

Wastewater Technical Review— PPC23

Private Plan Change 23 (Whisper Creek)

John Messerly, May 2026

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1. Scope, Purpose, and Relationship to Submission

This technical review is provided in support of the submission lodged by the Messerly and Lemzin Families on Private Plan Change 23 (Whisper Creek) to the Christchurch District Plan.

The report expands upon and provides further technical analysis regarding matters raised in that submission relating to:

- wastewater infrastructure capacity and resilience,
- the adequacy of three-waters assessment,
- groundwater and coastal-influenced infrastructure effects,
- natural-hazard interaction with infrastructure systems,
- section 32 evidential sufficiency,
- and the long-term infrastructure implications of urban intensification within a low-lying coastal environment.

In particular, this report elaborates upon matters raised in:

- Section 3 (Natural Hazards and Climate-Change Risk);
- Section 4 (Water Network – Adverse Effects);
- Section 5 (Stormwater, Floodplain Function & Hydraulic Constraints);
- Section 7 (MDRS, Qualifying Matters, and Clause 25(4A) Requirements);
- and the broader concerns throughout the submission regarding infrastructure resilience, groundwater and coastal-system interaction, cumulative effects, and the adequacy of the section 32 evaluation.

This technical review should therefore be read as supplementary technical analysis supporting and expanding upon the wastewater, infrastructure, hazard, and section 32 concerns already identified in the original submission.

The purpose of this report is not to determine whether wastewater infrastructure could theoretically be engineered to service additional development in principle. Rather, the purpose is to assess whether the evidential material presently before the Hearing Panel is sufficient to reliably understand the behaviour of the receiving wastewater system under the environmental conditions that govern it.

This report principally examines:

- the scope and adequacy of the wastewater assessment undertaken for PPC23,
- the relationship between groundwater, rainfall, sea-level rise, and wastewater-system behaviour,
- the condition and uncertainty associated with the existing Kainga–Brooklands–Spencerville wastewater network,
- the absence of demonstrated empirical calibration and wet-weather validation data,
- and the long-term infrastructure consequences associated with additional loading of the receiving coastal wastewater system.

The report also reviews and evaluates aspects of the wastewater, hydrological, and geotechnical evidence presented by:

- Andy Hall (Infrastructure / Three Waters / Flooding),

- Andrew Laughton Dark (Hydrology),
- and Mark Trainor (Geotechnical Engineering),

particularly where that evidence:

- confirms relevant environmental drivers,
- relies upon assumptions regarding wastewater-system behaviour,
- or illustrates the absence of integrated system-level assessment.

This review has been prepared within the context of the Resource Management Act 1991, including:

- section 32 requirements relating to risk, uncertainty, and evaluation of effects,
- the assessment obligations associated with Schedule 1 plan-making processes,
- and the broader requirement that infrastructure and environmental effects be sufficiently understood before substantial urban intensification is enabled.

This review is also prepared in the context of the Section 42A report's conclusion that PPC23 should not proceed unless the identified information deficiencies are addressed to the extent necessary to properly evaluate the effects and appropriateness of the rezoning. The report therefore considers whether equivalent evidential sufficiency has been established for wastewater infrastructure effects.

Accordingly, the focus of this report is not advocacy for a preferred engineering outcome, but evaluation of whether the current evidential record is sufficient to support reliable wastewater-effect assessment for PPC23.

2. Opening — Core Methodological Issue

This submission addresses the assessment of wastewater effects associated with Private Plan Change 23 (PPC23).

The central issue is not whether wastewater infrastructure can be engineered to service additional development in principle. Nor is it limited to whether localised upgrades to PS78 or downstream conveyance infrastructure may improve nominal operational performance.

Rather, the central issue is that the wastewater effects of PPC23 have not been assessed at the level necessary to understand the behaviour of the receiving wastewater system under the conditions that govern it.

The applicant's wastewater assessment principally focuses on:

- local servicing arrangements,
- attenuation through a proposed Local Pressure Sewer (LPS) system,
- operational upgrades to Pump Station 78 (PS78),
- and downstream conveyance improvements.

However, the relevant wastewater effects do not terminate at the PPC23 boundary, nor are they confined to nominal PS78 throughput assumptions.

PPC23 would transfer additional hydraulic loading into an existing coastal wastewater network operating within:

- shallow-groundwater conditions,

- low-gradient coastal terrain,
- earthquake-affected infrastructure,
- and a system environment influenced by rainfall-driven infiltration and inflow (I&I), groundwater interaction, tidal conditions, and future sea-level rise.

In such systems, apparent operational adequacy during ordinary conditions does not necessarily demonstrate resilience under compound wet-weather and groundwater-elevated conditions. This distinction matters because local operational upgrades and nominal conveyance improvements do not necessarily establish the behaviour or resilience of the wider receiving network under compound environmental conditions.

The evidence of Andy Hall, the applicant's infrastructure and three-waters engineering witness, substantially reinforces the existence of the environmental drivers underlying this concern. Hall's evidence expressly acknowledges the importance of sea-level rise (SLR), vertical land movement (VLM), elevated groundwater conditions, flood-level interaction, and cumulative hazard processes in determining future system behaviour. He further acknowledges that future SLR-induced groundwater rise would materially affect site development constraints and required finished floor levels (Hall, 2026).

Importantly, these are not stormwater-specific drivers. They are system-wide physical controls affecting low-gradient coastal infrastructure networks generally, including stormwater and wastewater systems operating within shallow-groundwater environments.

However, while Hall applies these interacting environmental drivers extensively within the stormwater and flood-assessment context, the wastewater assessment remains primarily focused on local servicing arrangements, downstream conveyance upgrades, and nominal attenuation assumptions associated with the proposed Local Pressure Sewer (LPS) system. The evidence does not establish an integrated, calibrated, assessment of the receiving wastewater network under the same interacting groundwater, rainfall, and climate-driven conditions acknowledged elsewhere in the evidence.

Hall's evidence therefore does not eliminate the central methodological issue identified in this review. Rather, it reinforces the underlying physical basis for requiring integrated system-level wastewater assessment.

Assessment:

The evidence presently before the Panel does not demonstrate:

- calibrated system-level wastewater modelling under current and future conditions,
- validated wet-weather performance of the receiving network,
- empirically characterised infiltration and inflow behaviour,
- or reliable understanding of how the wider Kainga–Brooklands–Spencerville gravity network behaves under compound environmental forcing.

This constitutes a methodological and evidential deficiency in the assessment supporting PPC23.

The issue is not whether wastewater infrastructure can be engineered in isolation, but that the system within which it must operate has not been analysed under the conditions that govern its behaviour.

This directly affects the adequacy of the section 32 evaluation under the Resource Management Act 1991 because:

- infrastructure risks,
 - long-term adaptation obligations,
 - cumulative wastewater effects,
 - and future infrastructure consequences
- have not been sufficiently characterised or quantified.

Accordingly, the evidential foundation necessary to reliably assess wastewater effects associated with PPC23 remains incomplete.

