Memorandum 2

To: The Expert Panel for the Ashbourne Fast-Track Application

From: Tony Cowbourne (Terrane Consultants Ltd)

Date: 27th November 2025

Fast Track Application FTAA-2507-1087: Ashbourne Development, Matamata

Minute 3 of the Expert Panel dated 21 November 2025 - Response to Request for Information on behalf of Matamata-Piako District Council (geotechnical matters and groundwater)

1.0 Introduction

This Memorandum has been prepared for the Matamata-Piako District Council in response to the Expert Panel's request as set out in Minute 3 dated 21 November 2025, for information pursuant to section 67 of the Fast-track Approvals Act 20024 (FTAA).

The Memorandum addresses geotechnical matters and matters pertaining to groundwater.

The numbering below refers to the paragraph numbers in the Expert Panel's Minute 3.

2.0 Geotechnical matters

2.1 Information request

[13] Has the site been shown to be free of active fault traces? If not what additional investigations or reporting is required to address this matter?

[14] Has the liquefaction hazard been addressed appropriately with respect to effects on proposed development, including buildings? If not what additional investigation or reporting is required?

2.2 Response

2.2.1 Active fault traces

Section 6.3 in Revision 3 of the geotechnical report by CMW is unchanged from the previous Revision 2 of the report (= October 2025). The uncertainties and errors identified in my peer review dated 10th November 2025 have not been addressed.

There was one change elsewhere within Revision 3 to do with active faulting. A bullet point was added into the list in *Section 8 - Future Works* thus:

> " • Check with GNS about high-resolution active fault maps within the vicinity of the development area that might not be available publicly."

This is not mentioned in the Section 6.3 assessment. It creates uncertainty in both Section 6.3 and by itself - for example:

- It is not clear when GNS will be contacted;
- Obtaining map data is not sufficient in itself; and
- It is quite possible that GNS has not mapped this area (it is not shown on either of their 2016 and 2024 papers), therefore they may want to do a specific assessment and possibly field investigations. This can require considerable time and resources.

The Ashbourne site has not been shown to free of active fault traces.

As for additional investigations I would expect a SQEP such as GNS would approach the assessment as follows:

- → An initial desktop study;
- → If judged that there is no elevated risk, then the issue is closed;
- → If uncertainties were present then they would do a site inspection, more detailed desktop assessment, and consider other aspects such as historical seismicity; then
- → If necessary, undertake field investigations, most likely involving specialist trenching as well as other techniques to define buried features. This would be followed by detailed analysis and, if necessary, identification of non-build zones. The work would take months to complete.

2.2.2 Liquefaction Hazard

The only change in the liquefaction hazard assessment from Revision 2 to Revision 3 of the geotechnical report was the inclusion of IL3 category buildings. There was no refinement in the assessment of IL1 or IL2 requirements, or consideration of the additional cost and design restrictions associated with the increase from TC2 to TC3 classification.

There are residual uncertainties for liquefaction, mostly the possibility of lateral spread displacements in the greenway, the ponds and the wetlands. However, the elevation differences are modest and it is likely that the stabilisation measures needed to address any deficiency in stability under earthquake conditions would not be too excessive.

Given the TC3 classification and the cost consequences it is more than likely that additional investigations and assessment will be undertaken.

For the purposes of the Fast Track Application the liquefaction assessment given in Revision 3 of CMW's geotechnical report can be used as a baseline.

3.0 Groundwater

3.1 Information request

[15] Is the updated hydrogeological information and assessment in the WGA Technical Memo of 18 November 2025 in Attachment 4 sufficient and appropriate for assessing groundwater levels with respect to assumptions and methodology used in the revised stormwater disposal design? This includes carrying out water balance or other modelling that assesses the effects of ongoing discharge by soakage for all rainfall up to the 10- year ARI rainfall event, together with proposed wastewater discharge at the retirement village, including any effects of future climate change on rainfall.

[16] For the proposed residential development, are the assumptions/assessments for ensuring adequate clearance of the bases of stormwater disposal soakage trenches above groundwater levels appropriate, including the use of subsoil drains proposed to lower winter groundwater levels?

