MEMO

TO:	Eric Osborne	DATE:	13 March 2025
FROM:	Tony Trueman	PROJECT NO.:	J000814
COPY:	Craig Martell, Susan Jones		
SUBJECT:	100 & 110 TE MOANA ROAD, FLOOD ASSESSMENT & STORMWATER MANAGEMENT CONCEPT MEMO		

INTRODUCTION:

Mitchell Daysh Limited have engaged AWA Environmental Limited (AWA), on behalf of their client, to undertake an assessment of the existing mechanisms for flooding within lots 100 - 110 Te Moana Road and recommend stormwater management measures.

The scope of this memo will cover the following.

- Flooding associated with the local flood hazard, assessed using KCDC's latest TUFLOW modelling.
- Flooding associated with the regional flood hazard – GWRC Breach Scenarios.
- On-site soakage tests.
- Mitigation measures.
- Wetland effects – stormwater.
- District Plan provisions as they relate to flood hazard.

The proposed development extent, QEII wetland extent, and KCDC stormwater network is shown in Figure 1.

The land-use capability overlay for the site records a majority of Lot 1 as LUC Class 2 and a majority of Lot 2 as LUC Class 6. The Plan Change Application is therefore being split into Stage 1 and Stage 2. However, if only Stage 1 were to proceed the effects in relation to flood hazard and stormwater management would be less than or no different to what has been assessed for the site as a whole.

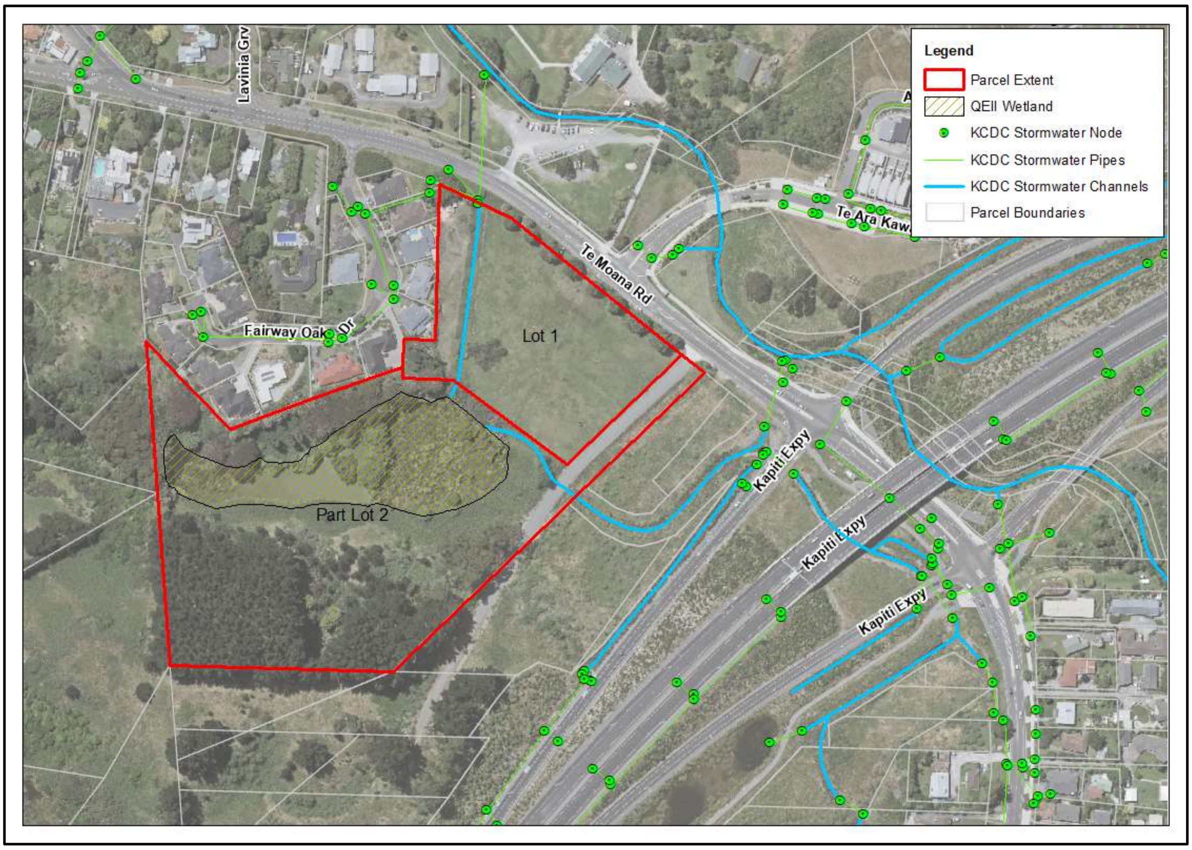

Figure 1 Development Lot1 and Part Lot2 Overlain Stormwater Network

TOPOGRAPHY:

The existing topography of Lot 1 is low lying and falls from Te Moana Road to the adjacent QEII wetland. The topography of Lot 2 is a mix of elevated dunes, lower lying areas and the QEII wetland. The site is located immediately downstream of the M2PP expressway overbridge over the Waimeha Stream, as shown in Figure 2.

