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Ōhoka Residential Subdivision Expert Panel Chair

7 October 2026

**Attention: Kate Barry-Piceno**

Dear Kate

**Ōhoka FTAA - Wastewater**

**Introduction**

**Purpose of the document**

The purpose of this document is to summarise my review of the proposed wastewater assessment for the proposed Ōhoka residential development.

**Documents reviewed**

I have referred to the following documents as part of my review:

Wastewater

- Fast Track Application – 531 & 535 Mill Road, Ōhoka – Wastewater Connection; 4 June 2026; Author: Eoghan O’Neill, Pattle Delamore Partners Ltd; Job Reference: C045180001
- Memorandum: Wastewater – Beca Review Questions; 9 September 2026; Author: Eoghan O’Neill, Pattle Delamore Partners Ltd;

**Key areas discussed in this memo**

Key areas discussed in this memo are:

- a. Capacity of Bradleys Road Pump Station
- b. Operation and Resilience of Bradleys Road Pump Station
- c. Existing Ōhoka Wastewater Connections
- d. Wastewater Storage Proposed by Developer
- e. Gravity Sewer versus Pressure Sewer
- f. Retirement Village Flows
- g. Expected Wastewater Flows

**Qualifications**

1. I hold a Bachelor of Engineering with First Class Honours (Civil) from the University of Canterbury and am a Chartered Professional Engineer (Civil, Water).
2. I am a Chartered Member of Engineering New Zealand and a member of Water New Zealand.



3. I have 32 years' water and wastewater engineering experience, with a focus on design, design management, contract management and construction monitoring for three waters infrastructure.
4. My experience includes the design of water and wastewater infrastructure, delivering end-to-end outcomes from feasibility and consenting through design, verification, construction support, and project management. Experienced in water bores, treatment plants, reservoir planning, water and wastewater pump stations, and long-distance gravity/pressure wastewater pipelines - with strong constructability-led design review, trenchless methods, and environmental/stakeholder integration. I have also provided independent design review for major pipeline projects, recently the large diameter PE Warkworth Wastewater Growth Servicing Pipeline. I've been involved in other land development projects in the Canterbury region.
5. I am familiar with the Ōhoka area and the Kaiapoi area including the current water and wastewater systems. I was responsible for the design of the Bradleys Road Pump Station and the wastewater pipeline that runs from the Bradleys Road Pump Station through to the Rangiora Wastewater Treatment Plant, that the proposed Ōhoka residential development is wanting to connect into. I also oversaw the design and construction of the existing Ōhoka Sewerage scheme. I worked with Waimakariri District Council (WDC) for a period of approximately 8 years from 2011 through to 2019, as the Water and Wastewater Discipline Lead for the Earthquake Infrastructure Recovery.

### Code of Conduct

6. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. This technical review has been prepared in accordance with that Code. In particular, unless I state otherwise, the opinions I express are within my area of expertise, and I have not omitted to consider material facts that might alter or detract from the opinions that I express.

### Background

#### Mandeville Wastewater Collection

7. Mandeville and the surrounding rural-residential areas were originally serviced by on-site septic tank systems. Under this arrangement, wastewater from each property discharged to individual septic tanks for primary treatment before being pumped to three separate small WWTPs at Ohoka Meadows, Mandeville and Swannanoa. New pipework was installed in these areas in 2011 to transfer the treated effluent to the Bradleys Road Pump Station.

#### Inflow and Infiltration (I/I)

8. A common issue affecting reticulated wastewater networks is inflow and infiltration (I/I), where stormwater or groundwater enters the wastewater system. Inflow typically occurs through direct connections or entry points such as incorrectly connected stormwater pipes, low-lying gully traps, or other surface entry pathways. Infiltration occurs where groundwater enters the network through cracks, joints, or defects in pipes and other structures. The effect of I/I is a substantial increase in wastewater flows during wet weather events. Due to I/I, wastewater infrastructure, including the Bradleys Road Pump Station, is generally designed to accommodate these peak wet weather flows. The wastewater network for Mandeville and surrounding areas system is more prone to I&I, because of the onsite septic tanks (ie not being as watertight as a pressure pump unit) and the age of this network.

