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SECTION 53 COMMENTS HYDROLOGY RESPONSE

Project	Waikanae North Development
Application reference	FTAA-2603-1194
Site	169-171 Peka Peka Road, Waikanae, Kapiti Coast
Document	Response to comments received under section 53, Fast-track Approvals Act 2024 Hydrology
Prepared by	Ray O'Callaghan, O'Callaghan Design Ltd
Date	9 August 2026
Status	Final

1. Purpose and scope

This report responds to the comments received under section 53 of the Fast-track Approvals Act 2024 on the Waikanae North Development substantive application (FTAA-2603-1194) that fall within the hydrology discipline. It forms part of a set comprising a covering note addressing planning, legal and conditions matters, individual topic area reports, and a tabulated response covering every comment received.

For each topic this report sets out the comments as made, where relevant a response drawn from the application as lodged, and also contains new additional information responding to the comments received where appropriate.

Comments are grouped by topic. Individual comment numbers and commenters are tagged against each topic so that complete coverage can be verified against the Section 53 Comments Register.

2. Author(s) and Code of Conduct

This response has been prepared by Ray O'Callaghan.

Although this document has not been written as a statement of expert evidence, I confirm that at all times I have complied with the Environment Court's Code of Conduct for Expert Witnesses contained in its Practice Note 2023.

3. Comments allocated to this discipline

Topic	Comment reference(s)	Commenter(s)
H1 Effect of earthworks on shallow groundwater and private bore supply	1.2	1 Sally & John Killick
H2 Off-site groundwater and flood effects on Paetawa Road properties	5.1, 8.1	5 Nicholas Brown; 8 Paul Westbury
H3 Net effect of peat removal, fill and hard surfacing on swamp and groundwater levels	5.3, 11.5, 16.5	5 Nicholas Brown; 11 Kevin & Karen Baker; 16 Glynn & Jennifer Cowley
H4 Wetland water levels and flooding of adjoining land	1.3, 13.4	1 Sally & John Killick; 13 Kensington Farm Park Ltd
H5 Monitoring, capped water levels, data sharing and independent review	5.5	5 Nicholas Brown
H6 Cumulative hydrological change and watercourse effects	13.4	13 Kensington Farm Park Ltd
H7 Absence of a hydrogeological assessment and groundwater model	21.5, 24.5	21 Kapiti Coast District Council; 24 Greater Wellington Regional Council
H8 Control measures preventing Te Harakeke Wetland receiving excess water and inundating properties to the west	21.6, 5.1, 5.3	21 Kapiti Coast District Council; 5 Nicholas Brown
H9 Eco-hydrological monitoring and management of water levels for ecological outcomes	24.5	24 Greater Wellington Regional Council

Total: 9 topics covering 12 individual comment issues.

4. Topic responses

H1 Effect of earthworks on shallow groundwater and private bore supply

Comments: 1.2 | Commenters: 1 Sally & John Killick

Comment. The Killicks rely on sand traps (shallow bores) at [redacted] for garden irrigation and stock water, and are concerned that large-scale earthworks and ground restructuring will lower or disrupt the water table.

Response. The Hydrological Report assesses the effect of removing approximately 475,000 cubic metres of peat and replacing it with compacted sand and silt. Using a transmissivity comparison across the peat layer and the underlying 20 metre natural sand profile, the report concludes that removal of the peat and replacement with a compacted sand and silt mix will not appreciably change the groundwater regime, because the peat contributes only a small proportion of the total transmissivity of the profile. The stormwater design is deliberately configured to increase, not decrease, recharge: annual discharge to infiltration and groundwater recharge in the low-lying area is estimated to increase from approximately 312,000 cubic metres per year to approximately 424,000 cubic metres per year. Following the circulation of alternative saturated hydraulic conductivity data by Greater Wellington Regional Council, the applicant provided a groundwater sensitivity memorandum dated 30 June 2026 (attached as Appendix 1) confirming that predicted groundwater change in the eastern area of the project remains at the millimetre scale even under conservative assumptions, against existing seasonal variation of the order of 0.5 metres.