3.2 Response

3.2.1 Sufficiency of the groundwater information

The sufficiency can be considered in three parts – (1) the input data, (2) the determination of design groundwater levels, and (3) how the uncertainties in the groundwater have been managed within the design process.

(1) <u>Input data</u>:

- The four piezometers installed in September 2025 appear to be reliable. Two of the four piezometers recorded perched water tables during installation, indicating uncertainty as to whether the most critical groundwater table is being monitored. There is an older piezometer that WGA acknowledged was not properly sealed. The piezometers are only shallow – there is no monitoring of groundwater below 10m depth.
- The four ± one piezometers are spread across the whole Ashbourne site. They are all more than 200 metres apart and cannot be cross-checked against each other.
- There is only approx. 6 weeks of groundwater monitoring results.
- This is a particularly limited factual basis on which to assess what is now recognised by all parties to be an abnormal groundwater system.

(2) <u>Design groundwater levels</u>:

- The WGA technical memo and informal feedback 27/11/25 indicates that the groundwater levels identified for the purposes of design were the maximum measured levels during the 6 weeks of monitoring, supplemented by selected information from earlier investigations which were judgement-adjusted for being at different times of the calendar year, etc. There was no specific factoring or scaling for uncertainties.
- It is not clear how the measured groundwater levels relate to historical averages. A simple way is to compare rainfall records for the 6 week period with historical rainfall records. I have undertaken a quick check as per the graphs appended to this Memo. The June-Oct 2025 rainfall in Matamata was above the historical average however nowhere near an upper bound such as the 95% percentile.
- Each of the 17th November 2025 reports that considered groundwater issues (the CMW geotechnical report Revision 3, the WGA technical memo and the Maven memo) refer to <u>maximum</u> or <u>peak</u> groundwater levels. The wording in each of the documents are consistent with these levels equating to the maximum measured groundwater levels. For example:
  - → CMW report Section 5.3, last sentence: "The maximum winter piezometric surface … has been presented in Appendix G", which is a copy of WGA's Figure A1 (copy attached herewith); and
  - → Maven memo, page 1: "Continuous monitoring and updated groundwater contouring has identified seasonal high levels", and page 5: "the proposed stormwater devices … can operate independently of groundwater peak levels".
- This was confirmed in the informal technical meeting 27/11/25. WGA staff explained that it included an experience-based judgement that the groundwater table would not rise to less than 0.5 metres below ground level.

- I question whether the maximum measured groundwater levels are the same thing as the maximum groundwater levels that need to be allowed for in the design of the Ashbourne (indefinite but at least 100 year AEP conditions). If they are to be directly equated then there should be a significantly larger amount of factual data to justify this.

- There are a number of aspects to determining what groundwater conditions to use within the overall project design. For example, I have not been able to locate any mention climate change effects. Climate change will affect both the ambient/ antecedent groundwater conditions and infiltration/recharge associated with specific storm events. The stormwater system has been designed for 2130 RCP8.5 and it is logical that the groundwater system should assessed on the same basis. The shallow groundwater table increases the likelihood of interaction between surface water and groundwater, therefore they should be considered in tandem.

- The process to determine design groundwater levels needs to be clarified. There are a number of scenarios that need to be considered – storm duration, intensity and return period, antecedent conditions, seasonal effects and climate change. It would not be surprising if resulted in a multi-variable design envelope rather than a single groundwater table.

(3) <u>Design Approach</u>:

- The WGA technical memo dated 18th November 2025 advised the geological model for the site had been refined by CMW. This was referencing the iteration from Revision 1 to Revision 2 of the CMW report. As per my evidence dated 18th November there were distinct gaps in the Revision 2 geological model. One way of looking at it is that there are five boundaries to the groundwater system at Ashbourne – north/south/east/west and vertically – and so far only the west (Waitoa River) boundary has been adequately defined. There have been no further site investigations and the geological model part of Revision 3 is the same as Revision 2, therefore the uncertainties remain unresolved.

