

Project Number: 3-C2493.00

GDC Future Development Modelling Assessment

3 October 2022

CONFIDENTIAL



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Document Details:

Date: 03/10/2022
Reference: 3-C2493.00
Status: Final

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Approved for release by



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Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
1	3/10/2022	A. Wilks	D. Ripley and C. Mills	A Bruce	Final

Revision Details

Revision	Details
1	

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Gore District Council ('**Client**') in relation to the letter *Growth Area Servicing Scoping Assessment Offer of Service - July 2022* ('**Purpose**') and in accordance with the Short Form Agreement with the Client dated 4 August 2022. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

In preparing the Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('**Client Data**') provided by or on behalf of the Client. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable in relation to incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

1 Summary

WSP was engaged by Gore District Council (GDC) to complete a wastewater (WW) and stormwater (SW) network impact assessment for the future development areas in Mataura and Gore. These were done to understand the existing network constraints to development and the potential upgrades required to accommodate the development flows. Four developments were assessed:

- Mataura East (residential)
- Mataura South (industrial)
- Gore West (two residential areas)
- Gore South (industrial)

The total area of the new development sites is approximately 160 ha.

The impact of the developments on the wastewater and stormwater network were assessed for three scenarios:

- 1 Wastewater performance in dry weather flow (DWF)
- 2 Wastewater performance in wet weather flow (WWF) during a 50% AEP rainfall event
- 3 Stormwater performance in WWF during a 20% AEP rainfall event

Our assessment found that the connection of the residential development areas to the wastewater networks are predicted to increase existing predicted overflows and create new overflows from the system during WWF. This is because the wastewater systems in both Gore and Mataura are already at capacity during the 50% AEP rainfall event. Upgrades to the networks will be required to accommodate the wastewater flows from the residential development areas.

The industrial flows in Mataura are significant compared to the existing wastewater catchment flows. Due to the location of the industrial land, we recommend that pumping these flows direct to the WWTP is investigated.

For the Gore industrial area, we found that the wastewater system has the capacity to accept the flows expected from the light industrial development. However, when the heavy industrial development was assessed, the system was under capacity and required both pipe and pump upgrades.

For the stormwater networks, our assessments found that the developments resulted in an overall increase in flood extent during the 20% AEP event. To accommodate these additional stormwater flows in Mataura and the industrial development in Gore; we recommend that stormwater is conveyed to the Mataura River directly. For the residential development in Gore, we recommend that onsite attenuation is investigated to maintain the current peak runoff flow from the sites.

For any new discharges to the Mataura River, we recommend GDC liaise with Environment Southland to ensure that the discharge comply with new Regional Plan requirements.

2 Scope

The assessment included the following future development areas:

- Mataura East (residential)
- Mataura South (industrial)
- Gore West (two residential areas)
- Gore South (industrial)

These are shown in Figure 2-1 and Figure 2-2. From the model results, the following were identified:

- New and increased wastewater constructed overflow volumes.
- New and increased wastewater manhole overflow volumes.
- Increase in flood depth extents, presented visually.

The results of this were used to inform upgrade recommendations for each development area. One high-level option per development site was identified.



Figure 2-1. Mataura proposed development areas



Figure 2-2. Gore proposed development areas.

3 Methodology

The following methodology was undertaken to assess the impact of the development on the existing wastewater network:

- 1 The existing Mataura#26_1 and Gore 2016 Update v1_ardwirck wigan networks were used as the Base scenario.
- 2 Two new scenarios per model were created for dry weather and wet weather flow comparisons with new subcatchments representing the developments added.
- 3 Two flow rates for the industrial development areas were considered. One for heavy industrial use and one for light industrial use.
- 4 The wastewater dry weather flow scenarios were set up with the residential development populations to allow the impact of the diurnal flow from the developments to be assessed.
- 5 The wastewater wet weather scenario was set up with a constant flow added on to the diurnal flow to achieve the PWWF from the developments.
- 6 Simulations were run to assess the impact of the developments on the existing network during dry and wet weather (50% and 20% AEP design storms).
- 7 Upgrade options were developed to resolve any detriment to network performance caused by the developments.

4 Assumptions

4.1 General

The Matura#261_1¹ wastewater model was used, which was modelled in InfoWorks ICM v2021.6.1. The model has not been updated or calibrated since it was first built in 2012 (Opus, 2012). There were outstanding anomalies from the 2012 model build and calibration that need to be investigated. These are possible overflows from the wastewater system to the stormwater system and the existence of stormwater reticulation on the State Highway 1 and 93 that are not in GDC records.

The model is acceptable for high level assessment such as this project. However, it is recommended that the model be improved before any significant network upgrades are considered.

An overview of the wastewater and stormwater system is presented in Figure 4-1 and Figure 4-2 respectively.



Figure 4-1. Matura Wastewater System Overview

¹ WSP model reference: dcapa500app57:40000/Gore DC WW and SW



Figure 4-2. Maitava stormwater system overview.

The Gore 2016 Update v1_ardwirck wigan wastewater model was used in the Gore area. This model was last updated to reflect changes in population and new infrastructure in 2016 and with other localised infrastructure upgrades since this time. The model has not been calibrated since it was first built in 2012 (Opus, 2012). However, validation checks have been undertaken during previous studies in some areas and the model results were considered reasonable. Therefore, we consider it suitable for this type of pre and post development comparison. An overview of the wastewater and stormwater system is presented in Figure 4-3 and Figure 4-4 respectively.

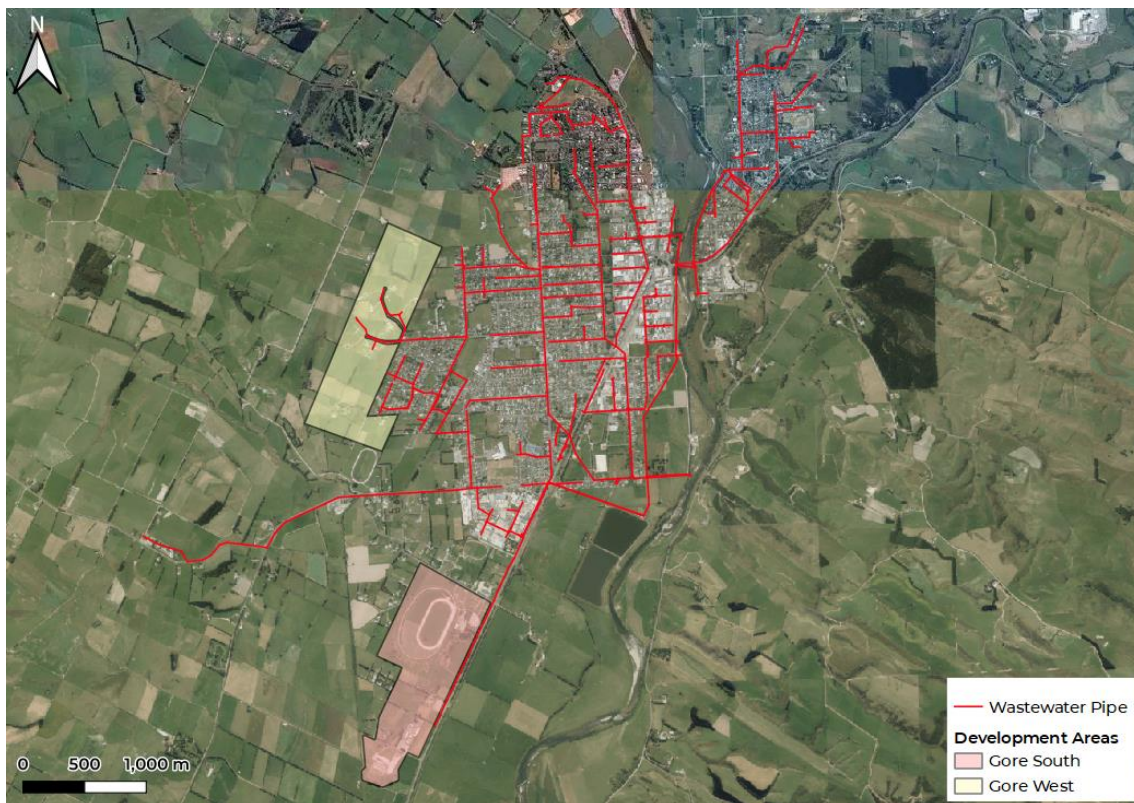


Figure 4-3. Gore wastewater network.