3. System-Level vs Site-Level Assessment

3.1 Analytical Scope of Wastewater Assessment

The Section 42A report explicitly requires system-level, climate-aware assessment for stormwater, including groundwater interaction, sea-level rise, relative sea-level rise, vertical land movement, and compound hazard effects. The Reporting Officer identifies stormwater, natural hazards, flood risk, VLM/RSLR, and groundwater intrusion as matters requiring further assessment before the effects of the rezoning can be properly evaluated.

These requirements reflect the Section 42A report's recognition that site-level design measures are insufficient where infrastructure performance is governed by wider receiving-system conditions, including groundwater interaction, flood behaviour, sea-level rise, and compound environmental forcing.

However, the wastewater assessment remains focused primarily on on-site servicing arrangements, local pressure sewer design, and connection feasibility. It does not establish the behaviour of the receiving wastewater network centred on Pump Station 78 (PS78), including the Kainga–Brooklands–Spencerville contributing catchment, under wet-weather, groundwater-influenced, or future climate conditions.

The applicant's evidence therefore does not ignore the receiving system, but treats its constraints principally as matters capable of being addressed through localised conveyance measures, including PS78 pump upgrades and downstream rising-main cleaning or rejuvenation. **However, the wider receiving gravity network operates within shallow-groundwater coastal conditions and includes earthquake-affected infrastructure restored principally to “serviceable” rather than empirically validated pre-earthquake performance.**

This is materially significant because Christchurch City Council and Environment Canterbury records relating to the 15 December 2021 PS78 overflow event attribute the overflow to excessive wastewater flows associated with rainwater inflow and groundwater infiltration (ECAN 2021). The occurrence of such an event demonstrates that infiltration and inflow behaviour within the wider receiving network is not merely theoretical, yet the evidential record does not presently establish calibrated understanding of the extent, behaviour, or future-condition implications of such loading under compound wet-weather and groundwater-elevated conditions.

This distinction is important.

The wastewater effects of PPC23 do not terminate at the legal boundary of the plan change area. The proposal transfers additional hydraulic loading into an existing coastal wastewater network that includes gravity mains, pump stations, rising mains, and associated infrastructure operating within a shallow-groundwater and sea-level-influenced environment.

The applicant's wastewater evidence principally addresses downstream conveyance measures, including:

- attenuation through a Local Pressure Sewer (LPS) system,
- upgrade of PS78,
- and rejuvenation or cleaning of downstream rising mains.

These measures may improve downstream transfer efficiency and local operational performance. However, they do not establish how the wider upstream gravity network behaves under compound conditions involving:

- rainfall-driven inflow and infiltration (I&I),
- elevated groundwater,
- tidal influence,
- sea-level rise,
- or groundwater rise associated with relative sea-level rise and vertical land movement.

Hall's evidence confirms that the proposed wastewater strategy relies substantially upon operational attenuation assumptions associated with the proposed Local Pressure Sewer (LPS) system. Hall states that the LPS system would be "programmed to attenuate flows and reduce the peak demand on downstream infrastructure." (Hall 2026)

However, attenuation of dry-weather or ordinary operational peak demand does not itself establish system resilience under groundwater-elevated or wet-weather conditions. In coastal wastewater systems, rainfall-driven infiltration and inflow (I&I), groundwater intrusion, tidal influence, and infrastructure degradation may materially alter system behaviour independently of nominal household discharge attenuation.

The relevant evidential question is therefore not whether LPS systems may theoretically reduce ordinary peak loading, but whether the behaviour of the receiving wastewater network under compound environmental loading conditions has been empirically assessed and validated.

Hall's evidence does not present:

- calibrated wet-weather wastewater modelling of the receiving network,
- measured system-wide I&I analysis,
- validated performance under observed wet-weather events,
- or integrated modelling incorporating groundwater elevation, coastal influence, rainfall loading, and existing network condition.

Accordingly, the proposed attenuation benefits associated with the LPS system cannot presently be treated as equivalent to demonstrated receiving-network resilience.

In coastal gravity wastewater systems, apparent operational adequacy during ordinary conditions does not necessarily demonstrate resilience under wet-weather or groundwater-elevated conditions. Increased downstream conveyance capacity may improve local pump station performance while leaving unresolved the behaviour of the wider gravity catchment under stress conditions.

This issue is materially relevant because the existing wastewater network is already known to operate within a coastal and groundwater-influenced environment, and overflow events have previously occurred during major wet-weather conditions.

Accordingly, the relevant assessment domain for wastewater effects is not confined to the PPC23 site itself, nor to local connection feasibility. The relevant issue is the behaviour of the receiving wastewater system as an interconnected coastal network under present and future environmental forcing conditions.

This creates a clear analytical asymmetry within the evidential record presently before the Panel.

The Section 42A report correctly recognises that stormwater effects cannot be reliably understood solely through site-level infrastructure design because downstream system behaviour is governed by wider hydraulic and environmental conditions.

However, no equivalent system-level assessment has been demonstrated for wastewater infrastructure, despite wastewater systems being materially influenced by many of the same external drivers, including groundwater conditions, rainfall-driven infiltration and inflow, tidal influence, and future sea-level rise.

If system-level modelling is required to understand stormwater effects under such conditions, then failure to apply an equivalent analytical standard to wastewater is not merely a difference in engineering discipline; it is a failure in analytical consistency.

3.2 Receiving-Network Effects Extend Beyond the PPC23 Boundary

The wastewater effects of PPC23 cannot be assessed solely within the legal boundary of the plan change area.

Unlike isolated on-site infrastructure, wastewater systems operate as interconnected receiving networks in which hydraulic effects are transferred downstream through gravity mains, pump stations, and conveyance infrastructure. The relevant environmental and infrastructure effects therefore occur not only at the point of connection, but within the wider receiving wastewater system.

This distinction matters because the applicant's wastewater assessment principally focuses on:

- on-site servicing arrangements,
- attenuation through the proposed Local Pressure Sewer (LPS) system,
- operational upgrades to PS78,
- and downstream conveyance improvements.

These measures primarily address local transfer efficiency and nominal conveyance performance. However, they do not establish how the wider receiving gravity network behaves under compound environmental conditions involving:

- rainfall-driven inflow and infiltration (I&I),
- elevated groundwater,
- tidal influence,
- sea-level rise,

- or groundwater rise associated with relative sea-level rise and vertical land movement.

The proposal does not discharge wastewater effects at the PPC23 boundary. It transfers additional hydraulic loading into the wider Kainga–Brooklands–Spencerville wastewater network, including gravity reticulation operating within shallow-groundwater coastal conditions where earthquake-related settlement, deformation, and pipe-joint disruption may increase vulnerability to groundwater infiltration and wet-weather inflow.

In coastal gravity wastewater systems, apparent operational adequacy during ordinary conditions does not necessarily demonstrate resilience under compound wet-weather or groundwater-elevated conditions. Increased downstream conveyance capacity may improve local pump-station performance while leaving unresolved the behaviour of the wider gravity catchment under stress conditions.

This issue is materially relevant because Christchurch City Council records indicate that the existing system has already experienced overflow behaviour during significant wet-weather conditions. Such events demonstrate that the receiving wastewater network is capable of entering stressed operational states under real-world environmental forcing.

