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TO: Expert Panel considering Taharoa Ironsands Limited's substantive Fast-track application for the Central and Southern Blocks Mining Project

11 June 2026 WWLA1303

Taharoa Ironsand Fast Track Application – Response to Hydrogeology Related Comments from Invited Parties

1. Introduction

Taharoa Ironsands Limited (TIL) has applied for all necessary approvals to continue mining of the Central and Southern Blocks at the Taharoa Ironsand Mine (Application) under the Fast-track Approvals Act 2024 (FTAA).

Williamson Water & Land Advisory (WWLA) prepared the Assessment of Groundwater Effects and the associated Groundwater Model Development Report (Appendix N to the Application) that were submitted as part of the Application. These reports documented the groundwater modelling assessment and results undertaken to quantify the potential effects of TIL's proposed mining activities on groundwater, groundwater users, and streams and wetlands connected to groundwater.

The Expert Panel considering TIL's Application invited written comments on the Application from invited parties in accordance with section 53 of the FTAA, which have been submitted to the Panel.

The Panel also engaged Philip Kelsey (of Earthtech Consulting Limited) to advise it on hydrology and hydrogeology matters. Mr Kelsey has peer reviewed WWLA's Assessment of Groundwater Effects and the associated Groundwater Model Development Report (Appendix N to the Application) and WWLA's Hydrology Assessment (Appendix I to the Application) and prepared a report for the Panel dated 29 May 2026.

This letter has been prepared in response to comments received from invited parties that raised matters relating to hydrogeology, and the report prepared by Mr Kelsey in respect of WWLA's Assessment of Groundwater Effects and the associated Groundwater Model Development Report (Appendix N to the Application).

This response has been jointly prepared by Jake Scherberg – Senior Hydrogeologist and Jon Williamson – Programme Director and Principal Hydrogeologist.

Qualifications and Experience

Jake Scherberg

My full name is Jacob Nathan Scherberg. I have a Bachelor of Science (BSc) from The Evergreen State College (2001), and a Master of Science (MSc) (2012) in Water Resource Engineering from the Oregon State University. I am a Senior Hydrogeologist for Williamson Water & Land Advisory (WWLA). I have been in my current role with WWLA since 2018, and prior to that served as a Hydrogeologist for GeoSystems Analysis Inc., a consulting firm based in the United States. I have extensive experience in hydrogeology, analysis of groundwater-surface water interactions, and numerical groundwater modelling.

I have 15 years of specialist professional experience with technical expertise in hydrogeology and hydrology covering a wide spectrum of services including numerical groundwater modelling; data collection and analysis; field investigations and testing; and technical reporting. I have provided independent advice to inform and support decision making for a wide spectrum of client types within New Zealand, including Regional Councils, District Councils, government agencies such as the Ministry of Primary Industries; Te Puni Kōkiri (Ministry of Māori Development); sector interest groups such as energy companies and mining companies; Horticulture New Zealand; and agricultural and horticultural businesses.

My specific experience related to this project has been in support of similar mining and quarrying operations such as Rotowaro Mine operated by BT Mining, Kings Quarry operated by Kings Quarry Limited, and Taotaoroa Quarry operated by J.Swap Limited.

Jon Williamson

My full name is Jonathan Lindsy Williamson. I am a Hydrogeologist and Hydrologist with 30 years of specialist expertise in water resource management, bore engineering, and environmental impact assessments. I hold a Bachelor of Science (BSc) in Earth Science and a first-class honours Master of Science and Technology (MSc Tech (Hons)) in Hydrology and Geology from the University of Waikato. Since 2015, I have been a shareholder, Managing Director, and Principal Hydrogeologist at Williamson Water & Land Advisory Limited. Prior to this, my background spans over 16 years in technical and managerial roles within the Auckland office of Sinclair Knight Merz (now Jacobs), alongside early career experience with a global multidisciplinary consulting firm in Sydney.

My sector experience includes energy and infrastructure projects such as hydropower, wind, solar, and geothermal developments, as well as roads, tunnels, shafts, and wastewater systems, alongside work in the mining and agriculture sectors with a focus on mine water management and irrigation, and in water supply, covering both municipal and rural potable and non-potable systems.

Throughout my career, I have led diverse projects across the full lifecycle of water resource management, including data collection, field investigations, testing and modelling, as well as engineering design and construction contract management. I also have extensive experience in technical report writing, community consultation, and stakeholder engagement.

As a recognised expert in my field, I am highly experienced in joint witness conferencing and have appeared numerous times as an expert witness in New Zealand before local councils, the Environment Court, Boards of Inquiry, and EPA Fast-track legislation hearings.

Expert Code of Conduct

The statement below pertains to both Jake Scherberg and Jon Williamson, who have prepared this response jointly and both acknowledge its content.

We have read and are familiar with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Consolidated Practice Note, and agree to comply with it. Our qualifications as experts are set out in the preceding paragraphs. Other than where we state that we are relying on the advice of another person, we confirm that the issues addressed in this report are within our area of expertise. We have not omitted to consider material facts known to us that might alter or detract from the opinions that we express.

2. Comments Received

The comments and reports pertaining to groundwater and related topics are summarised in **Table 1**:

Table 1. Submissions and technical review documents

Organisation		Author	Document Title
1	Waikato Regional Council (WRC) compiled by Mitchell Daysh Limited	Mark Chrisp (Mitchell Daysh) Sung Soo Koh (WRC)	TAHAROA IRONSANDS LTD CENTRAL AND SOUTHERN BLOCKS MINING PROJECT [FTAA-2512-1153] WAIKATO REGIONAL COUNCIL SECTION 53 COMMENTS UNDER THE FAST-TRACK APPROVALS ACT 2024 (Reference Appendix B – Memo from Sung Soo Koh - Hydrology)
2	Te Nehenehenui	Sam Mikaere	Attachment A: Te Nehenehenui Comments on the Fast-track Approvals Act 2024 Substantive Application for Taharoa Ironsands Limited
3	Te Ruunaunga o Ngāti Mahuta ki to Hauaaruru Charitable Trust, Maketuu Marae, Te Kooraha Marae, and Aaruka Marae (Ngaati Mahuta ki te Hauaauru)	Iarau Limited	Ngaati Mahuta Ki Te Hauaauru Comment On Taharoa Ironsands Limited Substantive Application Under The Fast-Track Approvals Act 2024
4	Department of Conservation (DOC) – Hydrology Review	Collaborations – James Blyth	Taharoa Ironsands Limited (TIL) – Central and Southern Blocks – Fast Track Application Hydrology Review
5	Department of Conservation (DOC) – Hydrogeology Review	Aqualinc – Nicole Calder-Steel & Matthew Jones	Groundwater advice on Taharoa Ironsands FTAA Application
6	Earthtech Consulting Limited	Philip Kelsey (engaged by Panel)	Technical Peer Review Report No. 1 For Fast Track Application Ftaa-2512-1153 – Appendix N: Hydrogeology Assessment – Appendix I: Hydrology Assessment

For the purposes of this response, the comments received pertaining to groundwater analysis have been grouped into the following key themes (where the same or similar matters have been raised across comments from more than one invited party):

- Groundwater modelling approach and methodology;
  - Groundwater monitoring data;
  - Lake level as a fixed head boundary;
- Saline intrusion effects;
- Stream depletion due to reduced baseflow;
- Wetland effects;
  - dewatering due to reduced groundwater levels for groundwater connected wetlands;
  - dewatering due to reduced stream inflows for surface water fed wetlands; and
  - contamination via salinisation from groundwater.
- Climate change.

Each of these topics is addressed in the following sections.

3. Responses

Each of these topics is addressed in the following sections. The responses set out below focus on the overarching nature of the comments received, with reference to specific documents and direct quotes where applicable. In cases where the comments are long, or several parties have submitted comments that are highly similar to each other, the relevant parties are noted, and the comments summarised, prior to the response.

The details of the comments received, including specific documents and sections, are provided in tables that are attached as appendices to this report.

3.1 Conceptual Groundwater Model and Numerical Modelling Methodology

The WRC, Earthtech Ltd, and DOC reviews all comment extensively on the groundwater analysis undertaken for the Application, which was based on a numerical modelling investigation. These comments relate to setup and application of the groundwater model and the conceptual model of the hydrogeological conditions across the study area that underpin the numerical model. **Appendix A** summarises the relevant comments. This section responds to those comments that are critical in nature. The critical comments focus on certain aspects of the analysis only and are balanced with reviews that concur with the applied methodology.

Response

General reply on Groundwater Modelling

The Earthtech and DOC reviews have raised criticisms regarding the specific methodologies employed in the hydrogeological assessment. We respectfully submit that these criticisms are more reflective of professional preference rather than an identification of material errors or fatal flaws. Further to this, the assessment of the site is based on firsthand knowledge gained over a series of site visits and investigations by WWLA personnel, and the professional judgement gained from familiarity with both the materials and operations at this site, the regional geologic setting, and sand mining practices in New Zealand. The modelling approach that was applied reflected all of these considerations in the context of developing a high level representation of the site and the ongoing and proposed mining practices.

Hydrogeological modelling and assessment can always be made infinitely more complex given unlimited time and budget. However, our methodology was deliberately selected to be "fit-for-purpose”, balancing scientific rigor with practical constraints – as supported by the WRC review and acknowledged in some sections of the DOC reviews.

For example, the DOC review includes the following statements from:

1. The Hydrology assessment, Collaborations – Summary Section states:

“Generally, I consider that the baseline hydrological and hydrogeological models (noting I did not review the latter models calibration, only it’s application) are appropriate for scenario testing of the applications potential effects on the environment.”