- Time restrictions meant that it was not possible to clarify uncertainties within the groundwater analyses summarised in the WGA memo. For example, the memo says that aquifer properties for the Hinuera Formation determined from elsewhere were used, yet a later section of the memo acknowledges that Ashbourne has abnormal groundwater conditions. Also, it is not fully clear what input data for groundwater levels and permeabilities were used and whether they included a factor of safety margin. These issues will need to be clarified so that there is full confidence when they are used in the project design.

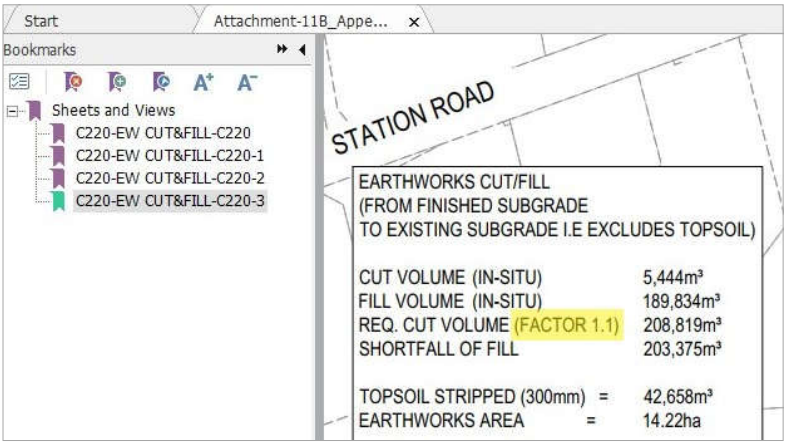
- Figure 4 of the WGA memo is important (see copy attached). It shows Depth to Groundwater in gradational/zone format. It looks to be at a quite detailed scale, however this is a reflection of the digital terrain model for the finished ground levels, not for the groundwater half of the equation. Informal feedback from WGA on 27/11/25 was that Figure 4 is based on the groundwater contours as per their Figure A1 (copy also attached).

- There are no details of the analytical model that generated the groundwater depth zonations shown in Figure 4. The colour gradations indicate simplifications and possible inconsistences in the boundary conditions.

- WGA Figure 4 shows locations A to E which were analysed for groundwater drawdown via subsoil drainage. WGA staff have advised that Figure 4 does not include the drawdown effects of the subsoils. This makes sense because the shading pattern would otherwise be inconsistent.
- Maven have informally confirmed that the groundwater levels used in the civils design were as advised by WGA. There was no specific allowance for unknowns or unforeseens.
- It is not possible to reconcile WGA's Figure 4 with Maven's cut-fill plans and the stormwater design drawings. There appears to be locations within the residential area that do not comply with the clearance to groundwater table criteria.

Management of Uncertainties:

- It is sometimes possible to take a small set of data and expand it by synthesising it with other sets of data. The associated uncertainties are allowed for in subsequent design steps by (1) including significant conservatisms in the design parameters identified from the analysis; and/or (2) ensuring there are contingency measures that could be activated if site conditions proved to be less favourable than had been predicted by the synthesised data.
- In the case of groundwater levels at Ashbourne the obvious comparative data would be historical rainfall records, conservatisms could be adding an additional freeboard allowance to the '*maximum groundwater levels'*, while contingency measures could comprise more subsoil drains, imported filling to raise ground levels, etc. There is no indication of this design approach having been adopted.
- I attempted to verify WGA Figure 4 and the soakage disposal trenches in the Maven plans by determining the depth to groundwater at a small number of locations. This was not possible using the information provided.
- I then looked at the possibility that the clearance to the groundwater table could be increased by raising the finished ground levels. Two uncertainties became apparent. Firstly, the schedules on the earthworks plans for both the residential area and the retirement village indicate only a limited surplus of cut versus fill. This plus the comment that raising the wastewater field will be by using topsoil, indicates there is no spare mineral soil.
- Secondly, and more importantly, the earthworks plans refer to a compaction factor of 1.1 – for example:



- A compaction factor allows for the loss of volume from natural soils to compacted filling. A factor of 1.1 equates to a -10% loss in volume and is reasonably common for 'conventional' soils. The Matamata soils are quite different as the weathered volcanic ashes are highly susceptible to particle crushing, and local Matamata experience is that the compaction factor is in the general order of ≈ 1.3 (I have checked this with a local engineer to make sure). So, unless I have mis-read the plans the Ashbourne earthworks are more likely to have -25% volume loss rather than the -10%. It is a puzzling inconsistency. I could not locate compaction factor information in any of the design documentation.
- The compaction factor discrepancy is directly relevant to groundwater related issues. If the finished ground levels have to remain as-is then additional fill will have to be found from somewhere. For just the northern part of the residential area (in the snip above) the deficit would equate to an additional 37,000 m^3, or roughly 2,100 truck and trailer movements. The only other alternative would be to install considerably more subsoil drainage than what appears to have been brought into the design so far. This is a completely unproven concept.