The Hydrological Report's conclusion on potential effects in the western zone (Section 9) is that the effects of the changes in hydrology associated with the project will be minor. That conclusion incorporates consideration of the proposed large earthworks and peat removal in the eastern portion of the site. This is assisted to some extent by the almost 1km separation between the eastern portion of the site and the Killick's property.

The Hydrological Report also concluded that the changes to stormwater discharges in the western zone are relatively small as stormwater neutrality on the house sites will be achieved and the free draining dune sands in the western zone are not being earthworked within the groundwater zone and hence there is not expected to be any adverse impact on groundwater levels in that zone.

Separately, the development is to be serviced by reticulated town water supply and reticulated wastewater, so it does not itself draw on the shallow groundwater resource on which the commenters rely.

Hence it is concluded that the project will not have any adverse effect on the water collection system used by the Killick's on their property.

H2 Off-site groundwater and flood effects on Paetawa Road properties

Comments: 5.1, 8.1 | Commenters: 5 Nicholas Brown; 8 Paul Westbury

Comment. Mr Brown identifies this as a major gap. He submits that the application (Stormwater Appendix 16, Hydrology Appendix 17 and Flood Appendix 20) assesses off-site effects to the north-east, east and south but gives no analysis of flooding impacts on Paetawa Road properties to the north-west; that all 17 groundwater piezometers were located on site with none in the Paetawa Road area; and that there is strong hydrogeological connectivity between Te Harakeke Swamp and Paetawa Road groundwater, evidenced by the 2021/22 flooding of approximately 50 properties. He requests time for independent expert review and raises the section 85(3) FTAA refusal test. Mr Westbury formally endorses that submission.

Response. This issue is discussed in detail in item F1. We acknowledge that the applicant has not installed any groundwater piezometers on the Paetawa Road side of Te Harakeke wetland. There are two piezometers on the eastern side of the Te Harakeke Swamp (P15 & P16 as shown by Figure 7 in the Hydrological Report). These have recorded the highest groundwater level over the 18-month recording period of RL2.9m. There is a groundwater gradient towards the west and the Paetawa Road properties are approximately 350m to the west of these two piezometers and thus the groundwater level at the Paetawa Road properties would be below the levels recorded at the eastern side of the Te Harakeke Swamp.

The technical issues covered in the Flood Hazard Assessment and the Hydrological Assessment are extensive, comprehensive and appropriate for the nature and scale of the proposed works, considering the actual soil conditions and groundwater conditions at the site. We consider these assessments provide a reliable conclusion that the proposed works will not result in adverse effects on the groundwater levels at the Paetawa Road properties.

H3 Net effect of peat removal, fill and hard surfacing on swamp and groundwater levels

Comments: 5.3, 11.5, 16.5 | Commenters: 5 Nicholas Brown; 11 Kevin & Karen Baker; 16 Glynn & Jennifer Cowley

Comment. Mr Brown submits that stormwater from parts of the development is released to Te Harakeke Swamp, that approximately 475,000 cubic metres of peat is removed (reducing storage) and replaced with compacted fill, and that extensive hard surfacing increases runoff, with a risk of re-creating the 2021/22 flood conditions. Mr and Mrs Baker and Mr and Mrs Cowley make similar points about converting free-draining sand to impervious surfaces in an area already flood-prone.

Response. This issue is responded to in F1 and I4. In addition, the Hydrological Report concludes that removal of peat within the development zone will not have an adverse effect on the behaviour of the Te Harakeke Swamp, because the loss of groundwater storage within the removed peat will be replaced within a short period, and that the increased supply of groundwater from the stormwater solution will have a positive effect on soil moisture. The appended 30 June 2026 sensitivity memorandum, prepared after Greater Wellington circulated alternative hydraulic conductivity data, confirms that predicted groundwater change remains millimetre-scale under conservative assumptions.

H4 Wetland water levels and flooding of adjoining land

Comments: 1.3, 13.4 | Commenters: 1 Sally & John Killick; 13 Kensington Farm Park Ltd

Comment. The Killicks are concerned that raising Te Harakeke Swamp levels for ecological restoration could re-flood their horse arena and pond and seek assurance on flood mitigation for the rear of their property. They note a cross-council debate on wetland levels. Kensington Farm Park notes changes to watercourses and ponding effects already caused by Expressway construction.