2. Hydrogeology assessment, Aqualinc - Section 4.1.3 states:

“The model calibration was completed using a proven method (PEST) and provides a good fit of modelled heads to available observations.”

The WRC review is also generally supportive of the modelling approach. The following statements have been excerpted from the review memo submitted by Sung Soo Koh – Hydrology:

1. *“A numerical groundwater model was constructed using a comprehensive dataset, including the applicant’s site-specific field investigations. Overall, I consider the technical*

rigour of the modelling work to be high. The model is robust and provides a reliable basis for assessing the potential hydrogeological impacts of the proposed activity." (Section 3.1).

2. *"I find the technical assessments for both surface water and groundwater to be generally robust and well-supported by data."* (Section 4 – Key Conclusions).

Had we adopted the approach recommended in the Earthtech review, which requested a significantly more complex model setup, boundary conditions and exhaustive documentation of model outputs at all stages of mining, it would have required significant additional time and resource expenditure. However, in our professional opinion this would have led to only marginally different numerical outputs that would not materially change the overall conclusions or the proposed effects management envelope.

All modelling investigations have uncertainty in their analysis. Incorporating greater complexity in the modelling approach, as suggested in the Earthtech review in particular, would not substantially reduce the uncertainty of the findings because there would still be a similar degree of uncertainty around every input that was represented in a more complex manner. Further to this, the Central and Southern Blocks have been progressively mined since the early 1970s (over 50 years) and the proposed ongoing mining operation is a continuation of these activities (with the exception of the deeper wet mining[1]), hence the majority of effects are largely realised within the realm of what has already occurred at this site.

The proffered consent conditions are designed to manage for the uncertainty related to the analysis of potential environmental effects. References to specific conditions to this effect are provided in the relevant sections of this document.

3.1.1 Groundwater Model Setup

The Earthtech review asserts that the conceptual model ignores drilling data showing a multi-layered sequence of aquifer and aquitard materials, as shown in the drilling data and interpretations completed by Geotechnics in 2014. The reviewer states that the WWLA model is an oversimplification of the available data.

WWLA notes that the Geotechnics 2014 investigation was heavily used in the conceptualisation of the numerical groundwater model, specifically in terms of the characterisation of the materials across the TIL site and the configuration of the greywacke basement material underlying the ironsand. The data from the Geotechnics drilling was then extended by the additional 18 bores drilled under WWLA supervision in 2024 and their respective logs.

The approach that is recommended in the Earthtech review, namely to incorporate all drilling information and develop a highly stratified model with a series of aquifers and aquitards, would not improve the accuracy of the model or the level of uncertainty. This is because:

1) The complex stratigraphy that occurs across the site due to the wind-blown depositional environment has inherent variability in extent, thickness, and dip angle of all subsurface layers. A representation of the materials that aligned perfectly with the data at a given drilling site could be significantly different at a location only 100 m away.
2) The predominant stratigraphy is windblown sand (hence the mine) and the implication of this from a hydrogeological perspective is that i) the sand layers are more pervasive laterally and vertically than the clay layers (otherwise mining stops), and ii) sand is of higher permeability than the clay-rich sand layers.

[1] We note that dredge/wet mining has always occurred at the mine but at generally higher levels.

3) The mining methodology itself entirely blends the stratigraphy (makes no distinction) because the ironsand concentration within the lower permeability layers is still economically viable to process.

Hence, in our opinion, combining the thin layers of lower permeability clay-rich sand layers with the more pervasive higher permeability sand layers, and assigning bulk hydrogeological properties that represent a weighted average (which in practice only slightly reduces the permeability of the sand) is appropriate.

With this consideration in mind, the calibration of the ironsand materials was undertaken by defining the base of the material from drilling information and treating the unit as a bulk layer. The variability of conductivity introduced using the pilot point calibration represents the heterogeneity of the multi-layered system. The range of calibrated hydraulic conductivity is from $1x10^{-7}$ m/s to $5x10^{-5}$ m/s, representing moderately low to moderate permeability and is based on hydraulic testing results as reported in Section 3.7.4.1 of the Hydrogeology Assessment (Appendix N of the Application).

It is also noted that, in contrast to the Earthtech review comments related to model setup and parameterisation, the Hydrogeology review commissioned by DOC (Hydrogeology assessment, Aqualinc, Section 4.1.1) and the WRC review (Memo from Sung Soo Koh – Hydrology, Section 3.1) confirmed a robust model setup and appropriate hydraulic parameters.

3.1.2 Groundwater Monitoring Data for Model Calibration

WWLA acknowledges the limitations of a 44-day data set used for groundwater model calibration. This data was only available following an intensive effort to install a network of monitoring piezometers across the Northern, Central, and Southern Blocks of the Mine.

Data collection at the 18 monitoring piezometers is ongoing, having been updated most recently on 31 October 2025 which extended the data set to 195 days for most sites[2] (**Figure 1**). The monitoring data generally shows that the water levels are stable, with a steady rise during the winter of 2025 that is consistent with typical seasonal variation anticipated in groundwater levels. The exception is the N102 piezometer, located in the TIL Northern Block, approximately 600 m north of the Mitiwai Stream, for which the measured water levels fluctuated for approximately five months before levelling off and becoming consistent with the other monitoring locations. The cause of this fluctuation is currently unresolved but thought to be related to an initial high groundwater table following construction of the piezometer.

On the whole, the data gathered from the further groundwater monitoring undertaken since the 44-day collection period demonstrates that the data used in model calibration is broadly representative of groundwater conditions at the site over time.

[2] With the exception of Piezometer C102, which was destroyed during mining operations.

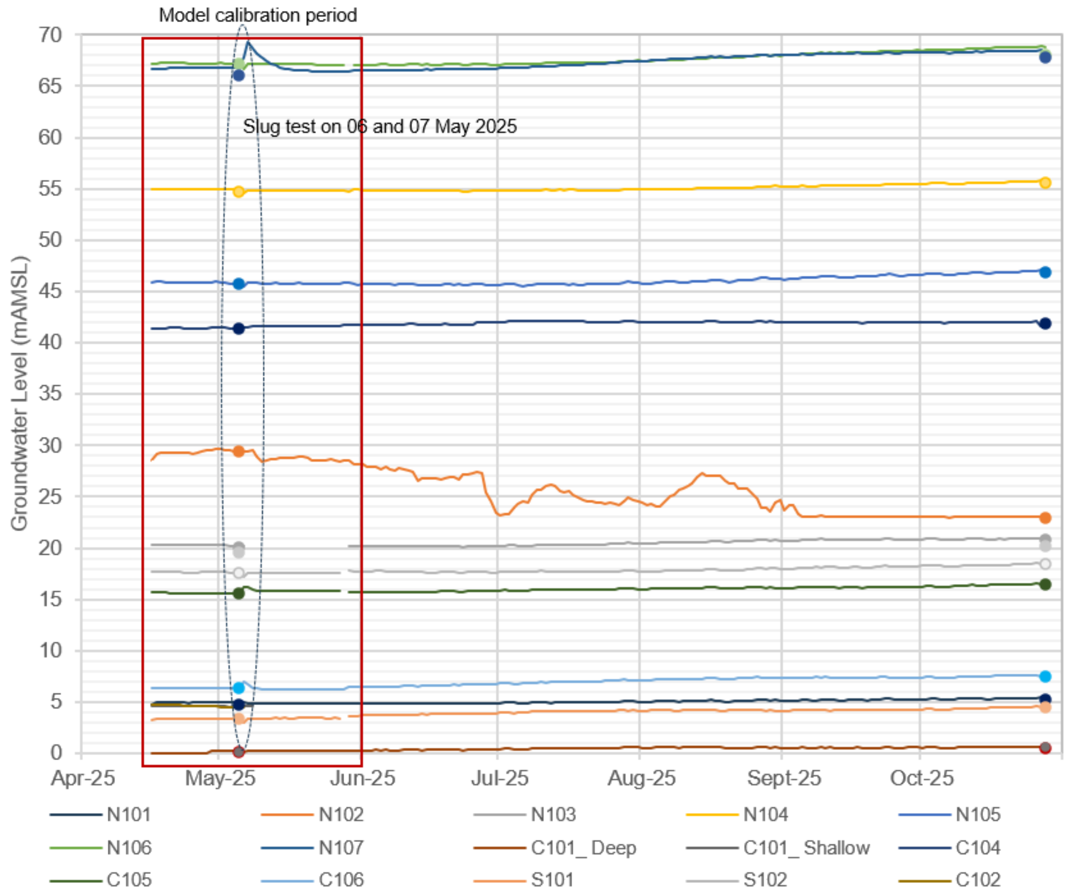

Figure 1. Updated groundwater monitoring data. Lines represent continuous monitoring data and dots represent manual water level measurements taken to confirm data.

3.1.3 Groundwater Recharge

The Earthtech review asserts that the groundwater recharge applied in the ironsand areas of the model, equating to 41% of mean annual rainfall, was significantly greater than what is appropriate for a dune environment, suggesting that 20-30% of rainfall would be a more suitable recharge rate. Groundwater recharge used in the model was derived from the Soil Moisture Water Balance Model (SMWBM) developed for the Mitiwai Stream catchment (which does not have a lake influence). This catchment model was parameterised based on physical catchment characteristics, and calibrated to flow data from Flow Site 3 on the Mitiwai Stream.