Bradleys Road Pump Station

9. The Bradleys Road Pump Station was designed as the starting point of the rising main conveying wastewater to the Rangiora Wastewater Treatment Plant (WWTP). While referred to as a pump station, the system primarily operates as a controlled transfer and storage system. For much of the time, treated wastewater is pumped into storage tanks at Bradleys Road and then released in a controlled manner to maintain the pipeline in a full condition. The pipeline generally falls from Bradleys Road towards Threlkelds Road near Ōhoka before rising again towards the Rangiora WWTP. A control valve at the Rangiora WWTP opens and closes to control the flow within the pipeline and prevents the main from emptying. The Bradleys Road pumps are typically operated once per day to provide flushing velocities within the pipeline and to accommodate increased wet weather flows.

Ōhoka Wastewater Collection

10. Following commissioning of the Bradleys Road system, it was decided to connect properties within Ōhoka to the network. The Ōhoka pressure sewer system differs from the Mandeville arrangement in that untreated wastewater is macerated and pumped directly into the rising main, rather than being treated within septic tanks prior to pumping. When the control valve at the Rangiora WWTP is closed, wastewater from the Ōhoka system backs up within the rising main towards the Bradleys Road Pump Station. However, it does not reach the Bradleys Road Pump Station itself; rather, treated wastewater from the Mandeville system is displaced back into the Bradleys Road Pump Station storage tanks. Additional storage tanks were installed at the Bradleys Road Pump Station to accommodate this operational arrangement when the Ōhoka connections were made.
11. When the Rangiora WWTP control valve is open, wastewater from Ōhoka progresses towards the treatment plant. The Ōhoka pumps were specifically selected to operate in conjunction with the Bradleys Road Pump Station system. Direct pumping of untreated wastewater into the rising main also avoids the odour issues that would likely occur if untreated wastewater was first stored in tanks prior to being pumped.
12. The Mandeville to Rangiora wastewater main does not operate as a typical pumping main as it can operate under gravity and also can operate partially in reverse when the Ohoka pumps are operating.

Rangiora WWTP

13. Wastewater from both Mandeville and Ōhoka is treated at the Rangiora WWTP before being conveyed to the Kaiapoi WWTP for final treatment and discharge via the ocean outfall. The Rangiora WWTP is currently subject to capacity constraints and is undergoing further assessment by Jacobs. Preliminary findings indicate that:
- The plant currently operates at or near capacity during wet weather events due to inflow and infiltration within the contributing networks, and further assessment of pond performance is required
  - The Rangiora to Kaiapoi transfer main is currently operating below its theoretical design capacity for reasons that are not yet fully understood, and detailed field investigations are underway to determine the cause, although more substantial upgrades cannot be ruled out
  - The remaining theoretical treatment capacity at Rangiora has already been allocated to planned development within the Rangiora catchment

14. Based on the above, any wastewater servicing solution for future Ōhoka development should not rely on additional discharge to the Rangiora WWTP without the potential need for significant infrastructure upgrades. Consequently, conveyance to the Kaiapoi WWTP represents the only practical long-term servicing solution currently identified for the proposed Ōhoka development. It is expected that upgrades at the Kaiapoi WWTP to the inlet screen system and UV disinfection system will be required from the additional flow, but this will be covered by existing development contributions.

