has a reduced capacity after the earthquakes. While the well can achieve a stable yield of approximately 6 L/s, it has elevated turbidity upon start-up, and can make it challenging to achieve compliance of the UV system. For this reason, this source is now considered a backup. When / if it is used, it is required to be manually run to waste for an extended period of time, then left running permanently in order for turbidity to be stable.

A shallow emergency backup well is also available at the old Tram Road Headworks. The Tram Road well pump has a capacity of 8 L/s or 690 cubic metres per day. Resource consent limits the extraction rate to 10 L/s and can be used for 30 days per year.

Council plans capacity for its water supplies on the basis that one of the primary wells is out of operation at any given time. This concept was used in deciding when source capacity upgrades would be required. This ensures that each scheme has an acceptable level of redundancy. A source upgrade is scheduled in the LTP period to meet redundancy requirements, as currently there is only one primary well, with no redundancy other than to utilise non-compliant backup wells.

The following table presents the projected water demand and associated required source capacity for the Mandeville-Fernside supply (Table 13). To calculate the required source capacity, a contingency is introduced through assuming 10% down time, which increases required source capacity above the Peak Daily Flow.

Table 13: Project Demand and Required Capacity for Scheme

	0yrs	10yrs	20yrs	30yrs	50yrs
Projected Peak Daily Flow (L/s)	27	35	38	41	44
Required Source Capacity (L/s)	30	39	42	46	49

There is sufficient capacity to meet the current demand. However source upgrades have been scheduled in years 2024/25 (for an additional 35L/s) and 2033/34 (for an additional 25L/s) to meet predicted growth demands and improve redundancy.

Treatment

During 2014/15 the design and installation of a UV disinfection unit for the Two Chain Road well no. 2 (principal source) was undertaken. This was implemented in the 2016/17 financial year and has meant that the scheme is now fully compliant with the bacterial and protozoal requirements of the DWSNZ. The system is reliant on stable turbidity and UV transmittance (UVT) with the source water. This is something that is required to be monitored and managed on an ongoing basis to ensure that compliance is maintained.

Chlorine disinfection has been maintained to ensure residual disinfection where the water enters private tanks, as well as provide an additional barrier to contamination.

The source water also requires pH correction through dosing with caustic soda. The scheme was experiencing high costs of frequent delivery of caustic soda to site, as well as posing some health and safety issues to staff, with the system for storing the chemical on site. For this reason a bulk storage system with a dedicated and isolated fill point was constructed in the 2016/17 financial year.

The original Tram Road headworks back-up supply does not provide secure groundwater. On the rare occasions when this backup water source is used, it is treated with chlorine to meet the bacterial requirements of the Drinking Water Standards. However the existing treatment system at the Tram Road headworks provides no protection against protozoan contaminants. This is the same case as for the old Fernside well which provides additional redundancy in the event of a failure at the primary headworks. Therefore, as these sources as not fully compliant with the DWSNZ, they are considered emergency backups only.

Certain water supplies have a risk of being plumbosolvent. The definition of plumbosolvent water is water that is able to dissolve lead easily. Water that has low pH and alkalinity tends to be slightly corrosive and therefore plumbosolvent. The Council complies with the requirements of the Drinking Water Standards for plumbosolvency by advertising twice per year advising customers to flush the first 500 mls of water before taking water for drinking purposes. Adverts are district wide and do not distinguish between water supplies. The pH correction of the water at Mandeville also lowers the risk of plumbosolvency.

Storage

The Mandeville-Fernside water supply scheme has a total storage capacity of 98 cubic metres made up from four 25 cubic metre tanks at the Two Chain Road headworks.

Emergency storage requirements for Mandeville-Fernside are 4.94 hours of Average Daily Flow, based on a 2020 update of the work carried out in the Water Supply Source Resilience Analysis (170623064893).

Table 14 presents the required storage capacity.

Table 14: Required Storage Capacity for Scheme

	0yrs	10yrs	20yrs	30yrs	50yrs
Required Storage Volume (m3)	463	301	326	350	377
Planned Storage Volume (m3)	120	500	500	500	500

A new 500m^3 reservoir is scheduled for construction in 2021/22 to replace the existing four 30m^3 reservoirs. This will be built to meet storage requirements (emergency storage requirements) for the existing scheme, and beyond the next 50 year period. It is noted that the addition of a second primary well within the first 10 years lowers the ongoing storage requirements, as it increases the resilience and redundancy of the headworks infrastructure.

Headworks

The existing Mandeville-Fernside Two Chain Road headworks consists of three supply pumps connected to VSD's (variable speed drives). The pumps operate as duty-assist-assist. Two pumps of the pumps have a capacity of 9L/s each and the third has a capacity of 8.3L/s. For redundancy it is assumed that one of the main pumps is unavailable, therefore the total assessed capacity is currently 17.3L/s.

Table 15 presents the projected peak hourly flows for the Mandeville-Fernside supply and includes the flows from the Fernside scheme.

Table 15: Projected Peak Hourly Flows for Surface Pumps in Scheme

	0yrs	10yrs	20yrs	30yrs	50yrs
Expected Peak Hourly Flow (L/s)	26.7	31.4	34.0	36.5	39.2

Partial fire flows are achieved on Tram Road & McHughs Road.

For redundancy, a surface pump upgrade is scheduled for 2021/22. This work would increase the headworks capacity to 31L/s (including redundancy), with 4 pumps operating duty-assist-assist-standby. There is also an additional upgrade scheduled in year 2030/31 to upgrade the remaining 9L/s pumps to 13L/s pumps (total capacity, including redundancy, of 39L/s).

Reticulation

The capacity of the water supply headworks and reticulation has been assessed using an uncalibrated but verified reticulation model. The model and associated monitoring has confirmed that the existing reticulation system has adequate capacity for the existing and future demands. However, substantial reticulation extensions will be required over the next 50 years to accommodate future growth into the larger supply area.

6 Future Works & Financial Projections (What Do We Need To Do?)

This section covers the future works required to meet the target levels of service, maintain the asset in an acceptable condition, reduce the risks to an acceptable level and accommodate growth.