In our professional opinion, the recharge rate used for ironsand in the groundwater model is typical for environments featuring predominantly coastal sands. For reference, the Aupouri Aquifer Groundwater Model used 45% of rainfall as recharge over coastal sand areas and 40% over more consolidated weathered sand areas[3]. The recharge component of the Aupouri Aquifer study has been reviewed and accepted by the Environment Court[4], and concurs with other studies of similar terrain[5],[6].

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[3] WWLA (2021). Aupouri Aquifer Groundwater Model Factual Data Science and Numerical Model Development Report.
[4] *Director-General of Conservation v Northland Regional Council* [2022] NZEnvC 170.
[5] Lincoln Agritech, 2015. Aupouri Aquifer Review. Consultancy report prepared for Northland Regional Council.
[6] SKM, 2007a. Awanui Artesian Aquifer Numerical Modelling. Consultancy report prepared for Northland Regional Council.

3.1.4 Groundwater Model Parameterisation

The Earthtech technical review asserts that hydraulic conductivity, the most sensitive parameter in a groundwater model, is not appropriately assigned to model layers in a manner that represents actual groundwater conditions (Section 2.2). Further to this point the reviewer asserts that the model uses a low permeability zone over the lower portion of the Mitiwai Stream in Model Layer 1 that conflicts with the Geotechnics Report (2014)[7].

Our response addresses these issues separately:

3.1.4.1 Hydraulic Conductivity

The hydraulic testing undertaken was used to apply upper and lower limits for the pilot points used to calculate the calibrated conductivities of the ironsand, such that the entire layer is within the bounds of measured conductivity and thereby represents realistic groundwater conditions. Individual point measurements, such as the slug testing reported in Section 3.7.4 of the Hydrogeology Assessment (Appendix N to the Application), are subject to a high degree of variability over an area as heterogeneous as the Central and Southern Blocks, evidenced by the slug test results themselves. Assigning fixed conductivities at the measurement points would constrain the model calibration in a manner that would negatively impact model calibration and thereby increase uncertainty.

3.1.4.2 Low Permeability for Lower Mitiwai Stream

The Geotechnics Report (2014) does indicate that part of the stream bed crosses 'free flowing black sand', however the text also notes lower permeability materials in the same area. These include weathered sand silt/silty sands, silty brown paleosols, and Tauranga Group Alluvium which is generally known to be low permeability.

The calibration process demonstrated that water levels at several of the monitoring locations near the Mitiwai Stream were likely to have relatively low permeability, that was still within the bounds of the hydraulic testing. Accordingly, lower conductivity was assigned around the stream channel, although the value was consistent with the surrounding material in the portion of the stream channel that traverses most of the mining site, and only varies by approximately 1.5 orders of magnitude in the lower reach of the stream, noting that text book values for silty to clean sand vary over five orders of magnitude[8].

3.1.5 Modelling Lake Taharoa as a Fixed Head Boundary

We acknowledge that it is a simplification to incorporate Lake Taharoa as a constant head boundary. However, we disagree that it represents a fatal flaw.

Monitoring data shows that the lake level typically fluctuates by approximately 0.8 m based on seasonal conditions and the consented water take from the lake[9]. Using a fixed head boundary to represent the average lake level does not impact the outcome of the model from an effects perspective because the effects analysis is focused on drawdown (the change in groundwater level) related to mining. Groundwater levels at the edge of the lake are governed by the lake level during all seasons. Hence, as indicated by the model (and given this is an unconfined aquifer system), drawdown can only manifest with distance away from the lake edge. In summary, a transient model simulation of lake levels would not produce drawdown at the lake edge.

[7] Geotechnics (2014). Taharoa Ironsand Deposit-Revised Geological Model, Geotechnics Limited. Ref: 615815.005-1(June 2014)
[8] Freeze, R. A., & Cherry, J. A. (1979). *Groundwater*. Prentice-Hall.
[9] WWLA (2025C). Lake Taharoa Hydrology Assessment. Consultancy report prepared for TIL.

Other relevant points to note are:

- minimum lake levels are controlled by consent conditions that specify trigger levels, which require TIL's water take from the stream (linked to the lake) to cease when water levels fall to the trigger levels (see for example AUTH142035.05.01, Conditions 7 and 10, and Schedule 1: General Conditions, Condition 17 relating to the Lake Level and Water Management Plan);
- The lake level was raised by approximately 1.5 m when the dam was installed on the Wainui Stream in the early 1970s and the wetlands along the lake margins reflect conditions that have developed with the dam in place.

The WRC review (Memo from Sung Soo Koh – Hydrology – Section 2.3) states that the modelling clearly demonstrates that the physical design level of the dam-weir is the dominant control over local hydrology (including lake levels and outflows), which effectively overrides operational rules like water take frequencies and tertiary influences such as seepage losses that may arise from mining.

3.1.6 Uncertainty Regarding Stream Flow Calibrations

Both the DOC Hydrology Assessment (Collaborations – Sections 4.1, 4.2.1) and Hydrogeology Assessment (Aqualinc – Sections 4.1.4, 4.3, 4.3.4.1, 4.3.4.2) assert that the water balance model used to generate groundwater recharge for the groundwater model and estimation of stream low flow statistics lacked sufficient monitoring data for calibration, and hence has a high degree of uncertainty.

As with other aspects of all groundwater models, we acknowledge a degree of uncertainty. Calibration of the catchment runoff models utilised the best, albeit limited, data available at the time of undertaking the assessment. While only 3 to 4 spot gaugings were available at this time, we note the simulated flows do show good agreement to these datapoints.

The resource consents require monitoring of streamflow in both the Mitiwai (Condition 2 of AUTH142035.14.01) and Wainui Streams (Condition 3 of AUTH142035.02.01), which is ongoing. Conditions 44 of "Schedule 1: General Conditions" requires the preparation and submission of an Annual Monitoring Report" to WRC. Further to that, Condition 45(g) states:

"*If necessary, recommend alterations to the monitoring required, including review of the monitoring site locations and recommended changes (if any) that would result in improved environmental performance*."

The implication being that if the monitoring indicates that environmental conditions are found to be materially different from those used in the Hydrogeology Assessment (Groundwater Effects), then the monitoring programme can be altered to enable better recognition and responses to any adverse environmental effects.

3.1.7 Modelling of Post-Mining Conditions

Both the DOC (Hydrogeology assessment, Aqualinc - Section 4.17) and Earthtech (Section 2.13) reviews state that post-mining conditions are not appropriately modelled based on the assumption that post mining conditions will be approximately equal to the current conditions.

To be clear, the model was developed with the assumption that after mining, the land would be restored to approximate a smoothed impression of the original topography, with the exception of the final excavation area, which is assumed to be a lower elevation for the purposes of this assessment, pending confirmation of the final landform through the final site closure plan.

Several comments state that the land cannot be restored to the original topography because of the material that is removed in the mining process. That is true, as no infilling is proposed. The final void will account for some of the material that is removed in the mining process. Further to this point, the area is naturally a dynamic sand dune environment, and it can be assumed that the landscape would change with or without the proposed mining activities. The assumption that the post-mining landscape will reflect approximate current topography is indicative given the uncertainty of continuous changes that occur under natural conditions in this environment. In other words, the area will remain a sand dune environment similar to how is it today, with the exception of a post closure void (depressional area).

Both reports also challenge the assumption that the materials will have the same hydraulic properties in the post-mining scenario as they currently do in-situ. The Earthtech report specifically mentions an increased proportion of silt due to the removal of the sand, which would cause a lower hydraulic conductivity in the post-mining landscape.

In fact, the processing of the raw ironsand generates three outputs:

- iron sand concentrate for export;
- clean sand used as tailings; and
- the high clay/silt content fluid that is discharged to settling ponds.

The tailings sand that is used to backfill excavation areas does not have a higher concentration of fines than the in situ (as the fines have been removed). The fines are settled out, dewatered and either used as 'topsoil' or left in pond.

Based on this information we consider that the hydraulic conductivity will not be reduced because the tailings will comprise a mixture of both non-metallic sand that passes through the processing plant with the fines removed and windblown sand from the surrounding area, which will be reincorporated into the rehabilitated dune environment.

Irrespective of the above, lower hydraulic conductivity would support increased water table elevation, making our assessment conservative in nature with regard to wetland effects and stream depletion.

3.2 Saline Intrusion Effects

The analysis of potential saline intrusion as a result of mine excavation is addressed in comments from several parties, specifically DOC, WRC and Te Nehenehenui, as well as the Earthtech technical review. The comments are summarised in **Appendix B**. In general terms we found little risk of saline intrusion beyond a brief period of possible incursion into the mine pit when it is near the coast during the excavation of the Southern Block, and no risk of saline intrusion causing adverse effects on water users or the environment under the management regime set out in the proposed conditions. Our response to the issues that are raised is as follows.

3.2.1 Saline Intrusion Into Mine Pits

Groundwater drawdown is calculated by comparing two versions of the model, one which includes the mine excavation and one which does not. Based on this method, maximum groundwater drawdown is a function of the excavation depth. Figure 13 of the Hydrogeology Assessment (Appendix N of the Application) shows the maximum drawdown that is predicted for the Southern Block and Central Block, respectively.

Upon further consideration of the review comments, it was determined that saline intrusion does not occur at the time of deepest excavation, but rather at the time when the excavation is closest to the ocean. This corresponds to Extension 2 excavation area of the Southern Block, shown in Figure 11 of the Hydrogeology Assessment.