Accordingly, the relevant assessment domain for wastewater effects is not confined to:

- the PPC23 site boundary,
- local attenuation measures,
- or nominal PS78 throughput assumptions.

Hall's evidence also confirms that the proposed servicing strategy depends upon intervention within existing downstream infrastructure external to the PPC23 site itself. He states that wastewater flows would be transferred to the existing Spencerville sewer network, requiring upgrades to degraded pumps and rejuvenation of downstream rising mains.

This is analytically significant because it confirms that:

- the relevant wastewater effects are not confined to the PPC23 development footprint,
- the existing receiving network is acknowledged to require operational intervention,
- and downstream infrastructure condition and performance are integral to the servicing assumptions relied upon.

However, the evidence does not establish the present wet-weather performance characteristics of the broader receiving network centred on PS78, nor whether the proposed upgrades and rejuvenation works have been evaluated against empirically demonstrated future loading conditions.

The evidence also does not establish how the receiving system performs under the same future groundwater and climate-driven conditions acknowledged elsewhere in Hall's flood and stormwater evidence, despite those conditions being directly relevant to infiltration-driven wastewater loading within low-lying coastal systems.

Accordingly, Hall's evidence materially reinforces that wastewater effects extend beyond the site boundary into a broader receiving-network environment whose system-level behaviour remains insufficiently characterised.

The relevant issue is the behaviour of the wider receiving wastewater system as an interconnected coastal network operating under present and future groundwater-, rainfall-, and climate-influenced conditions.

This creates a clear analytical asymmetry within the evidence currently before the Panel.

The Section 42A report correctly recognises that stormwater effects cannot be understood solely through site-level basin design because downstream hydraulic behaviour is governed by wider catchment and receiving-system conditions. However, no equivalent system-level assessment has been demonstrated for wastewater infrastructure, despite wastewater systems being governed by many of the same external hydraulic drivers.

Assessment:

If system-level modelling is required to understand stormwater effects, then failure to apply the same analytical standard to wastewater is not merely a difference in discipline; it is a failure in analytical consistency.

4. Physical Drivers — Equivalence Argument

The relevance of groundwater, sea-level rise, rainfall-driven infiltration and inflow (I&I), and compound coastal processes to wastewater-system behaviour is not speculative or peripheral. These are recognised physical drivers of wastewater-system performance in low-lying coastal environments. Importantly, the applicant's own hydrological, infrastructure, and geotechnical evidence acknowledges the existence and significance of these same environmental conditions within the PPC23 setting. The central issue is therefore not whether such drivers exist, but whether their effects on the receiving wastewater network have been sufficiently characterised through integrated system-level assessment.

Wastewater systems in coastal environments are governed by many of the same physical processes that govern stormwater systems.

These include:

- groundwater elevation and fluctuation,
- sea-level rise and tidal boundary conditions,
- rainfall-driven inflow and infiltration (I&I),
- vertical land movement,
- and compound hazard interactions involving simultaneous coastal, groundwater, and rainfall forcing.

These are not merely indirect influences. They act as external hydraulic boundary conditions on the wastewater network itself.

The applicant's own infrastructure evidence substantially reinforces the significance of these environmental drivers. Hall's evidence expressly acknowledges the relevance of sea-level rise (SLR), vertical land movement (VLM), elevated groundwater conditions, and cumulative flood-related constraints in determining future infrastructure performance. Hall further acknowledges that future SLR-induced groundwater rise would materially alter required finished floor levels and development constraints. However, the wastewater response presented in Hall's evidence

principally consists of operational and conveyance measures, including Local Pressure Sewer (LPS) attenuation, PS78 upgrades, and downstream rising-main rejuvenation, rather than a calibrated assessment of wider receiving-network behaviour under groundwater-influenced and wet-weather conditions.

The applicant's hydrological evidence also substantially reinforces the relevance of these physical drivers to the PPC23 environment. Dr Andrew Laughton Dark's evidence confirms that shallow groundwater beneath the site forms part of an unconfined groundwater system connected to the Styx River system, and that seasonally elevated shallow groundwater conditions are characteristic of the wider area. Dark further acknowledges that sea-level rise will affect shallow groundwater levels within both the site and surrounding environment (Dark, 2026).

These conclusions are important because they confirm that groundwater behaviour within the PPC23 environment is dynamic, groundwater-influenced, and materially affected by future coastal processes. However, while Dark's evidence confirms the existence of these hydrological drivers, the evidential record does not presently demonstrate an integrated and calibrated assessment of how those groundwater conditions interact with the wider receiving wastewater network under wet-weather, infiltration, or future sea-level-rise conditions.

In gravity wastewater systems, groundwater elevation and rainfall intensity directly influence system behaviour through infiltration pathways including pipe joints, fractures, manholes, service connections, settlement damage, and other defects within the network. These processes increase hydraulic loading within gravity mains, pump stations, and downstream conveyance infrastructure.

Accordingly, wastewater system performance is a function not only of nominal pump capacity or downstream conveyance efficiency, but also of the interaction between:

- groundwater conditions,
- rainfall-driven infiltration and inflow,
- catchment storage behaviour,
- tidal and coastal boundary conditions,
- and the physical state of the receiving network.

Peer-reviewed research demonstrates that these effects are both measurable and significant.

Research on coastal wastewater systems demonstrates that rainfall and groundwater conditions are statistically significant drivers of wastewater-system loading through infiltration and inflow processes. Other research demonstrates that combined effects involving sea-level rise, groundwater rise, and rainfall can substantially increase wastewater-system loading and wet-weather flows under coastal conditions.(Cahoon & Hanke, 2019) (Sangsefidi et al., 2023)

In the New Zealand context, wastewater infrastructure is explicitly recognised as vulnerable to compound climate-driven hazards including flooding, groundwater rise, sea-level rise, and coastal interaction processes. (Hughes et al., 2021)

Hall's evidence independently confirms the existence and importance of the same interacting environmental drivers identified within the literature reviewed in this report.

His evidence expressly incorporates:

- sea-level rise (SLR),
- vertical land movement (VLM),

- elevated groundwater conditions,
- compound flooding considerations,
- future rainfall-intensity projections,
- and groundwater-related constraints on infrastructure performance.

In particular, Hall acknowledges that future SLR-induced groundwater rise would require materially higher finished floor levels in order to accommodate elevated static groundwater conditions and stormwater-storage requirements.

This is important because it directly confirms that groundwater response to future coastal change is expected to materially alter infrastructure-system behaviour across the development area.

However, while these interacting environmental drivers are treated as central to stormwater and flood assessment, equivalent integrated analysis has not been demonstrated for the wastewater network receiving additional loading from PPC23.

This reinforces the core equivalence argument advanced in this report: if groundwater-, SLR-, VLM-, and compound-hazard interaction materially govern stormwater-system behaviour, then the same physical processes necessarily remain relevant to wastewater-system performance within the same low-gradient coastal environment.

The evidential issue is therefore not whether such drivers exist. Hall's evidence materially confirms that they do. The unresolved issue is that the receiving wastewater system has not been assessed at the same integrated analytical scale.