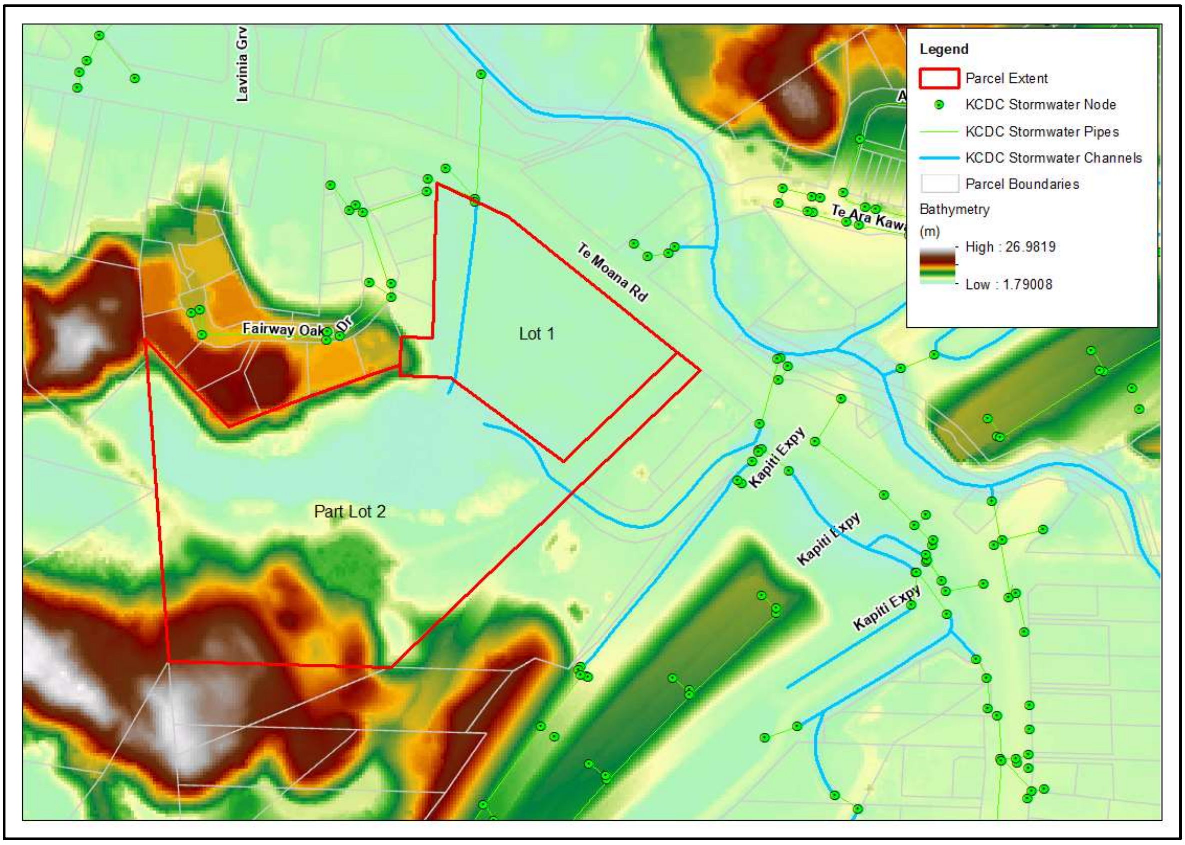

Figure 2 Development Lot1 and Part Lot2 Overlain Bathymetry

KCDC FLOOD HAZARD PLANNING MAPS:

The Flood Hazard Planning Maps show both Lot 1 and Lot 2 affected by stream corridor, residual overflow path, ponding and residential ponding areas flood hazard categories as shown in Figure 3.

It is worth noting that the Flood Hazard Planning Maps are out of date in this location as fill associated with the M2PP Expressway has moved the residual overflow path north and removed the ponding currently shown on the Expressway.

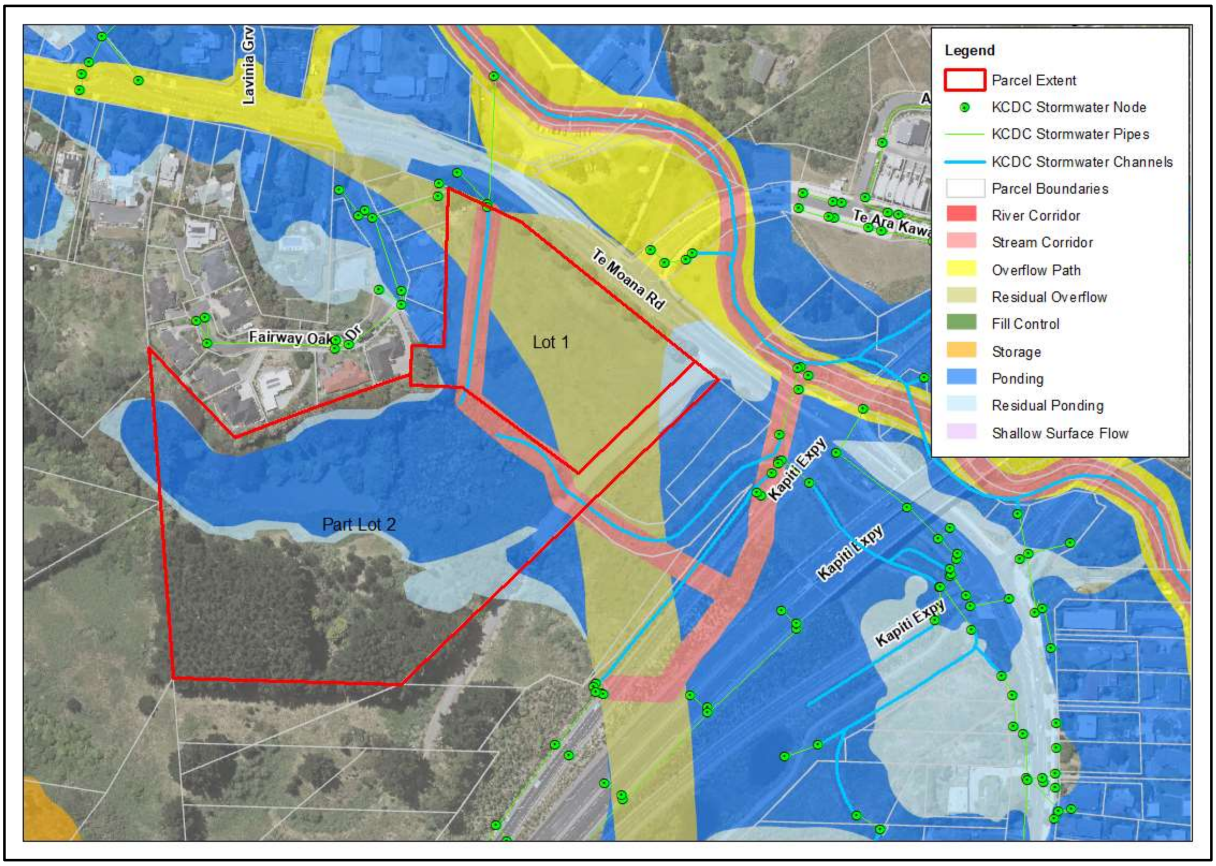

Figure 3 Flood Hazard Planning Maps Overlain Lots

The Kapiti Coast District Council Flood Hazard Planning Maps represent nine flood hazard categories, as shown in Table 1.

