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Reference: Te Karaka Stopbank Flood aspects

1 Introduction

This memorandum summarises the flood risk, hydrology, hydraulic, geomorphological and river engineering matters raised throughout the consent review process. The summary is presented chronologically through:

- s92 Request Stage 1 (Stantec response dated: 19 May 2026)
- s92 Request Stage 2 Review of Responses (Stantec response dated: 17 July 2026)
- Submission Review (Stantec response dated: 26 August 2026)

Only flood related technical matters raised by Stantec are included.

2 s92 Request Stage 1 (19 May 2026)

During the initial technical review of the resource consent application, several information gaps were identified regarding flood risk assessment, hydraulic modelling, geomorphology, residual risk and infrastructure performance. These gaps are summarised in the sections below.

2.1 Hydrology and River Dynamics Assessment

Stantec identified that Section 6.10 did not adequately demonstrate how hydrological and river dynamics effects had been assessed, particularly during large and overdesign flood events. Specific concerns included:

- Changes in flood levels and velocities.
- Potential scour and erosion effects.

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- Effects on third party properties and infrastructure.
- Basis for the adopted design event and level of service.
- Consideration of climate change.
- Residual risk associated with overdesign events.
- Relationship between freeboard and stopbank crest levels.
- Reliance on potentially outdated hydrological inputs.

Stantec requested additional explanation demonstrating why the identified risks and effects were acceptable.

2.2 Stopbank Failure, Breach and Scour

Stantec noted that the application did not clearly demonstrate whether scour induced stopbank instability or breach had been assessed.

Additional information was requested regarding:

- Potential breach mechanisms.
- Management of scour related risks.
- Flood consequences associated with stopbank failure.
- Residual flood hazard associated with overtopping or breach.

2.3 Drainage Discharges and Stopbank Stability

The application identified several drains discharging to the river but did not demonstrate whether those discharges could affect riverbank or stopbank stability.

Stantec requested assessment of:

- Erosion and scour potential.
- Seepage risks.
- Backflow prevention.
- Proposed mitigation measures.

2.4 Aggradation, Sediment Transport and Scour

A significant concern raised by Stantec related to the use of fixed bed hydraulic modelling without clear consideration of longer term geomorphic change.

Key issues included:

- Potential riverbed aggradation and degradation.
- Sediment transport processes.

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- Lateral channel migration.
- Increased scour depths.
- Bridge and infrastructure vulnerability.
- Conflicting statements regarding future aggradation under the preferred stopbank alignment.

Additional assessment of sediment transport and aggradation processes was requested.

2.5 Consequential Flood Risk Assessment

Stantec identified uncertainty regarding:

- Hydraulic modelling inputs.
- Model domain extent.
- Consistency between modelling scenarios.
- Treatment of future aggradation scenarios.
- Representation of stopbank alignments and project geometry.
- Impacts on properties outside the protected area.

Additional technical information was requested to verify the reliability of the consequence assessment.

2.6 Hydraulic Assessment of Consequences

Additional clarification was requested regarding:

- Hazard calculation methodology.
- Velocity and depth outputs.
- Assessment of overdesign events.
- Potential downstream flow impacts.
- Interpretation of minor flood depth changes.

3 s92 Request Stage 2 Review (17 July 2026)

Following receipt of the applicant's response on 10 July 2026 and additional supporting technical reports, Stantec undertook a further review and attended a specialist discussion with Tonkin & Taylor on 26 June 2026.

3.1 Hydrology and Design Event Clarification

The applicant provided additional hydrological and geomorphological information.

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Following review, Stantec considered the response generally adequate but recommended clearer documentation of the adopted design standard, specifically:

- Explicitly identifying the design flow as "Cyclone Bola +25%".
- Defining the equivalent contemporary AEP.
- Demonstrating how climate change allowances have been incorporated into the adopted design event.

3.2 Scour and Geomorphology

Additional geomorphological information was provided, including sediment transport and aggradation assessments.

Following discussion with Tonkin & Taylor, Stantec noted that bridge scour and foundation assessments would be addressed during detailed design. Preliminary information indicated that one bridge foundation was founded on rock, while the pier lengths for the other bridge exceeded 20 m. No further information was requested at the consent stage as these assessments will be undertaken during the detailed design which is a sensible approach.

3.3 Consequential Flood Risk Assessment

The applicant provided the hydraulic modelling report and further explanation regarding the consequence assessment.

Following review, Stantec accepted that:

- Opposite bank properties were included in the consequence assessment.
- Affected landowners had been consulted (however it is noted that evidence of this has not been sighted).
- Hydraulic model domain concerns had been addressed.

3.4 Overdesign Event Assessment

Additional evidence demonstrated that overdesign event scenarios had been modelled and assessed.