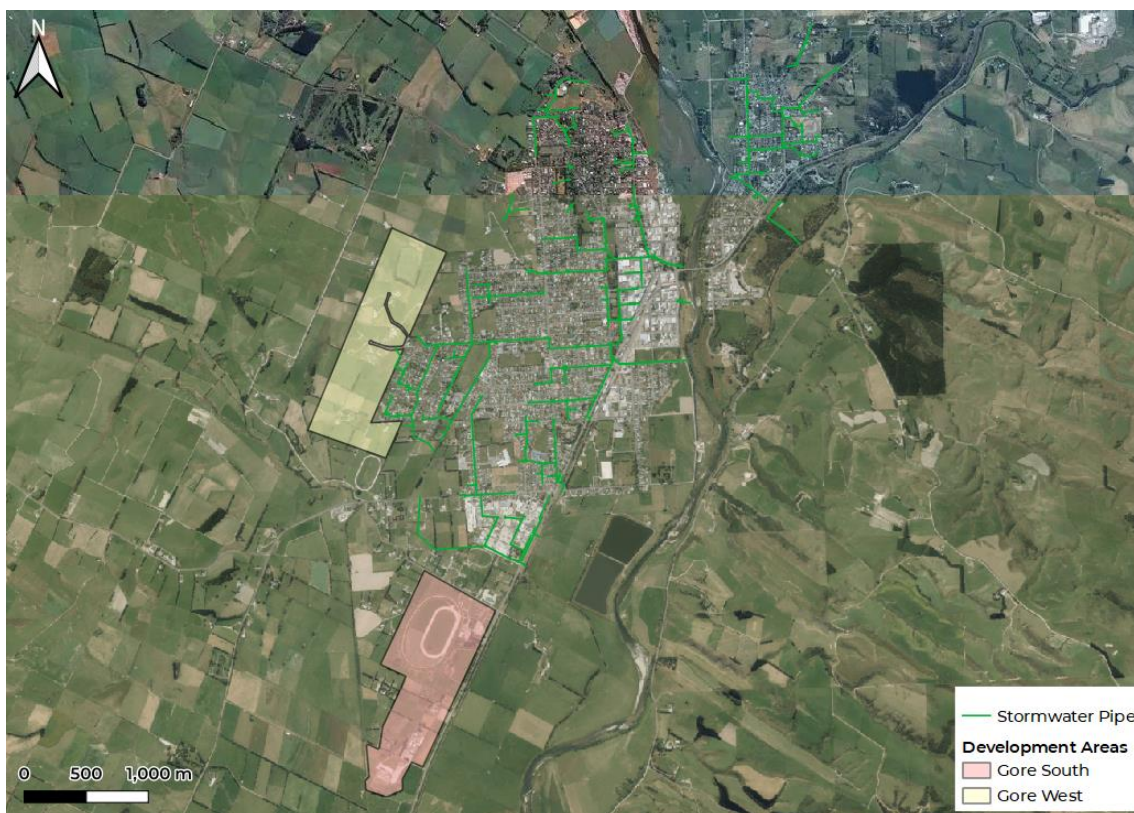


Figure 4-4. Gore stormwater network.

- Design rainfall, including an allowance for climate change, from the **Gore Design Rainfall Analysis Report** (Opus, 2012) was used. It should be noted that the percentage change factors to estimate increase in the rainfall depth due to increases in average temperature due to climate change are based on the outdated 2008 MfE guidance and not the latest

(2018) guidance. We recommend GDC revise their design rainfall to be in accordance with the latest guidance

- The Gore and Mataura models were run with the 50% and 20% annual exceedance probability (AEP) 1-hour design events (including climate change allowance) to replicate wet weather flow (WWF), as this was previously determined to be the critical storm duration for the wastewater system. To truly understand the impact of rainfall, a variety of rainfall events would need to be considered. However, there are many variables to consider, including but not limited to, the AEP, intensity, duration, and timing of the event (in relation to flows in the wastewater system). Comprehensive modelling of a variety of design rainfall events has not been conducted as part of this assessment.
- Gore WW and SW were assessed using the base model representing the existing performance, not the SW separation model.
- SW assessments of developments were limited where connection to the network does not seem relevant.
- Comment and assessment on the infrastructure within the developments was excluded.

4.2 Scenario Specific

Density and zoning assumptions for the development areas were provided by Matt Bayliss (GDC) on 27 May 2022: Growth Area Servicing Scoping Assessment (The Property Group, 2022). Wastewater flows from the industrial areas based on industry type were also confirmed by Matt Bayliss on 17 August 2022.

4.2.1 Residential Areas

The base wastewater flows for the residential areas modelled were determined using the estimated residential density and an assumed wastewater flow of 250 L/person/day. This gave the baseflow detailed in Table 4-1.

Table 4-1. Details of the residential areas modelled and the calculated wastewater baseflow.

Development Area	Area (ha)	Density (Section size) (m ²)	Proposed Lots	Population	ADWF (L/s)	PDWF (L/s)	PWWF (L/s)
Mataura East	32.8	2,000	164	574	1.66	4.15	8.31
Gore West	85.7	2,000	428	1,500	4.33	10.84	21.69

Stormwater subcatchments used the following parameters:

- Contributing area split applied is: 10% to road, 20% to roof, and 70% to permeable.

The Mataura residential area was connected at manhole 1082 on Kana Street for wastewater and 4065 on Doctors Road for stormwater (Figure 4-5).



Figure 4-5. Matura residential development connection points.

The Gore residential area was connected at manhole 2287 on Charlton Road for wastewater and 20091124094805 on Coutts Road for stormwater (Figure 4-6). It is noted that the wastewater connection would require additional infrastructure across private property. The feasibility of this will require further investigation. A wastewater connection point of 20070219145140 on Coutts Road was originally considered. However, due to the downstream capacity constraints an alternative connection point was used.



Figure 4-6. Gore residential development connection point.

4.2.1 Industrial Areas

Given that there is uncertainty regarding the servicing capacity of industrial development areas in the Gore District, two scenarios were considered. The first assumed the entire area will be developed as light industrial and the other assumed assuming the entire area will be developed as heavy industrial. This indicates the potential range of wastewater flows from the area. The resulting trade flow for each scenario is detailed in Table 4-2.

Table 4-2. Details of the Mataura South area and the trade waste flows calculated.

Development Area	Area (ha)	Scenario	Design Flow (L/s/ha)	Trade Flow (L/s)
Mataura South	126.34	Light	0.4	51
		Heavy	1.3	164
Gore South	86.66	Light	0.4	36
		Heavy	1.3	117

The Gore industrial area had an assumed connection point at manhole 1377 on the Gore-Mataura Highway (Figure 4-7).



Figure 4-7. Gore industrial development connection point.

The Matura industrial area had an assumed connection point at manhole 1005 on Main St (Figure 4-8).



Figure 4-8 Matura industrial development connection point.

5 Wastewater Results

The predicted change in wastewater network performance is described in the following section.

5.1 Trade Flows

5.1.1 Matura South

The flows calculated for the development are very high compared to the terminal pump station capacity. Trade flows are 51 L/s (light industry) or 164 L/s (heavy industry), whereas the terminal pump station has a peak capacity of 106 L/s.

The terminal pump station is already predicted to be at capacity during WWF. Therefore, the addition of these trade flows will require a significant upgrade of this pump station.

5.1.2 Gore South

When light trade flows were simulated for the industrial development in Gore, the existing network had sufficient capacity, as shown in the pipe long section in Figure 5-1. The

terminal pump station has a peak capacity of 200 L/s, and the maximum upstream flow is 180 L/s. Therefore, the current system has the capacity to accept the light industrial flows.