Subsoil Drains

Query [16] from the expert panel refers to subsoil drains. I note the following:

- The Maven memo only refers to subsoil drains twice and in passing. There is no basis of design given. I have checked the project drawings for locations and details of subsoil drainage. There appear to be two types;
  - → 200 mm perforated pipes shown on the stormwater drains, however these appear to be simple connector pipes between the soakage trenches; and
  - → 'traditional kerb subsoil drainage', as per the Maven memo (page 3, 3rd para). Kerb subsoil drains are shallow and for protection of the road pavement, not permanent groundwater drawdown over a wide area.
- Provisional feedback 27/11/25 from Maven and WGA staff is that the references to the subsoil drains in the context of positively lowering groundwater levels at the site equate to modified kerb subsoil drains.
- The design function of the subsoil drains modelled by WGA is fundamentally different to kerb subsoils. A subsoil drainage system for preventing groundwater rise needs to operate in perpetuity. There are no design details or levels to assess this. There is no mention of inspections, monitoring, periodic maintenance or product durability. There is no indication of Factors of Safety, redundancy and only limited allowance for clogging.
- Flow rates from the subsoil drains are not given. Given the presence of high permeability pumice sands and the very large area the cumulative flow rates are likely to be considerable. This need to be confirmed.
- There are a number of unproven aspects to using subsoil drainage as an active control on groundwater levels. The information provided to date is not sufficient to demonstrate viability.

4.0 Conclusion

Based on the information provided and the review assessment summarised above, the overall status of groundwater issues within the Ashbourne design can be summarised as follows:

(1) It appears that the design groundwater levels will need to increase from those used in the design to allow for climate change, etc;

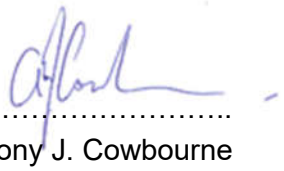
(2) there may be an issue with having enough fill to achieve the finished ground levels that have been specified;

(3) therefore the clearance to the groundwater table is at risk of being reduced from the top (finished ground level) and from the bottom (the depth to the groundwater table);

(4) there is little or no indication that there is spare margin available within the design to accommodate reduced groundwater clearances; and

(5) the design documentation does not recognise these uncertainties and no potential contingency/fallback measures have been identified.

Therefore the overall conclusion is that the information provided to date has not demonstrated that the abnormal groundwater conditions at the Ashbourne site have been adequately allowed for within the proposed design.