This is particularly relevant to the Kainga–Brooklands–Spencerville network because:

- the receiving system operates within a low-gradient coastal environment,
- shallow groundwater conditions are acknowledged within the applicant's own evidence,
- sea-level rise and associated groundwater rise are accepted future conditions,
- and parts of the network have experienced historical earthquake damage, settlement, and rehabilitation.

Under such conditions, increased downstream conveyance efficiency does not necessarily demonstrate overall system resilience.

The applicant's geotechnical evidence also reinforces the groundwater-sensitive and deformation-prone characteristics of the wider environment relevant to wastewater-network performance. Trainor describes the site as part of a coastal–fluvial transitional environment and identifies high groundwater conditions, liquefaction susceptibility, settlement-related hazards, and variable alluvial soil conditions as characteristic features of the area. While Trainor concludes that such conditions are capable of being managed through engineering and subdivision design processes, his evidence nevertheless confirms the presence of the same groundwater-sensitive and earthquake-affected environmental conditions relevant to long-term wastewater-network integrity, infiltration vulnerability, and uncertain post-earthquake hydraulic behaviour within the wider receiving system. (Trainor, 2026)

The relevance of these physical drivers is not merely theoretical. Environment Canterbury records associated with the 15 December 2021 PS78 overflow event attributed the overflow to “high levels of rainwater inflow and groundwater infiltration.” (CCC 2021) This does not by itself establish system-wide capacity failure. However, it demonstrates that groundwater and wet-weather

infiltration processes are already operationally significant within the receiving network environment relevant to PPC23.

A wastewater network may appear to operate adequately during ordinary or dry-weather conditions while remaining vulnerable to surcharge, infiltration-driven loading, or overflow behaviour during compound wet-weather events. Measures such as pump-station upgrades, rising-main cleaning, or local flow attenuation may improve local operational performance while leaving unresolved the behaviour of the wider upstream gravity network under stress conditions.

This distinction is important because the applicant's wastewater assessment principally focuses on downstream conveyance improvements and local attenuation assumptions, rather than demonstrating how the wider receiving network behaves under compound groundwater- and rainfall-influenced conditions.

Assessment:

Collectively, the applicant's own evidence confirms the presence of shallow groundwater, groundwater-surface-water interaction, sea-level-rise influence, elevated groundwater conditions, and groundwater-sensitive geotechnical environments within the PPC23 setting. The broader technical literature further establishes that such conditions materially influence wastewater-system behaviour in low-lying coastal systems through infiltration, inflow, and subsurface hydraulic interaction. However, the evidential record does not presently demonstrate an integrated, calibrated assessment of how those drivers affect the behaviour of the receiving wastewater network under current or future conditions. In the absence of such assessment, the wastewater effects of PPC23 remain insufficiently characterised at a system level.

5. Existing Network Condition — Empirical Vulnerability

The receiving wastewater network relevant to PPC23 is not a neutral or fully characterised baseline system. It operates within a shallow-groundwater coastal environment, includes earthquake-affected gravity infrastructure, and forms part of a broader network historically influenced by liquefaction, settlement, deformation, and infiltration-related stressors. These conditions are materially important because wastewater-system behaviour under wet-weather and groundwater-elevated conditions cannot be reliably inferred solely from nominal operational status or localised conveyance upgrades.

The Kainga-Brooklands-Spencerville wastewater system operates within a low-gradient coastal environment characterised by:

- shallow groundwater,
- permeable soils,
- tidal influence,
- and historical earthquake-related land deformation.

These conditions are materially relevant to wastewater-system behaviour because coastal gravity systems are sensitive not only to structural condition, but also to changing hydraulic boundary conditions, including groundwater elevation and wet-weather infiltration.

The SCIRT detailed design report for the Kainga, Brooklands and Spencerville wastewater system records extensive earthquake-related land damage, including liquefaction, lateral spreading, and

ground settlement exceeding 0.5 metres in places. The same report identifies high groundwater and permeable soils as important conditions affecting the PS78 system and associated infrastructure. (SCIRT, 2014)

The SCIRT material also confirms that the wider network includes approximately 13 km of gravity wastewater reticulation operating within shallow-groundwater coastal conditions where earthquake-related settlement, deformation, and pipe-joint disruption may increase vulnerability to groundwater infiltration and wet-weather inflow.

Importantly, the post-earthquake rehabilitation objective was not to comprehensively re-establish or validate long-term hydraulic performance under future conditions. Rather, the SCIRT objective was to restore the wastewater system to a “serviceable” operational state.

This distinction is material.

A wastewater network that is operational or “serviceable” under ordinary conditions is not necessarily demonstrated to be resilient under:

- elevated groundwater conditions,
- wet-weather inflow and infiltration loading,
- sea-level-rise-driven groundwater rise,
- or compound environmental forcing.

The available material also indicates that key system decisions involved retaining substantial portions of the existing downstream conveyance configuration, including:

- the existing PS78 arrangement,
 - existing downstream pressure-main infrastructure,
 - and associated network assumptions,
- while other upgrade options were considered but not adopted during rehabilitation planning.

At the same time, the evidential record does not establish:

- the original as-designed hydraulic performance of the system,
- the degree to which earthquake-related deformation altered effective network behaviour,
- or the current empirically validated wet-weather performance of the rehabilitated system.

This is significant because gravity wastewater systems affected by settlement, deformation, groundwater interaction, and infiltration pathways may continue to exhibit altered hydraulic behaviour long after restoration to nominal operational status.

Despite targeted Official Information Act requests and subsequent clarification requests seeking:

- original design specifications and baseline performance information for the Kainga–Brooklands–Spencerville wastewater system;
- post-SCIRT commissioning or validation assessments;
- calibrated wet-weather hydraulic modelling;
- flow metering data;
- infiltration and inflow (I&I) investigations;
- and validation of modelled behaviour against observed wet-weather events,

the presently available material does not establish a calibrated empirical understanding of current receiving-network behaviour under wet-weather or groundwater-elevated conditions.

The significance of this uncertainty is illustrated by observed wet-weather system behaviour. Christchurch City Council records indicate that PS78 experienced a sustained overflow event on 15 December 2021 during a significant wet-weather event, with the overflow alarm reportedly active for approximately six hours (CCC 2021). Environment Canterbury records associated with the same event attributed the overflow to “high levels of rainwater inflow and groundwater infiltration.”

The occurrence of multiple wet-weather overflow events across Christchurch during the same period is consistent with the broader sensitivity of earthquake-affected gravity wastewater systems to infiltration/inflow and wet-weather hydraulic stress. The timing of the PS78 event also coincided with elevated evening tidal conditions along the Christchurch coast, illustrating the potential for compound environmental forcing during significant wet-weather events.

However, no formal post-event analysis has been provided that reconstructs system behaviour, quantifies inflows, or identifies the dominant failure mechanism. While subsequent material refers to possible constraints such as rising-main condition and pump performance, these are presented principally as operational observations or future mitigation pathways rather than as a calibrated diagnosis of wider receiving-network behaviour. In the absence of a quantified and validated understanding of system performance under stress conditions, the operational performance envelope of the network—and the effectiveness of proposed upgrades—remains uncertain.