Financial forecasts do not include inflation

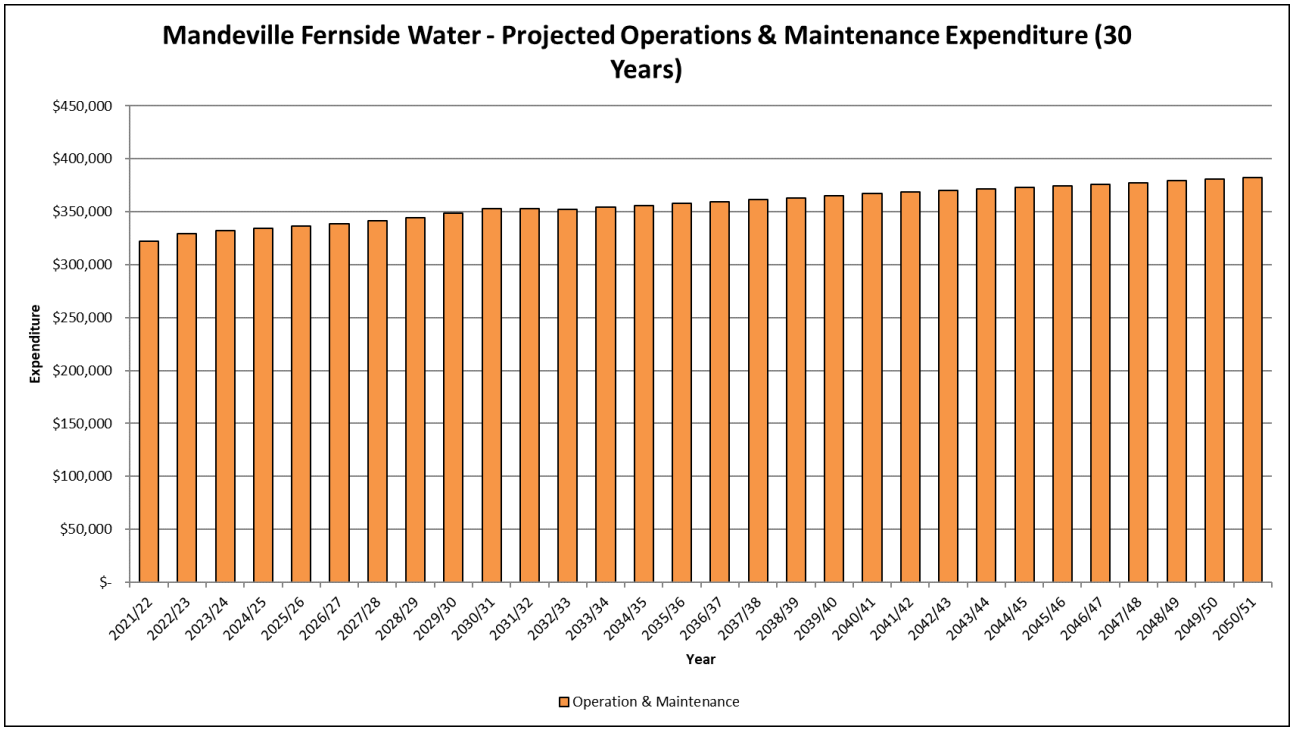
6.1 Operation & Maintenance

Operation and maintenance (O&M) expenditure incorporates the day to day running of the water supply network and allows the system to carry on functioning to deliver the agreed levels of service.

The O&M programme includes a combination of reactive and planned tasks. Examples of the differing nature of these tasks is summarised within the Overview document.

O&M budgets are set based on a combination of past expenditure (for reactive tasks), cost estimates for planned works, and adjustments going forward to account for growth, inflation, depreciation and any significant new works planned. Further detail of this process is provided in the Overview document. The end result of this is shown in Figure 7. There are no known deferred maintenance items

Figure 7: Annual Water Operation & Maintenance 30-Year Budget



6.2 Renewals Programme

A renewals model is used to generate renewal timeframes for each reticulation asset on each scheme. This model takes into account the remaining life from the asset condition data, and the criticality of each asset, and recommends an acceptable renewals window for each pipe. More information on the model is provided in the overview document.

Renewal of pipework assets are then programmed on an annual basis, taking into account the outputs from the renewals model, but also being informed by other works that may be planned in the area, as well as local burst history for the cases where a particular asset may be performing differently than its base life suggests.

The outputs from the renewals model are summarised in Figure 8 below, with category bands depicting how soon renewal is required of each asset. This data is available to staff for analysis on the Council's GIS mapping system (Waimap).

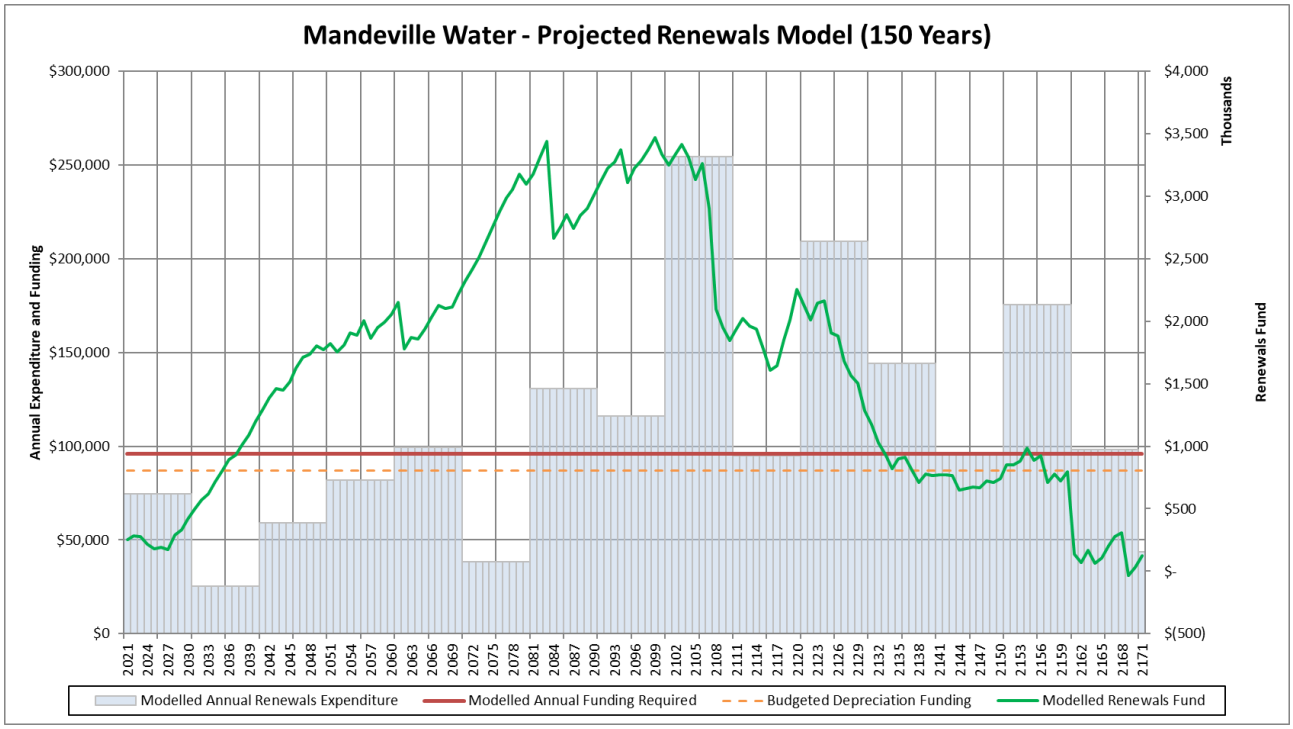
The first ten years of the programme are based on the above assessments by the Asset Manager, but from year 11 forward expenditure is taken directly from the model.