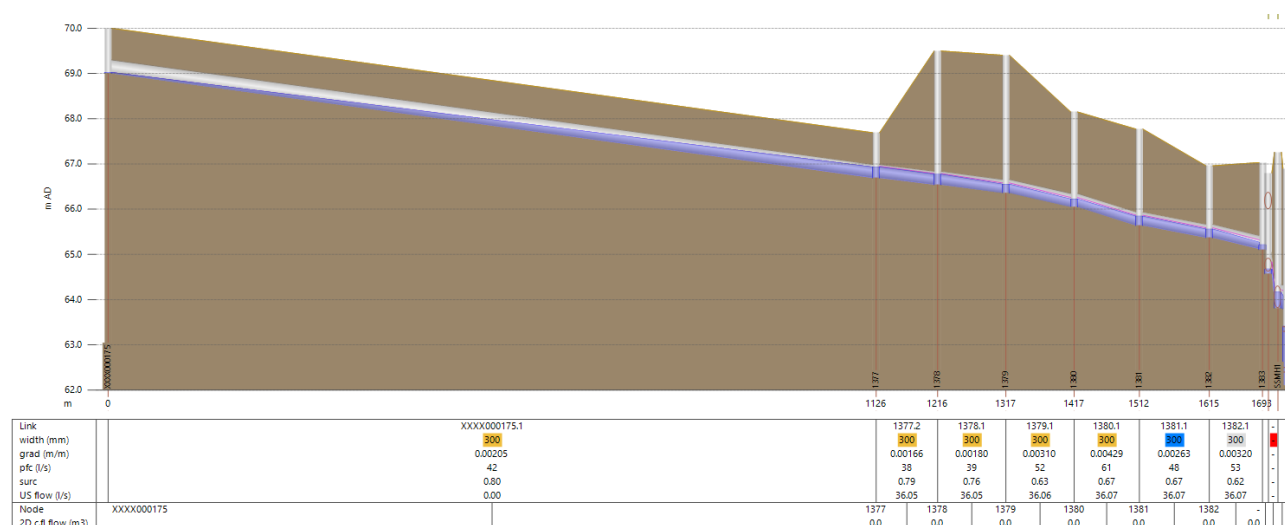


Figure 5-1. Pipe long section along Gore-Mataura Highway to terminal pump station with the light industrial flows.

When the heavy industrial flows were run, given that the maximum upstream flow into the pump station was 137 L/s, and the industrial flows would introduce a further 117 L/s, the terminal pump station will not have the capacity to accept the flows. Therefore, the addition of these trade flows will require a significant upgrade of the downstream pipes and pump station.

The following long section shows the pipe long section for the heavy industrial flows (Figure 5-2).

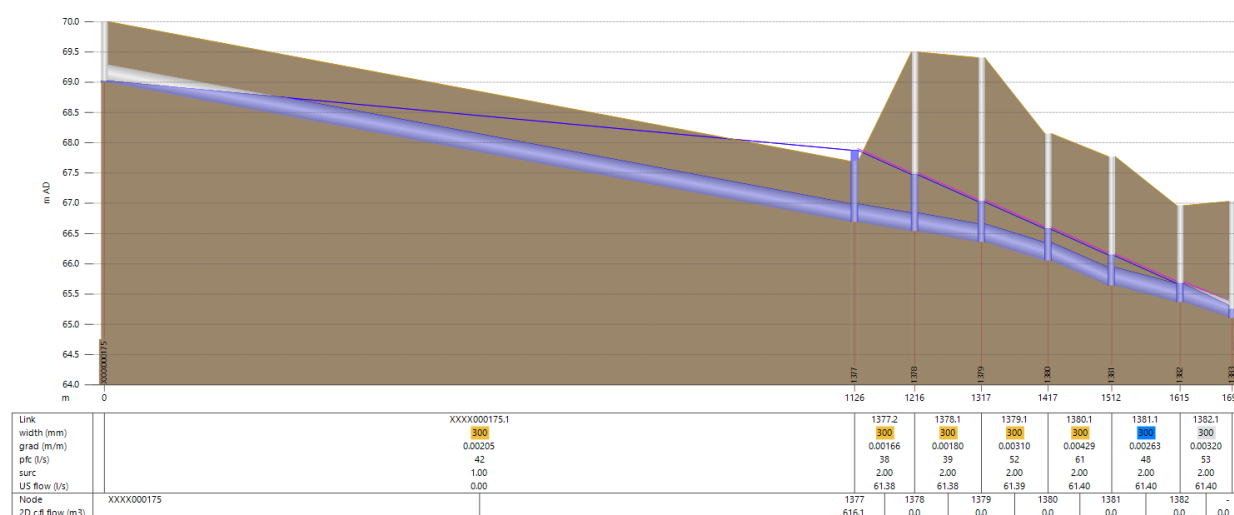


Figure 5-2. Pipe long section along Gore-Mataura Highway to terminal pump station with the heavy industrial flows.

5.2 Residential Dry Weather

No issues are predicted in the gravity networks downstream of the residential developments in either Gore or Mataura.

5.1 Residential Wet Weather

5.1.1 Gore – 50% AEP design rainfall event

When the additional development was connected to the network at manhole 2287, the spill volume from ten existing overflowing manholes were predicted to increase. Four new manhole overflows were also predicted and were caused by the new development flows. For more details refer to Table 5-1 and Figure 5-3.

Table 5-1: Change in predicted manhole overflow spill volume during a 50% AEP 1-hour design rainfall event

Model ID	Type	Increase in Spill Volume (m ³)	Percentage Increase
2287	Manhole	84.7	New
2236	Manhole	4.7	14%
20091125115852	Manhole	1.9	1900%
2238	Manhole	1.8	6%
2235	Manhole	1	3%
1444	Manhole	0.7	1%
2241	Manhole	0.5	4%
2143	Manhole	0.1	0%



Figure 5-3. Location of manholes where there is a predicted increase in spill volume during a 50% AEP 1-hour design rainfall event in Gore.

5.1.2 Mataura - 50% AEP design rainfall event

When the residential development was connected to the network at manhole 1082, the spill volume from 26 existing overflowing manholes were predicted to increase by greater than 1%. This is detailed in Table 5-2 and Figure 5-4.

Table 5-2: Change in predicted manhole overflow spill volume for the twenty manholes with > 1% increase in spill volume during a 50% AEP 1-hour design rainfall event

Model ID	Type	Increase in Spill Volume (m ³)	Percentage Increase
1118	Manhole	0.2	200%
20111006152732	Manhole	11.4	120%
1081	Manhole	57.7	16%
20060223085159	Manhole	9.7	13%
20100824094303	Manhole	2.9	9%
20100915094621	Manhole	36.9	8%

1142	Manhole	0.2	5%
2611	Manhole	0.9	5%
1062	Manhole	0.2	5%
20060223084859	Manhole	1.1	4%
1059	Manhole	0.5	2%
1094	Manhole	0.1	2%
1024	Manhole	4.3	2%
1179	Manhole	0.3	2%
1175	Manhole	0.4	2%
1007	Manhole	0.3	2%
1077	Manhole	0.1	2%
1139	Manhole	0.6	1%
20111006112551	Manhole	0.1	1%
1054	Manhole	0.1	1%
20111006092520	Manhole	0.1	1%
1115	Manhole	0.2	1%
20111005170223	Manhole	0.1	1%
1003	Manhole	1.7	1%
1121	Manhole	0.2	1%
20111005165717	Manhole	0.2	1%



Figure 5-4: Location of 28 manholes where there was a predicted increase in spill volume greater than 1% during a 50% AEP 1-hour design rainfall event.

The peak incoming flows to the pump station on Bridge Street was 59 L/s. Given that the maximum pump capacity 34 L/s it will be insufficient to pump the catchment flows. This causes existing surcharging and manhole overflows upstream of the pump station. These overflow volumes increase because of the addition of the development flow.

Similarly, the flow from the network upstream of the terminal pump peaks at 178 L/s. This also exceeds the current total pumping capacity of 110 L/s. This causes existing surcharging and manhole overflows upstream of the pump station. These overflow volumes also increase because of the addition of the development flow.

6 Stormwater Results

The predicted impact on the stormwater network performance is described in the following section.

6.1 Gore – 20% AEP design rainfall event

The peak stormwater outflow modelled from the proposed residential development site in Gore is 2,436 L/s (Figure 6-1).