Response. The proposal does not involve raising Te Harakeke Swamp water levels. The design maintains relative hydrological independence from Te Harakeke Swamp through the proposed stormwater management for surface water in the western portion of the site and separation distance between the eastern part of the site where peat removal will occur and the Paetawa Road area. This includes the expected minor effect on groundwater level associated with peat removal. Long-term management of the water level in Te Harakeke Swamp is a matter between Kāpiti Coast District Council and Greater Wellington Regional Council and is not something the proposal alters or controls.

H5 Monitoring, capped water levels, data sharing and independent review

Comments: 5.5 | Commenters: 5 Nicholas Brown

Comment. Mr Brown seeks conditions requiring regular monitoring and publication of Te Harakeke Swamp levels; a capped water level (for example 2.6 metres NZVD 2016 along the north-west edge) with remedial action if exceeded; a supplementary flood report using the 2025 KCDC modelling; a requirement that the developer meet residents and the KCDC Flood Defence Team and share raw data; and time for independent expert review before a decision is made.

Response. A Groundwater Level Monitoring Report prepared by a suitably qualified person is already required by condition, with specified content, and the ecological work programme is expressly integrated with it. Annual wetland monitoring reports are required after construction of the wetlands, and the applicant is required to report to the Manager by 1 December each year for a specified period. Monitoring data must be submitted to the Manager within a specified timeframe. Greater Wellington and the applicant agreed in June 2026 conferencing that wetland and Ngarara Stream water level (not flow) is the key parameter to monitor and manage, addressed through a conditions-based management plan with trigger levels integrated with the Groundwater Monitoring Report, with built-in adaptive management rather than fixed one-off solutions. Further revision of conditions, based on feedback from Greater Wellington, is underway.

It is not feasible for the consent holder to be held responsible for maximum groundwater levels in the Paetawa Road/Te Harakeke Swamp areas because the groundwater level is influenced by downstream drain capacity, which is outside the control of the consent holder and is a matter for KCDC and GWRC.

H6 Cumulative hydrological change and watercourse effects

Comments: 13.4 | Commenters: 13 Kensington Farm Park Ltd

Comment. Kensington Farm Park submits that this is a very ecologically sensitive area and that changes to water courses and ponding effects caused by the Expressway construction have already been noted.

Response. The proposal involves realignment of approximately 993 metres of the Ngarara Stream and 76.9 metres of culverting, with the realigned section designed to maintain more natural hydraulic and ecological conditions. The design and construction of the realignment is controlled by conditions, including final design certification, construction sequencing within Phase 2, and detailed design of all associated works. The existing modified condition of the drainage network, including the effects of prior works in the area, forms part of the receiving environment against which effects are assessed. The assessment of potential effects relating to the proposal through the Flood Hazard Report, the Stormwater Management Report and the Hydrological Report, alongside the Ecological Restoration Management Plan, conclude that the issues are well understood, the design deals with the matters appropriately and the proposed monitoring through conditions will confirm the expected outcome.

H7 Absence of a hydrogeological assessment and groundwater model

Comments: 21.5, 24.5 | Commenters: 21 Kapiti Coast District Council; 24 Greater Wellington Regional Council

Comment. Kāpiti Coast District Council identifies the absence of a hydrogeological environment assessment by a suitably qualified person and recommends a robust analysis including development of a groundwater model for a development of this scale. KCDC records that the applicant has acknowledged limited groundwater data is available, that the conclusions in the hydrology assessment are based largely on expected groundwater behaviour rather than site-specific monitoring data or quantitative groundwater modelling, and that uncertainty therefore remains as to how groundwater levels and flow paths may respond to the proposed changes in landform, stormwater management and wetland hydrology.

Greater Wellington's Issue 5 identifies the same gaps: no transient (daily or 7-day timestep) hydrological or hydrogeological models; modelling not accounting for local simulations of climate change; no Ngarara Stream level monitoring correlated with rainfall events and inundation frequency; and remaining uncertainty in effects on groundwater levels and wetland hydrology notwithstanding the peat replacement sensitivity analysis.