The inland influx of seawater (saline intrusion) that was simulated is highlighted with a red arrow in **Figure 2**[10]. The figure shows that saline intrusion is modelled to occur for a brief time (13 months) during mining of the Southern Block and not at all during mining of the Central Block. The volume during this 13-month period ranges from 2 m³/day to a maximum of 372 m³/day (average during this period is 161 m³/day), which is a small fraction of the 7,018 m³/day of groundwater that is simulated to discharge offshore as part of the regional groundwater flow within the model domain at the same time.

The piezometric surface simulated for the time corresponding to the peak saline intrusion is provided in **Figure 3**, also showing that no streams or wetlands are at risk.

Because saline intrusion in this mining scenario is a transient phenomenon that occurs strictly while the excavation is open near the coastline, it is governed primarily by the steep, mechanically imposed hydraulic gradient between the ocean and the pit. While this engineered gradient is the dominant control, climatic factors (such as seasonal precipitation and recharge) will play a secondary role by either modulating local groundwater mounding, which can provide a minor buffer, or slightly compounding the intrusion during extended dry periods.

Further to this, given the limited extent of predicted saline intrusion, there are no water bodies (streams or wetlands), or water users that face any increased risk due to the proposed mining. For these reasons, we consider the requested assessments of saline intrusion under 10-year and 50-year drought conditions to be unnecessary.

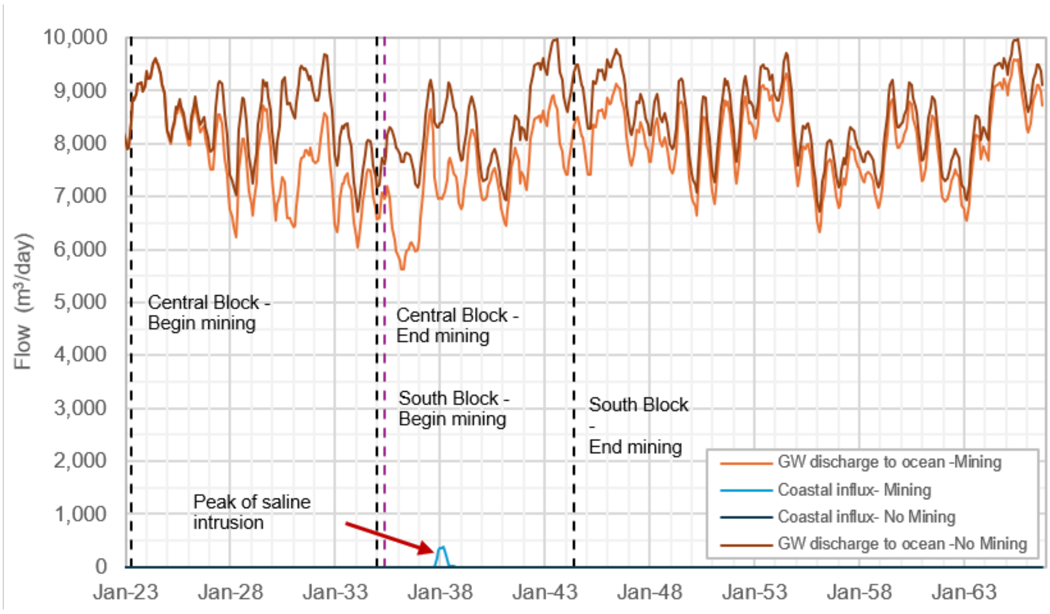

Figure 2. Simulated groundwater discharge from aquifer into ocean and ocean into aquifer for mining and non-mining scenarios.

[10] This figure is a reproduction of Figure 26 from Appendix N of the Application, however the units on the Y-axis had been labelled incorrectly as L/s in the original figure and are corrected here. WWLA regrets the error.

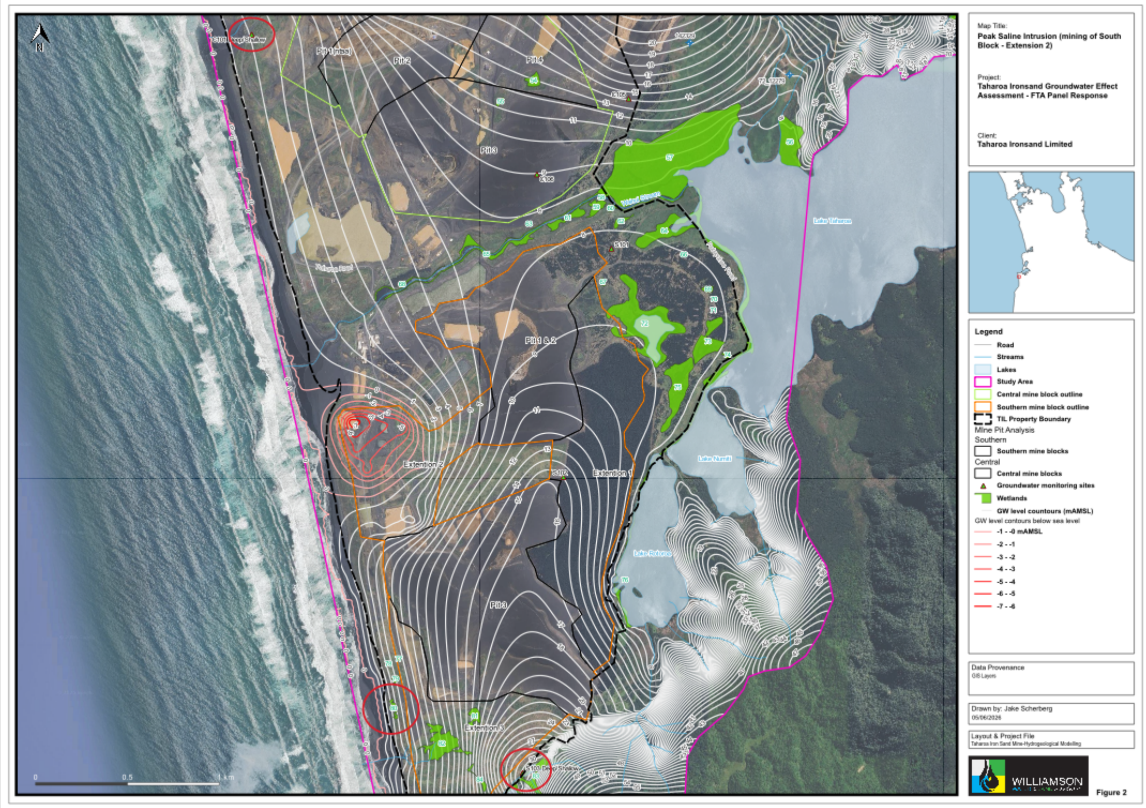

Figure 3. PLACEHOLDER - Will be replaced with A3 version of this figure

3.2.2 Saline Intrusion Effects on Surface Water Features

Comments from WRC and Te Nehenehenui focused on the potential effects of saline intrusion on surface water features and related effects. In response, we note:

1) that all of the wetlands and streams are above sea-level and will not be affected by sea-water incursion;
2) any saline intrusion into groundwater would only occur:
   - within the portion of the aquifer that is below sea level and immediately adjacent to the coast where there are no water users; and
   - at a depth far below any freshwater features, hence will not cause a degradation in water quality regardless of any baseflow depletion.

The Earthtech Review requested an assessment of maximum groundwater salinity for conditions of consent and also requests a description of where saline impacted groundwater that is pumped out of the mine pits will be discharged, and whether it could affect streams, wetlands or lakes.

TIL's internal operational procedures relating to mine water provide the process for how any saline water that discharges into the mine pit will be managed to avoid adverse environmental effects. It dictates that the water from mine pits (fresh or brackish) will be pumped to a settling pond where it will be diluted and ultimately percolate to the underlying saline coastal environment.

To provide assurance that water from settling ponds will not cause elevated salinity if used for augmentation of the Mitiwai Stream, we recommend that Condition 2 of AUTH142035.14.01 require that water used for flow augmentation shall be freshwater (i.e. with electrical conductivity below 1,000 uS/cm). We also recommend that an equivalent requirement is added to the proposed new Condition 7 of AUTH142035.16.01 in relation to water used to augment wetlands.

3.2.3 Saline Intrusion Effects on the Deep Aquifer

WRC (Memo from Sung Soo Koh – Hydrology, section 3.4) notes the lack of response to mining shown in the deep aquifer, citing the 20 m head differential between the pit and the coast. In response, we note that the lack of drawdown in the deep aquifer is a reflection of how the 2-layer model is set up. The upper model layer represents the ironsand materials (i.e. the resource that is being mined) and the lower model layer represents the underlying basement materials. The proposed mining will extend to the base of the resource material (Model Layer 1) with the lower layer, corresponding to the top of the deep aquifer that is referenced in the comment, not being affected by mining.

With respect to saline intrusion, our opinion is that the dominant mechanism (if any) would be via lateral inland migration as opposed to upconing due to significant contrast in material permeability between the ironsand and basement greywacke aquifers.

3.2.4 Salinity of Water in Mine Pits

WRC (Memo from Sung Soo Koh – Hydrology, section 3.5) requests a water balance of groundwater discharge into the mine pit to be used to assess the maximum salinity of the slurry extracted from the pit. The maximum discharge of saline water into the pit is 372 m^3/day (4.3 L/s), as explained in **Section 3.4.1**. The simulated groundwater discharge into the South Pit - Extension 2 (the active mining area at this time) is 3,084 m^3/day (35.7 L/s) as shown in **Figure 5** (a reproduction of Figure 29 from the Hydrogeology Assessment modified to highlight the time of maximum saline intrusion). Conservatively assuming that all sea water influx emerges in the pit and assuming there is no surface runoff at the time, it would amount to 12% of the groundwater inflow to the pit being sea water.

