Addendum – Specialist input: Healthy Waters

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Subject: FTA111 – Milldale Stages 4C and 10 - 13 Fast Track – Auckland Council Application Reference: BUN60446761

Date: 23 July 2025

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1. INTRODUCTION

1.1. This Addendum provides additional comments from Healthy Waters (**HW**) on the revised information provided by the Applicant on 10th July 2025 in respect of stormwater aspects of the Delmore Fast Track approval application.

Documents Reviewed

1.1 The following documents received from the Applicant on the 10th July 2025 have been reviewed in preparing this Addendum:

- Appendix 50 - *Updated Scheme Plans Stage* 1
- Appendix 50 - *Updated Scheme Plans Stage 2 Part 1*
- Appendix 50 - *Updated Scheme Plans Stage 2 Part 2*
- Appendix 52.2 - *Flood Model Response*
- Appendix 52.3 - *Healthy Waters Response*
- Appendix 52.4 - *Erosion and Geomorphology Response Memo*

2. ASSESSMENT

HW Memorandum Summary – 25th June 2025

2.1. HW's key assessment findings are outlined within the Memorandum dated 25th June 2025 including within the Executive Summary, in Section 3 in more detail, and within Appendix A in full. In brief areas of concern included:

(a) **Riparian margins**: The proposed riparian yards were considered insufficient given the site's steep topography and unstable East Coast Bays formation soils. The stream channels are expected to adjust (widen, deepen, meander) in response to urbanisation. Hydrology mitigation and riparian planting alone may not prevent erosion or protect stream health in the long term. A wider and variable riparian margin, ideally between 30-50 m, was recommended, informed by a detailed Geomorphic Risk Assessment.

(b) **T-Bar outlets:** Concern was raised with the widespread use of T-bar outlets for the discharge of stormwater in regard to the potential for destabilisation of stream embankments, increased erosion, and slope failure. These risks could be exacerbated by the site's geotechnical sensitivities and underlying soils. The use of T-Bar outlets was seemingly not supported by the Geotechnical Report prepared for the Application, which recommended stormwater be piped to suitable outfalls (e.g. gully bases or ponds) with engineered energy dissipation [1]. It was recommended that a detailed assessment of erosion and slope stability risks associated with the proposed T-bar outlets was provided.

(c) **Raingardens**: A number of communal raingardens are proposed, intended for vesting in Auckland Council. Concerns were raised in respect of the proposed raingardens including design, sizing, clarification of device catchments, and long-term maintenance access. Further design optimisation and clarification is needed prior to lodgement of Engineering Plan Approval.

(d) **Land to vest**: Stormwater assets and associated land were proposed to be vested as '*Local Purpose (Drainage) Reserve*'. Healthy Waters preference is for any land intended to be vested as '*Land in Lieu of Reserve – for Drainage Purposes*'.

(e) **Flood management:** The proposal does not include attenuation of the 1% AEP event. A copy of the flood model was sought as part of initial feedback provided to the Applicant's Agent on 19th May 2025 and was provided by the Applicant on the 12th June 2025. At the time of publishing the initial HW Memorandum dated 25th June, Healthy Waters had not yet been afforded sufficient time to review the Applicant's modelling information to accurately verify and assess upstream and downstream effects, ensure the reliability of model outputs, and confirm HW's support for the proposed stormwater

[1] *Geotechnical Report, Proposed Residential Development, Russell Road and Upper Ōrewa Road, Wainui* – Issue 1.0, dated 14 February 2025 (Section 5.9, page 47)

management strategy. HW provided comment on the modelling information to the Applicant on the 1st July 2025.

2.2. The key recommendations arising from HW assessment are summarised in Section 4 of the Memorandum dated 25th June 2025. Comments on the Applicant's proposed conditions were provided in Appendix C of the Memorandum. Additional conditions sought, if the Panel is minded to grant approval, were provided in Appendix D of the Memorandum.

