

IN THE MATTER of the Resource Management Act
1991

AND

IN THE MATTER of Proposed Private Plan Change 2
to the Hamilton City Operative
District Plan: Te Awa Lakes Private
Plan Change

**STATEMENT OF EVIDENCE OF NEILL EMERSON RAYNOR FOR THE APPLICANT
(WATER AND WASTEWATER)
29 OCTOBER 2019**

1. EXECUTIVE SUMMARY

- 1.1 Wastewater services on the site are currently serviced with an individual grinder pump solution connecting to a rising main that runs from the site to Maui St in Hamilton. This was installed as part of the IDP process in 2014. The design and sizing of all three waters infrastructure needed to be undertaken for the whole 62ha site, which included the additional stages of development under the IDP.
- 1.2 There is capacity within the Far Western Interceptor for wastewater flows from the development. However, as the proposed development progresses and flows increase, the capacity of the existing 110mm rising main, that connects to gravity reticulation in Maui Street, will be reached. At this capacity, an additional rising main will be required and will extend from the site to connect to the Far Western Interceptor, which can be addressed through future consenting processes.
- 1.3 In terms of internal reticulation of wastewater, the site could either be serviced by a conventional gravity reticulation with a pump station to transfer sewage from lower areas to the receiving system; or alternatively, through the use of a low pressure sewage system with individual grinder pumps on each property connected to common rising mains within the road.
- 1.4 Water supply services were also extended and connected to the site following the approval of the IDP in 2014. As part of that, a water supply pipe was installed to the Hutchinson Road area of the site to provide for the service station development.
- 1.5 Modelling for the 2021 horizon showed that full demand from the Te Awa Lakes development can be met, including fire flows of 50 litres per second, using existing water reticulation to the site, and the current proposed pipes of a single 150mm dia and a single 250mm dia trunk main. The 2061 modelled demand on the overall water reticulation network was not expected to be impacted by the Te Awa Lakes development and the assumed additional industrial development.
- 1.6 The modelling undertaken confirms that there is more than sufficient capacity within the existing Hamilton City Council's bulk water infrastructure to service the Te Awa Lakes development and assumed industrial development out to 2061. Additional connection capacity between the Hamilton City Council infrastructure and the site can be provided through the future consenting and design phases when the level of development requires it.

2. QUALIFICATIONS AND EXPERIENCE

- 2.1 My full name is Neill Emerson Raynor.
- 2.2 I am a Technical Director, Water and Land Development at Aurecon New Zealand Limited. My qualifications are a New Zealand Certificate in Engineering (Civil) from Waikato Technical Institute and a Bachelor of Engineering (Civil) from University of Auckland. I am also a member of EngNZ and a Chartered Professional Engineer.
- 2.3 I have 30 years' experience working as a civil engineer with experience in land development and three waters management. This includes large urban development such as the Tauriko Business Estate in Tauranga, Coast Development in Papamoa, Holy Oaks Development at Kinloch, and the Prestons Development in Christchurch.
- 2.4 I have been engaged by the Applicant since June 2017. I led the water and wastewater assessments for the HASHA applications for the site and had commenced the consent design prior to that process being placed on hold following the Minister's decision on the applications.
- 2.5 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and to the extent that I am giving expert evidence, have complied with it in preparing this evidence. I confirm that the issues addressed in this evidence are within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

3. SCOPE OF EVIDENCE

- 3.1 I have been asked to provide evidence in relation to the water supply reticulation and the wastewater reticulation and disposal to be provided to service the development enabled through Proposed Plan Change 2 to the Hamilton City District Plan: Te Awa Lakes (PPC2).
- 3.2 My evidence will cover the following matters:
- a) Relevant facts and context;
 - b) Summary of technical data / analyses;
 - c) Expert caucusing;

- d) Comments on the Section 42A Report;
- e) Comments on submissions;
- f) Conclusions.

4. RELEVANT FACTS AND CONTEXT

- 4.1 In this statement of evidence I do not repeat the description of the plan change and refer to the summary of the application in the evidence of John Olliver for the Applicant.