The electrical conductivity of the sea water is approximately 42,950 uS/cm and the fresh water is 200 uS/cm[11], so the conductivity of the mixture would be approximately 5,356 uS/cm (i.e. brackish). As previously mentioned, in Conditions 2 and 3 of the AUTH142035.14.01 and Condition 7 of AUTH142035.16.01, TIL has committed to discharging process water in a manner that will not impact any freshwater body.

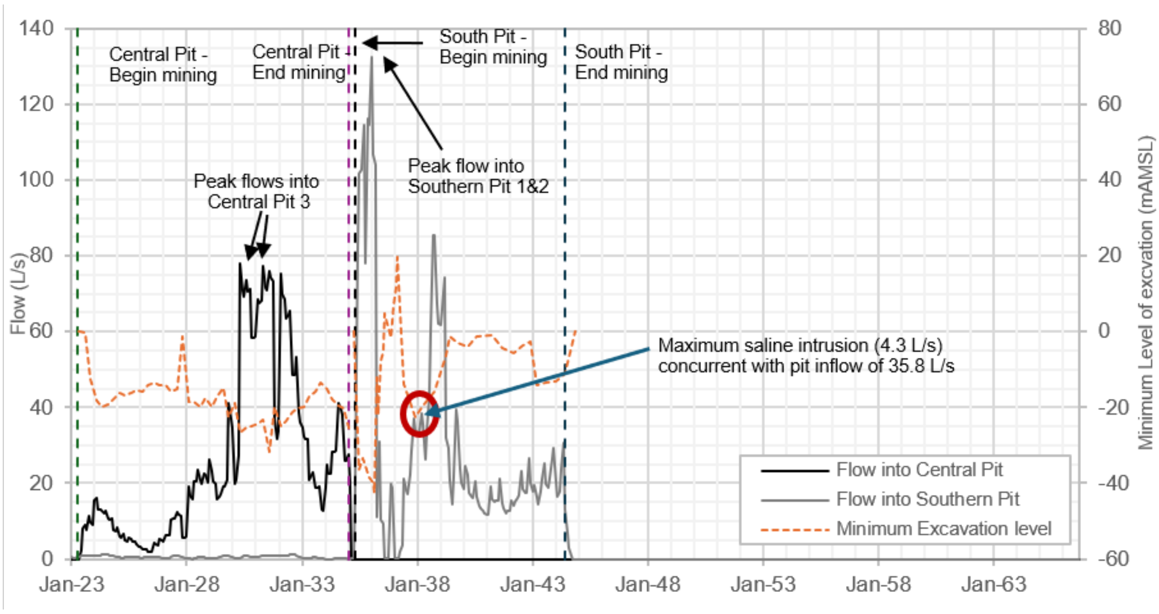

Figure 4. Simulated groundwater discharge into the mine pits, highlighting time of maximum saline intrusion.

3.2.5 Saline Intrusion Monitoring

The WRC and DOC comments both mention a lack of saline intrusion monitoring under the proffered consent conditions, although there have been no issues with saline intrusion through the mining that has already occurred at the site over the past 50+ years.

Electrical conductivity ("EC") monitoring is ongoing at piezometers C101, S103, and Wetland 80. These locations respectively represent an area that was deemed to be potentially vulnerable to saline intrusion in the deep aquifer during mining (C101), and areas within or adjacent to groundwater connected wetlands. As previously mentioned, saline intrusion is only a risk below sea level, though some salinity can reach open water bodies via aerosol deposition (sea-spray) which occurs naturally in the windy coastal environment.

All monitoring data has indicated that the deep aquifer is not saline and is hydraulically separate from all freshwater features. Monitoring data from the deep aquifer that has been collected to date is shown in **Figure 5**, indicating freshwater conditions in the aquifer at both locations.

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[11] s Culkin, F., & Ridout, P. S. (1998). Stability of IAPSO Standard Seawater. *Journal of Atmospheric and Oceanic Technology*, *15*(4), 1072-1075

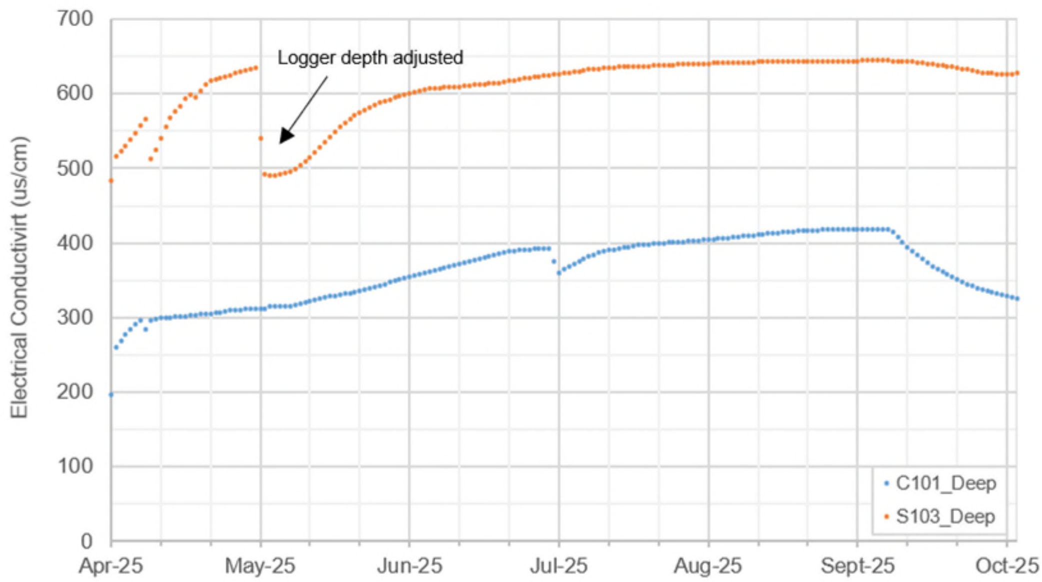

Figure 5. EC monitoring in deep aquifer piezometers (refer to Figure 3 for locations).

In the case of Wetland 80, the minimum groundwater level simulated under the 10th percentile dry conditions is 2.54 mAMSL. The Ghyben-Herzberg relationship (refer Section 6.4 of the Hydrogeology Assessment) would indicate that the saline interface would then be at -101.6 mAMSL. This analysis, indicating over 100 m of vertical separation between a low-lying coastal wetland and the saline interface, demonstrates that the wetland and other surface water features across the TIL site are not at risk of saline intrusion.

All monitoring data and analysis of saline intrusion risks indicate that no surface water features or water users are at risk of detrimental effects related to saline intrusion via groundwater. Hence, no explicit consent conditions are considered to be necessary beyond those requiring that any augmentation water used in the Mitiwai Stream or wetlands does not increase salinity to environmentally adverse levels (discussed in section 3.2.2 above).

3.3 Stream Depletion Due to Reduced Baseflow

The groundwater model was used to estimate the degree of baseflow reduction that can be expected with the ongoing mining of the Central and Southern Blocks. Several comments expressed concerns related to the analysis or the potential effects associated with baseflow depletion, namely those received from DOC, WRC, Te Nehenehenui, Te Ruunanga o Ngaati Mahuta ki te Hauaaru Charitable Trust, as well as the Earthtech peer review. The comments are summarised in **Appendix C**. Our responses are as follows.

3.3.1 Baseflow Depletion and Flow Augmentation of Mitiwai Stream

The Te Nehenehenui and the Te Ruunanga o Ngaati Mahuta ki te Hauaauru Charitable Trust both raised the concern that baseflow reduction in the Mitiwai Stream could sever the connection between the stream and its outlet at the coast. There is no indication that this would occur as a result of mining. Section 6.2.1 of the Hydrogeology Assessment indicates a maximum flow reduction of 5% of flow in the Mitiwai Stream during low-flow conditions. This effect will also only be temporary, abating after the mining advances away from the stream. For reference, the applicable allocation limit for the Mitiwai Stream in Section 3.3 of the Waikato Regional Plan

(Table 3-5) is 10% of the Q5 flow rate[12], indicating that the maximum baseflow depletion is within the limit of what could be allocated from the stream for consumptive use.

A programme is proposed in Condition 2 of AUTH142035.14.01 to determine flow rates where flow augmentation is necessary based on a trigger level criteria. As stated in the Earthtech review, the trigger levels are based on a calibrated model simulation of stream flow due the limited period of monitoring data available. It was not feasible to collect long term monitoring data for this Application, however the calibrated model is considered fit-for purpose given that all available stream flow monitoring data was used in the calibration and monitoring is ongoing.

To address this uncertainty, Condition 44 of "Schedule 1: General Conditions" requires the preparation and submission of an Annual Monitoring Report" to WRC. Based on Condition 45(g), if the monitoring indicates a stream flows are materially different from that utilised in the Hydrogeology Assessment (Groundwater Effects), the baseflow and augmentation rates required can be adjusted, hence the trigger levels will be updated based on further monitoring if required.

Water that is added to the stream as flow augmentation will meet the water quality standards set out in proposed conditions of consent (see Conditions 2 and 3 of AUTH145032.14.01).

WRC (Memo from Sung Soo Koh – Hydrology, section 3.2) confirmed that the trigger-based augmentation plan that is proposed to be a sound approach to preserving minimum flows in the Mitiwai Stream.