Revised Information

2.3. Appendix A of the HW Memorandum dated 25th June 2025 provided key areas of concern presented in a tabulated format. The areas of concern have been responded to within Appendix 52.3 of the additional information provided by the Applicant on the 10th July 2025. Appendix 52.2 of the additional information from the Applicant includes a response to comments on the flood modelling provided by HW on the 1st July 2025. The revised model referenced in the response comments from the Applicant has not been provided or reviewed by HW at the time of writing this Addendum.

2.4. **Appendix A** of this Addendum includes both HW key areas of concern as well as the Applicant's response to these matters. Additional review comments from HW on the revised information provided are also included within this table.

Outstanding Issues

2.5. Following review of the further information received from the Applicant, the key areas of concern have been updated as summarised below and in full within **Appendix A**:

(a) **Riparian margins**: The Applicant has provided a Geomorphic Response Memo in lieu of a detailed Geomorphic Risk Assessment. While the response from the Applicant asserts stream stability based on aerial imagery and site inspections, HW maintains that these methods are insufficient in Auckland's cohesive soils, where early-stage incision often precedes visible instability. No direct assessment has been undertaken to confirm whether the proposed development will accelerate incision or increase erosion risk over the 100-year design life. Without this, HW cannot confirm whether the proposed 10m riparian setbacks are adequate. A 20m minimum setback remains a precautionary interim position, consistent with the AUP and field observations, until a site-specific geomorphic assessment is provided which might justify the smaller setback sought by the applicant (or not). HW therefore continues to strongly recommend a Geomorphic Risk Assessment to inform appropriate riparian margins and ensure long-term resilience of stormwater and land development infrastructure.

(b) **T-Bar outlets:** HW remains concerned with the long-term viability of the proposed T-Bar outlets. Flow spreaders are known to clog over time, are

rarely maintained by private owners, and are vulnerable to damage or destruction. In steep, erosion-prone environments such as this site, the failure of these devices could result in bank destabilisation, gully incision, or slope failure. While the Applicant asserts that stabilised earth walls will mitigate this risk, no supporting design detail or durability assurances have been provided. HW does not consider private flow spreaders a suitable stormwater solution for this development. A reduction in their use and redesign of these discharges to connect with the public stormwater network is strongly recommended. Detailed erosion assessments for outlet structures also remain reliant on unverified assumptions of channel stability.

(c) **Raingardens**: While some concerns have been sufficiently addressed or are acceptable to defer to Engineering Plan Approval, several remain. In particular, clarification is needed regarding which catchments drain to each device, impervious area assumptions, and the basis for confirming sizing and treatment performance. Concerns remain that leaving key design details including infiltration feasibility to EPA stage may lead to changes that affect road or lot layout. Treatment of some areas (e.g. JOALs 01, 03 and 016) remains unclear. Uneven flow distribution in larger raingardens, maintenance access, and integration of GPTs with splitter boxes also require further detail.

(d) **Land to vest**: Land associated with stormwater assets was proposed to be vested as '*Local Purpose (Drainage) Reserve*'. The revised drawings provided now show land labelled as '*Land in Lieu of Reserve – for Drainage Purposes*' in line with HW preference. As acknowledged in the initial HW memorandum, detail on the final extent of land and design of assets proposed to be vested will not be provided by the Applicant until further stages of development (i.e. Engineering Plan Approval). Healthy Waters has not yet confirmed whether the proposed stormwater management assets and associated land is suitable for vesting. Matters such as long-term maintenance implications still require further assessment. Confirmation of whether the land will be accepted for vesting will be subject to ongoing review and coordination with Healthy Waters as part of future stages. Conditions must therefore provide for the eventuality that this land will not be accepted for vesting.