Table 1 Flood Hazard Planning Map Categories

Flood Hazard Category	Description
River corridor	This is the minimum area able to contain a flood of up to the 1% AEP event magnitude and enable flood water to pass safely to the sea. It includes flood and erosion prone land immediately adjacent to the river, where the risk to people and development is significant.
Stream corridor	*This is the minimum area able to contain a flood of up to a 1% AEP event magnitude and enable flood water to safely pass to the stream confluence or the sea. It includes flood and erosion prone land immediately adjacent to the stream.*
Overflow path	Overflow paths generally occur in lower-lying areas on the floodplain which act as channels for flood waters. They can be natural, or artificially formed, and are often characterised by fast flowing water during a flood event. An overflow path is a direct hazard.
Residual overflow path	*A residual overflow path is a residual flood hazard for areas which are protected from flooding by structural measures, such as stopbanks or floodwalls, constructed to the 1% AEP flood*

	standard. The residual hazard is in the event of a failure or overtopping of the flood protection structure.
Ponding	*These are areas where slower-moving flood waters could pond either during or after a flood event. A ponding area may be affected by a direct flood risk. Ponding can be associated with rivers and streams as well as the piped stormwater network. Ponding is a direct risk.*
Residual ponding areas	*Residual ponding areas related to a residual flood risk for areas which are protected from flooding by structural measures, such as stop banks or floodwalls, constructed to the 1% AEP flood standard. The residual risk is in the event of a failure or overtopping of the flood protection structure.*
Shallow surface flow areas	These are floodplain areas, typically on steeper catchments, where shallow moving flood waters could occur during a flood event. A shallow surface flow area is subject to a direct flood risk. This hazard is associated with high intensity rainfall that overwhelms the primary drainage paths resulting in shallow flows across the ground surface.
Flood storage areas	Land that provides flood water storage either during or after a flood event. Flood storage areas are located on local streams only. They include land that has been identified as flood prone where loss of storage due to mitigating measures, or filling, will cause flooding elsewhere. Any proposal for development of these areas (including filling) will need to provide compensatory storage below set ponding levels.
Fill control areas	Fill control areas are undrained "crater" type catchments where filling will raise the level of flooding on the property and on adjoining land.

LOCAL FLOOD HAZARD:

The 100YR ARI 2130 existing peak inundation flood hazard extents and depths are shown in Figure 4. The low areas within Lot 1 are impacted by ponding peak depths in the order of 10 – 800 mm. Within Lot 2 peak depths are more isolated in the order of 10 - 700 mm, peak depths within the wetland are in the order of 1.6 m.

LOCAL FLOODING MECHANISMS:

The mechanisms for flooding in the development extent are a result of flows from further up the catchment, localised ponding, and tailwater level impacts from the Waimeha Stream and associated tidal influences.

1. Flows from the south of the proposed development site enter the QEII wetland via swales and open channels associated with the M2PP expressway.
2. Flows from the west of the proposed development site enter the QEII wetland via overland flows from higher elevations into the gully.

3. The catchment is drained by two culverts to the Waimeha Stream (A & B). Model results indicate these culverts are tailwater controlled during the 100YR ARI 2130 event with a combination of peak flows in the Waimeha Stream and downstream tidal conditions resulting in backflow through the culverts.

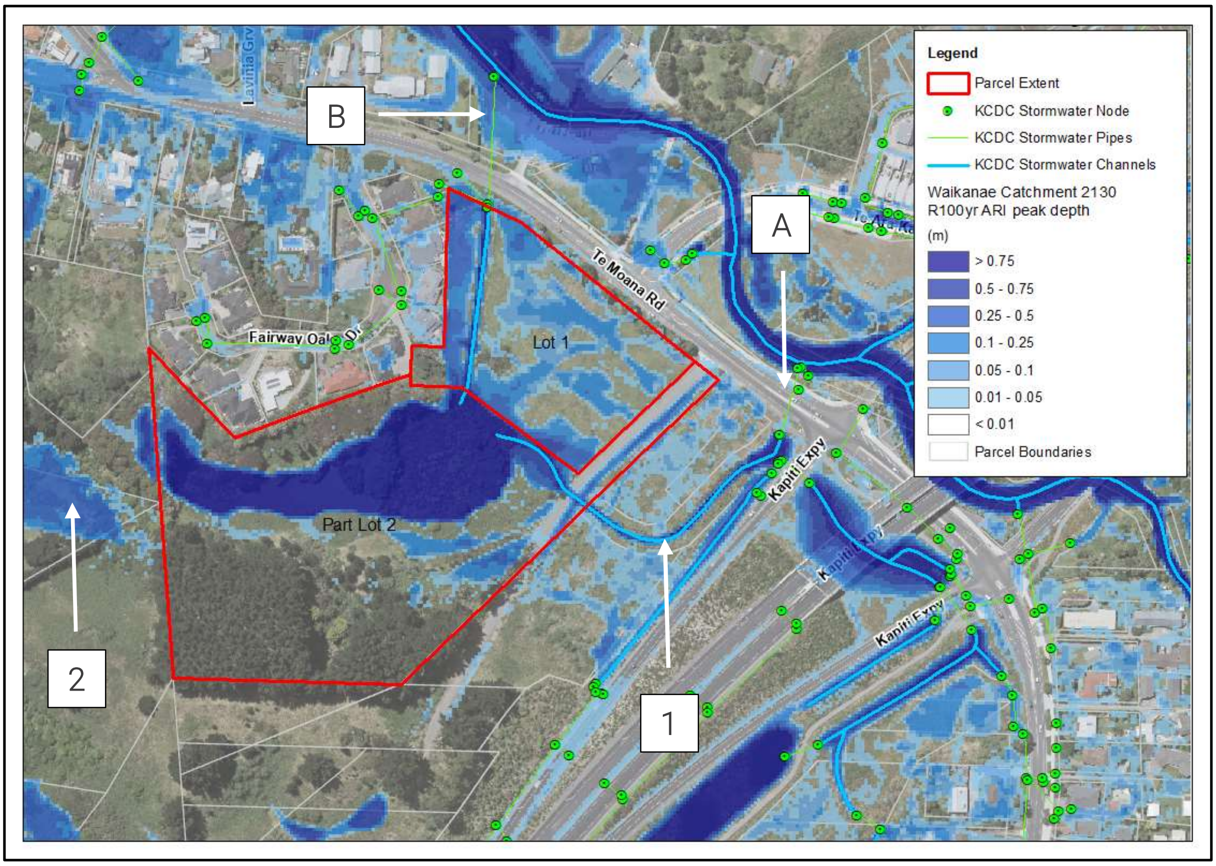

Figure 4 100YR ARI 2130 Existing Peak Inundation

REGIONAL FLOOD HAZARD:

Modelling of the Waikanae River, to the south of the development extent, considers several potential breach scenarios which are shown to impact on the development extent. Breach scenario flooding denotes residual overflow paths in the Flood Hazard Plan Maps. These breach scenarios are.