Response. The Hydrological Report provides approximately 10 months of groundwater monitoring data from 17 on-site piezometers together with hydrogeological cross sections and assesses the peat removal question by transmissivity comparison. Greater Wellington acknowledges this contains useful contextual information and that the applicant has provided further information following its initial feedback, including the appended 30 June 2026 peat-to-sand sensitivity memorandum.

The assessment in the Hydrological Report concludes that changes in groundwater level resulting from the proposed earthworks, peat removal and stormwater solutions for the project are unlikely to result in more than minor changes to groundwater levels. The Hydrological Report also notes that the expected changes are small in comparison to seasonal variation in ground water levels. This conclusion was supported by the 30 June peat-to-sand sensitivity memorandum.

We do not agree that a groundwater model is required for this development. The scale of the project is not a driver for the need for a groundwater model. A potentially significant effect resulting from significant changes in groundwater behaviour is the more correct trigger for the need for groundwater modelling.

The assessment carried out and presented in the Hydrological Report clearly identifies that the expected changes in groundwater level are small relative to the overall scale of the site and that the consequences of the changes in groundwater are relatively small beyond the site boundary. The key issue about groundwater for this project in the eastern area is achieving a suitable balance of soil moisture to maximise wetland enhancement, whilst avoiding adverse effects to other aspects of the environment.

This will be achieved by controlling the base water level in the reconstructed Ngarara Stream. The groundwater level in the Waikanae zone is closely aligned with dry weather stream water levels and the groundwater monitoring undertaken to date supports this linkage at this site. The Ngarara Stream water levels are being controlled by the downstream flow control system, hence there can be a high degree of confidence about stream water level. On-going monitoring of this stream water level and groundwater level is embedded in the proposed conditions to ensure there is ongoing review of groundwater behaviour correlation with stream level and wetland performance. Proposed conditions are being reviewed following GWRC feedback on those conditions.

In addition, there are large corridors in the eastern area of the site where existing peat is not going to be disturbed, including under the power corridor and under the large existing wetland area. These provide a corridor for the groundwater to pass through without any alteration, and this further diminishes the extent to which the peat removal activity can impact on the groundwater levels in that area of the site and reduce the risk of adverse effects on the wetlands.

We note that there has been no requirement to carry out detailed groundwater modelling at any other large scale land development in the Waikanae area in the past. This is as it should be because land development activities involving large footprints, but relatively shallow earthworks do not have the potential to notably change groundwater behaviour in this area.

That is because, as set out in Section 5 of the Hydrological Report, GWRC's own report (Kapiti Coast Groundwater Investigation – Catchment Hydrology and Modelling report, October 2014) describes the extensive unconfined aquifer system that is hydraulically connected to numerous wetlands and streams. This groundwater system is conveyed towards the coast through the underlying sand and gravel which are more than 20m thick at this site. The assessment carried out for the development concluded that the deep underlying groundwater movement through this layer, which extends to close to the surface on the site, dominates groundwater behaviour at the site. Seasonal variations and instantaneous variations, immediately after large rainfall, of groundwater levels recorded at the site support the dominance of the underlying soils on groundwater behaviour at the site. This is why the assessment of the expected changes in groundwater levels resulting from removing peat from the upper layer has concluded that the changes would be only a few millimeters.

Groundwater modelling is therefore not required at this site for this development – there is a clear understanding of the scale of potential changes to the groundwater system associated with the proposed development works and those potential changes are minor.

Greater Wellington considers the residual uncertainty is likely manageable through consent conditions requiring extensive monitoring, including baseline water levels measured with continuous pressure transducers rather than monthly readings at selected sites before, during and after development, integrated into an adaptive management framework with hydrological triggers. We support this approach and are reviewing the proposed conditions to ensure that they capture this process in the appropriate manner.

H8 Control measures preventing Te Harakeke Wetland receiving excess water and inundating properties to the west

Comments: 21.6, 5.1, 5.3 | Commenters: 21 Kapiti Coast District Council; 5 Nicholas Brown

Comment. Kāpiti Coast District Council seeks that the applicant explains clearly what control measures are proposed to prevent Te Harakeke Wetland receiving too much water from stormwater discharges and groundwater inflow, which may then inundate properties to the west. KCDC records the applicant's advice that seasonal variations in Te Harakeke water levels are likely to be greater than any change resulting from

additional stormwater inputs, and that elevated groundwater levels affecting properties west of the development are primarily attributable to reduced conveyance within Black Drain rather than the proposed development. KCDC accepts that wetland water levels are naturally variable and strongly influenced by downstream drainage conditions, but its concern is that the development should not exacerbate an existing problem. KCDC considers the groundwater monitoring period is relatively short and does not adequately capture inter-annual variability including wetter years.