3.3.2 Baseflow Depletion and Flow Augmentation of Wainui Stream

The Wainui Stream flow is controlled by the dam. The proposed flow augmentation is a continuation of ongoing management practices that require minimum flows of 10 L/s to be maintained downstream of the dam. In terms of water quality, the conditions of consent[13] require monitoring of the stream below the dam during times of low flow and implementation of measures to address any identified adverse effects (see AUTH142035.02.01, Condition 4).

Based on the information above, there is no impact on the Wainui Stream from an effects perspective, as supported in the WRC comments (Memo from Sung Soo Koh – Hydrology, Section 3.2).

The DOC Hydrology Assessment (Collaborations – Sections 4.2.1) states that the Q_5 flow rate for the Wainui Stream could not be reliably estimated from the available data. However, 10+ years of monitoring data would be required to define a representative Q5 or MALF statistic from measured data, which is not practicable. Hence our use of modelled streamflow.

The resource consents require monitoring of streamflow in both the Mitiwai (Condition 2 of AUTH142035.14.01) and Wainui Streams (Condition 3 of AUTH142035.02.01), which is ongoing. As previously mentioned, conditions 44-45 of "Schedule 1: General Conditions" requires the preparation and submission of an Annual Monitoring Report" to WRC. If the monitoring indicates a stream flows are materially different from that utilised in the Hydrogeology Assessment (Groundwater Effects), the baseflow and augmentation rates required can be adjusted to reflect the measured data.

3.4 Wetland effects

Comments relating to the assessment of effects on wetlands were made by some of the invited parties (DOC, WRC, Te Nehenehenui, Te Ruunanga o Ngaati Mahuta ki te Hauaaru Charitable Trust, as well as the Earthtech peer review), as summarised in **Appendix D**. These comments

[12] The Lower Mitiwai Stream is within a Lowland Catchment under the category Áll Other Catchments (Excluding Coromandel Peninsula)
[13] AUTH 142035.02.01 conditions 5 and 6

are addressed from an ecological perspective in the reports prepared by Hamish Dean and Hannah Mueller, on behalf of TIL.

Our response to the issues pertaining to hydrological effects on wetlands are provided as follows.

3.4.1 Incomplete Wetland Mapping

Mapping of wetlands was undertaken by professional ecologists with established expertise in the field. Their findings regarding the location, extent, and ecological classification of the wetlands were the basis for the hydrological analysis completed by WWLA.

The comment in Section 4.2.1 of Appendix B of the DOC comments (Aqualinc – Hydrogeology assessment), acknowledges that the wetland surveys followed Ministry for the Environment Wetland Delineation Protocols but suggests the that the mapping was incomplete because it excludes ponds primarily used for mining operations. As stated in Section Two of the Terrestrial Ecology – Wetlands and Vegetation Assessment[14], established delineation methods were followed in mapping wetlands and the full extent of features that can be considered a wetland from a hydrological perspective have been captured.

3.4.2 Dewatering due to reduced groundwater levels for groundwater connected wetlands

The Earthtech review requests monitoring data to verify the degree of wetland connectivity to groundwater or lack thereof, and that maximum groundwater drawdown at all mining stages be mapped to assess potential wetland effects across areas adjacent to the Central and Southern Blocks (Section 2.10).

The DOC review – Wetland Assessment (Appendix C) asserts that grouping wetlands has potential to mask effects on individual wetlands that may be particularly vulnerable or suffer a disproportionate effect based on their location relative to mining activities. We respond that the approach of grouping wetlands based on their location and hydrological conditions is appropriate based on the analysis described in the following paragraphs. The groupings have been agreed upon by both the ecological and hydrological experts undertaking these assessments, and the monitoring locations are proposed for the most vulnerable wetlands within each of the groups, as explained in Section 6.3.2 of the Hydrogeology Assessment (Appendix N to the Application).

The groundwater model has been calibrated to available monitoring data, and where the model indicated a wetland had a degree of groundwater connection and was at risk of drawdown during mining, a recommendation was made to install monitoring piezometers to monitor water levels prior to, during, and after mining. WWLA and SLR have collaboratively assessed a monitoring strategy that can be implemented to track water levels at selected wetlands from the groups defined in Table 13 of the Hydrogeology Assessment (Appendix N to the Application). These sites include:

- The existing piezometer C103 for Wetland Group 1;
- A new piezometer at Wetland 72 (referred to as Wetland 27 in Table 9 of the Terrestrial Ecology – Wetlands and Vegetation Assessment) for Wetland Group 3. This wetland was both the largest and closest to the excavation in its group; and
- A new piezometer at Wetland 80 (referred to as Wetland 15 in Table 9 of the Terrestrial Ecology – Wetlands and Vegetation Assessment) for Wetland Group 4. This wetland was determined to be the only retained wetland in Group 4 that was likely to have a degree of connection to groundwater, hence a shallow monitoring piezometer was recommended.

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[14] Appendix K of the Application.

- Wetland Group 2 is comprised of wetlands in the riparian zone of the Wainui Stream which will be sustained via the conditions governing flow that are addressed in **Section 3.3.2** of this report.

The piezometers recommended for Wetland 72 and Wetland 80 have been installed on 30/10/2025 and 6/11/2025, respectively (**Figure 6**), meaning that the 12 months of baseline data collection recommended by WWLA and SLR is underway.

Figure 6. Piezometer installed in Wetland 72 (left) and Wetland 80 (right).

In their comments, WRC confirm that that they are comfortable that the wetland loss has been fairly assessed and that the offsetting, monitoring, and seasonal trigger levels proposed in the draft NIWBMP are appropriate so long as they are carried out in a manner that is consistent with the proffered conditions[15] (Appendix C, Memo from Kaitlin Morrison – Wetlands).

This is a pragmatic approach based on recognising risk and connection to groundwater and has been supported by the project ecologists, as set out in the draft NIWBMP (Section 3.2). This approach is also supported by the comments in Section 4.2 of Appendix A – Hydrology assessment of the DOC comments that are broadly supportive of the WWLA analysis:

I support the inclusion of the potentially affected wetlands (with water tables within 3 m of the land surface) and the identification of these sites from a starting drawdown of 0.2 m as an appropriate conservative measure by the WWLA modellers, given the uncertainty due to the short piezometer monitoring records used for calibration (<44 days for most sites)…The WWLA report makes an

[15] See AUTH142035.16.01 condition 5

appropriate attempt at classifying the hydrological condition and modelling effects for the numerous wetlands based on the data available at the time.

3.4.3 Dewatering due to reduced stream inflows for surface water fed wetlands

The DOC comments suggest that surface water fed wetlands (primarily located along the margins of Wainui and Mitiwai Stream) are at risk from reduced groundwater levels that may occur during mining as the surface flow feeding the wetlands may be reduced (see Appendix B, Hydrogeology assessment – Section 4.1.4). We respond that surface flows will be monitored and sustained such that the flow regime remains highly similar to its present state, as explained in **Section 3.3** of this report, and further that the existing wetlands have persisted through mining in the same area over the past 50+ years.

Similarly, the concerns expressed in Appendix D (Terrestrial ecology assessment) of the DOC comments regarding the wetlands at the edge of Lake Taharoa are unfounded as these wetlands are hydraulically connected to the lake, and lake level management is already in place to assure that the wetlands remain viable. As previously mentioned, the trigger levels that have been established to protect the wetlands along the lake edge have never been breached, and if they were the mitigation response dictates that mining would cease. Notwithstanding this, TIL has proposed a condition of consent (AUTH142035.05.01, condition 10) that requires monitoring of the lake margin wetlands during times of lower lake levels and management responses to be implemented if adverse effects on the wetlands are becoming apparent.

3.4.4 Contamination via salinisation from groundwater

All wetlands in the Taharoa area are above sea level. This can be confirmed by cross-checking the surveyed wetlands with LiDAR elevation data which indicates that all wetlands within or adjacent to the TIL property are situated above sea level with significant vertical separation above the saline interface (refer to the example in **Section 3.2.5** of this document). Further to this, if a coastal wetland was at sea level it would already be an estuarine environment. As such, wetlands across the site are prone to saline aerosols, but not at risk of saline intrusion via groundwater.

3.5 Climate Change Not Addressed

Matters relating to the incorporation of climate change into the modelling assessment were raised in the DOC and Earthtech comments, and are summarised in **Appendix E**.

As stated in the DOC comments (Appendix B, Hydrogeology assessment – Section 4.1.3), the model was constructed with data from a 22-year period of historical climate data. This period includes both wettest year on record, 2023, and historic droughts in 2019 and 2020. Model results from these years can be taken as indicative of the level of effects that may occur if climate were to shift toward wetter or drier conditions within the envelope of anticipated climate change impacts, as requested in the Earthtech review comments (Section 2.9).

NIWA's "Our Future Climate New Zealand" online tool, which provides a web-based system for exploring projected temperature and rainfall maps across New Zealand was used as a source of projected climate data in the Hydrogeology Assessment. Specifically, the RCP8.5 (Representative Concentration Pathway for greenhouse gasses) scenario was used – which represents a high emission scenario for mid-century (2046-2065). The findings were:

a. Annual precipitation in the Taharoa area is projected to increase by 5-10%.

b. Summer mean rainfall in the Taharoa area is projected to increase by 5-10%.

c. The number of summer wet days (i.e., day in which rainfall occurs) in the Taharoa area is projected to decrease by 0-5 days.