**Key Issues**

**Wastewater**

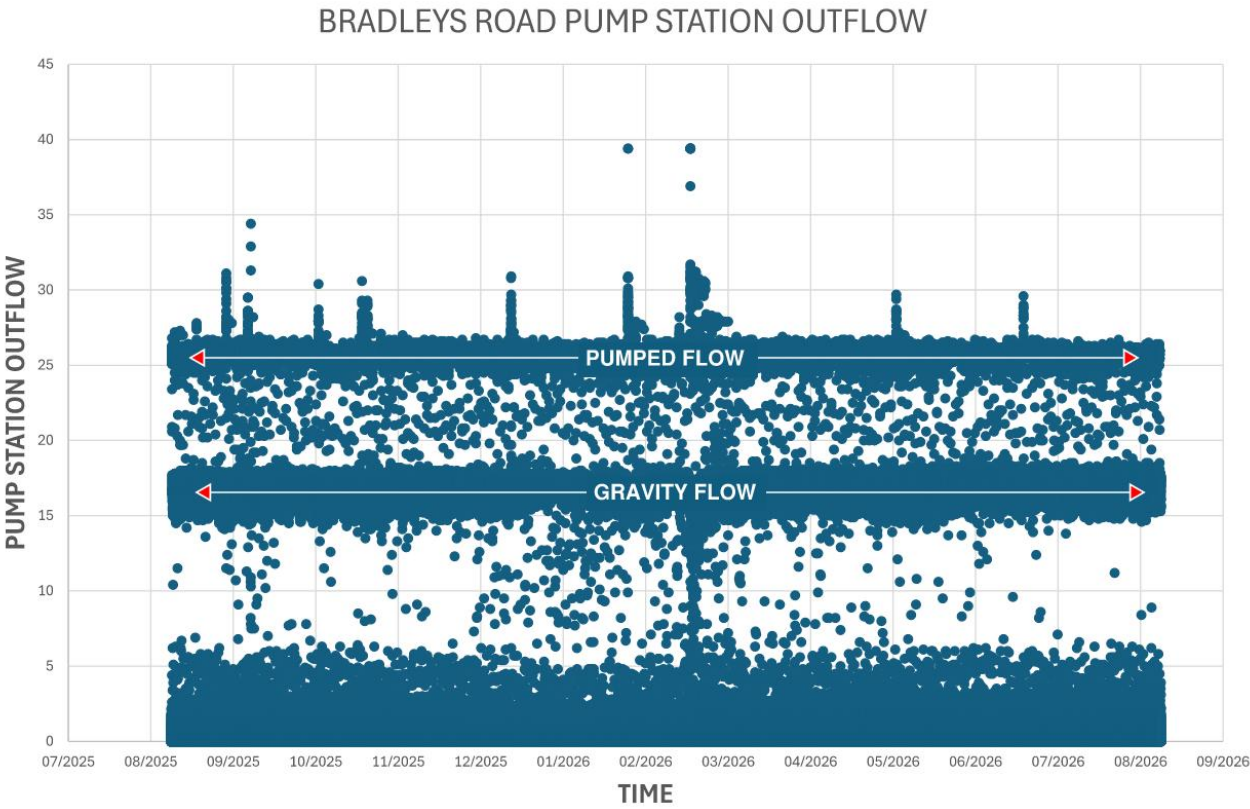
**Capacity of Bradleys Road Pump Station**