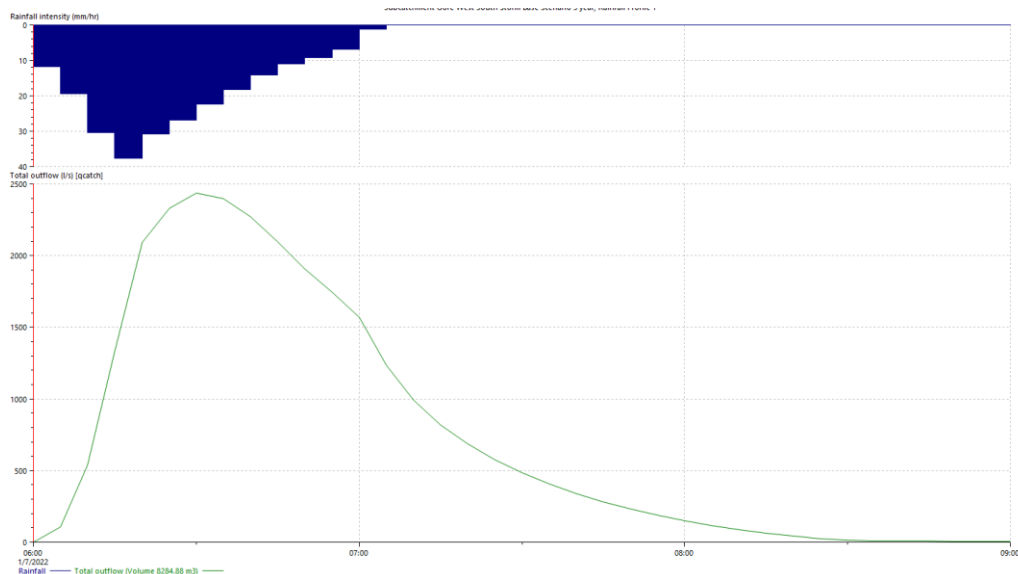


Figure 6-1 Total stormwater outflow from the proposed residential development area in Gore.

The predicted flood extent, as well as the increase in existing flood extent due to the residential development flows are shown in Figure 6-2.

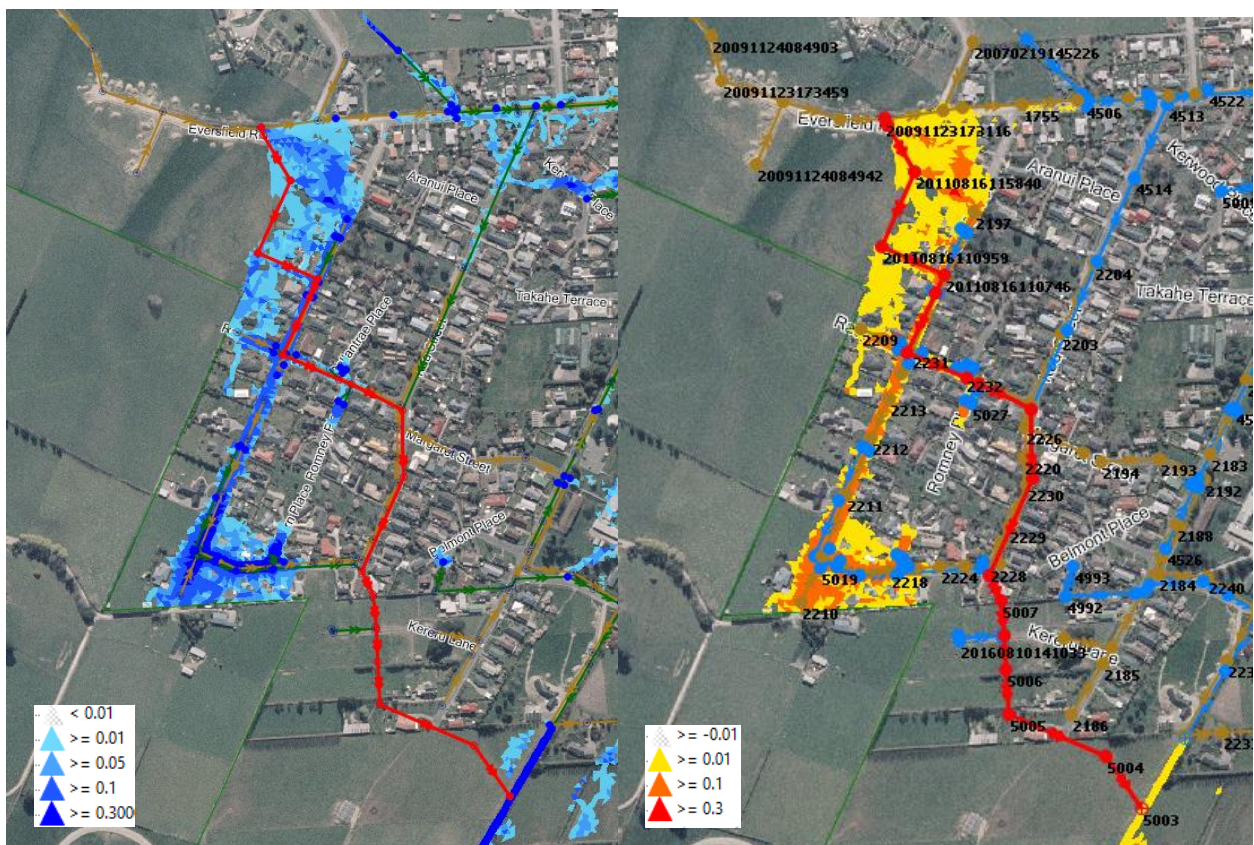


Figure 6-2. Predicted flood extents (m) with the development added (left) and increase in flood depth (right) for Gore.

The peak stormwater outflow modelled from the proposed industrial development site in Mataura is 2,125 L/s (Figure 6-3Figure 6-4).

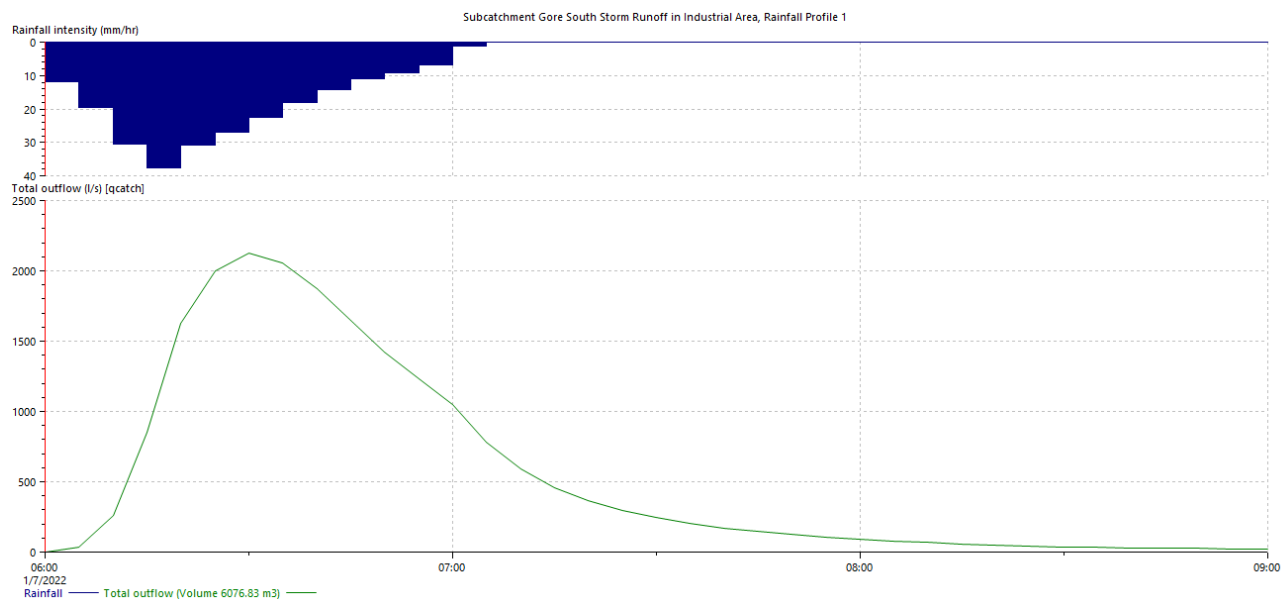


Figure 6-3. Total stormwater outflow from the proposed industrial development area in Gore.

6.2 Mataura – 20% AEP design rainfall event

The peak stormwater outflow modelled from the proposed residential development site in Mataura is 793 L/s (Figure 6-4).

