

BEFORE THE HEARING PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Proposed Plan Change 26 to the Operative Waipā
District Plan

STATEMENT OF EVIDENCE OF CHRISTOPHER ALLINGTON HARDY

Dated 24 March 2023

TOMPKINS | WAKE

Westpac House
Level 8
430 Victoria Street
PO Box 258
DX GP 20031
Hamilton 3240
New Zealand
Ph: (07) 839 4771
tompkinswake.co.nz

1. INTRODUCTION

- 1.1 My full name is Christopher Allington Hardy and I am a Technical Principal (Water and Wastewater) at WSP Ltd providing technical direction on projects.
- 1.2 I hold the qualifications of BE (Civil) from the University of Auckland, 2003, and NZCE (Civil) from the Waikato Polytechnic, 2000. Prior to my current position, I was an Associate Director at AECOM Hamilton. I had held a position with AECOM from 2010 to 2022. I have over 20 years of experience as a civil engineer working on stormwater, water and wastewater (three waters) networks.
- 1.3 WSP has developed master plans for the Waipā District Council (the “Council”) water and wastewater networks. I have been involved in the assessment of Water and Wastewater network capacity for the Council for Plan Change 26 over the past year. I have carried out a similar role related to wastewater network capacity for Hamilton City Council having been involved in Hamilton City Council’s wastewater network master plans over the last 10 years.

2. CODE OF CONDUCT

- 2.1 I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it. I confirm that the opinions expressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

3. **SCOPE OF EVIDENCE**

3.1 In my evidence I address:

- (a) The Water and Wastewater report forming Appendix 6 of the Section 32 report;
- (b) An outline of additional capacity modelling that has been undertaken;
- (c) Assessment of whether the rules which apply to the Infrastructure Constraint Qualifying Matter Overlay (“Infrastructure Overlay”) as notified in Plan Change 26 are sufficient to protect the qualifying matters, and any recommended changes to Plan Change 26; and
- (d) Response to submissions which address the Infrastructure Overlay.

4. **EXECUTIVE SUMMARY**

- 4.1 An empirical assessment of current and future network capacity was carried out assuming higher densities than those in the Operative District Plan. The assessment showed that the existing networks and planned upgrades would not be able to service higher densities.
- 4.2 Submissions related to water and wastewater have been received covering several themes including the need for more detailed assessment, removal of part or all of the Infrastructure Overlay, and changes to the density limits.
- 4.3 Additional modelling and assessment have been undertaken to identify the impact of higher densities with more certainty. Two scenarios were compared to the current Base 2050 Growth Model as follows:

- (a) Plan Change 26 - including qualifying matters (equivalent 2 dwellings per lot).
 - (b) Full medium density residential standards (“MDRS”) - without qualifying matters (equivalent 3 dwellings per lot).
- 4.4 The assessment showed that the future water and wastewater networks will have significant issues unless additional infrastructure is planned and implemented. Based on this I do not recommend any changes to the proposed rules, or the development density trigger levels for infrastructure assessments.
- 4.5 I also note that removal of some or all of the Infrastructure Overlay to permit development anywhere subject to capacity assessments, would result in significant network planning uncertainty. Infrastructure capacity could be needed anywhere which would require additional capacity to be installed that may not be used.
- 4.6 Removal of the Infrastructure Overlay would not be appropriate unless a specific area is identified for higher density development, for which capacity can be planned for and implemented.

5. **WATER AND WASTEWATER INFRASTRUCTURE ASSESSMENT**

- 5.1 An Infrastructure Capacity Assessment Report was undertaken for water and wastewater and forms Appendix 6 to the Section 32 Report.
- 5.2 The Water and Wastewater Assessment was a high level ‘traffic light’ comparison between Plan Change 26 proposed population densities, and densities used in the most recent network modelling and master planning for existing and future scenarios.
- 5.3 Three scenarios were assessed for various sub-catchment areas and the relative upstream (water) or downstream (wastewater) network:

- (a) Additional development may be able to be accommodated where the master planned network has spare capacity – Green Light.
- (b) Additional development may not be able to be accommodated where the master planned network is nearing capacity – Orange Light.
- (c) Additional development would not be able to be accommodated where the master planned network is at capacity or has ongoing issues (e.g. wastewater overflow) – Red Light.

5.4 The Water and Wastewater Assessment Report showed that there is no capacity in the existing infrastructure networks now or in the future when planned master plan projects are implemented. The network could not service any increased demand on the networks without investment in additional infrastructure capacity.