14. The Bradleys Road Pump Station was designed to serve 625 lots producing a wastewater average daily flow of 312.5m<sup>3</sup>/day (3.6L/s) and peak daily flow of 437.5 m<sup>3</sup>/day (or 5L/s). This is very similar to what is now being produced. However, pump stations are designed for the peak wet weather flow; which, for the Bradleys Road Pump Station, was estimated at design at 18.1L/s – again this is very close to what is found in practice. The PDP reports the peak flows occurring due to “extreme” events. The peak flows, however, are in line with the design and are as expected. As the Bradleys Rd Pump Station services an area with older STEP (Septic Tank Effluent Pumping) systems, it is more vulnerable to surface water inflow, which can significantly increase wet weather flows.
15. Although the peak flow was calculated at 18.1L/s a 20% contingency was added to give a pump station design flow of 21.7L/s (from 625 lots) and 8.6L/s (250 lots) from Ōhoka, that comes in part way along the pipeline. As is common with wastewater infrastructure, a 20% contingency has been included in the design for the intended flows. A 20% contingency is important to protect against overflows from the system and should be incorporated into all wastewater pump stations. There is no allowance for this contingency in the flow figures for the Ōhoka Pump Station proposed for the new land development. In my view there should be.
16. As noted in the PDP report the pumps have run for up to 17 hours a day. Given that the pump station was designed for a maximum 20 hour running per day it is noted that the pump station is operating as expected. There are still some connections to be made upstream of the Bradleys Rd Pump Station and this will further increase the running time of the pump station.
17. The Bradleys Rd Pump Station and pipeline were designed for 875 lots, it is not recommended that an additional approx. 900 lots be added to the system without risking overflows from the system. High intensity rainfall events are expected to increase in the future which will put more pressure on the system. The existing system has only been running for approximately 13 years. Longer and more frequent weather events are likely in the future.

**Operation and Resilience of the Bradleys Road Wastewater System**

18. The Bradleys Road Pump Station is not a conventional pump station arrangement. Wastewater from the surrounding properties predominantly passes through on-site septic tanks, where solids are removed. The primary treated wastewater is then pumped from each property to above-ground storage tanks at the Bradleys Road Pump Station. The removal of solids greatly reduces the risk of odour and blockages/maintenance.
19. There is an approximate 20 metre fall in level from the Bradleys Road Pump Station to the Rangiora Wastewater Treatment Plant (WWTP), where the wastewater is ultimately discharged. A control valve is located at the downstream end of the pipeline and remains closed until the wastewater level within

the Bradleys Road Pump Station storage tanks rises sufficiently to initiate valve opening. Once opened, wastewater flows by gravity (ie no pump operating) at an approximate flow rate of 16 L/s. Refer to the graph below showing the pumped and gravity flow over the last year.



20. Accordingly, for the majority of time, the properties serviced by the Bradleys Road Pump Station are able to discharge wastewater directly to the Rangiora WWTP without the need for additional pumping. That is, the primary treated wastewater flows by gravity from the Bradleys Road Pump Station tanks to the Rangiora WWTP without the Bradley Road pumps operating. The pumps at Bradleys Road are only activated for two purposes:
- a. To achieve flushing velocities within the pipeline – which can't be achieved with gravity flow alone. This is done once a day under normal circumstances.; and
  - b. To manage periods of high inflow where gravity flow alone is insufficient to convey the incoming wastewater.
21. PDP has noted how often (or how infrequent) the pumps run at Bradleys Rd Pump Station as justification for connecting to the pipeline. However, this isn't relevant as there is a high flow by gravity.
22. A key assumption that PDP has made when recommending a flow of 30 L/s (Option 2) for the new Ōhoka Pump Station is limiting the maximum total head in the rising main to Rangiora WWTP to 667kPa. This is based on a Max Operating Pressure (MOP) of the Bradley Road Pump Station main of 1000kPa (based on lowest rated pipe PN10 PE) and more than double the current pressure. The WDC CoP Section 6.9.1 requires that the MOP is  $>1.5 \times$  the max pressure (static + friction head), therefore the total head is limited to 667kPa. That is, there calculations have no contingency for if the friction is higher than expected.
23. I do not support the proposal for the Ōhoka Residential Development to discharge into the existing wastewater main. In my opinion, this would fundamentally alter the current operating arrangement from a relatively resilient system - where the on-site pumps within Mandeville and the surrounding

areas effectively pump directly to the Rangiora WWTP - to a system that would become increasingly reliant on the regular operation of the Bradleys Road pumps. This would, in turn, create a system that is more susceptible to operational failures and overflows. The increased use of the Bradley Road pumps will also increase the operational costs of the system.