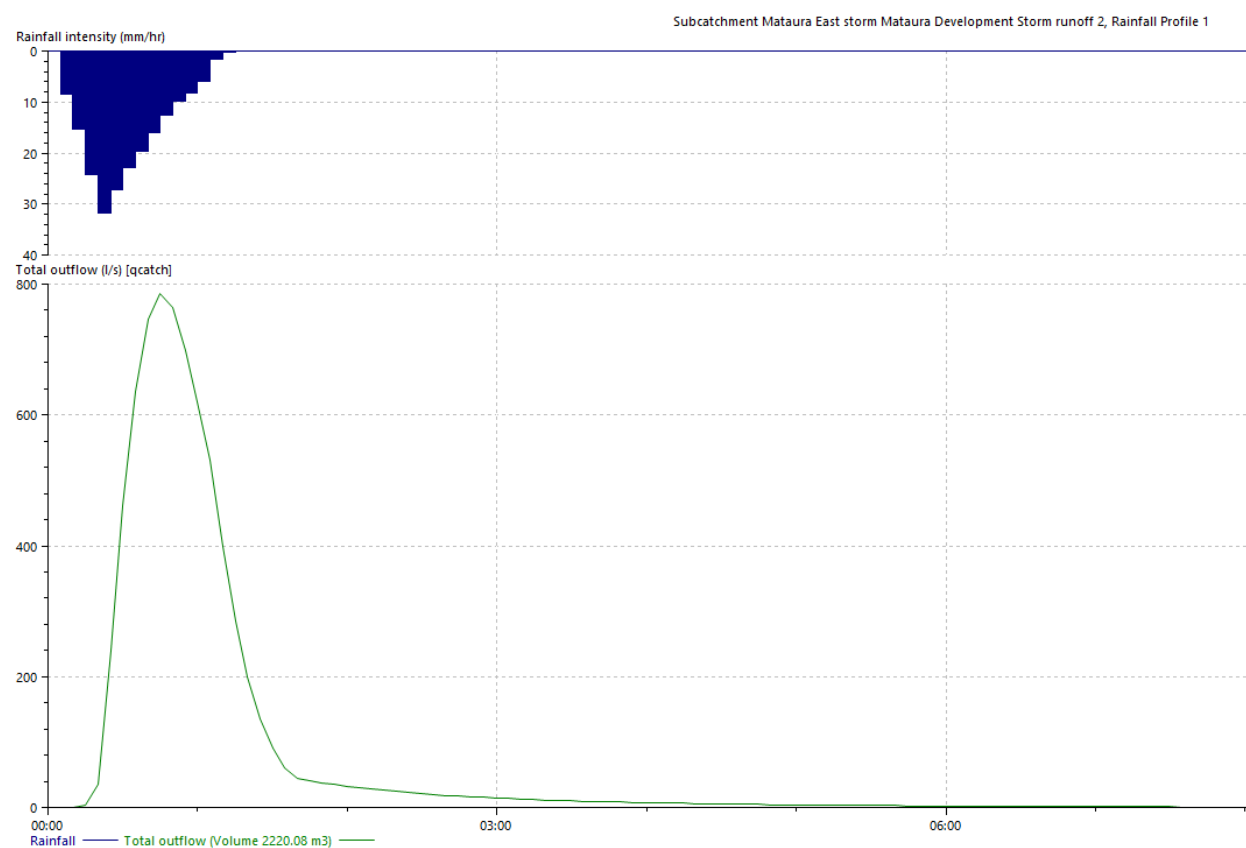


Figure 6-4. Total stormwater outflow from the proposed residential development area in Mataura.

The predicted flood extent, as well as the increase in existing flood extent due to development flows is shown in Figure 6-5.

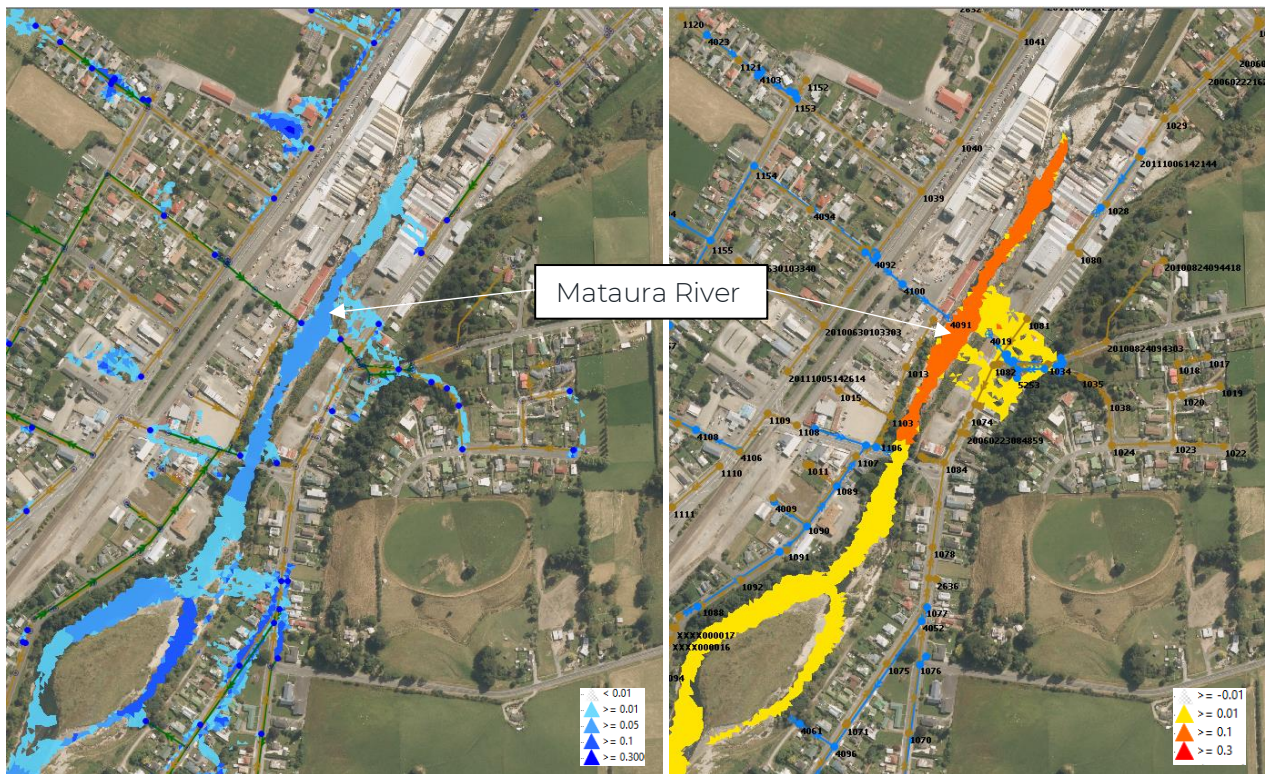


Figure 6-5. Predicted flood extents (m) with the development added (left) and increase in flood depth (right) for Matura. Note the increased depths in the river are not representative.

The peak stormwater outflow modelled from the proposed industrial development site in Matura is 1,461 L/s (Figure 6-6).

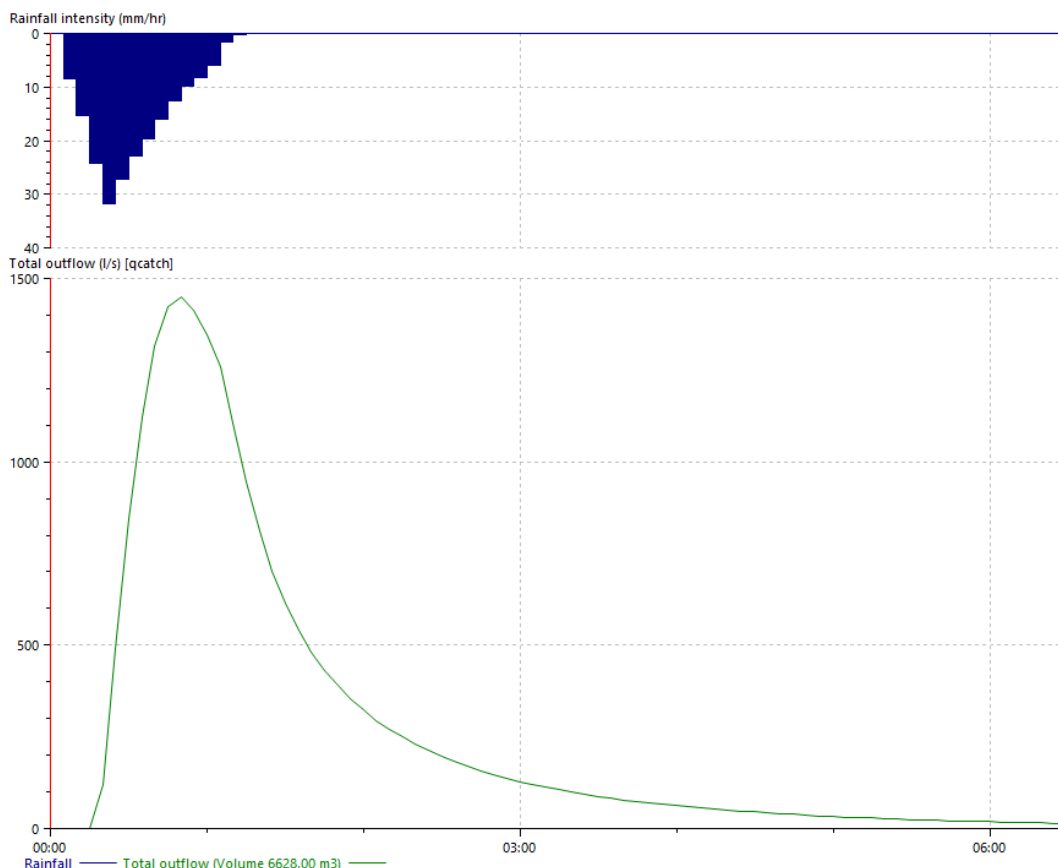


Figure 6-6. Total stormwater outflow from the proposed industrial development area in Matura.