6. **ADDITIONAL MODELLING AND ASSESSMENT**

6.1 WSP Ltd undertook additional modelling and assessment which is presented in the report titled '*Plan Change 26 – Water and Wastewater Infrastructure Assessment, 23 March 2023*' which is appended to my evidence as Appendix 1.

6.2 Modelling was undertaken for the following scenarios:

- (a) Base model 2050 Growth Model (current Operative District Plan population scenario) – current master planning is based on this. Referred to as the 'Base Model'.
- (b) Plan Change 26 – including qualifying matters (equivalent 2 dwellings per lot). Referred to as the 'PC26 Model'.
- (c) Full MDRS – without qualifying matters (equivalent 3 dwellings per lot). Referred to as the 'MDRS Model'.

6.3 Network system performance was compared for the following purposes:

- (a) Confirm whether 2 dwellings per lot can be serviced by the current planned network and future projects.
- (b) Confirm whether 3 dwellings per lot can be serviced by the current planned network and future projects.
- (c) Confirm the extent of the Infrastructure Overlay.

6.4 The wastewater model scenarios have shown the following:

- (a) Several overflows are predicted in the Base Model in Cambridge and Te Awamutu. This is expected as strategic planning will not always eliminate all issues in the wider non-strategic network. Such issues can be addressed through minor projects, renewals, or operational changes.
- (b) Several additional overflows are predicted in the PC26 Model in Cambridge and Te Awamutu. Pipe utilisation (a measure of how full the pipe is as a percentage) is generally comparable to the Base Model in both towns. The noted increase in network overflows and utilisation is minor and not likely to warrant major changes in planned infrastructure.
- (c) The MDRS Model resulted in a significant increase in predicted overflows. The number of overflows increased from 16 to 65 across both towns. A significant increase in the number of surcharged pipelines (pipelines greater than 100% full) was also observed. The noted increase is significant and would warrant further assessment and changes in planned infrastructure.

6.5 The water model scenarios have shown the following for Cambridge:

- (a) Hydrants not meeting FW2 fire flow requirements remains generally the same across all three scenarios.
- (b) There is a significant increase in the number of nodes (locations) with minimum pressure below 20m in both the PC26 Model and the MDRS Model.
- (c) The PC26 Model shows an increase in pipe friction losses in some of the network (visually estimated as an increase from 10% in the Base Model to 30% in the PC26 Model) indicating higher pipe flows and lower network efficiency.
- (d) The MDRS Model shows a further increase in pipe friction losses in the network (visually estimated at 50-60%) indicating higher pipe flows and lower network efficiency.

6.6 The water model scenarios have shown the following for Te Awamutu and Kihikihi:

- (a) Hydrants not meeting FW2 fire flow requirements remains generally the same across all three scenarios.
- (b) There is a significant increase in the number of nodes (locations) with pressure below 10m in both the PC26 Model and the MDRS Model. The entire area of Te Awamutu and Kihikihi is predicted to have less than 10m minimum pressure in the MDRS model.
- (c) The PC26 Model shows an increase in pipe friction losses in some of the network (visually estimated as an increase from 10% in the Base Model to 30% in the PC26 Model) indicating higher pipe flows and lower network efficiency.
- (d) The MDRS Model shows a further increase in pipe friction losses in the network (visually estimated at 50-60%) indicating higher pipe flows and lower network efficiency.

- 6.7 The wastewater scenario modelling shows that the MDRS scenario results in significant network capacity and potential overflow issues compared to the Base and PC26 scenarios.
- 6.8 The potential effects of wastewater overflows are:
- (a) Public health effects if contact is made with raw wastewater on the ground or in receiving waters (e.g. swimming).
 - (b) Adverse ecological effects on fresh water due to contamination and oxygen demand.
 - (c) Cultural effects – The Mauri of freshwater, and the relationship of Mana Whenua with freshwater.
- 6.9 The water scenario modelling shows potential issues in both the PC26 and MDRS scenarios, with the MDRS scenario being generally worse in terms of network efficiency.
- 6.10 The extent of the water network with high friction losses and low efficiency provides an indication of the sensitivity to changes. An efficient network could accommodate higher development with a low risk of significant changes in pressure. An inefficient network is at a high-risk pressure degradation with more development than planned.
- 6.11 The MDRS scenario predicts a significant portion of both water networks will operate with high friction losses. Therefore, the MDRS scenario is at a higher risk of developing issues.
- 6.12 The potential effects of high friction losses and low efficiency in the water network are:
- (a) Higher operational costs related to pumping to maintain network pressure.