- 24. It is noted that the pressure relief valve at the Bradleys Road Pump Station has not been assessed and, given the significant increase in pressure proposed, may require alteration or upgrade.
- 25. Any new Ōhoka Pump Station will need to differ significantly from the existing Bradleys Road Pump Station. Unlike the Bradleys Road system, the proposed Ōhoka station would need to manage solids conveyed from on-site pumps, which will require careful consideration in the selection of pumps and the design of the storage system. In addition, there will be no gravity inflow system at Ōhoka, and operating a new pump station in this manner would substantially change the operation of the existing Bradleys Road Pump Station.

**Existing Ōhoka Wastewater Connections**

- 26. Under the existing arrangement, the Ōhoka properties discharge wastewater via individual on-site pumps into the Bradleys Road Pump Station pipeline in 3 locations. These on-site pumps are able to operate whenever required to service the properties. This operating arrangement was specifically reviewed and confirmed during the design of the Ōhoka wastewater scheme.
- 27. Under current operating conditions, when the control valve at the Rangiora Wastewater Treatment Plant (WWTP) is closed, wastewater within the pipeline backs up towards the Bradleys Road Pump Station. Despite this, the existing system arrangement still enables the on-site Ōhoka pumps to continue operating as required.
- 28. As confirmed by PDP, the proposed Ōhoka development pump station would alter the hydraulic behaviour of the system, by doubling the pressure within the existing Ōhoka township, such that the existing on-site Ōhoka pumps would be unable to operate while the proposed development pump station is running. While this operating condition may not physically damage the pumps, it represents a reduced level of service compared with the existing arrangement.
- 29. In my opinion, the existing level of service should be maintained. The on-site pumps servicing the Ōhoka properties, which are owned and relied upon by individual residents, should continue to operate independently of the proposed development pump station and remain capable of operating whenever required.

**Wastewater Storage Proposed by Developer**

- 30. Emergency storage and operational storage serve very different purposes. Emergency storage is a standard requirement at wastewater pump stations and is provided to prevent overflows to the environment in the event of mechanical failure. Historically, wastewater discharges to waterways were relatively common, but the provision of emergency storage to avoid such discharges is now standard industry practice.
- 31. Any wastewater pump station designed for the proposed development will require dedicated emergency storage. The PDP report states that the required storage volume should be the greater of the emergency storage or the buffer/operational storage. In my opinion, this is incorrect, as the two types of storage serve different functions and emergency storage should not be relied upon for operational purposes. Its purpose is to provide a safeguard against overflow to the environment.

32. The Waimakariri District Council Engineering Code of Practice requires emergency storage equivalent to 8 hours of flow at Average Dry Weather Flow (ADWF). The PDP report confirms this requirement and notes that 215 m<sup>3</sup> of storage would be required for this purpose. However, the volume will be higher than this once an allowance for I/I is taken into account (refer paragraph 36).
33. Operational storage to accommodate diurnal variations in incoming or outgoing flows is not commonly provided at wastewater pump stations. Instead, pump stations are typically designed to manage peak instantaneous flows, with additional contingency capacity to accommodate all flow scenarios. While the Bradleys Road Pump Station includes storage, this was provided to facilitate the gravity system through to the WWTP. In addition, most of the wastewater entering that system has passed through septic tanks, where solids are removed. This is important because raw wastewater (containing solids), especially when anaerobic, generates significantly greater odour, and solids can accumulate within storage areas, creating operational difficulties.
34. Operational storage for raw wastewater is relatively uncommon and requires careful design. Where they have been used, it has generally been to address a level of service issue where no other practical alternative is available, rather than as a method of servicing new development areas. To my knowledge, there are no other raw wastewater operational storage systems in the Waimakariri district. Furthermore, contrary to the arrangement described in the PDP report (circular and hopper-bottomed), these storage structures are not typically circular, as rectangular configurations are generally preferred to assist with solids management and cleaning. Additional measures, such as washdown systems and bio-trickling filters for odour control, are also commonly required.
35. Finally, I disagree that most on-site pump stations provide 1 m<sup>3</sup> of emergency storage. In my experience (eg EOne Simplex), the emergency storage provided is generally around 400 litres per property before overflows will occur - the entire pump unit holds about 900 litres. However, it appears that this storage has not been taken into account in the pump station / storage sizing and therefore does not affect the overall assessment.