Response. This is the same subject matter as the concerns raised by the Paetawa Road commenters at Topics H2 and F1. The stormwater management strategy for the western area that drains to the Te Harakeke Swamp has some additional surface water runoff from the roads within the western catchment developed area draining to the Te Harakeke Swamp for ecological enhancement. Stormwater from the houses will discharge to on-lot tanks and soakage systems to achieve stormwater neutrality and runoff from roads is to be passed through stormwater treatment basins and discharged via overland flow towards Te Harakeke Swamp without additional detention storage.

The additional runoff via these basins (above existing pre-developed conditions) is estimated to be approximately 825m^3 (3.7Ha catchment of roads, 223m^3/Ha additional volume in 1% AEP – page 31 of SMP). This volume would be discharged to a ponded wetland area (within the site boundaries) of approximately 110,000m^2, resulting in a potential increase in wetland maximum flood water level of approximately 8mm at the peak of the storm event. However, in practice the actual increase is expected to be less than 8mm because it will flow into a much larger water body extending well beyond the site boundaries at the peak of the event. Hence it is concluded that there is negligible increase in surface flooding risk associated with the development.

Notwithstanding this, out of an abundance of caution, the applicant has proposed an adaptive management approach whereby additional monitoring data would be collected prior to development of the western zone, potentially providing a further five to six years of groundwater and wetland monitoring data and allowing the design to be reviewed and refined during the subsequent engineering approval process.

If, at the time of detailed design for the western area, it is concluded that the additional runoff from the roads in the western part of the site adds an undesirable additional flooding component, the final approved stormwater management plan for that area can incorporate full detention of the road runoff (after treatment) and discharge of that runoff to ground via soakage. The geotechnical investigations have confirmed suitable soakage capacity for such a solution. However, the current disposal strategy has been adopted on the basis of ecological feedback that the small amount of additional water provides for an enhanced opportunity for the improvement of Te Harakeke Swamp.

H9 Eco-hydrological monitoring and management of water levels for ecological outcomes

Comments: 24.5 | Commenters: 24 Greater Wellington Regional Council

Comment. Greater Wellington seeks information addressing remaining uncertainty relating to development of a management approach ensuring water levels are appropriate for the ecological planting plans and proposed earthworks for wetlands and riparian corridors, and the possible establishment of an eco-hydrological monitoring plan. Greater Wellington would welcome the opportunity to participate in further conferencing on these matters and associated conditions. It also seeks better understanding of the annual variation of the Ngarara Stream and its hydrographical response to rainfall events of varying intensity and duration, to inform the design of riparian corridors and wetland offsetting and restoration, and further detail on predicted outcomes if the streambed level increases over time due to sediment deposition and the flatter gradient established following construction of the proposed weir.

Response. Greater Wellington and the applicant agreed as part of conferencing (4-5 June 2026) that wetland and Ngarara Stream water level (not flow) is the key parameter to monitor and manage, to be addressed

through a conditions-based management plan with trigger levels integrated with the Groundwater Monitoring Report, and that a robust monitoring framework with built-in adaptive management, rather than fixed one-off solutions, is appropriate. The applicant also agreed at that conferencing to tighten the wording of the stream-monitoring condition on sediment build-up triggers, response and responsibility. The applicant is reviewing the proposed conditions addressing these issues and will submit a revised wording of them to appropriately capture the outcome sought by GWRC.