1. Chillingworth stop-bank breach
2. Kauri-Puriri stop-bank breach
3. Jim Cooke Memorial Park stop-bank breach

The locations of the stop-bank breach scenarios are shown in Figure 5.

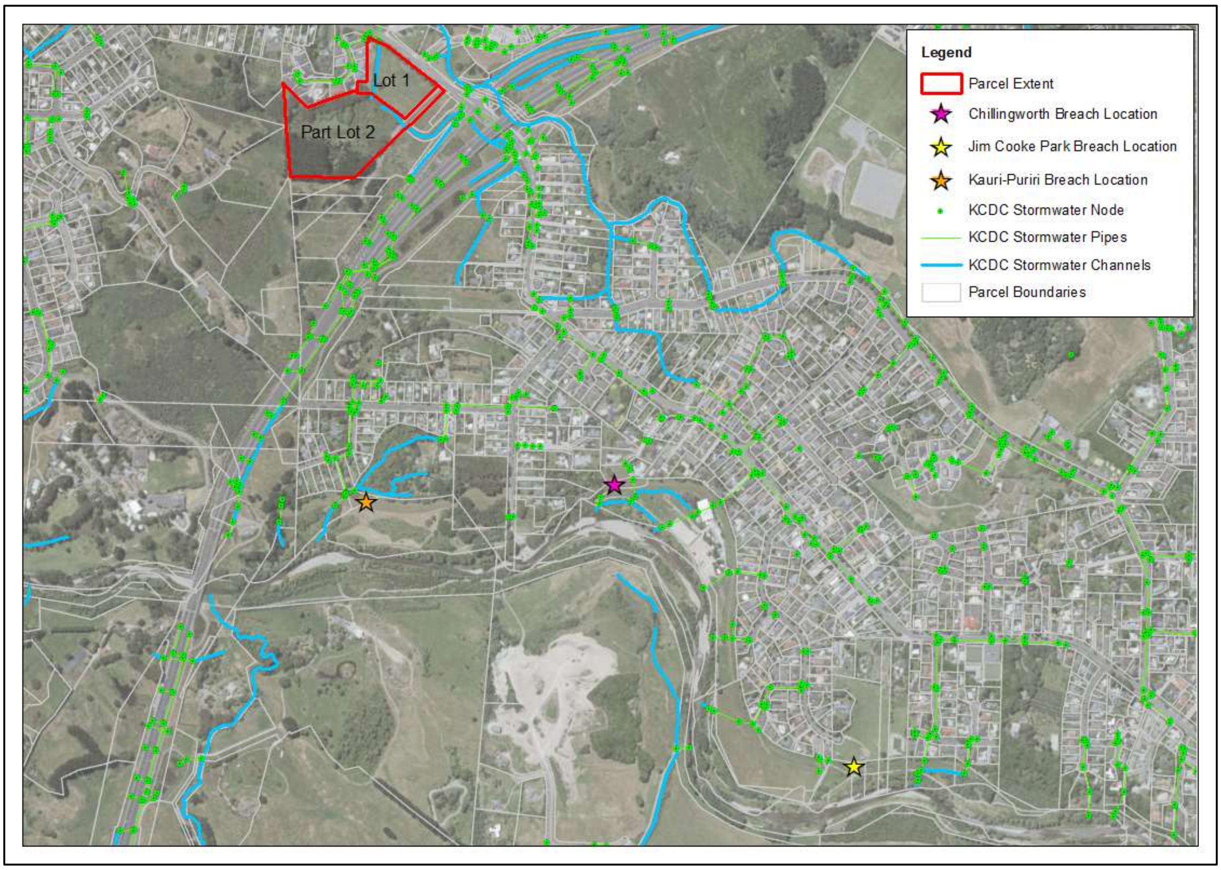

Figure 5 GWRC Breach Scenario Locations

REGIONAL FLOODING MECHANISMS:

JIM COOKE MEMORIAL PARK STOP-BANK BREACH

The assumed breach site is near the upstream end of Jim Cooke Memorial Park, on the outside of a river meander. The maximum breach width assumed is 80 m, while the breach lowers the stop-bank from its crest level of 12.5 m to 11.4 m.[1]

Note that flood protection works including rock groynes have been built at this site since the original breach modelling, diminishing the likelihood of a breach at this site. [1]

The peak depths associated with the Jim Cooke Park stop-bank breach scenario is shown in Figure 6. Note, this is the legacy model result which doesn't include the elevated M2PP Expressway.

[1] Waikanae River Hydraulic Modelling and Mapping – River Edge Consulting Ltd & SKM Ltd, March 2023

C.1.13 Jim Cooke Memorial Park stopbank breach, 100 year (1% AEP) Waikanae River flows, with climate change