Dark’s evidence further reinforces that the receiving wastewater environment cannot properly be understood independently of groundwater-system behaviour.

While his evidence primarily addresses potable-water abstraction and hydrogeological separation between shallow and deeper aquifers, he nevertheless confirms the existence of:

- seasonally elevated shallow groundwater conditions,
- groundwater interaction with the Styx River system,
- and future SLR-driven groundwater change across the surrounding environment.

These factors are materially relevant because the Kainga–Brooklands–Spencerville wastewater network operates within the same shallow-groundwater environment identified by Dark.

The evidential issue is therefore not whether shallow groundwater exists or may change over time. Dark’s evidence independently demonstrates both propositions. Rather, the relevant question is the absence of demonstrated assessment of how those groundwater conditions interact with:

- existing wastewater infrastructure condition,
- infiltration susceptibility,
- wet-weather loading,
- and long-term receiving-network performance.

This becomes particularly important within an earthquake-affected coastal network where historic liquefaction, settlement, pipe deformation, and subsurface intrusion pathways may influence ongoing groundwater-related loading behaviour.

Accordingly, the issue is not simply whether the system presently functions during ordinary conditions. The issue is whether the effective hydraulic behaviour of the receiving network under groundwater-influenced and wet-weather conditions has been sufficiently characterised to support substantial additional urban loading.

Assessment:

The presently available evidential record does not establish a reliably characterised baseline for the receiving wastewater network under wet-weather and groundwater-influenced conditions. While operational upgrades to PS78 and downstream conveyance infrastructure may improve aspects of local system performance, the wider hydraulic behaviour of the receiving gravity network under compound environmental stress conditions remains insufficiently understood, calibrated, and validated.

6. Absence of Empirical Baseline

The central evidential deficiency within the wastewater assessment is not merely the existence of uncertainty, but the absence of demonstrated empirical characterisation of receiving-network behaviour under wet-weather and groundwater-influenced conditions. In groundwater-sensitive coastal wastewater systems, operational performance cannot be reliably inferred solely from theoretical network modelling, nominal infrastructure configuration, or ordinary dry-weather operation. Reliable system understanding instead depends upon calibrated empirical assessment using measured wet-weather flows, observed system response, and validation against actual operational events.

The presently available evidential record does not demonstrate:

- calibrated wet-weather hydraulic modelling of the receiving wastewater network;
- measured wet-weather flow data associated with PS78 or downstream receiving infrastructure;
- validated flow metering data characterising receiving-network behaviour under stress conditions;
- post-SCIRT validation assessments demonstrating actual wet-weather operational performance;
- quantified infiltration and inflow (I&I) assessment for the wider receiving gravity network;
- assessment of groundwater-driven I&I behaviour under elevated groundwater, rainfall, tidal, or future sea-level-rise conditions;
- or demonstrated calibration of modelled system behaviour against observed wet-weather overflow events.

Despite targeted LGOIMA information requests and subsequent clarification requests, the presently available material does not establish a calibrated empirical understanding of how the wider receiving wastewater network behaves under compound wet-weather and groundwater-elevated conditions (LGOIMA 1614626).

This absence is not merely informational. It directly affects the ability to understand the governing hydraulic behaviour of the system.

The applicant's wastewater assessment principally focuses on local conveyance measures, including:

- attenuation through the proposed Local Pressure Sewer (LPS) system,
- upgrade of PS78,
- and cleaning or rejuvenation of downstream rising mains.

However, these measures principally address downstream transfer efficiency. They do not establish how the wider upstream gravity network behaves under compound wet-weather conditions, nor whether the governing causes of wet-weather loading within the receiving catchment are adequately understood.

This distinction matters because increased downstream conveyance efficiency may improve apparent operational performance at PS78 while leaving unresolved the behaviour of the wider coastal gravity network under stress conditions involving:

- rainfall-driven inflow and infiltration,
- elevated groundwater,
- tidal influence,
- sea-level rise,
- and future groundwater rise associated with relative sea-level rise and vertical land movement.

The evidential record also demonstrates that Christchurch City Council has undertaken some wet-weather monitoring and hydraulic modelling work relevant to the wider Christchurch wastewater network, including short-term flow monitoring associated with the Heyders Road (PS78) catchment as part of the 2018 Christchurch STFM wastewater model calibration programme (Mott MacDonald, 2018). The available material further indicates that wastewater modelling was undertaken for PPC23 (McDonald, 2025) using data the Council and its advisors collected regarding the effective capacity of PS78 and the downstream rising-main system relying on visual inspections and a pump wet-well drawdown test (CCC WW Team 2025).

Contemporary modelling platforms are capable of sophisticated wastewater-network simulation when supported by adequate empirical inputs and calibration data. This review does not imply that hydraulic modelling is inherently unreliable or inappropriate when those inputs are adequate. The present issue is that the evidential record does not establish that the receiving-network model has been calibrated and validated against measured wet-weather system behaviour sufficient to reliably characterise wastewater-system response under the environmental conditions relevant to PPC23.

Dark's evidence illustrates an additional analytical asymmetry within the current evidential record.

His hydrogeological evidence relies upon measured groundwater conditions, aquifer characterisation, and conceptual understanding of groundwater-system behaviour. The evidence therefore appropriately recognises that environmental systems cannot be reliably evaluated solely through assumption or generalised engineering expectation.

However, equivalent empirical characterisation has not been demonstrated for the wastewater network operating within the same shallow-groundwater environment.

In particular, the evidence before the Panel still does not demonstrate:

- measured infiltration and inflow (I&I) rates,
- calibrated wet-weather wastewater-system response,
- validated groundwater-influenced network behaviour,
- or empirical correlation between rainfall, groundwater elevation, and wastewater loading within the receiving network.

Accordingly, while the hydrogeological evidence materially confirms the environmental conditions governing the system, the wastewater assessment remains insufficiently empirically grounded to establish how the receiving network behaves under those conditions.

However, the available material does not establish that the receiving wastewater system has been assessed through a fully integrated, empirically validated, future-condition analysis of the type ordinarily associated with long-term resilience assessment of a coastal, groundwater-influenced wastewater network subject to additional urban intensification.

In particular, no material has been identified demonstrating:

- assessment of groundwater-driven infiltration and inflow behaviour under elevated groundwater, tidal, sea-level-rise, vertical land movement, or related future-condition scenarios;
- calibrated assessment of compound coastal and wet-weather effects on the receiving wastewater network;
- long-duration permanent flow metering associated with PS78 or the downstream receiving network;
- post-rehabilitation or post-SCIRT validation of actual long-term wet-weather system performance under present operating conditions;
- event-based validation comparing observed wet-weather overflow behaviour against wastewater model predictions;
- quantified attribution of the relative contribution of rainfall-derived inflow, groundwater infiltration, downstream conveyance limitation, pump-station limitation, or cumulative catchment loading during overflow events;
- or uncertainty analysis establishing the range of possible system responses under additional loading from PPC23.