Figure 8: Pipe Renewal Time Frames

Figure 9 below shows the financial output from the model alone. Over a 150 year period it shows the projected expenditure; the value in the renewals fund; the level of funding required to ensure the fund can meet the required renewals programme, and the annual depreciation.

The figure only shows the output from the model, so expenditure shown in the graph for the first ten years may be different from the expenditure shown in the LTP, as adjustments may have been made by the Asset Manager from the direct renewals model outputs. Individual scheme AMPs detail the actual planned renewals budgets for the first ten years.

Figure 9: Annual Water Renewals 150-Year Budget



The key parameters in the figure above are explained below:

- **Modelled Annual Renewals Expenditure:** This is the direct output from the renewals model, recommending the annual investment to be made in renewals each year.
- **Modelled Annual Funding Required:** This is the amount of annual renewals funding required, to ensure there are sufficient funds available to carry out the recommended annual renewals each year.
- **Budgeted Depreciation Funding:** This is the actual amount of depreciation being collected, which is extracted from the Council's budgets.
- **Modelled Renewals Fund:** This is the modelled balance in the renewals account, assuming the annual funding and annual expenditure is completed as per the recommendations from the renewals model.

The key point to note is that the Budgeted Depreciation Funding is slightly less than the Modelled Annual Funding Required. The reason for this discrepancy is twofold:

- **Depreciation Discount Factor:** Council's financing of future renewals incorporates the expectation that depreciation funding can be invested at a higher rate of return over the life

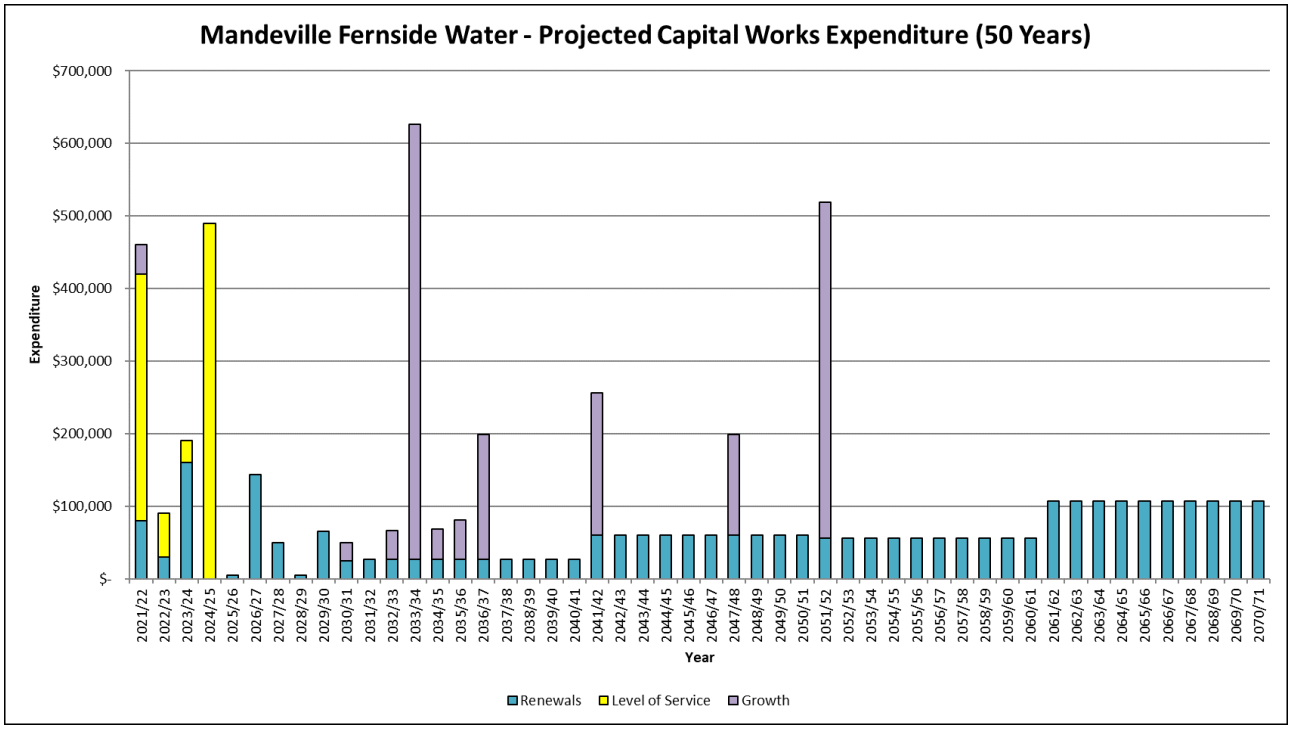
of the assets than the rate of inflation. Further information regarding this approach is provided in the Finance Policy. This concept is embodied in the scheme budgets in the form of a discount rate (referred to in the budgets as the 'Depreciation Discount Factor'). This reduces the annual depreciation funding required from rates, while still ensuring that there will be sufficient funding available to renew assets at the end of their useful life. The renewals model takes a simpler and more conservative approach to the way this effect is calculated, which accounts for some of the difference shown in Figure 9.

Improvement in Asset Base Lives: The second, and more significant, factor explaining this difference particular to this LTP, is a consequence of recent analysis work carried out on the base lives of all water pressure pipe (refer 200508053285 for a record of this analysis, or refer to the Asset Condition section). A significant difference from the previous base lives to the updated ones is that the previous 100 year life for old PVC (defined as pre-1997 installation) pipe, should be reduced to 60 years. This reduced life for this particular pipe class increases the depreciation rate, and therefore increases the annual renewals funding required for schemes with a high proportion of old PVC mains. The analysis was undertaken after asset lives were finalised for the three yearly valuation update, so the updated depreciation rates from the pipe burst analysis work were not able to be incorporated into the 2020 valuation work. However they have been incorporated into the renewals model, which is the primary cause of the difference shown in Figure 9. This will be self-correcting at the next LTP, as a common life for old PVC pipes will be used for both the valuation and the renewals modelling work. Going forward this improved understanding of the expected base lives of pressure pipes will ensure that the required amount of depreciation funding is allowed for.