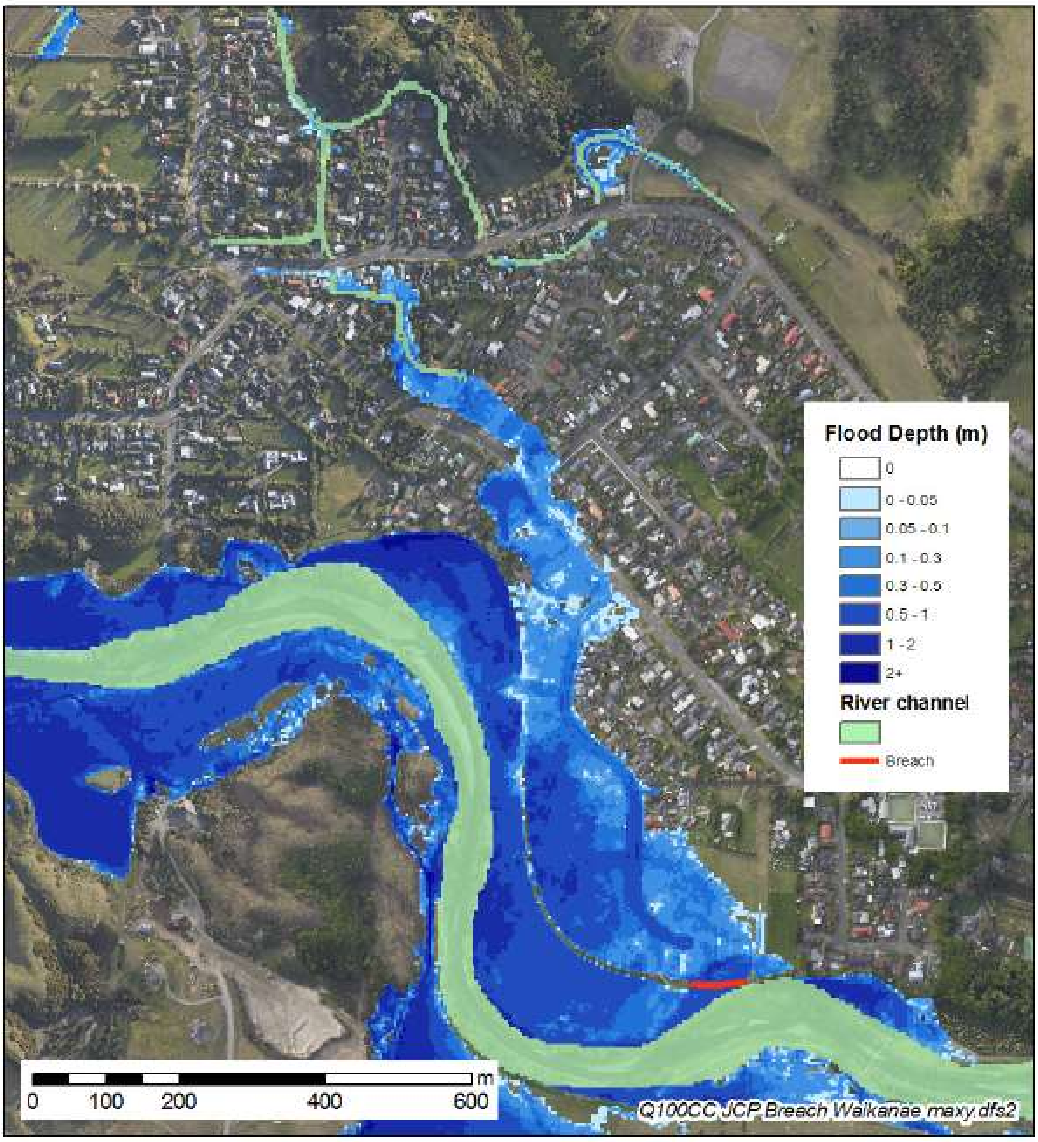

Figure C.13 100 year flood (climate change), Jim Cooke Park stopbank breach, predicted peak flood depths

Figure 6 Jim Cooke Park stop-bank breach scenario peak depths, source Waikanae River Hydraulic Modelling and Mapping - River Edge Consulting Ltd & SKM Ltd, March 2023

CHILLINGWORTH STOP-BANK BREACH

The assumed breach site is along a short stop-bank on the right bank upstream of Greenaway Road. The maximum breach width assumed is 60 m, as was assumed in modelling for the M2PP expressway proposal (River Edge Consulting, 2011), although the original GWRC modelling assumed only a 20 m maximum width. The breach lowers the stop-bank from its crest level of around 8 m to 6.5 m.[1]

This breach gave the greatest outflow onto the Waikanae floodplain of all the three right bank breach scenarios in the modelling for the M2PP expressway proposal.[1]

The peak depths associated with the Chillingworth stop-bank breach scenario is shown in Figure 7. Note, this is the legacy model result which doesn't include the elevated M2PP Expressway.

C.1.16 Chillingworth stopbank breach, 100 year (1% AEP) Waikanae River flows

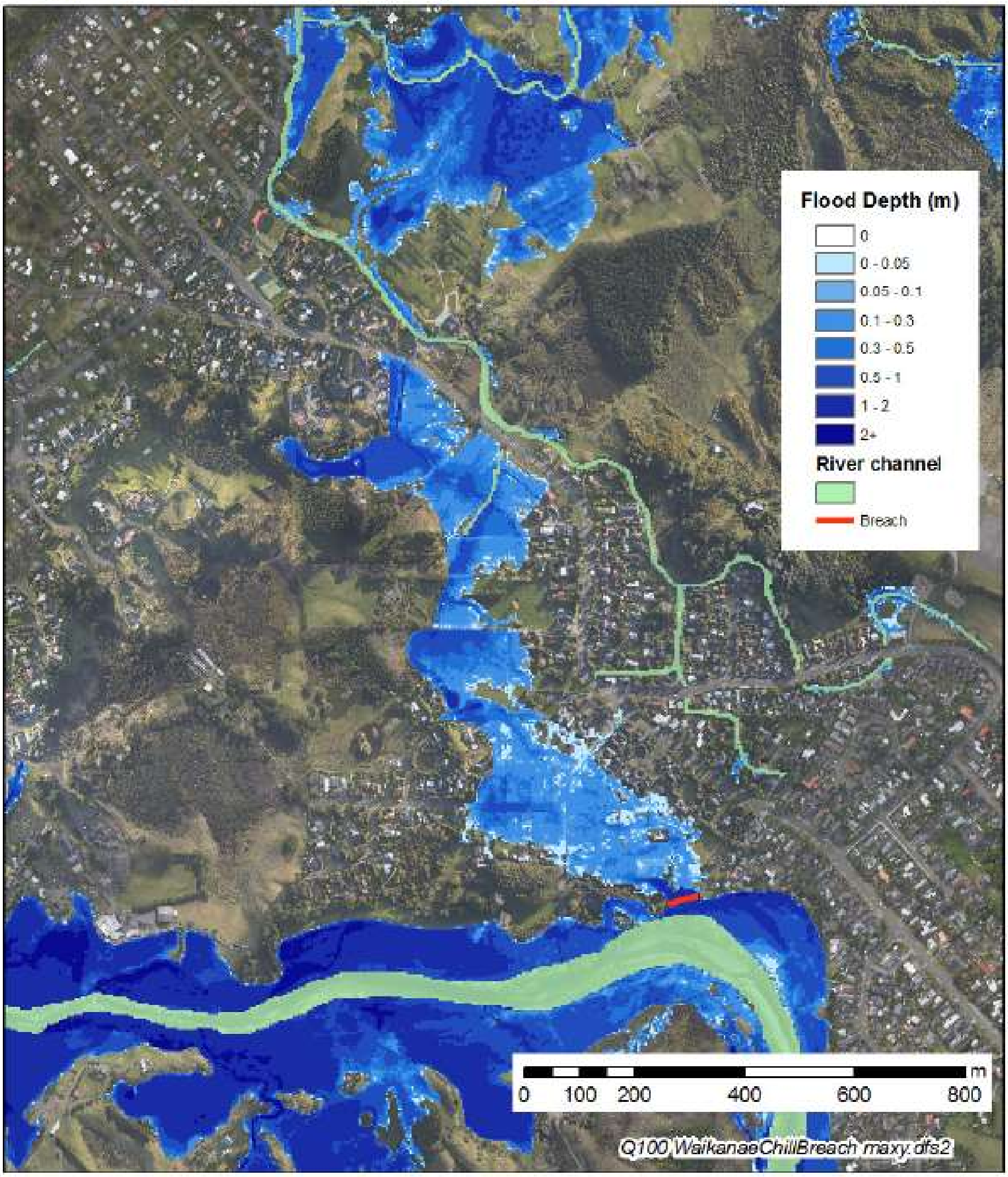

Figure C.16 100 year flood (climate change), Chillingworth stopbank breach, predicted peak flood depths