5. SUMMARY OF TECHNICAL DATA / ANALYSES

Wastewater

Existing on-site wastewater services

- 5.1 The site is currently serviced with an individual grinder pump solution connecting to a rising main that runs from the site to Maui St in Hamilton. The rising main is a 110mm Outside Diameter Polyethylene (*OD PE*) line. This currently services the existing service centre and the industrial lots created directly off Hutchinson Road as stage 1 of the Indicative Development Plan (IDP) approval in 2014. While the IDP only provided for the development of 30 ha of the site, a condition of that consent was that the design and sizing of all three waters infrastructure needed to be undertaken for the whole site, which included the additional stages of development under the IDP.
- 5.2 The current rising main discharge point on Maui St has limited capacity and Hamilton City Council have limited discharge rates at this point to a maximum of 2 l/s. To provide for the full proposed development of the land under the IDP, the rising main will require an 800m extension to the interceptor main which is the accepted receiving location for the wastewater flows as detailed in paragraph 5.4 below.

Proposed wastewater generation / demands

- 5.3 Due to the change in proposed land use, and as part of the HASHA application, an initial assessment of the demand created by up to 1500 residential lots, 2.7ha of commercial, 3.6ha of Tourism, 16.2ha of Adventure Park was undertaken and provided to Hamilton City's consultants to test within the network model. This was considered to be more than could reasonably be achieved, however it enabled a

potential worst-case scenario to assess and is therefore conservative in terms of PPC2.

5.4 A wastewater flow calculation was assessed based in the Hamilton Infrastructure Technical Specification (HITS) that was current at the time of the assessment. This was based on:

- 2.8 persons per dwelling (residential).
- 45 persons / ha (commercial and tourism).
- 2 persons / ha (tourism).
- 200 Litres/person/day.
- Infiltration allowance of 2250 L/ha/day.
- Surface water ingress of 16500 L/ha/day.
- Peaking Factors as prescribed in Section 5.2.4 of the HITS

5.5 This combination provided 1.03 million litres per day total Average Day Flow and a Peak Daily flow of 32.5 litres per second. Peak Wet Weather Flow converts to 43.1 litres per second. Those assumptions were provided to HCC to confirm that they reflect a realistic estimate of potential demand. HCC engaged their consultants Aecom to undertake the testing by their hydraulic model. Aecom stated in their summary letter that the HCC Infrastructure Technical Specifications (ITS) method yields a peak wet weather flowrate (i.e. pump rate) of 44 l/s which confirms our assessment.

Existing receiving system

5.6 The final receiving main is the Far Western Interceptor at existing manhole WWK 11001. This is located within Maui Street where the Interceptor crosses Maui Street on its route to the Pukete WWTP.

Modelling of the effect of proposed development on the existing network

5.7 HCC's wastewater network modellers, Aecom, added the additional catchment demand to the Hamilton City model and tested the impact of the proposed development on the Hamilton City network. Aecom allowed for their estimated 44

litres per second at Peak Wet Weather Flow, and added an additional 50% for conservatism, modelling a peak flow rate of 66 litres per second. They modelled a 4.5 day duration that include the largest wet weather event in the 10 year rainfall time series being 23 January 2011.

- 5.8 Their assessment confirmed that the least capacity in an individual section of pipe the Interceptor downstream of Maui Street is 73 litres per second prior to the Te Awa lakes connection being added. This critical pipe length increases to 78% of its full capacity after adding the modelled Te Awa Lakes peak discharge of 66 litres per second.
- 5.9 Aecom also confirmed that there were no manhole overflows within the vicinity of the connection and the maximum flow levels in the Far Western Interceptor remains below pipe full.

Required upgrades

- 5.10 Therefore there is capacity within the Far Western Interceptor for flows from the development. However, as the proposed development progresses and flows increase, the capacity of the existing 110mm rising main, that connects to gravity reticulation in Maui Street, will be reached at the equivalent to 2475 persons, approximately 50% of the total development. At this capacity, an additional rising main will be required and will extend from the site to connect to the Far Western Interceptor. A trigger will be required to specify the point at which the wastewater network needs to be upgraded, which can be addressed through future consents for the site (and any private developer agreements for infrastructure outside the RMA process).
- 5.11 As the proposed development fills to its full capacity, the flows can be switched from the current flow to the second (larger flow) and, as growth occurs, can then utilise both rising mains. This twin main solution allows for a wastewater outlet at all times for any maintenance that may be required on one of the mains. A single pump station is anticipated to take the development flows and pump to the Far Western Interceptor.