7 Recommended Wastewater Solutions

As a result of the proposed developments in Gore and Mataura, there is an overall increase in manhole spill volumes across the wastewater networks which are to be addressed. This was due to the increased volume of wastewater coming from the development areas into the wastewater networks which are already at capacity. Given that the networks are unable to convey these increased flows, a larger volume of wastewater was spilled from the manholes. To address this, one high-level solution for each of Gore and Mataura were identified.

7.1 Gore

7.1.1 Gore Residential

To maintain the existing level of service in Gore with the addition of the residential flows, the following upgrades are recommended:

- Connect the Gore West residential area to manhole 2287.
- Upgrade 500 m of DN150 pipeline on Charlton Road to DN225.
- Upgrade a further 315 m on Charlton Road and Oreti Street of DN300 pipeline to DN375

Following these upgrades, manhole 2290 will no longer overflow. The required upgrades are indicated in Figure 7-1 below, and a summary is presented in Table 7-1. Figure 7-2 shows the pipe long section after the upgrades were applied.

Table 7-1. Wastewater pipe assets to be upgraded in Gore to service the residential development.

Asset ID	Length	Existing Diameter (mm)	Proposed Diameter (mm)
2287-2291	120.7	150	225
2288-2292	141.6	150	225
2291-2288	121.7	150	225
2292-2305	122.1	150	225
2303-2259	104.5	300	375
2304-2303	76.4	300	375
2305-2306	45.9	300	375
2306-2304	88.6	300	375

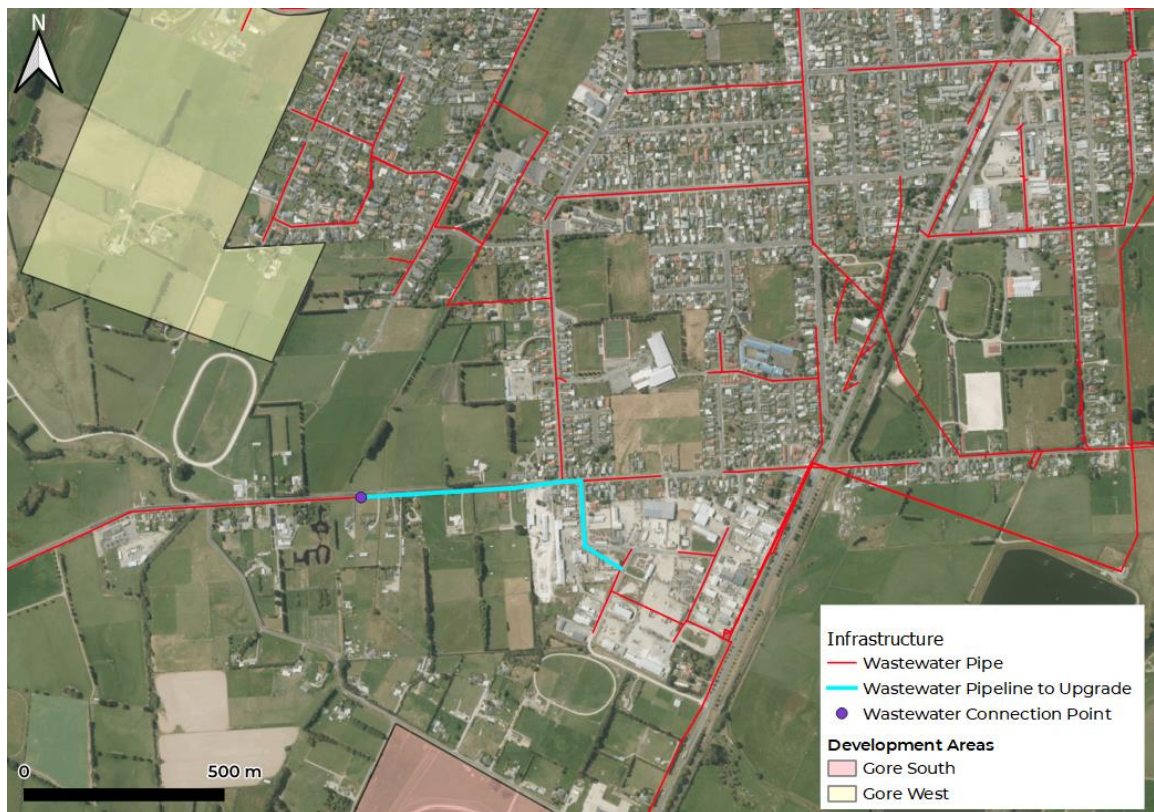


Figure 7-1. Connection point and required upgrades proposed for Gore West Development.

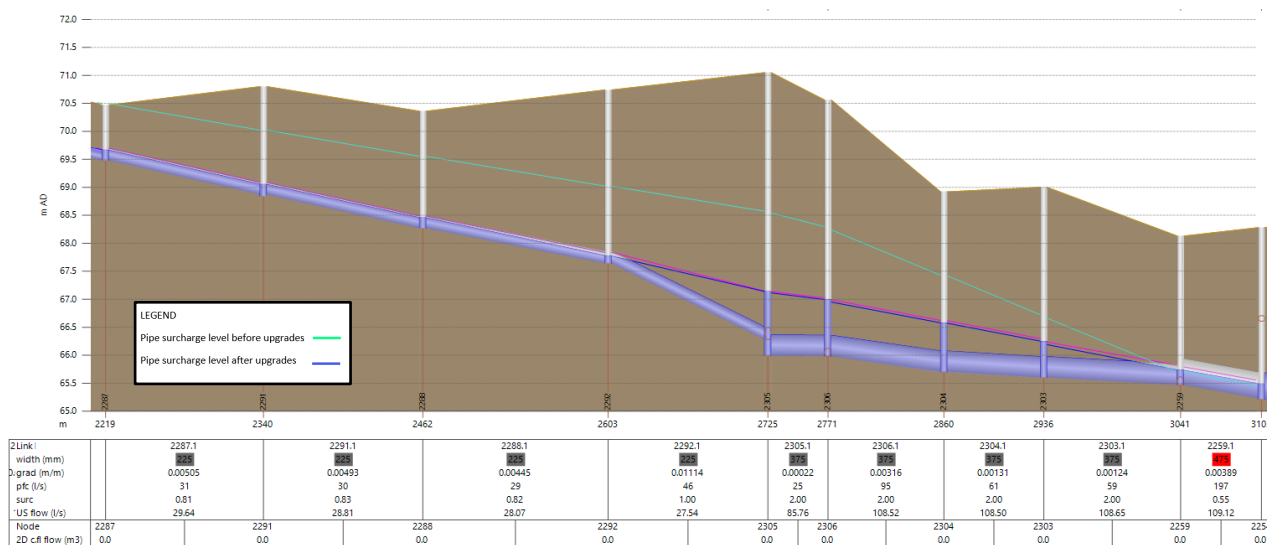


Figure 7-2. Long section showing pipe along Charlton Road and Oreti Street before and after upgrades.

As a result of upgrades, the manhole overflows are mostly resolved, with only some minor residual overflows increase remaining (Table 7-2 and Figure 7-3).

Table 7-2. Manhole with spill volumes that increase from baseline following upgrades.