Figure 7 Chillingworth stop-bank breach scenario peak depths, source Waikanae River Hydraulic Modelling and Mapping - River Edge Consulting Ltd & SKM Ltd, March 2023

KAURI-PURIRI STOP-BANK BREACH

The assumed breach site is at the centre of the Kauri-Puriri stop-bank on the right bank, adjacent to a low-lying area of floodplain. The maximum breach width assumed is 50 m, while the breach lowers the stop-bank from its crest level of 6.4 m to 3.8 m. The stop-bank however does have substantial dimensions, appears to be well maintained and is set some distance back from the river, so that a breach here would seem most unlikely.[1]

The peak depths associated with the Kauri-Puriri stop-bank breach scenario is shown in Figure 8. Note, this is an updated model result which **does** include the elevated M2PP Expressway.

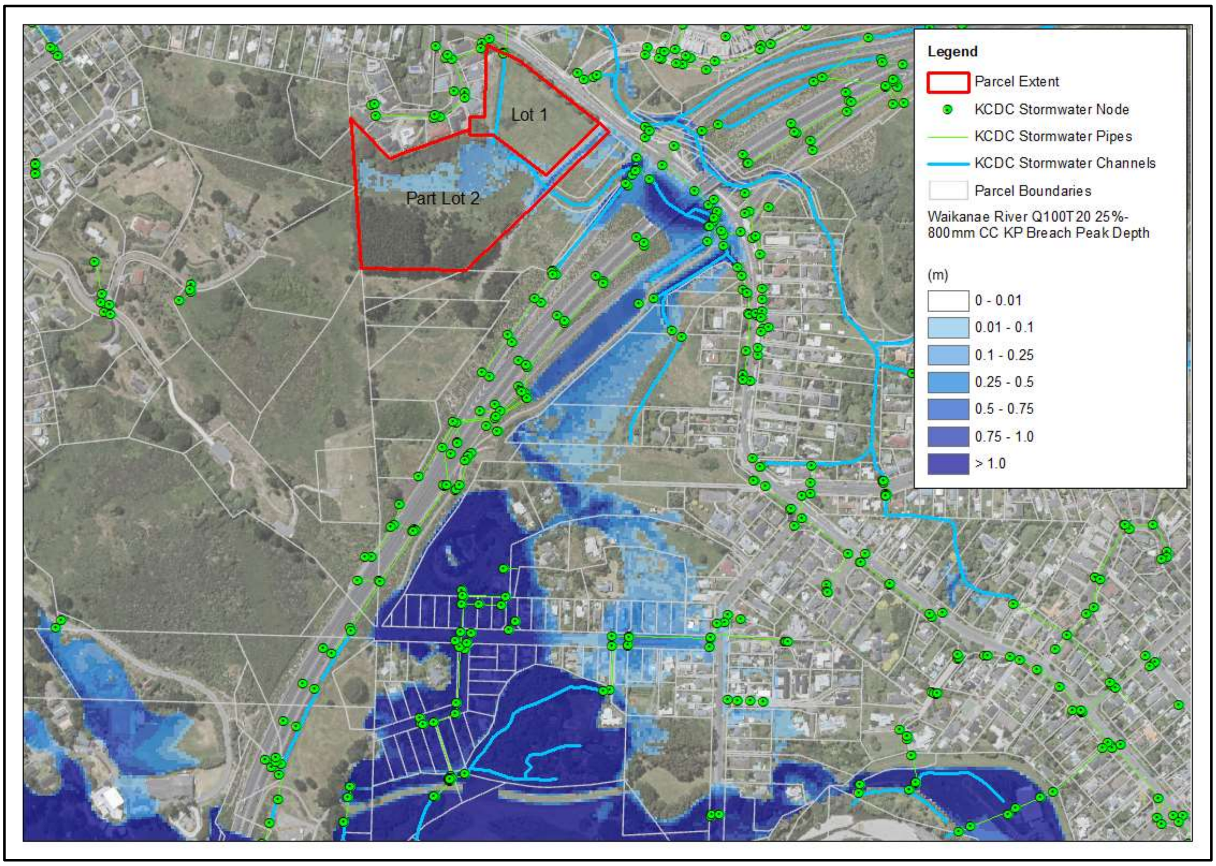

Figure 8 Kauri-Puriri stop-bank breach scenario peak depths

The raising of the land for construction of the expressway has altered the location of the breach scenario flooding which has the effect of moving the residual overflow path shown in the KCDC Flood Hazard Planning Maps moving it to the north, however the site is still impacted by flooding in a stop-bank breach scenario as flows can still enter the site under the expressway bridge over Te Moana Road.

The Jim Cooke Memorial Park and Chillingworth stop-bank breach scenario updated models which have been requested from GWRC have not yet been supplied.

SOAKAGE TESTING:

Soakage testing was undertaken at four locations, as shown in Figure 9. The results of the testing are shown in Table 2.

Council's Subdivision and Development Principles and Requirements document considers 0.25 (a factor of 4) to be an appropriate reduction factor to be applied to the rate of soakage determined through soakage testing. The recorded soakage rates are all high and lend themselves to low impact design solutions.

Table 2 Soakage Test Results

Location	(Unfactored) Soak Rate	(Factored) Soak Rate
Soak Test 1	2,384 mm/hr	596 mm/hr
Soak Test 2	11,087 mm/hr	2,771 mm/hr
Soak Test 3	6,874 mm/hr	1,718 mm/hr
Soak Test 4	5,600 mm/hr	1,400 mm/hr

The water table was encountered at approximately RL 1.3m (NZVD 2016).