- (b) A greater reduction in network pressures during high demand resulting in a lower level of service.

6.13 It could be interpreted that the PC26 scenario will require additional infrastructure. However, I note that:

- (a) The extent of the network predicted to operate with high friction losses is not a majority.
- (b) It is my understanding that Council is prepared to accept the risk associated with the PC26 level of development in the water network.
- (c) It is my opinion that the MDRS scenario is too high a risk to be adopted without assessment of individual proposals for both water and wastewater.

7. **PLAN CHANGE 26**

7.1 A single Infrastructure Overlay is proposed for water and wastewater. In my opinion, a single overlay is appropriate because a limitation in either network will trigger a common process for infrastructure assessment.

7.2 In my opinion, the proposed extent of the Infrastructure Overlay should remain as proposed in Plan Change 26. The additional modelling and assessment showed that:

- (a) Issues are predicted across the water and wastewater networks;
and
- (b) Wider network issues are influenced by development elsewhere in the networks.

7.3 The following rules have been proposed in Plan Change 26 related to water and wastewater (including changes proposed in the Section 42A report):

(a) Rule 2A.4.1.3(c) - Restricted discretionary activities

Three dwellings per site within the Infrastructure Constraint Qualifying Matter Overlay.

Discretion will be restricted to the following matters;

- *The outcomes of an infrastructure capacity assessment;*
- and*
- *Stormwater disposal.*

(b) Rule 15.4.2.19 – *An infrastructure capacity assessment by a suitably qualified and experienced person will be required where it is proposed to establish more than two dwellings on a site located within a qualifying matter overlay or overlays to ensure that there is sufficient capacity in the infrastructure network to deal with the additional demand being placed on the existing network from developments.*

(c) Assessment criteria Rule 21.1.2A.5 – *More than two dwellings per site within the Infrastructure Constraint Qualifying Matter Overlay or more than three dwellings per site outside the Infrastructure Constraint Qualifying Matter Overlay: (e) The adequacy of the servicing proposed for the development.*

7.4 The following definitions are proposed in the s42A report:

(a) ***Infrastructure Capacity Assessment*** means an assessment of the capacity of an existing water, wastewater, or stormwater network to determine if there is enough capacity for a proposed development, or to define the requirements for network upgrades that would need to be implemented for the development to be approved. The exact requirements for an Infrastructure Capacity

Assessment should be discussed and agreed with WDC on a case-by-case basis.

- (b) ***A Suitably Qualified and Experienced Person to prepare an Infrastructure Capacity Assessment*** means a Chartered Engineer (or equivalent) experienced in the planning and design of three waters networks who is competent to carry out the assessment of development impacts on three waters networks. It should be noted that Council may require the use a nominated Consultant to carry out hydraulic modelling on behalf of Council for the purpose of a capacity assessment, but developers may wish to engage their own Engineer to assess on their own behalf.

7.5 I do not propose any changes to the rules or definitions as written. The requirement for an infrastructure capacity assessment is sufficient for potential effects on water and wastewater networks to be identified.

8. **RESPONSE TO SUBMISSIONS**

8.1 My evidence responds to submissions based on four themes as follows:

- (a) Permitted number of dwellings per lot / permitted density;
- (b) Deletion of the Infrastructure Overlay;
- (c) Permitted density versus realistic yields; and
- (d) Water network loss and wastewater network inflow and infiltration.

Permitted number of dwellings per lot / permitted density

8.2 Several submitters have stated that insufficient investigation has been undertaken to limit the number of dwellings per lot to two. Some

submitters also note that the Infrastructure Overlay is applied to all areas of Cambridge, Te Awamutu and Kihikihi.

- 8.3 Additional modelling and assessment have been undertaken as described in paragraphs 6.1 to 6.13 above.
- 8.4 The new assessment has shown that the network restrictions and the proposed Infrastructure Overlay area remains appropriate. In my opinion, the proposed restriction to 2 dwellings per lot is appropriate because the networks are already under stress at that level of development. The predicted issues with 3 dwellings per lot are significant.