Model ID	Type	Increase in Spill Volume (m ³)	Percentage Increase
2295	Manhole	0.1	1%
2143	Manhole	0.1	0%



Figure 7-3. Manhole with spill volumes that increase from baseline following upgrades.

Alternative options explored were the connection to the manhole closest to the development on Coutts Road (ID: 20070219145140) or the connection to the system at manhole ID 2259 on Waiau Street. The connection at Coutts Road required significant pipe upgrades downstream of the connection point (approximately 2.4 km). A connection at Waiau Street would require significant lengths of new pipework between the development area and the connection point, which would be impractical.

7.1.2 Gore Industrial

The wastewater system is predicted to have capacity for the light industrial flows.

To ensure that the system has capacity to accept the heavy industrial flows, the following upgrades are recommended:

- Connect the Gore South industrial development to manhole 1377.
- Upgrade 575 m of DN300 pipes along Gore-Mataura Highway and Charlton Lane to DN450.
- Upgrade the terminal pump station from maximum pumping capacity of 200 L/s to 254 L/s.

Following these upgrades, manhole 1377 will no longer overflow. The required upgrades are indicated in Figure 7-4 below, and a summary is presented in Table 7-3. Figure 7-5 shows the pipe long section after the upgrades were applied.

Table 7-3. Wastewater pipe assets to be upgraded in Gore to service the industrial development (heavy flows).

Asset ID	Length	Existing Diameter (mm)	Proposed Diameter (mm)
1377-1378	90.16	300	450
1378-1379	100.1	300	450
1379-1380	100.1	300	450
1380-1381	95.6	300	450
1381-1382	102.6	300	450
1382-1383	78.1	300	450
1383-SSMH10	8.6	300	450



Figure 7-4. Connection point and required upgrades proposed for Gore South Development.

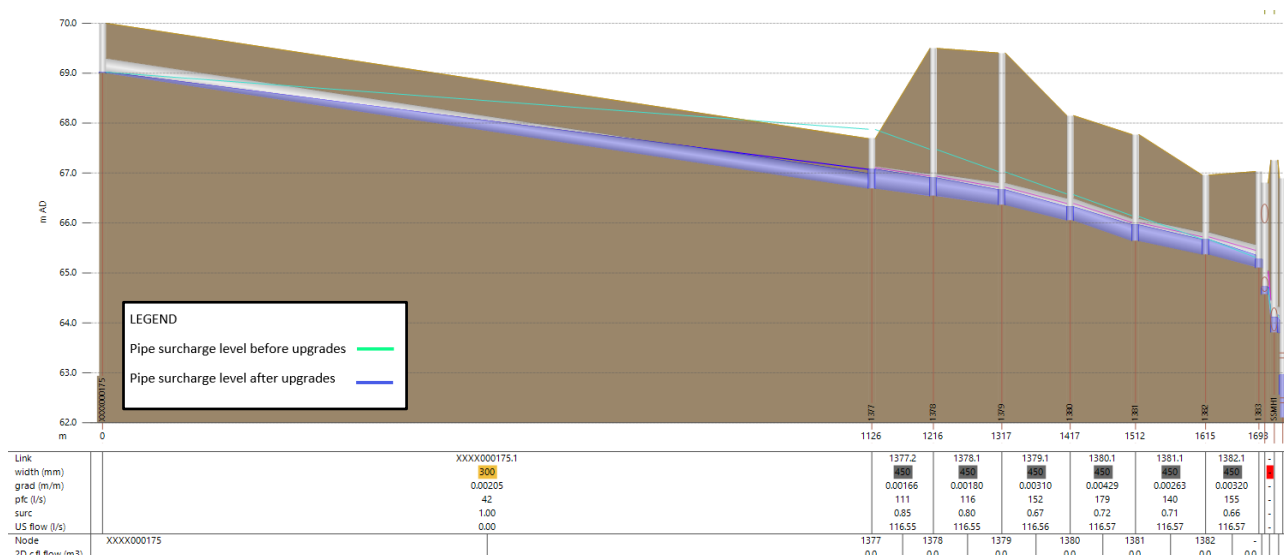


Figure 7-5. Long section showing pipe along Gore-Mataura Highway and Charlton Lane before and after upgrades.

7.2 Mataura

It is recommended that the wastewater flows from the Mataura South industrial development are sent directly to the wastewater treatment plant, given that the system is already at capacity.

To achieve or overall improve on the existing level of service in Mataura with the addition of the residential flows, the following upgrades are recommended:

- Connect the Mataura East residential area to manhole 1082
- Upgrade approximately 1,600 m of pipeline from the connection point to the WWTP pump.
- Upgrade the pump rate of two pumps in the network and the associated rising mains

The required upgrades are indicated in Figure 7-6 below, and a summary is presented in Table 7-4 and Table 7-5. Figure 7-7 and Figure 7-8 show the pipe long section after the upgrades were applied.

We have not assessed the physical sizing requirement for the proposed pump station upgrades. Where the future flow rate is significantly higher than the current flow rate, the current wet well may not be able to accommodate the larger pumps required.

Table 7-4. Wastewater pipe assets to be upgraded in Mataura.

Asset ID	Length (m)	Existing Width (mm)	Upgraded Width (mm)
1004-1003	70.9	375	450
1079-1080	15.2	150	225
1074-1084	27.9	225	300
1082-1074	63.1	225	300
1084-1085	29	300	450
1108-1109	47.1	300	375
1109-1126	70	300	375
1126-1127	99.3	300	375
1127-1158	91.2	300	375
1158-1160	115.6	300	375
1160-1161	42.8	450	525

1161-1162	83.2	450	525
1162-1163	82.8	450	525
1163-1164	80.5	450	525
1164-1165	10.4	450	525
1165-1166	82.5	450	525
1166-1167	50.9	450	525
1167-1168	99	450	525
1168-1169	98.3	450	525
1169-1170	105.9	450	525
1170-1171	72	450	525
1171-1172	101.7	450	525
1172-1004	2.4	375	450
20100915094715	5.6	300	450
1082-1074	18.3	225	300
1074-1084	50.3	225	300

The approximate size of the rising main was estimated based on the model flow rates and typical design velocity (1 m/s).

Table 7-5. The pump upgrades required for the Mataura wastewater network.

Upstream and Downstream Node IDs	Existing maximum pump capacity (L/s)	Upgraded maximum pump capacity (L/s)	Upgraded Rising Main Diameter (mm)
1085-1108	34	68	300
1072-1005	106	233	600