Appendices

1. WNDL memorandum to Greater Wellington Regional Council – Groundwater Sensitivity

WAIKANAE NORTH DEVELOPMENTS LIMITED
169-171 Peka Peka Road, Waikanae | FTAA-2603-1194

To:	Joshua Knowles and Katherine Greenaway Greater Wellington Regional Council
From:	Ray O'Callaghan, Engineering Director, O'Callaghan Design Limited (for Waikanae North Developments Limited)
Date:	22 June 2026
Project:	Waikanae North Developments Limited (Peka Peka Farm) -Fast-track Consenting (FTAA-2603-1194)
Re:	**Peat-to-Sand Replacement -Groundwater Sensitivity Commentary, in response to 4 June 2026 hydrology conferencing meeting**

1. Purpose

At the hydrology conferencing meeting on 4 June 2026, James Blyth raised the proposed peat-to-sand replacement within the development footprint, under which peat is excavated and removed in its entirety, with the resulting void backfilled with compacted sand/silt fill, seeking further sensitivity analysis on the relevant modelling variables and flagging a possible existing hydraulic-conductivity (KSAT) dataset from prior Kapiti peat investigations. We undertook to provide further commentary on this point and do so below.

This memo:

- recaps the basis of the assessment in the Hydrological Report (Appendix 17 of the substantive application);
- addresses the alternative KSAT data subsequently circulated by James on 9 June 2026, and clarifies how it relates to the material actually proposed;
- re-tests the assessment against that data; and
  sets out the wider factors that, taken together, support our conclusion that this matter is not a key driver of groundwater or wetland outcomes.

2. Basis of the Original Assessment

Section 5 of the Hydrological Report assesses the change in groundwater level expected where peat beneath the development footprint is removed and replaced with compacted sand/silt fill, using a representative cross-section between monitoring sites P013 and P07. The Hydrological Report adopts the following parameters:

Parameter	Value	Basis
Hydraulic conductivity (K) -in-situ peat	5×10^{-5} m/s	Adopted in Hydrological Report, App. 17
Hydraulic conductivity (K) -underlying sand	1×10^{-4} m/s	GWRC Kapiti Coast groundwater investigation (2014)
Hydraulic conductivity (K) -compacted sand/silt replacement fill	1×10^{-6} m/s	Adopted in Hydrological Report, App. 17
Underlying sand thickness	~20–30 m	GWRC (2014); site geotechnical investigations
Reach assessed	300 m (P013–P07 cross-section)	Hydrological Report, App. 17

On this basis, the peat layer contributes only around 3% of total natural transmissivity along this cross-section. This is because the great majority of groundwater movement occurs through the 20–30 m deep sand aquifer beneath, consistent with GWRC's own 2014 Kapiti Coast groundwater investigation. Replacing the peat with compacted sand/silt fill reduces total transmissivity along the reach by only around 3%, which the Hydrological Report translates into a predicted increase in groundwater level of approximately 5 mm over the 300 m reach. The Hydrological Report describes this as a negligible change that would be difficult to record, and "inconsequential when compared to the 500 mm change occurring on an annual basis with seasonal variation." This is consistent with the site's own groundwater monitoring record, which shows seasonal fluctuation of up to 0.5m.

3. Alternative KSAT Data

On 9 June 2026, following our conferencing, James Blyth circulated peat infiltration testing data for Kapiti. James also recommended obtaining Awa's summary report determining steady-state KSAT from this dataset, together with any updates since 2022, before relying on the raw results.

James also mentioned a wetland drainage-setback report authored for the Ministry for the Environment, which records slug-test KSAT values - actual measured results from monitoring bores - for *disturbed* peat ranging from 4.45×10^{-7} m/s to 2.96×10^{-8} m/s, on the basis that disturbed peat has low KSAT due to the breakdown of organic matter. It was noted this range sits well below the 5×10^{-5} m/s value used in the Hydrological Report.

It is worth clarifying which physical condition these parameters describes, and compare them to the conditions actually proposed. The 5×10^{-5} m/s figure is the conductivity adopted for in-situ, undisturbed peat - used to characterise existing conditions ahead of any works, and where peat remains in the ground undisturbed. The data circulated by James relates to a different condition again: peat that has been physically disturbed but remains *in situ*, with its KSAT reduced by the breakdown of the organic structure.

At the development footprint, however, peat is not to be disturbed and left in place - it will be excavated and removed in its entirety, and the resulting void backfilled with compacted sand/silt. No peat, disturbed or otherwise, remains within the replacement profile. The replacement fill was independently assigned a conductivity of 1×10^{-6} m/s in the Hydrological Report, reflecting the engineering properties of the compacted granular fill itself - already an order of magnitude lower than the in-situ peat value. The disturbed-peat data nonetheless provides a useful, conservative cross-check. Section 4 below re-tests the assessment substituting that lower range for the replacement fill's conductivity, notwithstanding that it describes a significantly different material to the one actually proposed.