The available material instead indicates that aspects of PS78 effective operating capacity were inferred using wet-well level-change testing because permanent flow metering was not available for the pump station at the time of the modelling exercise. The modelling material also indicates that the downstream rising-main system itself was considered a possible limiting factor in effective network capacity.

Despite targeted LGOIMA requests, subsequent clarification requests, and follow-up correspondence seeking:

- original design specifications and as-built hydraulic baseline information for the Kainga–Brooklands–Spencerville wastewater network,
- post-2014 SCIRT commissioning or validation information,
- and empirical wet-weather performance data,

(LGOIMA 1604217) (LGOIMA 1614626)

the evidential record does not presently establish either:

- the original intended hydraulic performance and design capacity of the receiving system,
- or its current empirically validated post-rehabilitation performance under wet-weather and groundwater-influenced conditions.

This is materially significant because the effective hydraulic state of the receiving wastewater network therefore remains uncertain. The available evidence does not demonstrate continuity between:

- original system design assumptions,
- post-earthquake degradation and rehabilitation,
- and current demonstrated operational performance under compound environmental conditions.

Nor does the available material demonstrate that the revised PS78 operating assumptions and proposed wastewater upgrades have been validated against observed historical wet-weather behaviour of the wider coastal catchment.

Accordingly, while the evidential record demonstrates that operational hydraulic modelling and wet-weather monitoring activities have been undertaken, it does not establish that the receiving wastewater network has been empirically characterised at a level sufficient to reliably determine:

- the governing causes of wet-weather loading and overflow behaviour;
- the sensitivity of the system to groundwater-driven infiltration and inflow;
- the behaviour of the upstream gravity catchment under compound coastal conditions;
- the future resilience of the receiving network under sea-level rise and related coastal stressors;
- or the long-term infrastructure implications of additional urban loading associated with PPC23.

Without validated system-level modelling under present and future stress conditions, the range of potential system responses cannot be meaningfully bounded. This limits the ability to reliably assess:

- overflow risk;
- infrastructure resilience;
- infrastructure upgrade requirements;
- lifecycle and renewal costs;
- and cumulative wastewater effects associated with PPC23.

This directly affects the adequacy of the section 32 evaluation because the infrastructure consequences and long-term risks associated with the rezoning cannot be properly quantified where the governing hydraulic behaviour of the receiving wastewater system remains only partially characterised.

Assessment:

The current operational performance envelope of the receiving wastewater system remains insufficiently characterised. The presently available evidence does not reliably establish:

- how the wider receiving gravity network responds under compound wet-weather and groundwater-elevated conditions;
- the extent to which infiltration and inflow behaviour presently influences network loading;
- whether current operational constraints are localised or system-wide in nature;
- or how future groundwater and sea-level-rise conditions may alter receiving-network behaviour over time.

In the absence of such calibrated understanding, the wastewater effects associated with transferring additional hydraulic loading from PPC23 into the wider receiving system cannot presently be evaluated with sufficient reliability to support rezoning-stage decision-making.

7. Load Transfer and Cumulative Risk

The wastewater effects of PPC23 are not confined to the plan change area itself.

PPC23 is not proposed as a hydraulically isolated wastewater system. Rather, the development would transfer additional hydraulic loading into the existing Kainga–Brooklands–Spencerville wastewater network through connection to the wider receiving system associated with PS78 and downstream conveyance infrastructure. The significance of this arrangement is not confined to whether wastewater can be conveyed from the PPC23 site under ordinary operating conditions, but whether the wider receiving network can be reliably characterised under the environmental conditions that govern its long-term behaviour.

Hall's evidence proposes that additional wastewater loading associated with PPC23 can be accommodated through a combination of Local Pressure Sewer (LPS) attenuation, upgrades to PS78, and rejuvenation or cleaning of downstream rising mains. These measures may improve aspects of local operational conveyance and downstream transfer efficiency.

However, the principal issue identified in this report is not confined to local pump-station throughput or downstream pressure-main condition. The wider receiving wastewater system includes groundwater-sensitive gravity infrastructure operating within a coastal environment affected by elevated groundwater conditions, rainfall-driven infiltration and inflow (I&I), earthquake-related deformation history, and future sea-level-rise influence.

In this context, localised operational upgrades do not by themselves demonstrate calibrated understanding of wider receiving-network behaviour under compound environmental stress conditions.

This distinction is materially important at the rezoning stage because approval of PPC23 would progressively increase long-term dependence on the performance and future adaptability of an existing coastal wastewater system whose operational behaviour under groundwater-elevated and wet-weather conditions remains insufficiently characterised. Once additional urban development is enabled and connected to the wider network, future infrastructure adaptation obligations,

operational constraints, and cumulative system pressures may become progressively more difficult and expensive to address.

Proposed adjustment measures primarily address nominal conveyance performance and local operational throughput. They do not establish how the wider receiving gravity network behaves under compound environmental conditions involving:

- elevated groundwater,
- rainfall-driven infiltration and inflow,
- tidal influence,
- sea-level rise,
- and cumulative future loading.

This distinction becomes important where additional urban loading does not merely increase average wastewater flow volume, but has the potential of altering the behaviour and stress profile of the wider receiving network during wet-weather and groundwater-elevated conditions.

In coastal gravity wastewater systems, apparent operational adequacy during ordinary conditions does not necessarily demonstrate resilience under compound-event conditions. A system may continue to function during typical operating periods while remaining vulnerable to surcharge, infiltration-driven loading, overflow behaviour, or escalating operational dependency during periods of environmental stress.

The available evidence does not presently establish:

- how the wider Kainga–Brooklands–Spencerville gravity network behaves under compound conditions,
- the degree to which groundwater-driven infiltration contributes to system loading,
- or whether future climate-related changes in groundwater and wet-weather conditions materially alter network performance over time.

This uncertainty is particularly significant because approval of PPC23 would not merely authorise additional dwellings. It would progressively deepen Christchurch's long-term operational and financial dependence on an existing coastal wastewater system whose future performance requirements and adaptation burden remain insufficiently characterised.

That dependency extends beyond PS78 itself.

The receiving system includes substantial downstream conveyance infrastructure, including long pressure mains traversing low-lying coastal terrain between PS78 and the wider receiving network. Continued urban intensification within the catchment may therefore create increasing long-term pressure for:

- future upgrades,
- rehabilitation,
- operational intervention,
- and continued investment in infrastructure operating within environmentally vulnerable coastal conditions.

Once additional urban growth is committed to such systems, future adaptation flexibility may become progressively constrained. Infrastructure investment decisions made to support present-day

growth can create long-term path dependency, requiring future councils and ratepayers to continue maintaining and upgrading increasingly climate-sensitive infrastructure networks.

This issue is materially relevant under section 32 because the long-term infrastructure implications of PPC23 cannot be reliably evaluated where:

- the current hydraulic behaviour of the receiving system remains insufficiently characterised,
- future groundwater- and climate-driven loading effects remain unresolved,
- and the scale of future infrastructure adaptation obligations has not been quantified.

Assessment:

The present issue is therefore not whether operational upgrades or future engineering responses may improve aspects of local wastewater conveyance. The issue is that the evidential record does not presently establish a calibrated understanding of how the wider receiving wastewater system behaves under the compound environmental conditions that govern it, nor how that behaviour may evolve under future groundwater, sea-level-rise, and cumulative loading conditions.