(e) **Flood management:** The Applicant has responded to comments provided by HW on the modelling information for the development but has not provided the revised model for further verification. As such, HW is unable to confirm whether the identified issues and comments provided on the model have been resolved. A copy of the updated model must be provided to complete the review and confirm the proposed stormwater management and outcomes are acceptable. HW cannot support the development without reviewing the revised model, and the pass-forward approach cannot be confirmed as appropriate until the revised model has been assessed.

Additional Conditions

2.6. Additional conditions sought, if the Panel is minded to grant approval, were provided in Appendix D of the HW Memorandum dated 25th June 2025. Following a review of the revised information provided by the Applicant, further conditions are now recommended. These are included in **Appendix B** of this addendum, alongside those originally proposed in the 25 June 2025 HW memorandum.

APPENDIX A: HW COMMENTS REGISTER

REF	HW REQUEST FOR INFORMATION/CLARIFICATION	REASON FOR REQUEST	APPLICANT RESPONSE – 02.07.2025	HW RESPONSE – 23.07.2025	STATUS
Waterways Planning – Stream Erosion					
SW1	It is essential that the applicant undertakes detailed stability and erosion assessment of the gully and stream network for the 100-year design life including: • Evaluation of the Current Network State • Identification of Development Impacts and Mitigation Strategies • Assessment of Natural Hazards and Public Safety Risks. This should not only reflect the change in land use, but also the concentration of flows in response to the outlets from the communal devices, 10% AEP pipe network and the 1% AEP flowpaths.	The channels within the proposed Fast Track area and beyond appear to be founded on East Coast Bays formation. Channels within these areas respond slowly yet significantly to hydraulic changes influencing channel incision and lateral migration. The current stream networks will continue to evolve with the proposed alteration of flow regime within their respective drainage catchments. Without adequate consideration now, the channel networks may require interim stream works to be undertaken to provide protection to property and infrastructure over the design life. The adjoining subdivision to the north (Ara Hills) has similar stormwater management to what is proposed for Delmore. Despite its relatively recent construction and reliance on generic SMAF1 hydrology mitigation there is evidence of gully failure as well as stability failures of the stormwater management devices themselves. Within these East Coast Bay formation areas, the application of generic SMAF controls is not considered appropriate for the long-term safe operation of the subdivision.	Please refer to the attached Geomorphic Response Memo, which provides a site-specific assessment addressing the matters raised. A summary is provided as follows. *Current Network Evaluation* A review of long-term aerial imagery (dating back to the 1980s) and site inspections were undertaken, to evaluate channel form and behaviour. Both investigations showed no evidence of stream incision, bank instability, meandering, or lateral migration was noted within the streams. Field observations confirm that the stream network has remained geospatially stable under current hydrological conditions. *Development Impact and Mitigation Strategy* The proposed stormwater system has been carefully designed to preserve natural flow patterns, with stormwater flows directed to vegetated, mechanically stabilised earth bunds via T-bar spreaders, which mimic diffuse stormwater sheet flow. This avoids creating concentrated discharges that could lead to stream bank / riparian gully erosion. In this regard, the development impact is considered low. Our key Mitigation Strategies have been designed to be intentionally conservative, incorporating: • Stabilisation and Vegetation establishment on batters to enhance resistance to any long term channelisation scour from the T-bar spreaders and promote natural sheet flow runoff; • Spreader structures and TR2013/018 compliant energy dissipating devices at all stormwater discharge points, including all private T bars and at centralised raingarden outlets; and • Preservation of low-order stream headwaters to maintain stream baseflow and minimise large pipe/single discharge point type design. *Natural Hazard and Public Safety Risk* The Geotechnical Assessment Report confirms that the slopes adjacent to the stream riparian zone are suitable for development under the proposed stormwater regime, with recommendations below to minimise hazard potential. • The use of Geotechnical Engineered earthworks, • Combination of mechanical and vegetated stabilisation, and • limited earth fill and adequate setbacks in sensitive areas Furthermore, no development is proposed in areas identified as having active landslips or creep, and all structures are set back in accordance with geotechnical advice. We consider the risk of gully destabilisation or public safety hazard to be low under the proposed conditions. *Response to Ara Hills Comparison* We acknowledge that Ara Hills has experienced some isolated erosion issues; however, we have visited the site,	*Current Network Evaluation* Historical aerial imagery is not an appropriate tool for a complete assessment of geomorphic risk in Auckland's cohesive soils. In clay- and silt-dominated systems, such as those found on this site, channel evolution typically follows a well-documented sequence: extended periods of vertical incision precede any visible signs of lateral migration or slope instability. These early-stage processes, particularly incision, are not readily apparent in aerial imagery but are nonetheless critical indicators of geomorphic change and future risk. *Development Impacts and the Need for Assessment* The proposed development does alter hydrological conditions and is expected to at least maintain if not accelerate the ongoing incision process. A geomorphic assessment is required to identify whether the incision presently observed is transitional or likely to progress toward bank widening and slope instability, and if it does, at what rate and extent. Without such an assessment, the effectiveness of proposed mitigation (e.g., 10 m riparian margins, T-bar outlets) cannot be reliably evaluated. *Complementing Other Reports* While geotechnical and ecological assessments are valuable, they are not designed to assess fluvial evolution or geomorphic sensitivity. For example, the geotechnical report assesses slope stability under current conditions. But if the channel migrates or widens, undermining slope toes, those assumptions may no longer hold, and design requirements may need to be revised. Without a geomorphic assessment, this interaction remains untested. *In Summary* The applicant appears to be working under two key assumptions: 1. That the existing stream network is currently stable; and 2. That the proposed development will not significantly alter the hydrology of the natural system, or that the proposed design sufficiently mitigates any effects. However, nothing provided by the Applicant substantiates these assumptions. In fact, some of the evidence presented, along with field observations by HW staff, suggests that the system is already exhibiting signs of instability, such as active incision. It is Healthy Waters' strong recommendation that a geomorphic risk and effects assessment be undertaken. This is not only necessary to assess and protect the stability of the stormwater network, but also to ensure the long-term safety and resilience of other infrastructure and buildings proposed on the site.	Open