6.3 Capital Works

The following graph shows the 50 year budget for new work derived from growth and levels of service (Figure 10). Renewals expenditure showing in the first ten years of the graph, includes the actual planned programme, not the model output. District funded projects are not shown.

Figure 10: Projected Capital works Expenditure



The significant expenditure showing in 2021/22 is for planned new storage capacity to meet WDC storage standards, and the 2024/25 spike is for an additional well to provide redundancy in case of a primary well outage

Table 16 summarises the projected capital works for the next 50 years. Including renewals. An additional row has been added below the grand total to show the project funded by the district wide rates for UV installation. Figure 11 shows the corresponding location of the projected capital works, including the district wide funded project.

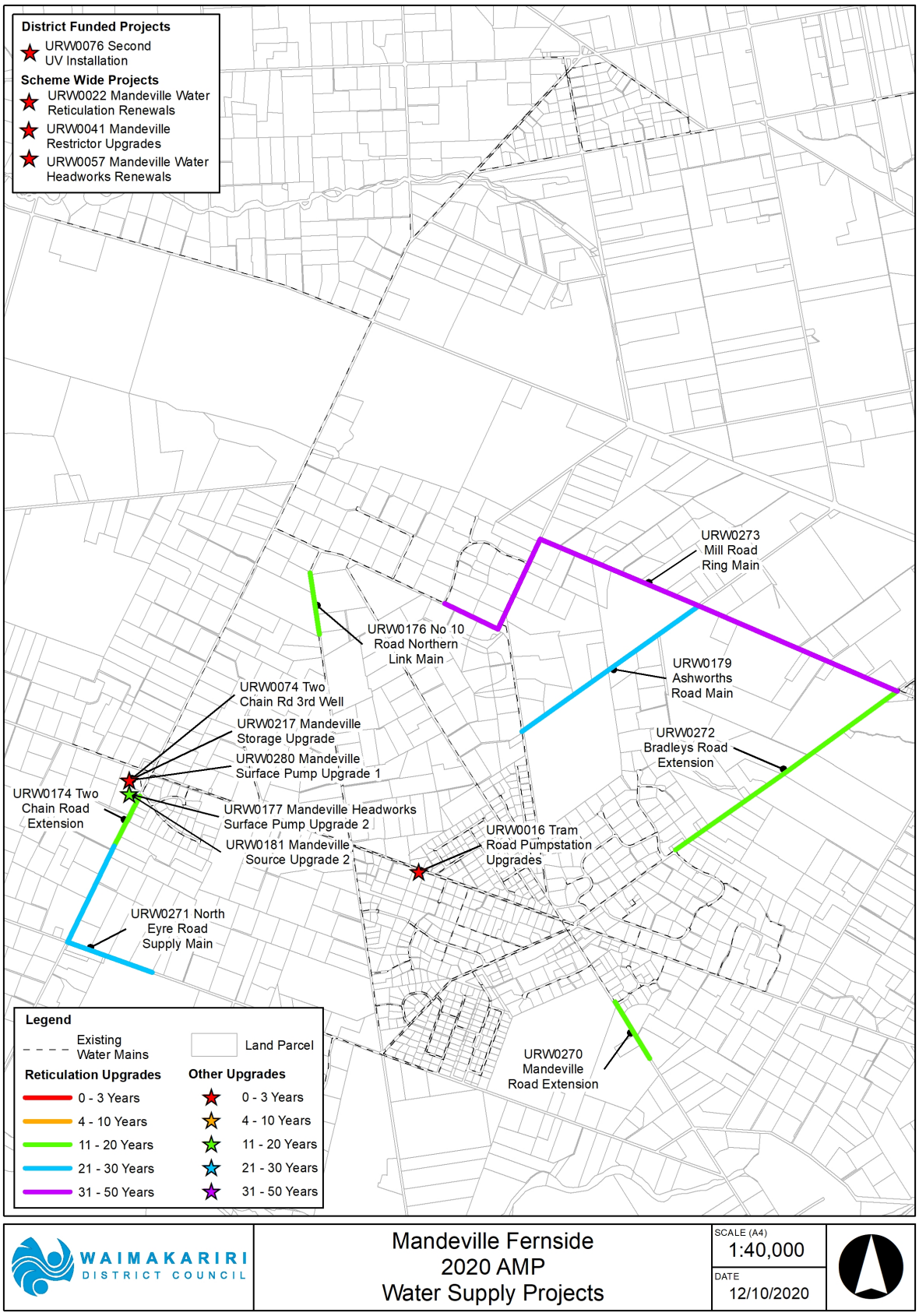
The level of confidence in the budget for the works (High / Medium / Low) is presented in the table. For a more complete discussion on the level of optimisation, refer to the introductory chapter of the AMP. The figures in the table are not adjusted for inflation.

Any programme or project that occurs over a number of years, such as the renewals programme, is only shown within the table for the first year in which it occurs. The Project Value indicates the projected full total cost of the project over the number of years it occurs.

Table 16: Summary of Capital Works (Includes Renewals)

Year	Project ID	Project Name	Level of Confidence	Project Value	LOS Component	Renewals Component	Growth Component
Year 1 - 10							
2022	**URW0022**	Mandeville Water Reticulation Renewals	**3 - Low**	**$ 1,380,014**	**$ -**	**$ 1,380,014**	**$ -**
2022	**URW0041**	Mandeville Restrictor Upgrades	**5 - Medium**	**$ 120,000**	**$ 120,000**	**$ -**	**$ -**
2022	**URW0217**	Mandeville Storage Upgrade	**5 - Medium**	**$ 280,000**	**$ 280,000**	**$ -**	**$ -**
2022	**URW0280**	Mandeville Surface Pump Upgrade 1	**3 - Low**	**$ 50,000**	**$ -**	**$ 10,000**	**$ 40,000**
2023	**URW0016**	Tram Road Pumpstation electrical upgrades	**5 - Medium**	**$ 20,000**	**$ -**	**$ 20,000**	**$ -**
2023	**URW0057**	Mandeville Water Headworks Renewals	**3 - Low**	**$ 1,611,262**	**$ -**	**$ 1,611,262**	**$ -**
2024	**URW0074**	Two Chain Rd 3rd Well	**3 - Low**	**$ 520,000**	**$ 520,000**	**$ -**	**$ -**
2031	**URW0177**	Mandeville Headworks Surface Pump Upgrade 2	**3 - Low**	**$ 50,000**	**$ -**	**$ 25,000**	**$ 25,000**
Year 11 - 20							
2033	**URW0176**	No 10 Road Northern Link Main	**3 - Low**	**$ 40,000**	**$ -**	**$ -**	**$ 40,000**
2034	**URW0181**	Mandeville Source Upgrade 2	**3 - Low**	**$ 600,000**	**$ -**	**$ -**	**$ 600,000**
2035	**URW0270**	Mandeville Road Extension	**3 - Low**	**$ 42,000**	**$ -**	**$ -**	**$ 42,000**
2036	**URW0174**	Two Chain Road Extension	**3 - Low**	**$ 55,000**	**$ -**	**$ -**	**$ 55,000**
Year 21 - 30							
2042	**URW0271**	North Eyre Road Supply Main	**3 - Low**	**$ 197,000**	**$ -**	**$ -**	**$ 197,000**
2048	**URW0179**	Ashworths Road Main	**3 - Low**	**$ 139,000**	**$ -**	**$ -**	**$ 139,000**
Year 31 - 50							
2037	**URW0272**	Bradleys Road Extension	**3 - Low**	**$ 172,000**	**$ -**	**$ -**	**$ 172,000**
2052	**URW0273**	Mill Road Ring Main	**3 - Low**	**$ 463,000**	**$ -**	**$ -**	**$ 463,000**
Grand Total				**$ 5,739,276**	**$ 920,000**	**$ 3,046,276**	**$ 1,773,000**
2022	**URW0076**	**Second UV Unit (funded from district wide rates)**	**3- Low**	**$ 75,000**	**$ 75,000**		