Internal reticulation options

- 5.12 The current HCC Regional Infrastructure Technical Specification (RITS) allows conventional gravity reticulation with a pump station to transfer sewage from lower areas to the receiving system. For the current layout of the proposed development,

this would require two or three internal pump stations and a larger pump station delivering flow to the Interceptor. The final layout, land form design and acceptable depths of gravity sewers will determine the final number of internal pump stations.

- 5.13 Alternatively, the site would also benefit from the use of a low pressure sewage system with individual grinder pumps on each property connected to common rising mains within the road. HCC are developing a policy that could apply to the use of this type of system. A SMART telemetry linked system can manage the individual pump stations to manage peak flows to benefit the conveyance and receiving networks. There are many other advantages to this type of system as well. However, the servicing of this development for wastewater is not dependent on the use of a low pressure wastewater system.

Conclusion on wastewater services and infrastructure effects

- 5.14 There is sufficient capacity within the HCC's existing bulk infrastructure to service the proposed development. A second rising main to that infrastructure will be required when the development reaches a full time people equivalent of around 2,475, which can be controlled through the consenting process.

Water Supply

Existing water supply

- 5.15 Water supply services were extended and connected to the site following the approval of the IDP in 2014. As part of that, a water supply pipe was installed to the Hutchinson Road area of the site to provide for the service station development. This pipeline was modelled by AWT in 2013 on the basis it would serve 150 hectares of industrial development. The AWT report confirmed that this demand would not negatively impact other users within Te Rapa, including the Fonterra dairy factory.

Proposed water generation

- 5.16 An assessment of the likely water supply demand has been undertaken for the proposed development based on the HITS. The HITS provides that a figure of 260 Litres/person/day with a peak flow of 5 x this amount should be used to model domestic demand (Section 6.2.3 of HITS).
- 5.17 For the residential lots, due to the size of the lots and proposed dwellings, a number of 2.8 persons per dwelling (the same as for the wastewater assessment) has been

used, resulting in a peak demand of 1.09 million litres per day at a peak flow of 63.2 litres per second (using a peaking factor of 5).

- 5.18 The alternative uses proposed were assessed based on a number of sources including Auckland Regional Council Technical Publication No. 58 On-site Wastewater Systems: Design and Management Manual (TP 58). There is a relationship between water demand and wastewater generated for urban land uses. The resulting demand flows are determined as follows:
- 5.19 Commercial Precinct demand was assumed to be 2.7 ha at 0.9 litres/sec/ha requiring 2.4 litres per second including a peaking factor. This is higher than the wastewater generation calculated by the RITS for 30 people per ha at 200l/sec per person per day with allowance for infiltration, inflow and peaking factors, but consistent with US EPA Onsite Wastewater Treatment Systems Manual. The Tauranga City Council Infrastructure Development Code recommends 0.75 l/sec per hectare. Due to the unknown commercial uses of the land a factor of 1.2 was applied to the TCC IDC flow.
- 5.20 Tourism Precinct demand was assumed to be 3.6 ha at 1.5 litres/sec/ha requiring 5.4 litres per second including a peaking factor. This was assessed using TP 58 for wastewater flows per guest and 2.5 guests per unit on average. A factor of 1.2 was applied to the wastewater generation to allow for the additional water not converted to wastewater.
- 5.21 Adventure Park Precinct demand was assumed to be 16.1 ha at 0.9 litres/sec/ha requiring 14.5 litres per second including a peaking factor. This is a specific use area and the Commercial precinct flows were considered to be transferable, however they are expected to be conservative.
- 5.22 Combining the peaks (with allowance for the residential peaking timeframes differing from those in the Commercial and Adventure Park Precincts) resulted in a modelled peak demand of 70 l/sec with firefighting to FW 3 in addition. Those assumptions were provided to HCC to confirm that they reflect a realistic estimate of potential demand. Mott MacDonald, as HCCs Water Network Modeller assessed the flows from the mixed use on site to be 55.5 l/sec peak flow. This is lower than Aurecon's assessment as it allows for a different timing of the peak flows from the different landuses.