Based on the above, NIWA's predictions indicate:

a. Rainfall overall is expected to increase slightly; and

b. Summer rainfall is projected to increase by 5-10% but occur over slightly fewer days (between 0-5 days less). This is unlikely to manifest in a perceptible change in summer low lake levels in comparison to existing variation.

The implication is that the extreme wet and dry years that were included in the data set used in the modelling assessment are beyond the variations that would be applied in a climate change scenario that represented the greatest emissions scenario predicted by NIWA. Based on these predictions relative to the range of data that was used in the modelling assessment, we do not consider that the incorporation of climate change projection for this area affects the conclusions of our original analysis.

4. Conclusion

We have carefully reviewed the comprehensive feedback provided by the invited parties and peer reviewers, including WRC, DOC, Te Nehenehenui, Ngaati Mahuta ki te Hauaauru, and Earthtech Consulting Ltd. The comments received cover topics including our conceptual groundwater modelling approach, and numerical modelling methodology, and our assessment of effects derived from the model with regard to saline intrusion, stream baseflow depletion, wetland hydrology, and the influence of climate change.

Our overall view on these comments is that the majority of the matters raised reflect a preference for greater complexity rather than the identification of material errors or fatal flaws. We assert that the methodology we have applied is suitable and pragmatic given the available data and supporting information. While some technical refinements could theoretically be applied to the model, they would not materially alter the assessment or the predicted scale of the environmental effects.

The comments and critiques received have not materially changed our view that our Hydrogeology Assessment is suitable, or altered the conclusions in our assessment of environmental effects. As WRC's reviewing hydrologist noted, the numerical groundwater model is robust, utilises a comprehensive dataset of site-specific field investigations, and provides a reliable basis for assessing the proposed activity's hydrogeological impacts.

We note that some changes to the proposed resource consent conditions and management plans have been recommended to define the water quality standards that apply to augmentation of the Mitiwai Stream or wetlands. These adjustments are not due to deficiencies or inaccuracies in our hydrogeological assessment, but are added to provide clarity and operational consistency for the exercising of the consents sought through this Application.

In our final view, the Hydrogeology Assessment, its underpinning numerical groundwater model, and the associated conditions and management plans remain highly appropriate and robust. They establish a scientifically sound, fit-for-purpose framework to safely manage, monitor, and mitigate the hydrogeological effects of the TIL Central and Southern Blocks mining project over the life of the consent.

Yours sincerely,

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Appendix A. Summary of Groundwater Modelling Comments

The Table below provides a summary of comments pertaining to the applied groundwater modelling approach and methodology.

Table 2. Summary of comments related to groundwater modelling approach and methodology.

Type	Source Document / Section Reference	Party	Comments on the Modelling Assessment
Critical	Central and Southern - s53 DOC comments Section 4.4; Appendix B (Sections 4.1.2, 4.1.3, 4.1.7, 4.1.4, 4.3, 4.3.4.1, 4.3.4.2)	DOC / Aqualinc (Nicole Calder-Steele & Matthew Jones)	A) Calibration Data: The model was calibrated using an inadequate, short-term groundwater monitoring record of only 44 days (April–May 2025), which fails to capture annual highs or lows. B) Lake Boundaries: Lake Taharoa was modelled as a constant head boundary, effectively treating it as an unlimited water supply. This artificially fixes the lake level in the model and masks potential drawdown impacts on lake-margin wetlands. C) Climate Data: The transient model repeats 22 years of historical climate data to forecast the next two decades rather than using future climate projections, which could cause inaccuracies. D) Post-Mining Assumptions: The model relies on unverified assumptions for the post-mining scenario, incorrectly assuming the land surface will return to pre-mining levels and that the backfilled tailings will have the exact same hydraulic conductivity as the undisturbed state. E) Inadequate Rating Curves: Strongly criticizes the rating curves for being based on only 3 to 4 flow gaugings in potentially unstable channels, which fails to meet National Environmental Monitoring Standards (NEMS). F) Unreliable Low Flow Estimates: Expresses very low confidence in the derived flow estimates because the lowest gauged flows (e.g., 75 L/s for Wainui Stream and 50 L/s for Mitiwai Stream) are significantly higher than the proposed minimum flows (34 L/s and 28 L/s, respectively), meaning the models cannot accurately predict low-flow conditions. G) Conclusion: States that because the data used to convert river stage to flow data is so poorly constrained, they "cannot have faith in the flow data used in the modelling process".

Type	Source Document / Section Reference	Party	Comments on the Modelling Assessment
	Technical Peer review report 29.05.2026 Sections 2.1, 2.2, 2.3, 2.6, 2.7, 2.13	Earthtech Consulting Ltd (Philip I. Kelsey)	A) Conceptual Model Oversimplification: The conceptual groundwater model is insufficiently defined and ignores previous drilling data. It improperly groups all geological units above the basement rock into a single "Ironsand" layer, rather than a layered sequence of aquifers and aquitards. This oversimplification means predicted groundwater effects could be understated. B) Hydraulic Conductivity: The model assigns permeability using statistical pilot points rather than actual soil types. Notably, it places an unverified low-permeability zone directly under the Mitiwai Stream, which artificially limits predicted stream depletion effects. C) Recharge Rates: The model uses an unusually high groundwater recharge rate (476mm/yr, or 41% of rainfall) compared to typical dune environments. D) Lake Effects: Setting all four lakes as constant head boundaries prevents the model from assessing drawdown effects on the lakes themselves. E) Rehabilitation Modelling: The model predicts full recovery by assuming that the mine backfill (tailings) has the same hydraulic conductivity as the in-situ ironsand, despite tailings expected to have higher silt content and lower permeability
	Central and Southern - s53 DOC comments Appendix A (Sections 4.1, 4.3)	Collaborations Ltd (James Blyth)	A) Uncalibrated Catchment Models: Notes that the lack of limited streamflow data means the catchment runoff model is uncalibrated, increasing the uncertainty of the model's outputs. B) Limited Monitoring Record: Highlights that Mitiwai Stream flow modelling relies on only ~11 months of monitoring data and lacks presented calibration parameters to consider if it is satisfactory for setting flow triggers. C) Wainui Stream Data: Points out that very little flow monitoring data is presented for the Wainui Stream to understand its natural low-flow (Q5) conditions.
Supportive	Central and Southern - s53 DOC comments Sections 4.2, 4.4, and 8.1	DOC)	• Acknowledges a common theme across the technical reviews that the application documents and hydrological modelling have used generally appropriate methodologies.

Type	Source Document / Section Reference	Party	Comments on the Modelling Assessment
	Central and Southern - s53 DOC comments Appendix A (Sections 4.1, 4.3)	Collaborations Ltd (James Blyth)	• Considers the baseline hydrological and hydrogeological models generally appropriate for scenario testing of the application's potential environmental effects. • Finds the Lake Taharoa model appropriate for a water balance and notes that its calibration appears satisfactory based on water level comparison charts. • Supports the use of the 0.2 m drawdown contour to assess potential effects on retained wetlands, describing it as an appropriately conservative measure by the modellers.
	Central and Southern - s53 DOC comments Appendix B (Sections 4.1.1, 4.1.3)	Aqualinc (Nicole Calder-Steele & Matthew Jones)	• States that the numerical groundwater model appears to be well constructed, despite having identified some specific data limitations. • Considers the assessment of aquifer hydraulic properties acceptable, noting that slug tests were completed using accepted methods and produced values within a realistic range suitable for informing the model.
	Waikato Regional Council - Central and Southern Block Mining Project inc. Appendices Appendix B (Sections 2.2, 2.3, 3.1, 4)	Waikato Regional Council (Dr. Sung Soo Koh, Hydrologist)	• Finds the technical assessments for both surface water and groundwater to be generally robust and well-supported by data. • Accepts the facts and data sources, noting that the catchment inflow modelling and subsequent scenario analysis are adequate and robust for the assessment's intended purpose. • States that the surface water modelling is valid and robust, providing useful insights into the lake's hydrological behaviour. • Commends the numerical groundwater model for being constructed using a comprehensive dataset from site-specific field investigations, stating that the "technical rigour of the modelling work is high" and that the model provides a reliable basis for assessing hydrogeological impacts.

Appendix B. Summary of Saline Intrusion Commentary

The Table below provides a summary of comments pertaining to the analysis of potential saline intrusion.

Table 3. Summary of comments pertaining to saline intrusion and related risks.

Source Document	Section Reference	Reviewer / Entity	Comments on the Assessment of Saline Intrusion
Technical Peer Review report 29.05.2026	Section 2.9 (Groundwater Model Predictions / RFI 9)	Earthtech Consulting Ltd (Philip I. Kelsey)	A) Requests that the applicant provide predicted groundwater drawdowns and effects assessments for saline intrusion under reduced recharge conditions linked to 1:10 year and 1:50 year drought scenarios. B) Requests an assessment of whether saline water within mine pits will have any adverse effects on surrounding groundwater or surface water. C) Requests an assessment of the expected maximum groundwater salinity which can be considered for conditions of consent. D) Requests a description of where saline impacted groundwater is to be discharged to (from pumping) and how this discharge will avoid adverse water quality effects to groundwater and surface water.
Waikato Regional Council - Central and Southern Block Mining Project	Appendix B: Sections 3.1, 3.5, and Review of Proposed Conditions	Waikato Regional Council (Dr. Sung Soo Koh, Hydrologist)	A) Identifies seawater intrusion as a specific area needing technical clarification, pointing out a lack of deep aquifer response to a 20-metre head differential between the pit and the coast. B) Requests a water-balance-based estimate of worst-case salinity concentrations in the mined slurry to ensure the protection of freshwater environments. C) Flags the complete omission of a salinity monitoring or seawater intrusion management plan from the draft conditions as an outstanding gap that must be resolved by having conditions to deal with it, or by proving the intrusion will not happen.