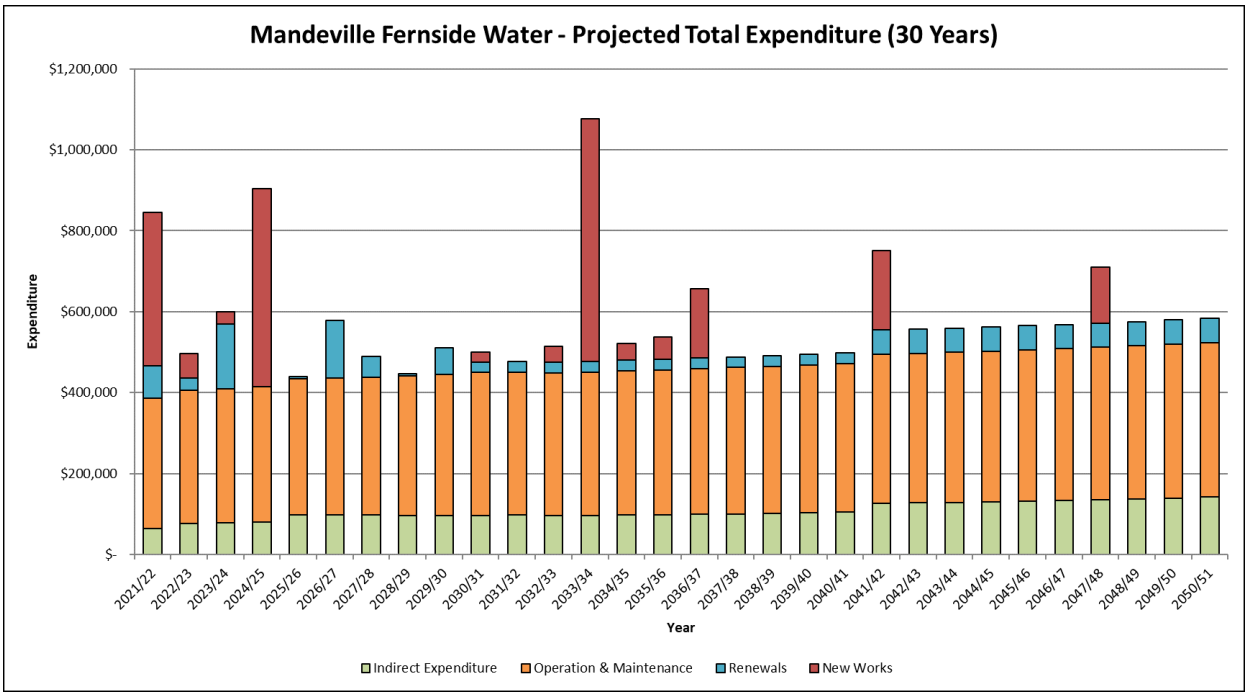
Figure 11: Projected Capital Upgrade Works (not to scale)



6.4 Financial Projections

The following graph summarises the breakdown of projected total expenditure over a 30 year time horizon. It includes both operational and capital expenditure. Operational costs include operations and maintenance, and indirect expenditure. Indirect expenditure includes interest, rating collection costs, costs associated with maintaining the Asset Register, and internal overhead costs. Capital includes expenditure for growth, levels of service and renewals. District wide funded projects are not included

Figure 12: Projected Expenditure



6.5 Valuation

A full peer reviewed valuation of assets is carried out on a three yearly cycle, using the asset data in our asset management information system. Table 17 below provides a summary of the replacement cost, depreciated replacement cost and annual depreciation for this scheme

Table 17: Asset Valuation

Asset Type	Unit	Quantity	Replacement Cost	Depreciated Replacement Cost	Annual Depreciation
Valve	No.	215	$553,907	$475,079	$5,735
Main	m	81,101	$6,828,765	$5,571,138	$73,474
Hydrant	No.	36	$93,145	$85,353	$931
Service Line	Properties	896	$954,448	$768,733	$10,461
Facilities			**$1,637,130**	**$1,062,644**	**$42,929**
Total			**$10,067,395**	**$7,962,947**	**$133,530**

6.6 Revenue Sources

Revenue is provided from two key sources; targeted rates and Development Contributions. Development contributions are calculated in accordance with Council's Development Contributions Policy (TRIM 191129168016), while targeted rates are charged in accordance with Council's Revenue and Financing Policy (TRIM 180522056008).

A further revenue source is the district wide rate that has been set up specifically to fund installation of UV disinfection at all schemes that do not already have it. This scheme already has a UV system, with ongoing operating costs covered by the UV cost centre, rather than the Mandeville-Fernside cost centre.

7 Improvement Plan

7.1 2021 Improvement Plan

Error! Reference source not found. details the scheme specific improvements and relevant district wide improvements recommended to address the management issues identified in Section 3. Each improvement item has been tagged to either a capital project or, a process improvement project to help manage and track Councils response. Short term indicates within the first three years of the LTP, long term, out beyond that timeframe.

If the table is empty, this indicates that all improvements required are either district wide improvements (covered by the Overview AMP), or covered by a capital project or projects, covered in the Capital Works section.