Modelling of the effect of the proposed development on the existing network

- 5.23 Mott MacDonald, as HCCs Water Network Modeller, tested the impact of the assumed demand of the proposed development at Te Awa Lakes on the HCC water supply network, including the size of the supply pipeline. The model used all updates to the reticulation at the time of the modelling (July 2017) and also accounted for the redevelopment of adjacent land to industrial activities in addition to the proposed development. This was considered a worst case scenario for water supply demand, and included 30ha of Fonterra land and 25ha of additional land converted to industrial outside of the Te Awa Lakes development.
- 5.24 Mott MacDonald assessed the demand for the areas of each usage provided and determined an instantaneous peak of 55.5 litres per second for the Te Awa Lakes Residential and Tourism Precincts, with the additional Industrial demand of 4.7 litres per second in 2021 increasing to 37.2 litres per second by 2061. This created a peak combined demand of 92.7 litres per second being modelled, with fire flow of 50 litres a second additional to that.
- 5.25 The HCC's modelling assumed the maximum ground level within the Te Awa Lakes development of RL 25 which compares with the current landform design level range between RL24m at the Hutchinson Road Service Centre, to RL 16.5m adjacent to the lakes.
- 5.26 Their modelling for the 2021 horizon showed that full demand from the Te Awa Lakes development can be met, including fire flows of 50 litres per second, using existing water reticulation to the site, and the current proposed pipes of a single 150mm dia and a single 250mm dia trunk main.
- 5.27 For the 2061 horizon, the increased demand of the additional possible industrial, land results in levels of service not being achieved through the modelled single 150mm dia and single 250mm dia mains for connection to the existing HCC system. Their conclusion was that increased pipe capacity would be required to achieve the level of service to maintain a minimum of 20m of pressure head. Their conclusion was that increased pipe sizes would be required to achieve the level of service necessary.
- 5.28 Mott MacDonald also concluded that the 2061 demand on the overall water reticulation network was not expected to be impacted by the Te Awa Lakes development and the assumed additional industrial development. Even in the worst case scenario modelled, the minimum pressure at the Fonterra site along

Meadowview Lane is still forecast to be 36-38m pressure head. This confirms that the capacity of proposed connections to the Te Awa Lakes site, and not the existing bulk infrastructure itself, is the only constraint to achieving the level of service required.

Future work

- 5.29 As the layout and development becomes better defined through the consenting process, the final residential demand elevations can be tested to provide a better defined solution as a requirement of any consents granted. For example, an increase in the pipe sizes required from the modelled 150mm / 250mm dia combination may be only required for part of the length of pipeline between the site and the connection to the HCC mains. This is more appropriately dealt with at the future consenting and detailed design phases.

Conclusion on water supply services and infrastructure effects

- 5.30 Similar to the finding above for wastewater services, the modelling undertaken confirms that there is more than sufficient capacity within the existing bulk water infrastructure to service the Te Awa Lakes development and assumed industrial development out to 2061. Additional connections can be provided through the future consenting and design phases when the level of development requires it.

6. EXPERT CAUCUSING

- 6.1 Expert caucusing on the wastewater and potable water elements of this proposal was not required as there were no areas of disagreement and no issues for discussion which related to them, and so I did not attend the caucusing on Three Waters and Water Quality.

7. COMMENTS ON THE SECTION 42A REPORT

- 7.1 Paragraphs 3.8, 3.9, and 3.10 of the 42A report refers to the Water and Wastewater services and confirms the statements made in the application and concludes that that there are no adverse effects as a result of water and wastewater services, and a positive benefit is being able to utilise the previous investment in the infrastructure installed to date.

8. COMMENTS ON SUBMISSIONS

- 8.1 Submission 47 from Hamilton City Council is the only submission that relates to water supply and wastewater. This relates to the type of internal reticulation for wastewater and whether the low pressure system or a conventional gravity main and pump station system is to be adopted, and the future ownership of that system.
- 8.2 As noted above, HCC are developing a policy on the use of low pressure wastewater systems and identify in their submission that this is an outstanding issue to be resolved through a separate process. As detailed in paragraph 5.13 above, while there are many operational benefits of a low pressure system, the development is not reliant on this system for its wastewater disposal as an alternative conventional gravity system is also available.

9. CONCLUSION

- 9.1 The assessments undertaken to date confirm that the development enabled through PPC2 can be serviced to acceptable standards for water supply and wastewater systems without impacting on existing networks, or on possible future industrial development between the site and the existing urban area.

Neill Raynor

29 October 2019