4. Sensitivity Check

To test whether the Hydrological Report's conclusion is sensitive to this input, the same cross-section calculation has been re-run substituting the disturbed-peat KSAT range for the conductivity of the replacement fill, with all other parameters unchanged. This is a deliberately conservative substitution, adopted purely as a lower-bound sensitivity test - not because it reflects the material actually present, since no disturbed peat is proposed to remain within the replacement profile.

Replacement fill K (m/s)	Basis	Predicted Δ groundwater level (300 m reach)
1×10^{-6} m/s	Adopted in Hydrological Report, App. 17	≈ 5 mm
4.45×10^{-7} m/s	Upper bound, disturbed-peat slug tests (Blyth, 9 June 2026)	≈ 5 mm
2.96×10^{-8} m/s	Lower bound, disturbed-peat slug tests (Blyth, 9 June 2026)	≈ 5 mm

Across this full range of replacement-fill conductivity - more than three orders of magnitude - the predicted change in groundwater level varies by only around 0.1 mm. This is because the underlying sand aquifer (20–

30 m thick, $K \approx 1 \times 10^{-4}$ m/s) governs more than 96% of total transmissivity along this cross-section. The conductivity of the thin peat/replacement layer is simply not large enough, in either direction, to materially change the regional groundwater response. The Hydrological Report's conclusion is therefore robust to the KSAT data provided, including at the lower end of the disturbed-peat range that has been flagged - even though that range describes a different material to the compacted sand/silt fill actually proposed.

We have reviewed the additional information supplied by James on 9th June that related to peat infiltration testing carried out in the Kapiti area a few years ago by Awa. This information is not really relevant to the assessment of potential change in groundwater behavior at the site for the pre-development vs post development scenarios because it appears to be primarily testing vertical infiltration through the soil layer (i.e. mm/hr). As discussed above, the more appropriate assessment of potential change of groundwater level between the two development scenarios is dominated by horizontal conductivity through the existing deep, thick undisturbed sand.

5. Wider Context

The peat-to-sand transmissivity change should also be read alongside several other features of the design that affect groundwater and wetland soil moisture in the same area, and which point in a positive direction:

- **Retained peat corridors -** substantial areas of peat across the site are left undisturbed; the status quo is unchanged wherever peat is not removed.
- **Increased recharge -** increased surface water runoff from the developed area is being deliberately directed to ponds, soakage and wetlands, returning more water to the groundwater system than occurs under existing conditions.
- **Raised stream levels -** the Ngarara Stream realignment is designed to raise the stream water level by approximately 0.3–0.4 m relative to existing, raising adjacent groundwater levels along the same corridor.
- **Staged construction -** earthworks proceed in small cells across several years, allowing groundwater response to be monitored well ahead of later development phases.
- **Monitoring and adaptive management -** the conditions-based monitoring framework agreed at the 4 June meeting, integrated with the Groundwater Monitoring Report, allows trigger levels and in-stream structures (i.e. the stormwater control structure) to be adjusted if monitoring shows performance is not tracking as expected.

Taken together, these factors are expected to maintain or improve wetland soil moisture outcomes, not reduce them.

6. Conclusion

The change in groundwater level attributable to peat-to-sand replacement remains in the order of a few millimetres, is immaterial against the natural seasonal groundwater fluctuation of approximately 0.5m recorded at the site, and - as demonstrated above - is not sensitive to the disturbed-peat KSAT data that has been provided, notwithstanding that the replacement profile itself contains no disturbed peat.

Combined with the retained peat corridors, increased recharge, raised stream levels and the agreed monitoring/adaptive-management framework, our assessment remains that peat-to-sand replacement is not a key driver of groundwater or wetland soil-moisture outcomes for this development.

We are happy to discuss this commentary directly.

Kind regards,

Ray O'Callaghan
Engineering Director
O'Callaghan Design Limited
BE (Civil), Dip. Hydraulics (Delft), FEngNZ
30 June 2026