Table 18: 2021 AMP Improvement Plan

Project Ref	AMP Section	Project Description	Priority	Status	Estimated Cost
NA	NA	NA	NA	NA	NA

8 Changes to AMP as a result of Long Term Plan consultation

Some changes to budgets have arisen as a consequence of a staff submission report to Council during LTP hearings 25-26 May (TRIM 210420063358). Projects themselves have not changed, but budgets have been modified as a consequence of detailed designs progressing. The table below provides a summary of the changes to capital budgets for this scheme

Budget Name	Draft 2021-31 LTP (2021/22)	Proposed Revised Budget (2021/22)	Difference	Notes
Mandeville Water Renewals	$ 70,000	$ 90,000	$20,000	Design completed and cost estimate revised
Mandeville Pump Upgrade – Renewal	$ 10,000	$ 20,000	$10,000	Concept design completed and cost estimate revised
Mandeville Pump Upgrade – Growth	$ 40,000	$ 60,000	$20,000	
Mandeville Storage Upgrade (Partially Growth)	$ 280,000	$ 500,000	$220,000	Early concept design completed and cost estimate revised.

APPENDIX 'A'. PLANS

Figure 13: A1 - Plan of Serviced Area – Fernside

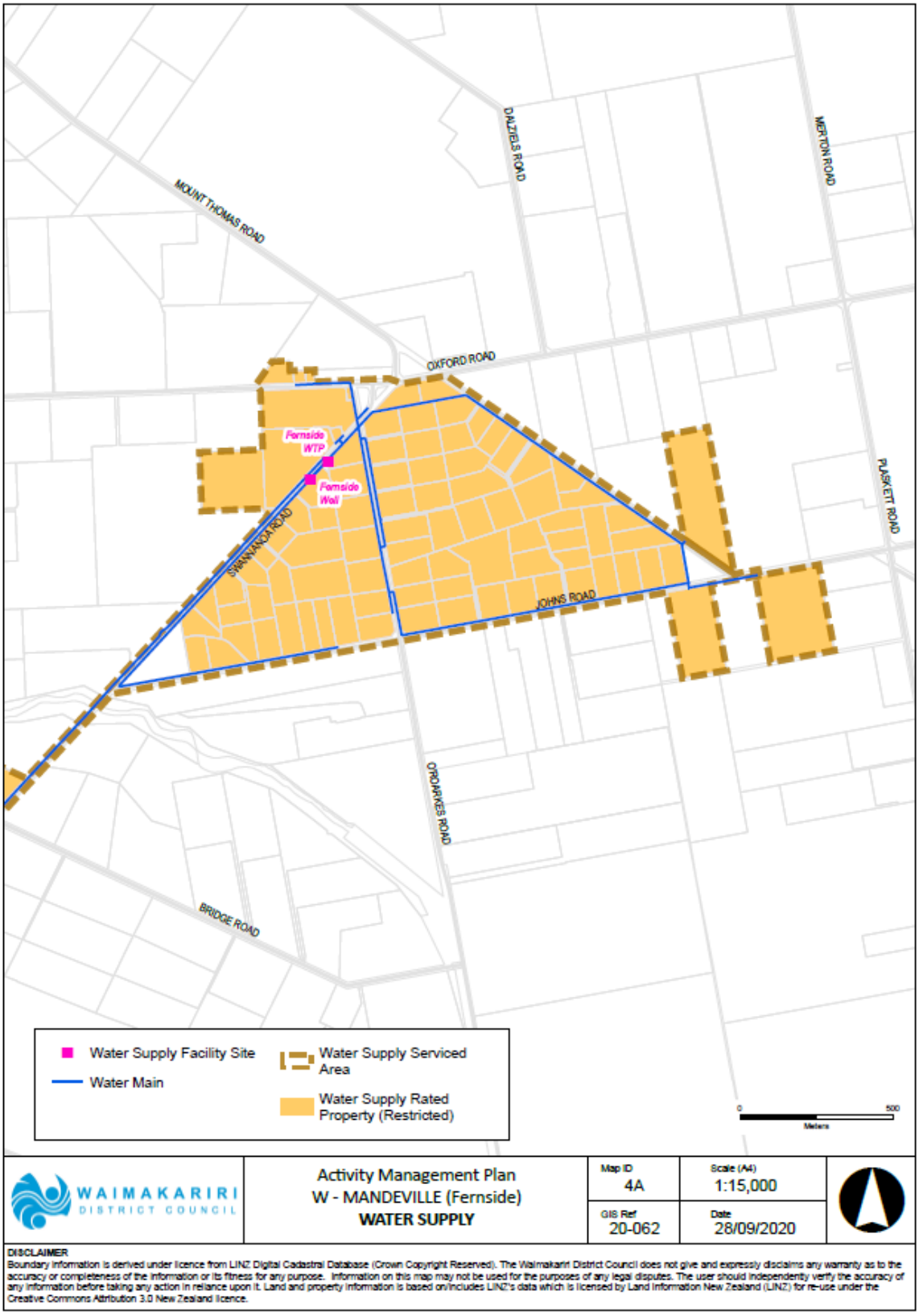


Figure 14: A1 - Plan of Serviced area – Mandeville

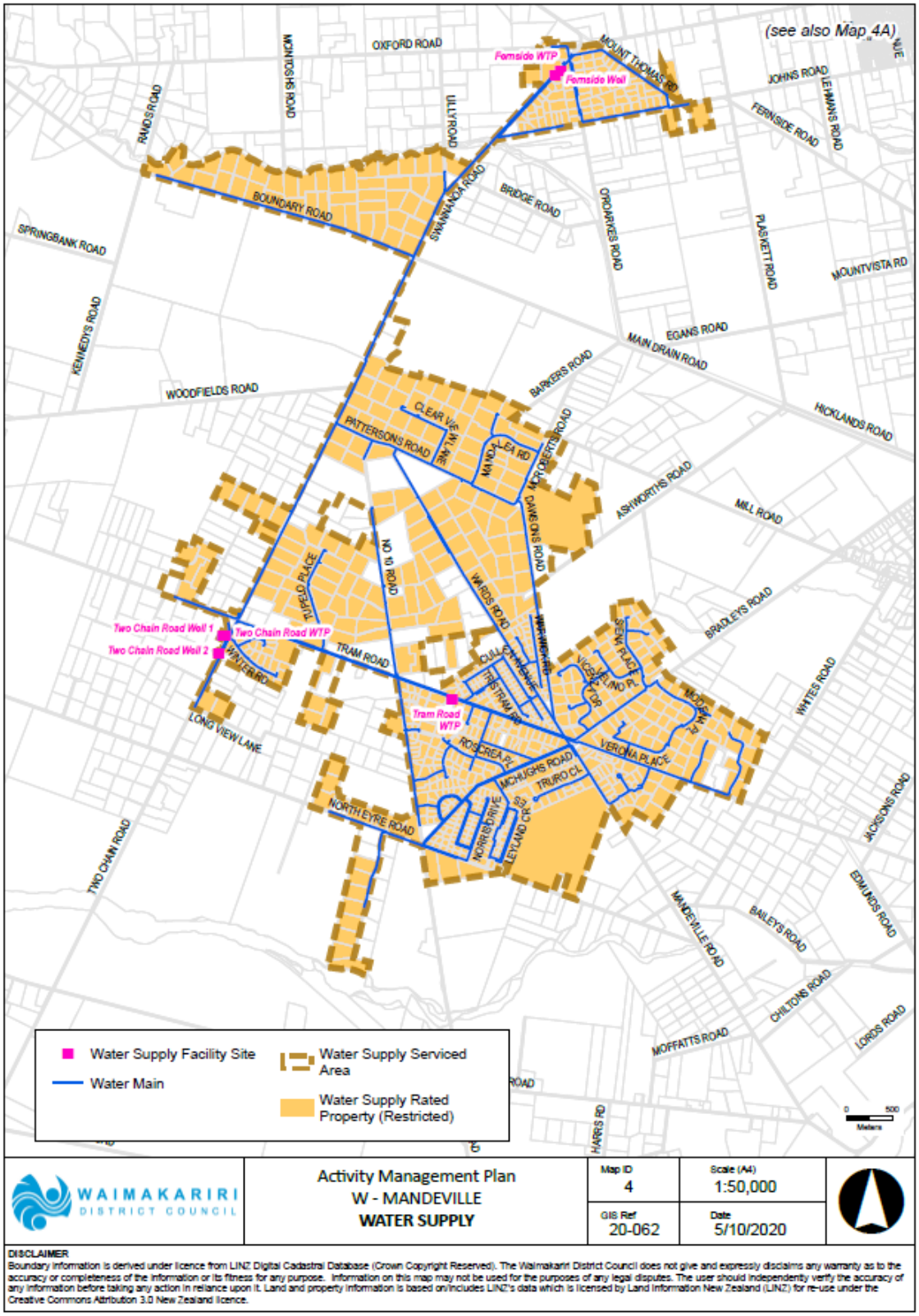
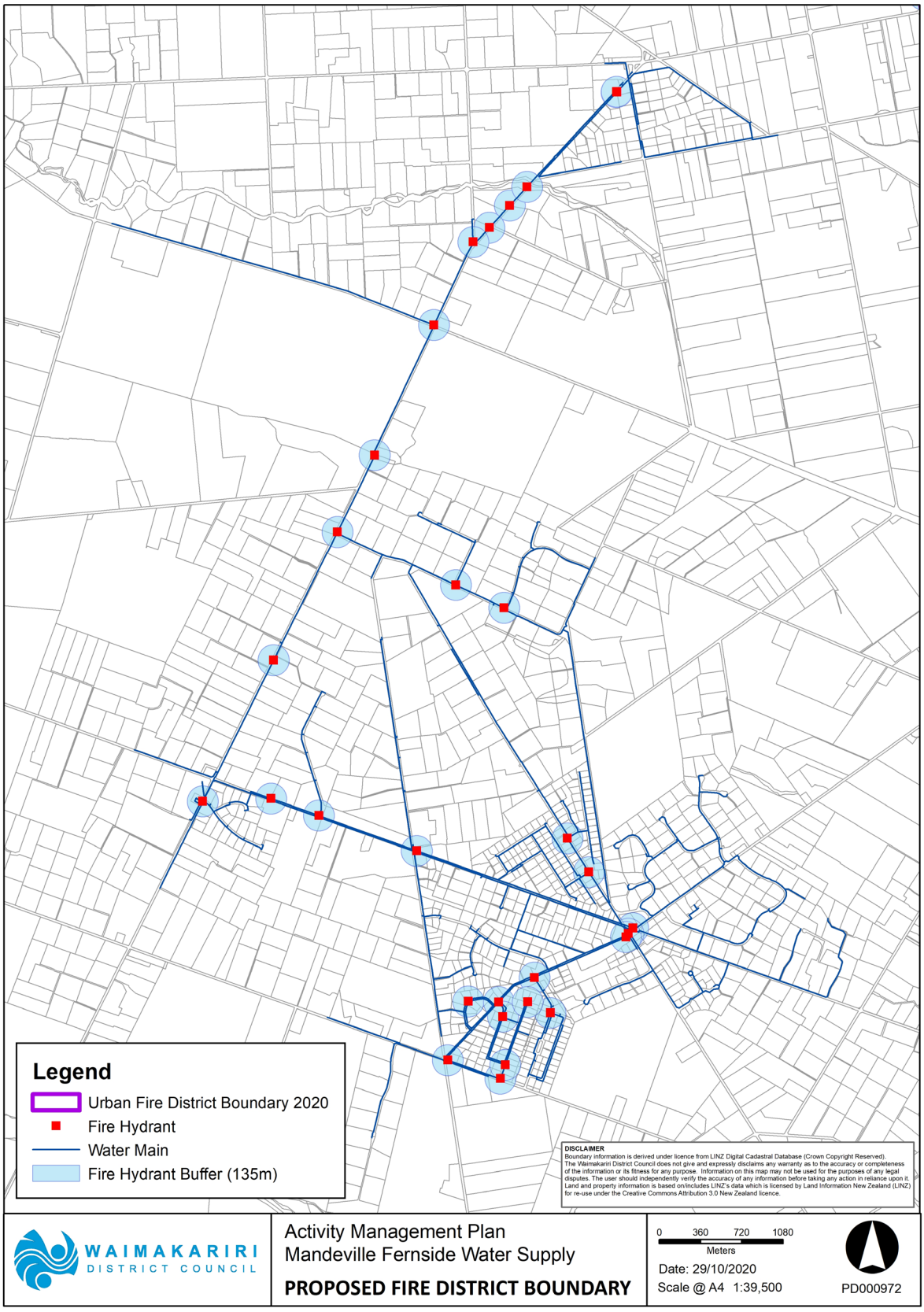


Figure 15: A2 - Plan of Fire District & Extent of Fire Mains



The Mandeville-Fernside Water Supply is not included in a Fire District but a plan of hydrants is provided for reference.

Figure 16: Mandeville Water Supply Statistics

Mandeville Historic Water Supply Statistics

Mandeville Historic | 19/20 | Last Update Jun-20

Note that shading indicates the relative quantity measured for the ten year period (i.e. the lowest value has no shading, the highest has complete shading.)