**Gravity Sewer versus Pressure Sewer**

36. The WDC CoP Section 6.1.2 New Developments states that a *"gravity reticulation, with a minimum amount of pumping is the preferred method of wastewater reticulation for new developments. In areas where gravity retic systems are not practicable due to flat grades or long distances, alternative systems (such as common pressure main systems, including small privately operated and municipal treatment and disposal systems) may be accepted, subject to the Council's approval. Typically each lot must have an individual wastewater pump connected to the common pressure main system."*
37. The developer has not demonstrated why a gravity reticulation system is not practicable, particularly within the higher-density areas and the proposed retirement village. The site appears to have sufficient fall that could be utilised effectively for a gravity system. A gravity reticulation network would generally be more appropriate than a pressure sewer system, particularly given the operational and maintenance implications associated with a large number of individual on-site pump stations. This is of particular concern within a retirement village setting, especially where units or lots may be individually owned and responsibility for maintaining on-site pump systems could fall to residents or individual property owners. A gravity sewer system is generally the superior, more sustainable choice over a pressure sewer system for high density developments like the proposed Ōhoka development for the following reasons:
- Lower Long-Term Costs - a single shared mainline in the street, requiring minimal infrastructure per home. No on-site pumps required.

- Operational Simplicity and Reliability – There are no mechanical or electrical moving parts along the main lines, meaning they do not suffer from power outages or mechanical wear-and-tear.
- Ease of Maintenance and Lifespan - maintenance is limited to manholes and mains in the road reserve, which are easily accessed by operational teams. Gravity pipes will typically last 50 to 100 years. Pressure sewer pumps and control panels have a much shorter lifespan (typically 10 to 15 years)

38. It is noted by PDP that there may be “five units sharing an LPS pump station” in the retirement village. This will not comply with the requirements of 6.1.2 of the CoP quoted above.
39. It is understood that the on-site pumps would be located within each private lot rather than within the road reserve. Confirmation is required regarding ownership of the on-site pump systems, and that individual landowners would be responsible for the ongoing operation and maintenance costs associated with these systems. This ownership and operational arrangement would be consistent with other pressure sewer networks within the Waimakariri District.

**Retirement Village Flows**

40. It is noted that the original flow quoted by PDP from the retirement village of 300 lots was 60m<sup>3</sup>/day. This has now increased to 68m<sup>3</sup>/d or even 78m<sup>3</sup>/day, according to the memo from PDP dated 9 September 2026. It is noted that there is no allowance for restaurant or kitchen facilities, pools or other facilities that you might have at a retirement village. No allowance has been made for I/I within the quoted figure even though the on-property pipework will be vulnerable to high ground, similar to how Mandeville currently is.

**Expected Wastewater Flows**

41. The PDP report has relied solely on the flow figures produced by Ecoflow Ltd, the seller of the pressure sewer system, to determine the expected wastewater flows for the proposed development. Although Ecoflow has used the average **dry** weather flows required in the Waimakariri District Council (WDC) Engineering Code of Practice (ECoP) (refer Section 6), they've made no allowance for an increase in flows during wet weather. Although it is reasonable to expect that there will be no I/I downstream of the on-site pumped system (ie within the pressurised network), there will likely still be I/I coming into the pipes upstream of the on-site pumped system ie from high ground water and rain water getting into the private gravity laterals. This might not occur initially but over time as the lateral systems degrade and illegal connections are made, I/I will likely increase. Watercare stipulate in their code of practice that a factor of 1.2 should be allowed for I/I within a pressure sewer network like this.
42. The result of this is that the flows should be another 20% higher than what is shown, as the quoted flows don't allow for a 20% I/I value.
43. Flow from inflow and infiltration (I/I) is typical in wastewater conveyance systems and was allowed for in the design of the Bradleys Rd Pump Station.
44. The total flows quoted for the development are lower than expected, as they do not allow for inflow and infiltration.