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			taken photos and assessed the performance of the streams and discharges from the stormwater system. Please refer to the Geomorphic Response Memo for documentation of the Ara Hills assessment. The Delmore design reflects lessons learned from that site and incorporates more robust gully protection and discharge design which will perform better for the topography. Based on the above, McKenzie & Co are confident that the proposed stormwater and gully management approach provides a stable, resilient outcome over the 100-year design life, and a separate, standalone erosion risk assessment is not necessary.		
SW2	Increase the Riparian Margin to a more appropriate width following detailed geomorphic investigations. In the absence of this detailed assessment, the Riparian Margin should be not less than 20m.	As mentioned in the SW1 (above) the channels within the current Fast Track area will respond to development through increased incision and lateral movement over the design life. Due to the sensitive nature of the East Coast Bays formation, it is recommended that the Riparian Margin is increased to account for the changes in stream hydraulics and hydrology within the drainage sub-catchments.	We note Council's recommendation; however, it remains unclear why the currently proposed riparian setbacks are considered inadequate. The reference to a 20m margin appears somewhat arbitrary in the absence of site-specific evidence to suggest this stream and its tributaries and/or the surrounding topography is subject to bank instability for a distance of 20m. Our position is detailed in the accompanying Geomorphic Response Memo, which outlines the rationale for our proposed setbacks and why McKenzie & Co do not believe that a geomorphic assessment is necessary. The widths have been developed in consideration of the site's geotechnical constraints, slope stability, stormwater hydrological design, and we remain confident that the proposed development widths adjacent to the stream are appropriate and defensible.	*Recommended Riparian Setbacks* We agree with the applicant that a 20 m riparian margin is ultimately arbitrary in the absence of a site-specific geomorphic assessment. However, without that assessment, it is not possible to determine the minimum appropriate setback based on channel sensitivity, likely evolution, or erosion hazard zones. A Geomorphic Assessment would identify how far lateral migration or bank instability may extend under the proposed flow regime. In lieu of this and based on what we do know from the geotechnical and ecological assessments, as well as the observed channel incision, plus results from other developments in the region, it is both reasonable and precautionary to assume that a larger setback is warranted. The proposed 10 m margins may not provide sufficient protection from future bank widening or slope instability. The 20 m setback recommended by Healthy Waters is to align with the larger minimum riparian buffer (typically reserved for streams more than 3m wide) referenced in the Auckland Unitary Plan and reflects a conservative interim position pending further site-specific investigation It is also important to note that, when reviewing planning guidelines and technical reports, the basis for a 10 m riparian margin focuses primarily on ecological outcomes, particularly limiting the encroachment of exotic weeds into natively planted margins. While this is a valid environmental consideration, it does not address the physical effects of channel incision and the potential for subsequent mass wasting or bank failure. These geomorphic risks require a different form of assessment and planning response.	Open
SW3	Carry out detailed erosion assessment around the outlets from the proposed raingardens and public stormwater networks (including overland flowpaths) for all events up to 100-year ARI and provide appropriate erosion protection.	Urbanisation of greenfield areas will result in the concentration of discharges to the gully networks on the site. The concentration of flows has the potential to significantly destabilise the gullies resulting in widespread bank failure and slips that could endanger property.	All stormwater outlet structures—including those from T-bars, raingardens, piped networks, and overland flow paths—will be designed with erosion protection measures appropriate for the relevant storm events, up to the 100-year ARI event. This will be based on site-specific conditions and in accordance with Auckland Council's Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices – Technical Report 2013/018. Outlet locations have been identified on the submitted stormwater plans, and erosion risks will be mitigated through: • Appropriately sized energy dissipation features (e.g. rock rip-rap, stilling basins, or spreaders);	*Proposed stormwater outlet structures* While erosion protection for outlets is acknowledged in principle, the concentration of runoff into steep gullies in a sensitive cohesive soil environment raises long-term concerns. T-bar spreaders and energy dissipators may function well initially, but their performance relies again on assumptions of channel stability that remain untested without a geomorphic assessment. Detailed erosion risk assessments should be informed by an understanding of how incision and lateral adjustment may evolve and interact with outlet locations over time.	Open