The applicant confirmed that:

- An approximately 0.2% AEP (1 in 500 year ARI equivalent) scenario was assessed.
- Property impacts were evaluated.
- Residual flood risk had been considered.

Stantec considered the response adequate for the purposes of the consent review.

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4 Submission Review

Following receipt of submissions, Stantec undertook a targeted review of flood and hydraulic matters raised by submitters. Stantec provided a response on 26 August 2026.

4.1 Consequential Flooding Assessment

Several submissions challenged the adequacy of the consequential flood risk assessment and argued that adverse effects had been underestimated.

The principal concern identified was that the current assessment appears primarily focused on buildings and dwellings rather than productive land and rural activities.

Stantec recommends that the applicant provide additional information regarding:

- Existing flood frequency affecting productive land.
- Future changes in flooding frequency.
- Flood duration.
- Flood velocities.
- Changes across a range of AEP events.
- Effects on farm infrastructure and business activities.

Stantec also identified a need to verify whether all potentially affected properties and assets had been assessed, including properties specifically identified in submissions.

4.2 Aggradation and Scheme Longevity

Submitters raised concerns regarding long term scheme performance and future aggradation.

Stantec concluded that aggradation had been considered throughout the project and integrated into optioneering and hydraulic modelling.

However, an outstanding uncertainty remains regarding:

- Whether the +1.0 m aggradation scenario considered during optioneering was incorporated into the final design assessment.
- Whether the adopted 600 mm freeboard allowance is additional to, or inclusive of, the aggradation allowance.

Stantec considered that monitoring and adaptive management conditions could assist in managing long term uncertainty.

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4.3 Bridge Effects

Submitters raised concerns regarding bridge scour, hydraulic loading and flood performance.

Stantec consider that bridge assessments can be appropriately addressed during detailed design but recommended that:

- Detailed design reports be provided to Council.
- Any revised scour assessments be documented.
- Proposed mitigation measures be reviewed and approved by Council.

4.4 Debris Blockage Scenarios

Stantec identified debris accumulation at bridge structures as a potentially significant unresolved issue.

A key outstanding question is whether debris blockage scenarios have been incorporated into the hydraulic modelling and whether associated flood level increases have been assessed.

Stantec considered this to be a potential gap that should ideally be resolved prior to the hearing because of its direct relationship with:

- Stopbank design levels.
- Freeboard adequacy.
- Residual flood risk.

4.5 Property Specific Flood Effects

Stantec reviewed concerns raised regarding individual properties and generally considered that:

- Several issues overlap with the broader consequential flooding assessment.
- Additional evidence may be required regarding changes in flood depths, velocities and duration affecting productive land and orchards.
- The current information may not be sufficient to fully assess impacts on rural land uses.

4.6 Culverts, Drainage and Flood Management

Submitters questioned the adequacy of culvert and drainage design.

Stantec consider that detailed design is the appropriate stage to address these matters but recommended a condition requiring:

- Submission of detailed design documentation to Council for review.
- Demonstration of hydraulic performance.

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- Council review and sign off of final designs.

4.7 Emergency Management and Residual Risk

Residual risk remained a key issue raised through submissions.

Stantec identified that the information currently available provides insufficient detail regarding:

- Stopbank overtopping pathways.
- Potential breach initiation locations.
- Breach progression.
- Emergency response implications.

Stantec recommended that the applicant provide:

- Longitudinal stopbank profiles.
- Crest elevations.
- Modelled flood levels including debris loading on bridges.
- Assessment of possible overtopping locations.
- Assessment of sensitivity to aggradation and freeboard.

5 Key Outstanding Flood and Hydraulic Matters

The following matters remain the principal outstanding technical issues from a flood risk, hydraulic and hydrological perspective:

1. Assessment of flooding impacts on productive land, farm infrastructure and rural business activities, including frequency and duration of inundation.
2. Confirmation that all affected assets and properties have been captured within the consequence assessment.
3. Assessment of debris blockage scenarios at bridge structures and implications for flood levels and freeboard.
4. Clarification of the relationship between aggradation allowances and the adopted 600 mm freeboard.
5. Improved assessment and communication of residual risk, including overtopping and breach scenarios.
6. Development of monitoring and adaptive management measures to address long term aggradation and scheme performance uncertainty, informed by the sensitivity of the scheme performance to aggradation.

We also recommend the adopted design standard is documented more clearly, specifically:

- Explicitly identifying the design containment flow as "Cyclone Bola +25%".

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- Defining the equivalent contemporary and future climate AEP's under different climate emissions scenarios and epochs.

We recommend the following matters are addressed at detailed design:

- Provision of detailed bridge scour assessments during detailed design (not required for consenting).
- Provision of detailed culvert and drainage design documentation during detailed design (not required for consenting).

Yours sincerely

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