Source Document	Section Reference	Reviewer / Entity	Comments on the Assessment of Saline Intrusion
Central and Southern - s53 DOC comments	Section 5.2 (Matters requiring consent / Table 5-1)	Aqualinc (Nicole Calder-Steele & Matthew Jones)	A) Recommends that the consent conditions explicitly address how saline intrusion will be monitored and prevented, particularly concerning the protection of wetland health.
Te Nehenehenui - Central and Southern Block Mining Project	Section 11 (Hydrology – effects on the Mitiwai Stream)	Te Nehenehenui	A) Warns that flow reductions could cause variations in the saltwater/freshwater transition zone and lead to upstream saltwater intrusion.

Appendix C. Summary of Stream Depletion Effects

The Table below provides a summary of comments pertaining to the analysis of stream depletion effects.

Table 4. Summary of comments pertaining to stream depletion effects

Source Document	Section Reference	Reviewer / Entity	Concerns Regarding Stream Baseflow & Depletion
Central and Southern - s53 DOC comments	Appendix A (Sections 4.2.1, 4.3)	Collaborations Ltd (James Blyth)	A) Wainui Stream faces a maximum baseflow drawdown of 43.3 L/s, but this is likely mitigated by flow augmentation, assuming the augmentation is adequate for stream health and fish passage.
Te Nehenehenui - Central and Southern Block Mining Project	Section 11 (Hydrology – effects on the Mitiwai Stream)	Te Nehenehenui	A) Baseflow reductions in the lower Mitiwai Stream could sever the stream's connection to the coast, reducing instream habitat, blocking fish passage, and causing saltwater intrusion. B) Loss of cooler groundwater inflows could increase water temperatures and reduce dissolved oxygen. C) Strongly concerned that augmenting flow with treated mine water will degrade water quality, as it will differ in temperature, nutrients, suspended solids, and pH.
Te Ruunanga o Ngaati Mahuta ki te Hauaauru Charitable Trust, Maketuu Marae, Te Kooraha Marae and Aakura Marae	Freshwater Ecology / Hydrological Effects	Ngaati Mahuta ki te Hauaauru	A) Rejects flow augmentation as an adequate mitigation for altered stream flows, arguing it fails to replicate naturally occurring conditions and disrupts ki uta ki tai (source-to-sea) connectivity.
Technical Peer review report 29.05.2026.pdf	Sections 2.2, 2.12, 3.5	Earthtech Consulting Ltd (Philip I. Kelsey)	A) The groundwater model places an unverified low-permeability zone directly under the Mitiwai Stream, artificially limiting the predicted stream depletion effects. B) The Mitiwai Stream Mean Annual Low Flow (MALF) of 45 L/s was derived from a model and needs verification using actual measured data.
Waikato Regional Council - Central and Southern Block Mining Project inc. Appendices	Appendix B (Sections 2.4, 3.2)	Waikato Regional Council (Dr. Sung Soo Koh, Hydrologist)	A) Identifies a discernible depletion effect on the Mitiwai Stream but considers the trigger-based augmentation plan a sound approach to preserving minimum flows. B) Considers Wainui Stream depletion minimal because existing operational rules (34 L/s combined minimum flow) will maintain required levels.

Appendix D. Summary of Comments Relating to Wetland Hydrology and Effects

The Table below provides a summary of comments pertaining to potential effects of mining on wetlands.

Table 5. Summary of comments pertaining to effects on wetlands.

Source Document	Section Reference	Reviewer / Entity	Comments on Wetland Effects
Central and Southern - s53 DOC comments	Appendix C (Sections 23, 24, 70-74)	Dr Catherine Beard (Wetland Ecology / DOC)	A) Notes the permanent loss of natural inland wetlands, including irreplaceable naturally uncommon seepage wetlands. B) Criticizes the Draft Natural Inland Wetland and Buffer Management Plan (NIWBMP) for being input-based rather than setting enforceable, outcome-focused performance requirements for buffers and wetlands.
Central and Southern - s53 DOC comments	Appendix A (Sections 4.2, 4.3)	James Blyth (Collaborations Ltd / DOC)	A) Supports the conservative use of a 0.2m drawdown contour to identify ~44 wetlands potentially connected to groundwater. B) Recommends setting a two-tier trigger system (Alert at 10th percentile, Alarm at 5th percentile of low water levels) instead of using the lowest natural level. C) Identifies severe limitations with proposed rewatering mitigations, including unknown water quality, unproven infiltration success, and the risk of permanently altering the wetland's hydrological regime.

Source Document	Section Reference	Reviewer / Entity	Comments on Wetland Effects
Central and Southern - s53 DOC comments	Appendix B (Sections 4.1.4, 4.2.1, 4.2.4)	Aqualinc (Nicole Calder-Steele & Matthew Jones / DOC)	A) Points out a flawed conceptual model where wetlands primarily fed by surface water are wrongly assumed to be at low risk from groundwater depletion. B) Criticizes the incomplete mapping of wetlands, as constructed ponds were excluded from the effects assessment. • Warns that the proposed offset wetland will not be classified as a "natural inland wetland" and could therefore be legally damaged or destroyed in the future.
Central and Southern - s53 DOC comments	Appendix D (Sections 16-17, 29)	Rhys Burns (Terrestrial Fauna / DOC)	A) Emphasizes that lake-fringe wetlands provide critical habitat for the Nationally Critical Australasian bittern, which requires specific water depths to forage and breed. B) Warns that pumping sediment-laden stored mine water into wetlands could cause rapid depletion of food resources, shallowing of the wetlands, and permanent habitat unsuitability.
Te Nehenehenui - Central and Southern Block Mining Project	Sections 4, 12	Te Nehenehenui	A) Opposes relying on a generic 30m setback, arguing it only prevents physical damage but does not protect against adverse hydrological effects. B) Criticizes the proposed 8.3 ha wetland offset condition as vague and unenforceable ("as far as reasonably practicable"), suggesting strict timeframes and measurable survival metrics (e.g., 80% survival after 4 years) are needed instead.

Source Document	Section Reference	Reviewer / Entity	Comments on Wetland Effects
Te Ruunanga o Ngaati Mahuta ki te Hauaauru Charitable Trust, Maketuu Marae, Te Kooraha Marae and Aakura Marae	Hydrogeological Effects / Terrestrial Effects	Ngaati Mahuta ki te Hauaauru	A) Rejects the idea that compensation wetland packages can replace the ecological and cultural functions of existing systems, stating wetlands are taonga whose mauri cannot be reduced to technical buffer diagrams. B) Demands that stock-proof fencing be installed around wetland buffers to ensure effective habitat protection.
Technical Peer review report 29.05.2026.	Section 2.10	Earthtech Consulting Ltd (Philip I. Kelsey)	A) Requests monitoring data to verify the assumption that certain wetlands are disconnected from groundwater. B) Requests wetland effects be assessed using maximum groundwater drawdown plots across all stages within the Central and Southern pits.
Waikato Regional Council - Central and Southern Block Mining Project inc. Appendices	Appendix C (Conclusions / Main Points)	Waikato Regional Council (Kaitlin Morrison, Wetland Scientist)	A) Is comfortable with the 4.25 ha wetland loss provided appropriate offsetting and monitoring are implemented. B) Requires a full 12-month baseline data collection across all seasons to set accurate trigger levels. C) Expresses significant concern over the long-term viability of the offset site, specifically questioning if it will fail once water supplementation ceases at the end of the consent term.

Appendix E. Summary of Comments Relating to Climate Change

The Table below provides a summary of comments pertaining to the incorporation of climate change into the modelling assessment.

Table 6. Summary of comments pertaining to climate change.

Source Document	Section Reference	Reviewer / Entity	Comments on Wetland Effects
Central and Southern - s53 DOC comments	Section 4.4; Appendix A (Summary); Appendix B (Sections 4.1.3, 4.2.5); Appendix C (Section 69)	Department of Conservation (DOC), including Collaborations Ltd, Aqualinc, and Dr. Catherine Beard	A) Use of historic data instead of projections: The transient groundwater and lake water balance models improperly repeat the last 22 years of historic climate data to project the next two decades, rather than using actual future climate projections. B) Omission of evaporation changes: The hydrology modelling completely omitted climate change scenarios based on the assumption that rainfall changes would be small (<5%), while failing to mention or model changes in evaporation due to warmer global temperatures. C) Inadequate consideration: Aqualinc notes that climate change consideration is highly inadequate given the scale and 35-year duration of the consent, having been addressed in only one paragraph in the hydrology report and ignored entirely in the hydrogeology report. D) Flawed scenario data: The applicant unusually mixed and matched numbers from different climate scenarios (e.g., SSP1, SSP2, SSP3) to describe potential changes, rather than modelling a consistent scenario.
Technical Peer review report 29.05.2026	Sections 2.9 (RFI 9) and 3.6 (RFI 19)	Earthtech Consulting Ltd (Philip I. Kelsey)	A) Drought predictions lack climate data: Requests that the applicant's predictions for groundwater drawdown, lake levels, stream depletion, and saline intrusion under 1:10 and 1:50 year drought conditions be updated to explicitly include anticipated climate change impacts over the next 50 years.