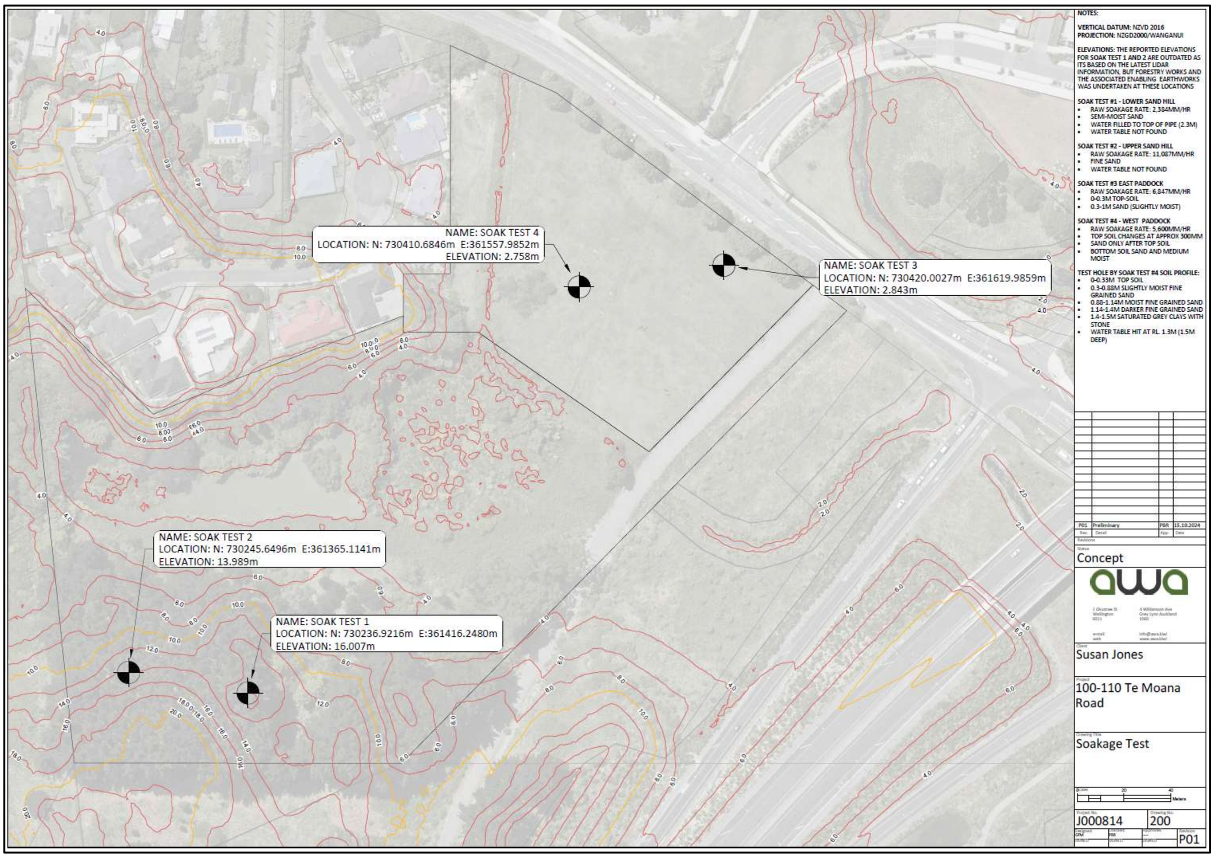

Figure 9 Soakage Test Locations

GROUND WATER:

The ground water levels have been shown to vary across the site in response to seasonal, wet weather events, soil type and local drainage. Awa and Cuttriss both encountered groundwater at varying depths using a hand auger. Within Lot 1 AWA encountered ground water at approximately 1.5 metres below ground level while Cuttriss encountered ground water at approximately 600mm below ground level. CGW have assumed a ground water 1.0 metre below ground level.

It is recommended by Cuttriss, CGW and AWA that standpipe piezometers are installed across the site along with regular water level monitoring to determine the groundwater level across the site. This will aid in future planning and development.

STORMWATER MANAGEMENT:

The development site can be roughly broken into two distinct areas. Lot 1 located on the flat land opposite Te Moana Road and Part Lot 2 located on the elevated dunes overlooking the QEII wetland. The following considers the development approach to each area in the context of the local and regional flood hazard, soakage testing results and water table influence.

LOT1 - STORMWATER STRATEGY

A majority of Lot 1 is located on flat land opposite Te Moana Road with an approximate RL 3.0m (NZVD 2016). The site is shown as impacted by ponding in both the local and regional flood hazard models. Soakage testing returned a high rate with groundwater encountered at approximately RL 1.3m (NZVD 2016).

Filling of the site is recommended to ensure dwellings are above the recommended building level, flood hazard and fluctuating ground water levels. The extent of fill and the associated loss of storage could be managed, through compensatory storage, to remove the risk of displacement of flood waters beyond the site. Depending on the level of fill a low impact stormwater design option could still be considered utilising soakage or storage/soakage in crates, ensuring these are above the winter water-table.

An alternative approach could be a lowered attenuation area which would provide for hydraulic neutrality and compensatory storage for any loss of storage on the floodplain associated with filling. A lowered storage area could be constructed as a wetland providing additional treatment and amenity.

The legacy Chillingworth breach scenario shows flow entering the site and flowing south into the QEII wetland and north into the Waimeha Stream, via culverts under Te Moana Road, as shown in Figure 7. The development can be designed to maintain the "effective functioning" of these residual overflow paths by moving them through the site in a controlled manner into the QEII wetland and Waimeha Stream.

Existing residential development is located along the western extent of Lot 1, as shown in Figure 1, accessed of Fairway Oaks Drive. While the building platforms are elevated between

RL 4.3 to RL 3.5 (NZVD 2016) the lower lying areas of lots 2 & 4, adjacent Te Moana Road, are at lower elevations RL 2.5 (NZVD 2016).

Any alterations to Lot 1 will need to demonstrate there will be less than minor impacts on surrounding flood levels including within the adjacent residential area. Any proposed fill or diversion of floodwaters within the site will be accompanied by an assessment of effects report demonstrating impacts of the development will be less than minor.

LOT 2 - STORMWATER STRATEGY

A majority of Lot 2 is located on elevated dunes overlooking the QEII wetland above both the local and regional flood hazard models. The dunes, in their current form, are at approximately RL 3.5 to RL 22. Soakage testing returned a high soakage rate as would be expected within the elevated dune formation.