### Information Gaps / Clarification Required

- 45. Clarify why a conventional gravity sewer option is not feasible given the site's gentle slope, including any constraints that led to selecting a low-pressure sewer solution.
- 46. The existing Bradley Road Pump Station main is not suitable for connection, as it has no available capacity and operates as a gravity main. A description and drawings of the proposed new pipeline route to the Kaiapoi WWTP is required.
- 47. A description of how solids will be managed to prevent nuisance and operational issues at any proposed new pump station.
- 48. Confirmation of what I/I (inflow and infiltration) allowance will be adopted and what the corrected flow values will be.
- 49. Information is required on how odour will be controlled using a low-maintenance odour removal system.

### Areas of Agreement

- 50. It is agreed that an emergency generator is required at any new pump station in Ōhoka.
- 51. A pipe roughness coefficient of 3mm has been used in the pipe headloss calculations to match actual conditions, which is suitable.

### Recommendations / Conditions

- 52. I recommend that consent conditions are included to address the following items:
- 53. Wastewater from the proposed development shall be conveyed through a new pipeline to the Kaiapoi WWTP. An emergency-only bypass connection should be added between the proposed pipeline to Kaiapoi and the existing Bradleys Rd pipeline to provide redundancy in the event of a pipe failure.
- 54. Use a conventional gravity sewer network to collect the wastewater as required by WDC CoP Section 6.1.2
- 55. Emergency Storage (8 hours ADWF) and an emergency generator shall be provided at any new pump station provided for the Ōhoka Development.
- 56. A low-maintenance odour device, such as a bio-trickling filter, shall be provided with any new pump station provided for the Ōhoka Development.
- 57. A suitable level of I/I is included in the flow calculations.
- 58. All wastewater conveyance infrastructure associated with transferring flows from the development to the WWTP, including the main pump station and pumping main, shall be sized with a 20% contingency to provide operational resilience and allow sufficient time for maintenance activities to be undertaken.

Overall Position / Conclusions

- 59. The Ōhoka development wastewater scheme should not connect to the existing Bradleys Road rising main. The current system was designed to operate predominantly by gravity to Rangiora WWTP with limited pump assistance, and adding approximately 900 new lots would fundamentally change its operation, increase reliance on frequent pumping, raise system pressures, heighten overflow risk, and degrade the level of service for existing Ōhoka residents with their on-property pumps. Instead, convey new development flows via a dedicated pipeline to the Kaiapoi WWTP, and design the proposed Ōhoka pump station specifically for raw wastewater (solids, odour).
- 60. The Bradleys Road Pump Station and main were designed with a 20% contingency, which is common for wastewater infrastructure, and a gravity-driven regime; connecting the new development would push the system beyond its intended operational mode. Developer flows are underestimated by omitting a reasonable I/I allowance. In addition, retirement village flows may be underestimated without ancillary facilities.
- 61. Confirm why a gravity sewer network cannot service the development; confirm the receiving system (Kaiapoi WWTP); define a proposed pipeline route through to the WWTP; provide information on the new pump station for raw wastewater with 8h ADWF emergency storage, generator, odour control, and solids management; adopt a 20% I/I factor in flow sizing and maintain a 20% design contingency for all wastewater conveyance infrastructure associated with transferring flows from the development to the WWTP.
- 62. In my opinion, the wastewater servicing proposal for the Ōhoka development should not be approved in its current form. Further information and a revised servicing strategy are required to demonstrate that a proposed scheme can be designed and operated reliably without adversely affecting the performance, resilience, and level of service of the existing wastewater network and its current users.

Yours sincerely



Paul Reed

Principal - Civil Engineering

on behalf of

Beca Limited

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