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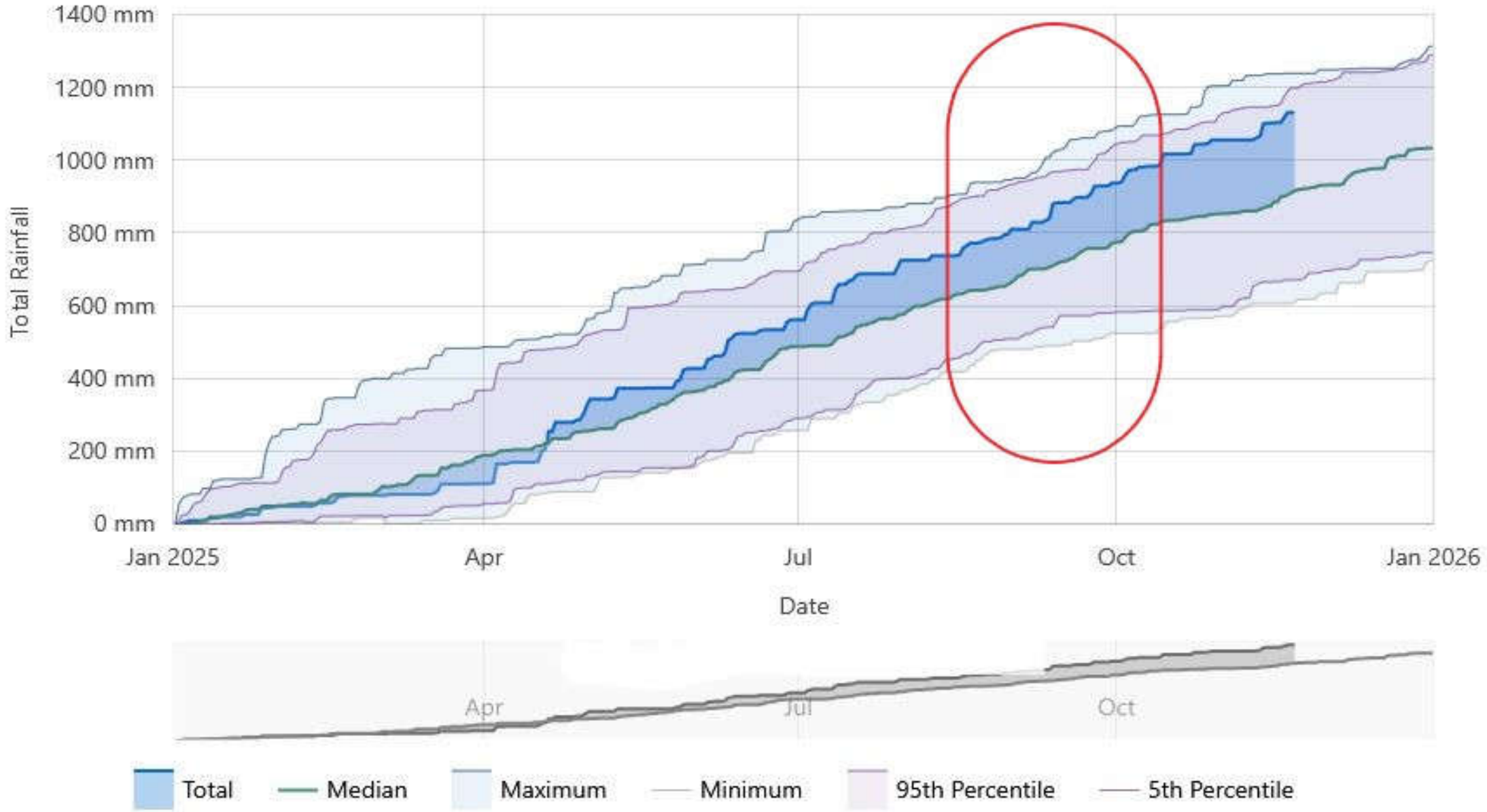
ATTACHMENTS:

Rainfall graphs

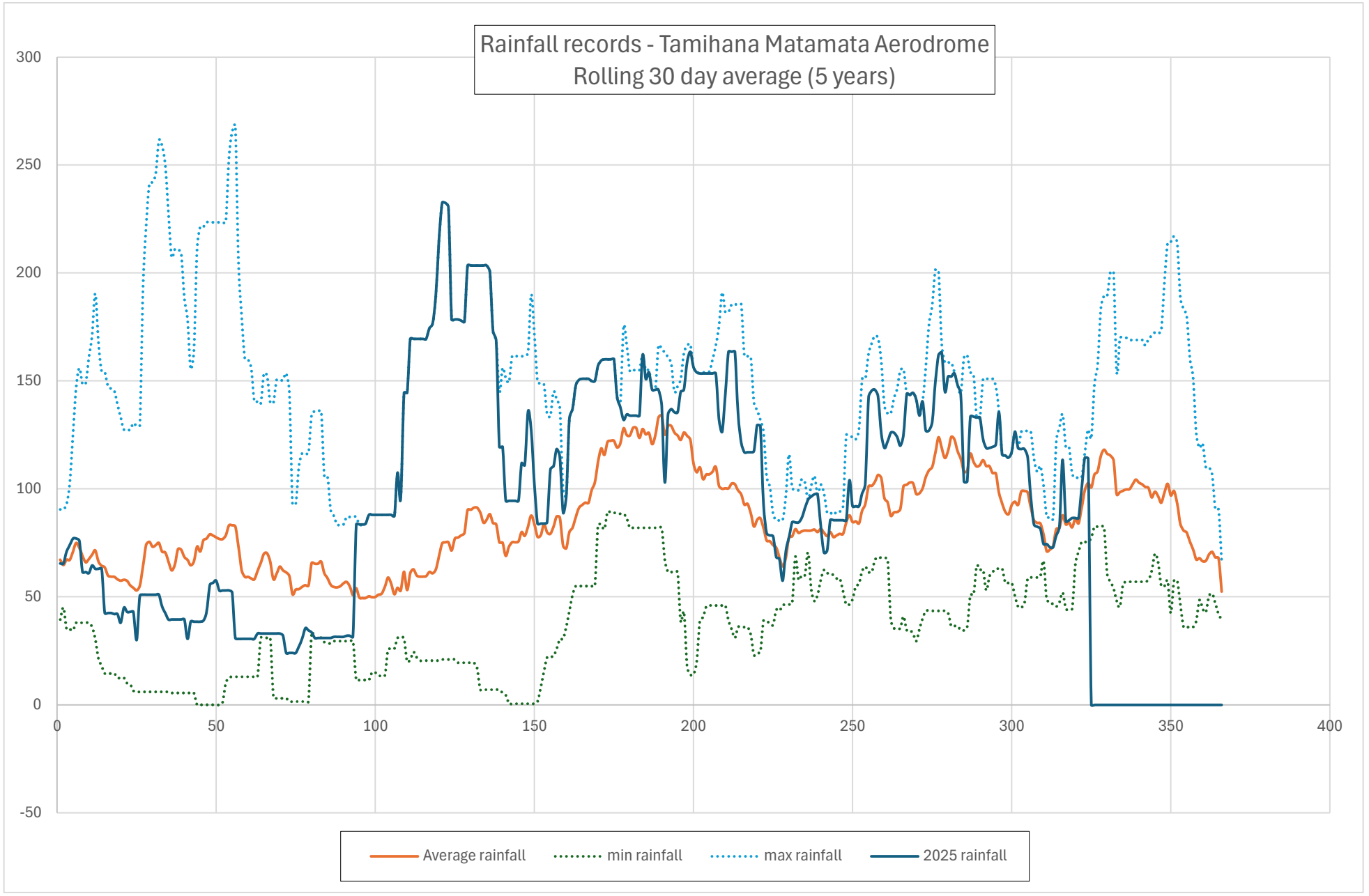
Copy of WGA Figure A1

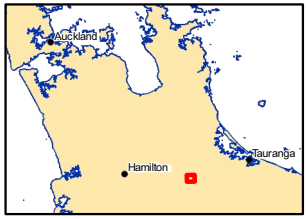
Copy of WGA Figure 4

Total Rainfall - Tamihana - Matamata Aerodrome



* The information here is provisional and intended as a guide only


Rainfall records - Tamihana Matamata Aerodrome
Rolling 30 day average (5 years)
300
250
200
150
100
50
0
-50
0
50
100
150
200
250
300
350
400
Average rainfall
min rainfall
max rainfall
2025 rainfall



LEGEND

- Piezometer (GWL in m RL)
- Piezometric Surface (m RL)
- Wastewater Disposal Site