The site conditions are such that a low impact stormwater design option would be recommended utilising soakage and infiltration in both public and private spaces. Earth-working of the site should be undertaken in a manner which does not overly compact the free draining nature of the sand.

This solution will discharge water to ground as close to source as possible (not via an outlet to the wetland) and will mimic the natural hydrology of the pre-developed site. This approach will ensure the quality and quantity of water from the development will not cause adverse effects on the wetland.

WETLAND EFFECTS – STORMWATER:

Under the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 it is a requirement to consider the implications on the natural wetlands where the discharge of water within 100m requires a non-complying activity consent.

The stormwater design for this development has therefore been to focus on retaining the natural hydrological function of the wetland areas.

To mitigate any negative impacts of development on the existing hydrological processes occurring within the wetland areas, the proposed design methodology will.

- Return stormwater back into the ground by focusing on soakage solutions.
- Design soakage in a distributed way by having regularly spaced soakage intervals along the roads and soakage fields at household rain tank overflows. This ensures as close to natural infiltration patterns as reasonably possible.
- For larger events runoff from roads will be directed to soakage devices with overflows via secondary overflow paths.

In undertaking this approach, the intention is that the rain that falls on impervious surfaces (roofs, driveways and roads) will be returned to ground as close to source as possible. As such the groundwater hydrology is unlikely to be altered and the only rainfall diverted away from groundwater will be the water that ends up in each home rain tank.

DISTRICT PLAN PROVISIONS:

OPERATIVE DISTRICT PLAN 2024 – NATURAL HAZARDS

Publicly and privately initiated development must be undertaken in a manner that achieves the objective for natural hazards. The Council has adopted a precautionary and risk-based approach to hazard management. The approach includes avoiding new development in areas subject to high risk from hazards, if the hazard cannot be mitigated, and allowing a greater level of development, especially if the hazard can be mitigated, in areas subject to lower risk from hazards or where the hazard has a low probability or long occurrence interval. The approach takes into account the effects of climate change and considers relocation of existing development subject to hazards worsened by climate change effects.[2]

This section considers the proposed development approach in the context of the Operative District Plan rules for clarity in processing

The relevant policies for assessing the proposed development are outlined in KCDC's Operative District Plan – Policies – Flood Hazards as summarised below.

Policies – Flood Hazards

NH-FLOOD-P8	Flood Mapping
Flood hazard categories are mapped using the 1% AEP flood modelling scenario. The extents and categories consider projected climate change and precautionary freeboard to minimise risks. Residual risks are also mapped where flood mitigation structures are present.	
NH-FLOOD-P9	Flood Hazard Categories
The flood hazard categories have been developed using the following criteria: 1. depth and speed of floodwaters; 2. the threat to life; 3. difficulty and danger of evacuating people; 4. the potential damage to property; and 5. the potential for social disruption.	
NH-FLOOD-P10	Flood and Erosion Free Building Areas.
All new allotments must have a flood and erosion-free building (excluding minor buildings) areas based on 1% AEP flood modelling.	
NH-FLOOD-P11	Flood Risk Levels.
A higher level of control on subdivision, use and development will be applied within river corridors, stream corridors, overflow paths and residual overflow paths areas. A generally lesser level of restriction on subdivision, use and development will be applied in ponding, residual ponding, shallow surface flow, flood storage and fill control areas.	

[2] Operative District Plan 01/10/2024

NH-FLOOD-P12	High Hazard Flood Areas.
Development in the river corridor, stream corridor, overflow path, and residual overflow path areas will be avoided unless the 1% AEP hazard can be mitigated on-site to avoid damage to property or harm to people, and the following criteria are met: 1. no increase in flood flow or level on adjoining sites or other parts of the floodplain; 2. no reduction in storage capacity on-site; and 3. all flow corridors or overflow paths are kept clear to allow flood waters to flow freely at all times.	
NH-FLOOD-P13	Ponding, Residual Ponding, Shallow Surface Flow, Flood Storage and Fill Control Areas.
When assessing applications for subdivision, the use or development within a ponding, residual ponding, shallow surface flow, flood storage or fill control area, shall consider the following: 1. the effects of the development on existing flood mitigation structures. 2. the effects of the development on the flood hazard – in particular flood levels and flow. 3. whether the development redirects floodwater onto adjoining properties or other parts of the floodplain. 4. whether access to the site will adversely affect the flood hazard. 5. the extent to which buildings can be located on areas of the property not subject to flooding; and 6. whether any subdivision or development will or may result in damage to property or harm to people.	
NH-FLOOD-P14	Flood Hazard Management Activities
Recognise the importance of flood hazard management activities (including gravel extraction) in the river corridor to the reduction of flood hazard risk.	

The development site is impacted by policies NH-FLOOD-P12 and NH-FLOOD-P13. There is sufficient scope within the development of the site to ensure the post development site is consistent with these Operative District Plan policies.

Some earth working of the site, particularly within Lot 1, may be required to create flood free building areas above the 1% AEP flood hazard. This earth working can be off-set utilising soakage or storage within crates or compensatory storage areas to ensure less than minor increases in peak flood depths in surrounding properties and no reduction in storage capacity.

There is sufficient scope, through site earthworks, to maintain the "effective functionally" of the residual overflow path through the site post development.

CONCLUSION:

The flood assessment shows the site is impacted by flooding and residual ponding in both the local and regional flood hazard models. The results from the three breach scenarios show the raising of the land for construction of the expressway has altered the location of the residual overflow path shown in the KCDC Flood Hazard Planning Maps moving it to the north, however the development site is still impacted by flooding from these scenarios.

Earth working of the site (Lot 1) will be required to ensure dwellings are above the local and regional flood hazard and fluctuating ground water levels. The flood hazard across the site can be managed utilising soakage or storage/soakage solutions, ensuring these are above the winter water-table. Where this is not desirable an alternative approach could be a lowered attenuation area which would provide for hydraulic neutrality and compensatory storage for any loss of storage on the floodplain associated with filling while providing treatment.

The site conditions within Lot 2 are such that a low impact stormwater design option would be recommended utilising soakage and infiltration in both public and private spaces. Earth-working of the site should be undertaken in a manner which does not overly compact the free draining nature of the sand.

The stormwater design ensures as close to natural infiltration patterns as reasonably possible.

Taking the above into account there is sufficient scope across the site for development and flood mitigation which meets the requirements of KCDC's Operative District Plan 2024. In our professional opinion we see the site being considered suitable for future residential development subject the implementation of the above strategies.

Tony Trueman

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