In the absence of such system-level understanding, the long-term wastewater effects associated with transferring additional hydraulic loading from PPC23 into the wider coastal receiving network remain insufficiently characterised for rezoning-stage decision-making.

8. Internal Inconsistency within S42A

The Section 42A report adopts a system-level and climate-aware analytical framework when assessing stormwater, groundwater, flood behaviour, and related natural-hazard effects associated with PPC23. In particular, the report recognises that infrastructure and hazard effects within low-lying coastal environments cannot be reliably understood solely through site-level assessment where wider system behaviour is influenced by groundwater interaction, sea-level rise, cumulative hydraulic effects, and compound environmental processes.

The physical processes identified within the Section 42A report as relevant to stormwater-system behaviour—including groundwater interaction, rainfall-driven loading, sea-level rise, vertical land movement, and cumulative coastal effects—are also materially relevant to wastewater-system behaviour within groundwater-sensitive coastal networks.

This relevance is reinforced by the applicant's own evidence. Hall acknowledges the importance of elevated groundwater conditions, sea-level rise, and cumulative hazard interaction. Dark confirms shallow groundwater dynamics and future sea-level-rise influence. Trainor confirms high-groundwater and deformation-sensitive geotechnical conditions characteristic of the wider environment.

However, unlike stormwater, the wastewater assessment presented in support of PPC23 remains principally focused on local servicing arrangements, PS78 operational upgrades, and downstream conveyance measures rather than calibrated system-level assessment of wider receiving-network behaviour under compound environmental conditions.

A recurring feature of the evidential material is the proposition that a number of the identified hazards, infrastructure constraints, or environmental uncertainties may ultimately be capable of

being managed through later engineering design, subdivision-stage investigation, or future consenting processes.

Trainor's evidence also illustrates a broader tension within the present evidential framework.

His evidence repeatedly concludes that the identified geotechnical hazards are "manageable" through established engineering practice, future subdivision design, remediation measures, and detailed engineering assessment at later stages.

However, the Section 42A report simultaneously concludes that unresolved natural-hazard, groundwater, stormwater, and infrastructure issues presently prevent reliable evaluation of PPC23 at rezoning stage. The Reporting Officer expressly identifies the need for additional system-level assessment before the effects of the rezoning can be properly understood.

This creates an important analytical distinction:

the existence of potential future engineering responses does not itself eliminate present evidential uncertainty.

In other words, the proposition that hazards may potentially be managed at later design stages is not equivalent to demonstrating that the present rezoning-stage evidential platform is sufficient to reliably evaluate:

- long-term infrastructure resilience,
- cumulative system effects,
- or future environmental risk under interacting coastal-system conditions.

This distinction is particularly important for wastewater infrastructure because the relevant effects extend beyond individual lot engineering and into the long-term performance of the receiving network operating within the same geotechnical and groundwater environment described throughout the applicant evidence.

The present issue before the Hearing Panel is not whether future engineering responses may theoretically exist in principle. Rather, the issue is whether the current evidential platform is sufficiently complete to reliably evaluate the long-term effects, risks, and infrastructure implications of enabling rezoning at the scale proposed.

This distinction matters because the Section 42A reporting framework repeatedly identifies circumstances where site-level assessment alone is insufficient to understand broader system behaviour, particularly where groundwater interaction, climate-driven change, cumulative effects, and infrastructure-system performance remain incompletely characterised.

Assessment:

If system-level modelling and integrated climate-aware assessment are considered necessary to reliably evaluate stormwater and natural-hazard effects within the PPC23 environment, then the absence of equivalent system-level wastewater assessment is not merely a difference in engineering emphasis; it is a difference in evidential standard.

The resulting analytical asymmetry is materially significant because wastewater systems within groundwater-sensitive coastal environments are governed by many of the same underlying environmental drivers identified elsewhere in the Section 42A analysis.

9. Consideration of Potential Mitigation Pathways (Indicative LPS Conversion Costs)

This section does not attempt to predict the future infrastructure response that may ultimately be required within the Kainga–Brooklands–Spencerville wastewater system. Nor does it assert that conversion of existing gravity infrastructure to alternative servicing arrangements is presently necessary or inevitable.

Rather, the purpose of this section is to illustrate the possible scale of infrastructure interventions and associated costs that may become relevant where the operational behaviour and long-term adaptability of the wider receiving wastewater network remain insufficiently characterised at the rezoning stage.

9.1 Illustrative Scale of Intervention

Indicative order-of-magnitude costs for conversion of an existing gravity wastewater network to a Low Pressure Sewer (LPS) system demonstrate that such an intervention constitutes a material, system-level infrastructure investment, not a marginal upgrade. The significance of these indicative figures lies not in their precise magnitude, but in the scale of potential infrastructure obligations that may arise where long-term receiving-network behaviour and adaptation requirements remain insufficiently understood.

Publicly available New Zealand wastewater upgrade assessments illustrate that conversion or augmentation of groundwater-sensitive coastal wastewater systems can involve infrastructure interventions of substantial scale and cost, particularly where existing gravity systems experience infiltration, inflow, groundwater interaction, or long-term resilience constraints. While such examples are not directly predictive of future requirements within the PPC23 receiving environment, they nevertheless demonstrate that unresolved uncertainty regarding long-term wastewater-system behaviour may carry materially significant infrastructure and financial implications.

A recent New Zealand local authority source—New Plymouth District Council’s 2024 technical report on wastewater management options for Urenui and Onaero—provides a robust empirical benchmark. The report identifies a total capital cost of approximately \$9.1 million for LPS collection infrastructure, covering approximately 230 serviced properties (derived from LPS pump counts). (New Plymouth District Council, 2024)

This yields an indicative fully-loaded system cost of approximately \$39,500 per property.

This figure is methodologically important because it reflects system-level implementation, not merely household retrofit costs. It includes:

- reticulation network construction
- on-property pump units and boundary kits
- connections and septic system decommissioning
- design, consenting, contingencies, and project overheads

Accordingly, it provides a credible New Zealand baseline for LPS conversion at scale.

9.1.1 Application to Kainga–Spencerville catchment (illustrative only)

Applying this indicative per-dwelling cost to the approximately 621 dwellings within the existing gravity catchment suggests a total order-of-magnitude cost of:

- ~\$24 million ($621 \times \$39,500$)

This estimate is:

- illustrative only
- not site-specific
- not a substitute for system modelling

and does not include:

- downstream infrastructure upgrades (e.g. PS78, rising mains)
- coastal groundwater / infiltration effects
- abnormal geotechnical conditions
- lifecycle operational and maintenance costs

9.1.2 Critical evidential limitation

While the NPDC source establishes a credible national benchmark, the actual cost of conversion for the Kainga–Spencerville system:

- is highly sensitive to network topology, condition, and infiltration behaviour
- depends on wet-weather loading and groundwater interaction
- requires integrated system-level modelling to quantify

This aligns with the broader technical literature demonstrating that coastal wastewater systems experience significant variability in flows and infrastructure stress due to groundwater, rainfall, and sea-level interactions, which directly influence infrastructure performance and upgrade requirements. (Hughes et al., 2021)

9.2 Uncertainty and Avoidance of False Precision

These values are expressed as broad ranges rather than point estimates. Actual costs would vary materially depending on:

- groundwater conditions and coastal influence
- asset condition and extent of replacement required
- property layout and pump installation complexity
- staging and integration with existing infrastructure

Accordingly, these figures are indicative of scale only and are not predictive.