N

0 90 180 270 m

Scale 1:9 000 @A4

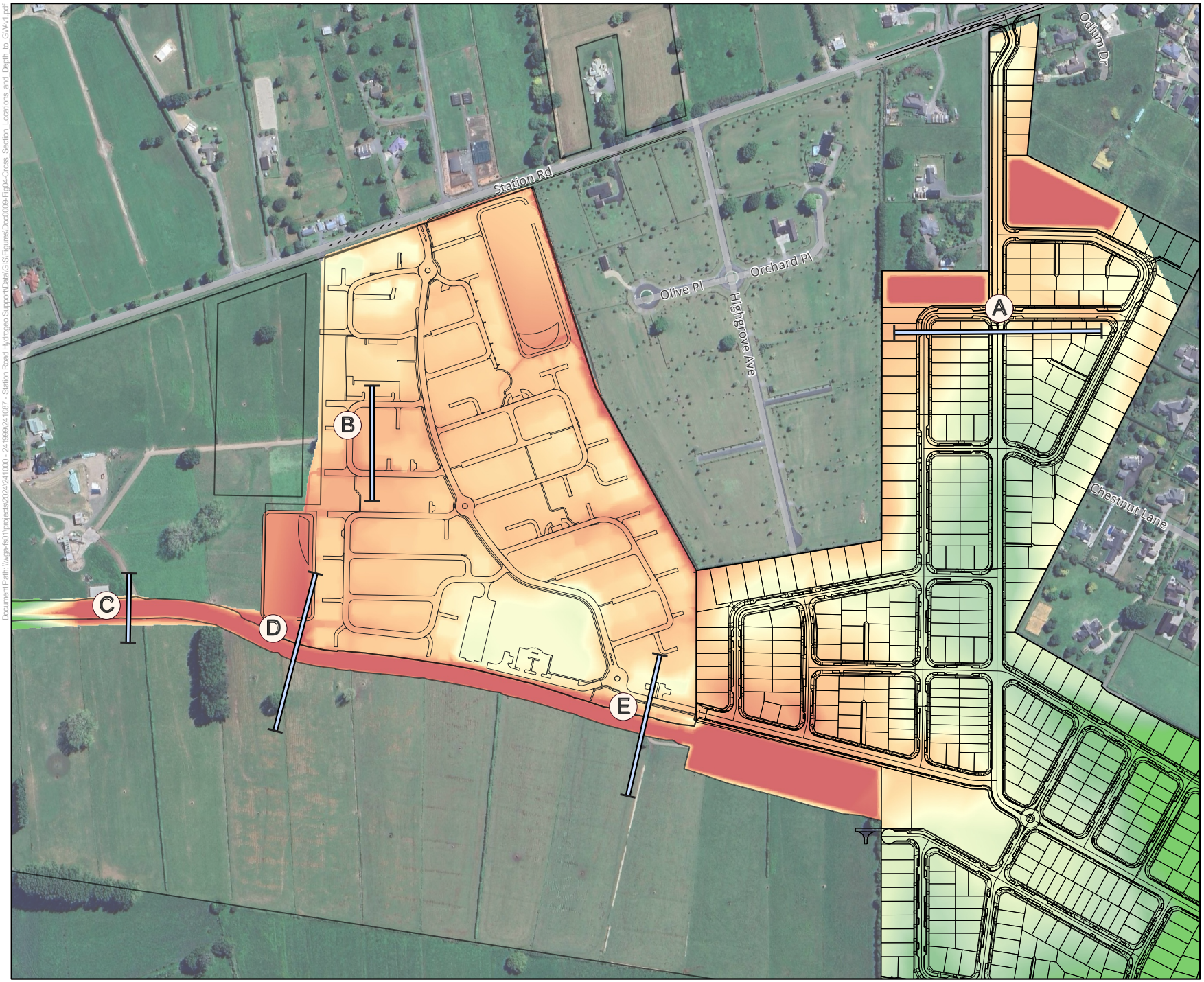
Coordinate System: NZGD 2000 New Zealand Transverse Mercator

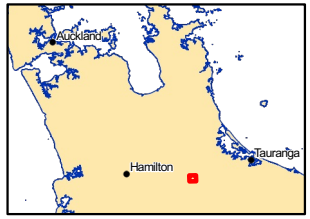
WGA

Figure **A1**

Ashbourne Development

Piezometric Surface





LEGEND

Drawdown Cross Section

Depth to Groundwater From Design Surface

- 0
- 0.5
- 1.0
- 1.5
- 2.0
- 2.5
- 3.0
- 3.5
- > 4

N

0 60 120 180 m

Scale 1:6 000 @A4

Coordinate System: NZGD 2000 New Zealand Transverse Mercator

WGA

Figure **4**

Ashbourne Development

Cross Section Locations and Depth to GW