Deletion of the Infrastructure Overlay

- 8.5 The Kāinga Ora submission requests that the Infrastructure Overlay is deleted entirely, and all development be subject to individual infrastructure assessments.
- 8.6 In my opinion, it is not feasible to delete the entire Infrastructure Overlay and rely on individual infrastructure assessments.
- 8.7 The Infrastructure Overlay provides for a minimum permitted (or baseline) density which protects re-development up to a certain density level, for all landowners – in this case, 2 dwellings per lot.
- 8.8 The permitted baseline is accounted for in long term infrastructure planning and therefore in any infrastructure assessment for a discretionary higher-density development application.
- 8.9 Is it not possible to delete the Infrastructure Overlay without development becoming 'first in first served' based on infrastructure assessments, and development could then occur anywhere until system capacity is used up.

- 8.10 Removing the Infrastructure Overlay would mean that strategic infrastructure planning and upgrades must account for the uncertainty of development occurring anywhere with additional capacity being required at additional cost.
- 8.11 Infrastructure installed for potential higher density development may not be fully utilised where development cannot occur due to downstream infrastructure capacity being used up.

Permitted density versus realistic yields

- 8.12 Several submitters note that an approach based on realistic yields would be more appropriate than an overarching permitted density.
- 8.13 I agree that planning for a realistic population yield could result in cost effective investment in infrastructure. However, specific development areas must be known for this to be realised, otherwise development can occur anywhere.
- 8.14 A base level of acceptable development (e.g. 2 dwellings per lot anywhere) as currently proposed, or targeted permitted high-density areas, provides more certainty around the network investment and future utilisation.
- 8.15 Unless higher density development is limited to specific areas, then capacity planning uncertainty exists.
- 8.16 I could support a higher density than 2 dwellings per lot, in specific areas, as that would allow targeted infrastructure to be planned for. However, I note that current network master planning does not take this approach and the Council would need to commit to additional infrastructure possibly being required should such an approach be adopted.

Water network loss and wastewater network inflow and infiltration

- 8.17 Several submissions question whether water losses and inflow and infiltration (“I&I”) are included in the hydraulic models used for planning.
- 8.18 The implementation of water loss reduction and I&I mitigation in networks in the long term can be difficult – the level of reduction that can be practically achieved and maintained is often uncertain.
- 8.19 While an allowance could be included in modelling this would have no effect on my recommendation for future infrastructure, or current restrictions on development, noting the following:
- (a) Losses in the water network do not typically govern peak flow rate and therefore pipe capacity. Loss reduction does have a positive effect on water taken and treated.
 - (b) Water losses can be reduced over time through infrastructure renewals but not eliminated as newer parts of the network age.
 - (c) Wastewater I&I reduction is generally effective in areas of high I&I as the largest and most apparent sources are repaired.
 - (d) Wastewater I&I elimination is both hard to achieve and hard to maintain therefore some allowance is required.
- 8.20 The preferred approach is to:
- (a) Continue programmes or work to reduced water loss and I&I where practical and cost effective.
 - (b) Monitor the benefits of the programmes over time and allow discretionary higher-density development if additional and reliable long-term capacity has been realised.

- (c) Stage the construction of infrastructure where possible (e.g. reservoir volume, pump station capacity) to defer cost and review based on programme effectiveness.

9. CONCLUSION

- 9.1 Plan Change 26 proposes an extensive Infrastructure Overlay to limit permitted development to 2 dwellings per lot. Higher density development will require an Infrastructure Capacity Assessment to be carried out to identify potential adverse effects on water and wastewater networks.
- 9.2 Additional modelling and assessment have been undertaken to identify the impact of higher densities with more certainty. Two scenarios were compared to the current Base 2050 Growth Model as follows:
 - (a) Plan Change 26 – including qualifying matters (equivalent 2 dwellings per lot).
 - (b) Full MDRS – without qualifying matters (equivalent 3 dwellings per lot).
- 9.3 The assessment showed that the future water and wastewater networks will have significant issues unless additional infrastructure is planned and implemented. Based on this I do not recommend any changes to the proposed rules, or the development density trigger levels for infrastructure assessments.

- 9.4 In my opinion, the proposed extent of the Infrastructure Overlay should remain as proposed in Plan Change 26. Adequate rules are in place to allow proposals for higher density development to be assessed through an Infrastructure Capacity Assessment, to identify potential network issues and mitigations.

Christopher Hardy
Dated 24 March 2023

**Appendix 1: Plan Change 26 Water and Wastewater Infrastructure Assessment
March 2023**