9.3 Implications for System-Level Assessment and s32

The relevance of these indicative costs is not their precise magnitude, but their scale.

Conversion to LPS is not a localised engineering adjustment confined to the development site. It is a network-wide intervention, involving distributed mechanical infrastructure, property-level installation, and ongoing operational obligations.

Despite this, no assessment has been provided of:

- whether such conversion would be required under realistic system conditions
- the extent of the network to which it would apply
- the capital or lifecycle costs involved
- the interaction of such a system with groundwater, sea-level rise, and wet-weather loading
- the implications for downstream infrastructure, including PS78

Industry guidance emphasises that infiltration and inflow must be quantified through flow monitoring and model calibration, rather than assumed, in order to evaluate system performance and the effectiveness of remedial measures (Water Environment Federation, 2017, p. 2).

The relevance of these indicative infrastructure scenarios is not that they establish a known future upgrade pathway for the Kainga–Brooklands–Spencerville wastewater system. Rather, they illustrate that where receiving-network behaviour under groundwater-elevated and wet-weather conditions remains insufficiently characterised, potentially significant long-term infrastructure obligations cannot presently be reliably excluded, quantified, or evaluated.

This is materially relevant to section 32 evaluation because the efficiency, appropriateness, and long-term infrastructure implications of rezoning cannot be reliably assessed where potentially significant downstream adaptation requirements remain unresolved at the plan-change stage.

Assessment:

Any potential invocation of LPS as a possible mitigation pathway for the PS78 upstream network does not resolve wastewater effects.

Rather, it introduces a material, unquantified alternative pathway involving significant capital investment, operational complexity, and system transformation, none of which have been evaluated.

Low pressure sewer (LPS) systems comprise distributed on-property mechanical infrastructure, including pumps, control systems, and associated equipment, which require ongoing operation, maintenance, and lifecycle replacement responsibilities distinct from conventional gravity systems (QLDC, 2021), introducing a materially different long-term cost profile.

Importantly, indicative costs derived from comparable New Zealand implementations demonstrate that conversion of an existing gravity network to a low pressure sewer (LPS) system could constitute an ***intervention potentially involving many tens of millions of dollars*** at the scale of the Kainga–Spencerville catchment. While no such mitigation has been advanced in the applicant’s evidence, the potential necessity of interventions of this magnitude cannot be excluded in the absence of system-level modelling of the existing network under current and future conditions.

In these circumstances, both the feasibility and economic implications of any downstream mitigation response—including, but not limited to, network conversion, augmentation, or replacement—remain unquantified. Without integrated hydraulic modelling of the receiving system, it is not possible to determine whether such interventions would be required, nor to assess their scale, timing, or cost.

Accordingly, this section is not advanced as a prediction of inevitable future infrastructure outcomes, but as an illustration of the scale of potential consequences that may remain unevaluated where system-level wastewater behaviour and long-term receiving-network adaptability have not been sufficiently characterised. In the absence of such understanding, the long-term infrastructure implications associated with transferring additional hydraulic loading from PPC23 into the wider receiving system remain materially uncertain.

10. Conclusion

The wastewater effects associated with PPC23 have not been assessed at the level necessary to reliably characterise the behaviour of the receiving wastewater system under the environmental conditions that govern it. While the applicant's evidence addresses local servicing arrangements, Local Pressure Sewer (LPS) attenuation, upgrades to Pump Station 78 (PS78), and downstream conveyance measures, the evidential record does not presently demonstrate an integrated and calibrated assessment of wider receiving-network behaviour under groundwater-influenced, wet-weather, and future climate conditions.

The applicant's own evidence materially confirms the relevance of the environmental drivers underlying this concern. Hall acknowledges the importance of elevated groundwater conditions, sea-level rise (SLR), vertical land movement (VLM), and cumulative hazard interaction in determining future infrastructure constraints and performance. Dark confirms shallow groundwater dynamics and future SLR influence within the wider environment. Trainor confirms groundwater-sensitive and deformation-prone geotechnical conditions characteristic of the coastal setting. Collectively, this evidence confirms that the receiving wastewater environment associated with PPC23 is materially influenced by the same broader environmental and hydraulic processes identified elsewhere in the Section 42A analysis.

The broader technical literature further establishes that groundwater elevation, rainfall-driven infiltration and inflow (I&I), coastal boundary conditions, and compound wet-weather processes materially influence wastewater-system behaviour within low-lying coastal environments. These processes are particularly relevant where wastewater systems include aging or earthquake-affected gravity infrastructure operating within shallow-groundwater conditions.

The presently available evidential material does not establish:

- calibrated wet-weather hydraulic modelling of the wider receiving wastewater network;
- validated empirical understanding of groundwater-driven infiltration and inflow behaviour;
- quantified reconstruction of observed overflow events;
- or reliable characterisation of current operational performance under compound environmental stress conditions.

This evidential deficiency is materially significant because Christchurch City Council and Environment Canterbury records associated with the 15 December 2021 PS78 overflow event attributed the overflow to high levels of rainwater inflow and groundwater infiltration during a significant wet-weather event. The occurrence of multiple wet-weather overflow events across Christchurch during the same period further illustrates the broader sensitivity of earthquake-affected wastewater systems to infiltration and wet-weather hydraulic stress. However, no calibrated post-event reconstruction or validated system-level analysis has been demonstrated establishing how the wider receiving network behaved under those conditions, nor the extent to which groundwater interaction, infiltration, conveyance constraints, or other factors contributed to the observed system response.

Accordingly, the present operational performance envelope of the wider receiving wastewater network remains insufficiently characterised. While operational upgrades to PS78 and downstream conveyance infrastructure may improve aspects of local wastewater transfer and throughput, the

presently available material does not reliably establish how the wider receiving gravity network behaves under groundwater-elevated, wet-weather, tidal, and future climate conditions.

This uncertainty is materially significant at the rezoning stage because PPC23 would progressively increase long-term dependence on the performance and future adaptability of an existing groundwater-sensitive coastal wastewater system whose behaviour under governing environmental conditions remains insufficiently characterised. In such circumstances, the long-term infrastructure implications, cumulative wastewater effects, and future adaptation requirements associated with additional hydraulic loading cannot presently be reliably excluded or evaluated.

The issue is not whether wastewater infrastructure can theoretically be engineered in principle. The issue is that the system within which that infrastructure must operate has not been sufficiently characterised under the environmental conditions that govern its behaviour.

In the absence of calibrated system-level understanding of the wider receiving wastewater network, the evidential foundation necessary to support reliable section 32 evaluation of wastewater effects associated with PPC23 remains incomplete.

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