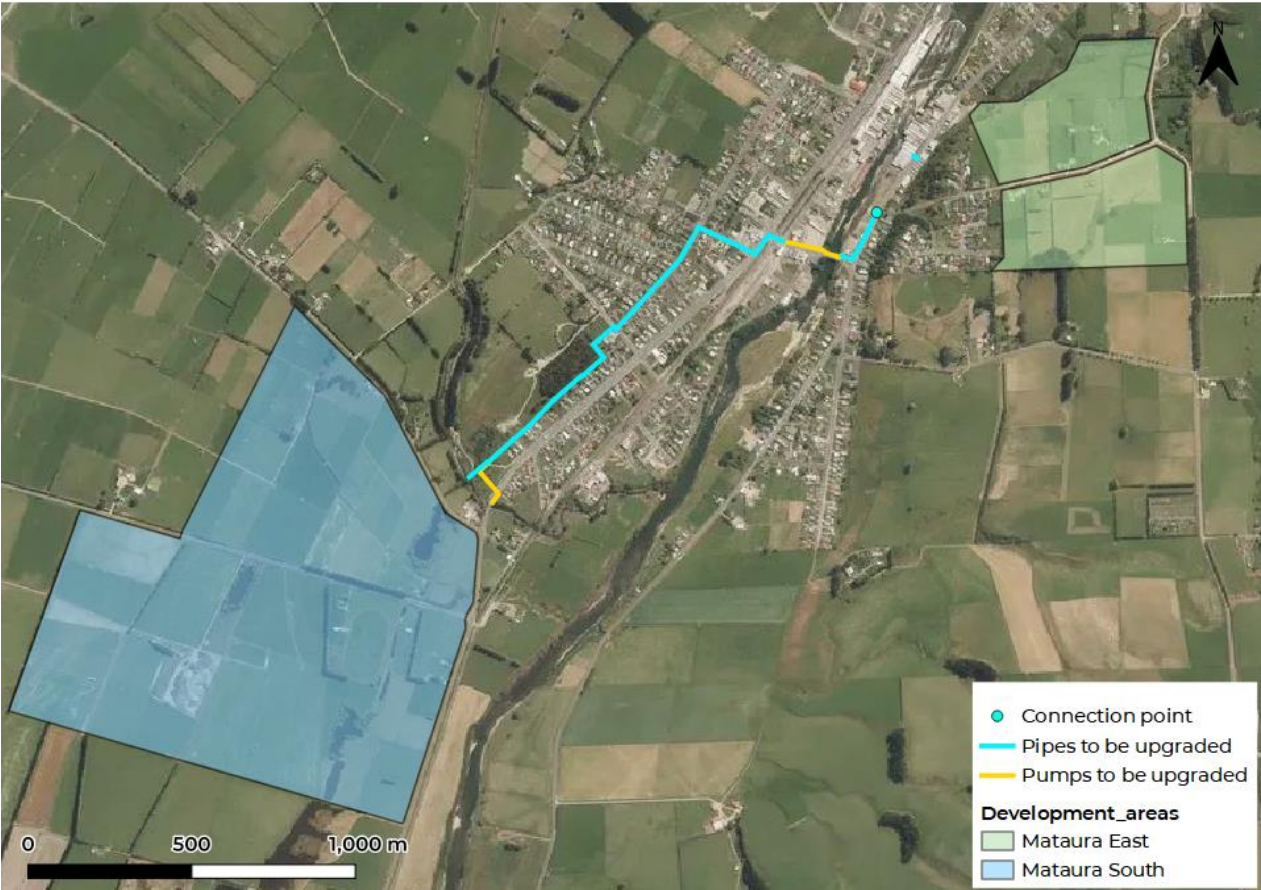


Figure 7-6. Connection point and required upgrades proposed to service the Matura East Development.

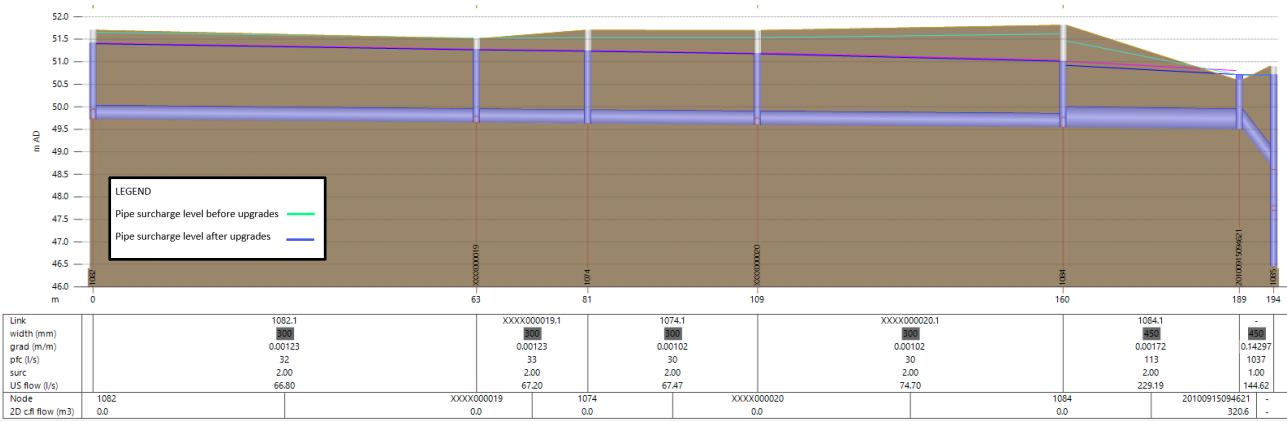


Figure 7-7. Long section showing pipe along Kana Street after upgrades

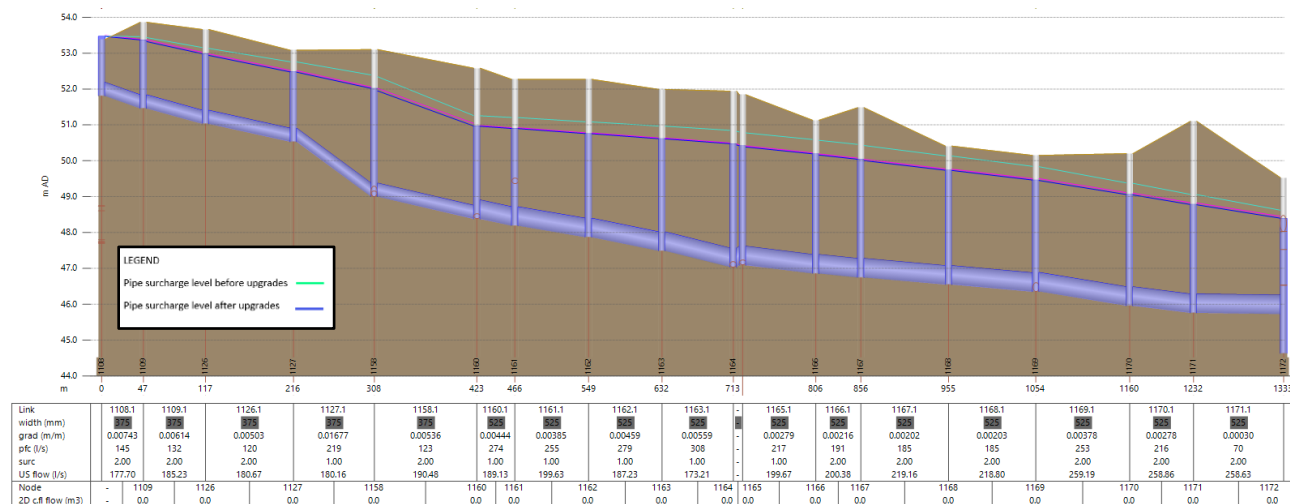


Figure 7-8. Long section showing pipe along Carlyle Street towards WTP after upgrades (pt. 1).

As a result of upgrades, the manhole overflows are mostly resolved, with only some minor residual overflow increases remaining (

Table 7-6 and Figure 7-9).

Table 7-6. Manhole with spill volumes that increase from baseline following upgrades.

Model ID	Type	Increase in Spill Volume (m ³)	Percentage Increase
1022	Manhole	2	2%
1094	Manhole	0.1	2%
1038	Manhole	1	1%
20111006135800	Manhole	0.1	1%
20100824094303	Manhole	0.2	1%
2611	Manhole	0.1	1%
1112	Manhole	0.1	0%
1016	Manhole	0.5	0%
1032	Manhole	0.1	0%
2614	Manhole	0.1	0%



Figure 7-9. Manhole with spill volumes that increase from baseline following upgrades.

8 Recommended Stormwater Solutions

8.1 Gore

The current stormwater system adjacent to the residential development is at capacity. Therefore, we recommend that the storm flows are attenuated on site to maintain the existing peak flows from the site.

There is no stormwater system within the vicinity of the trade development. Therefore, we recommend that the storm flows are conveyed to the Mataura River directly.

8.2 Mataura

The current stormwater system adjacent to the residential development is at capacity. Therefore, we recommend that the storm flows from the residential development are conveyed to Mataura River directly.

There is no stormwater system within the vicinity of the trade development. Therefore, it is recommended that the storm flows are conveyed to the Mataura River directly.

8.3 General

For any new discharges to the Mataura River, we recommend GDC liaise with Environment Southland to ensure that the discharge comply with new Regional Plan requirements.

9 Exclusions

- We have not considered whether the wastewater treatment plant has the capacity to accept flow from the development, or any increase in catchment flows due to upgrades.
- We have not considered the specific requirements of how the development will connect to the existing wastewater system.
- We have only considered the existing wastewater network operation with the additional demand from the proposed development. We have not accounted for any additional developments and their impact on the wastewater network.
- The pipeline to the Mataura WWTP is identified as a 375 mm gravity pipe in the model but it is 2328 m long with no manholes and the upstream manhole is sealed. This suggests that at the time of the original model build no information was available for this pipeline, so it was modelled in a simple manner or that it is actually a pressure pipe. Due to there being uncertainty around the details of this pipeline it has not been included in this assessment. We recommend that GDC confirm the operation of this pipeline (e.g. gravity or pressure) and the model is updated accordingly.

10 References

Opus. (2012). *Gore Design Rainfall Analysis Report*.
Opus. (2012). *Gore Wastewater and Stormwater Model Build and Calibration Report*.
The Property Group. (2022). *Growth Area Servicing Scoping Assessment*.

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