		July '09 - June '10	July '10 - June '11	July '11 - June '12	July '12 - June '13	July '13 - June '14	July '14 - June '15	July '15 - June '16	July '16 - June '17	July '17 - June '18	July '18 - June '19	July '19 - June '20	5 yr Average	10 yr Average
Nightly Flow	L/s	-	-	-	-	-	-	-	-	8.40	9.30	-	8.85	8.85
Average Daily Flow	m^3/day	559	555	585	653	750	1,001	1,047	1,140	1,129	1,196	1,341	1,171	940
Peak Daily Flow	m^3/day	892	799	809	1,015	1,183	1,542	1,512	1,650	1,731	1,641	1,728	1,652	1,361
Peak Weekly Flow	m^3/day	794	752	765	929	1,081	1,360	1,412	1,472	1,647	1,579	1,697	1,561	1,269
Peak Monthly Flow	m^3/day	736	696	715	871	1,011	1,335	1,294	1,463	1,492	1,500	1,600	1,470	1,198
Peak Hourly Flow	L/s	-	-	-	-	-	-	-	-	25.9	-	-	25.9	25.9
Peak Month		Feb	Dec	Jan	Feb	Feb	Jan	Dec	Feb	Dec	Feb	Jan		
Peak Week		Week 53	Week 49	Week 4	Week 3	Week 6	Week 2	Week 49	Week 8	Week 50	Week 7	Week 5		
Peak Day		25/12/2009	3/12/2010	22/01/2012	28/11/2012	4/02/2014	19/01/2015	28/11/2015	5/03/2017	10/12/2017	10/02/2019	25/01/2020		
Peaking Factor		1.6	1.4	1.4	1.6	1.6	1.5	1.4	1.4	1.5	1.4	1.3		
Total Annual Volume	m^3	205,068	203,582	214,611	239,546	275,422	367,189	384,163	418,550	414,228	439,039	492,131	429,622	344,846
Resource Consent	m^3/day	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024	3,024
Well Pump Capacity	m^3/day	2,678	2,678	2,678	2,678	2,678	2,160	2,160	2,160	2,160	2,160	2,160	2,160	2,367
Surface Pump Capacity	m^3/day	1,434	1,434	1,434	1,434	1,434	2,938	2,938	2,938	2,938	2,938	2,938	2,938	2,336
On-Demand Connections		-	-	-	-	-	-	-	-	-	-	-		
Restricted Connections		534	534	556	572	734	745	810	841	841	866	879		
Total Connections		534	534	556	572	734	745	810	841	841	866	879		
Average Daily Demand	L/con/day	1,046	1,040	1,052	1,141	1,022	1,343	1,292	1,356	1,342	1,381	1,526	1,379	1,250
Peak Daily Demand	L/con/day	1,670	1,497	1,455	1,775	1,612	2,070	1,867	1,962	2,058	1,895	1,966	1,950	1,816
Allocated Water Units	m^3/day	1,082	1,081	1,098	1,458	1,491	1,517	1,686	1,744	1,746	1,815	1,848		
Average Daily Flow per Unit	L/unit/day	516	513	533	448	503	660	621	654	646	659	726	661	596
Peak Daily Flow per Unit	L/unit/day	824	739	737	696	793	1,017	897	946	991	904	935	935	866
On-Demand Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Restricted Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Total Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Data Quality		very high	very high	very high	very high	very high	very high	high	very high	very high	very high	very high		

Figure 17: Fernside Water Supply Statistics

Fernside Historic Water Supply Statistics

Fernside Historic | 19/20 | Last Update Jun-20

Note that shading indicates the relative quantity measured for the ten year period (i.e. the lowest value has no shading, the highest has complete shading.)

		July '09 - June '10	July '10 - June '11	July '11 - June '12	July '12 - June '13	July '13 - June '14	July '14 - June '15	July '15 - June '16	July '16 - June '17	July '17 - June '18	July '18 - June '19	July '19 - June '20	5 yr Average	10 yr Average
Nightly Flow	L/s	-	-	-	-	-	-	-	-	1.30	0.90	-	1.10	1.10
Average Daily Flow	m^3/day	121	124	133	136	115	134	133	145	168	123	148	143	136
Peak Daily Flow	m^3/day	177	178	196	177	185	216	182	203	240	169	262	211	201
Peak Weekly Flow	m^3/day	158	160	168	165	155	204	174	196	229	163	254	203	187
Peak Monthly Flow	m^3/day	149	155	160	161	142	187	161	179	219	158	204	184	173
Peak Hourly Flow	L/s	475.2	475.2	475.2	475.2	475.2	-	-	-	-	-	-	-	475.2
Peak Month		Feb	Dec	Jan	Aug	Feb	Feb	Dec	Feb	Nov	Feb	Apr		
Peak Week		Week 48	Week 48	Week 4	Week 36	Week 47	Week 10	Week 49	Week 6	Week 50	Week 8	Week 19		
Peak Day		7/02/2010	7/02/2011	9/06/2012	15/07/2012	18/11/2013	4/03/2015	5/12/2015	6/02/2017	22/11/2017	27/01/2019	2/05/2020		
Peaking Factor		1.5	1.4	1.5	1.3	1.6	1.6	1.4	1.4	1.4	1.4	1.8		
Total Annual Volume	m^3	44,462	45,623	48,861	50,026	42,369	49,347	48,904	53,071	61,813	45,186	54,138	52,622	49,934
Resource Consent	m^3/day	432	432	432	432	432	432	432	432	432	432	432	432	432
Well Pump Capacity	m^3/day	1,555	1,555	1,555	1,555	1,555	389	389	389	389	389	389	389	855
Surface Pump Capacity	m^3/day	631	631	631	631	631	449	449	449	449	449	449	449	522
On-Demand Connections		-	-	-	-	-	-	-	-	-	-	-		
Restricted Connections		85	85	85	85	85	85	85	85	85	85	85		
Total Connections		85	85	85	85	85	85	85	85	85	85	85		
Average Daily Demand	L/con/day	1,425	1,463	1,566	1,604	1,358	1,582	1,568	1,701	1,982	1,448	1,735	1,687	1,601
Peak Daily Demand	L/con/day	2,082	2,094	2,306	2,082	2,179	2,541	2,137	2,388	2,819	1,987	3,078	2,482	2,361
Allocated Water Units	m^3/day	172	176	176	176	178	178	180	180	180	180	180		
Average Daily Flow per Unit	L/unit/day	704	706	756	774	649	755	740	803	936	684	820	797	762
Peak Daily Flow per Unit	L/unit/day	1,029	1,011	1,114	1,006	1,040	1,213	1,009	1,128	1,331	938	1,453	1,172	1,124
On-Demand Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Restricted Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Total Rating Charges		-	-	-	-	-	-	-	-	-	-	-		
Data Quality		very high	very high	very high	very high	very high	very high	high	very high	very high	very high	very high		