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			• Vegetated surfaces and reinforced outfalls where required; and • Confirmation of low exit velocities and shear stress calculations at each discharge point. While detailed erosion control design will be finalised at the Engineering Plan Approval (EPA) stage, we confirm that this will include: • Erosion risk screening for each outlet; • Confirmation of location-specific protection needs based on contributing catchment size and velocity, and • Additional early co-ordination with Healthy Waters to agree on acceptable detailed design solutions.		
Waterways Planning – Water Quality					
SW4	Confirm how even surface distribution of flows will be achieved in the larger raingardens proposed in the Fast Track area.	Raingardens throughout the Fast Track areas Stage 1 and 2 have significantly varied drainage catchment areas. Two specifically (RG11 and RG01) have areas greater than 900m^2. The flows that will be entering these raingardens will be relatively high and design is required to ensure that channelling of flows does not occur impacting to the long-term stability and function of the devices.	At detailed design we will confirm the appropriate method(s) and will be finalised during the Engineering Plan Approval (EPA), in consultation with Healthy Waters. Several strategies are currently under consideration, including: - Installation of level spreaders to ensure uniform sheet flow entry; - Use of multiple inlet structures into the raingardens, designed with energy dissipation and erosion protection to safeguard the media; Provision of a perforated pipe along the length of the raingarden with bubble-up sumps or scruffy domes, each protected by rip-rap, to evenly distribute flow across the surface. These measures will be selected and sized in accordance with Auckland Council's GD01 guidance and based on catchment-specific hydraulic inputs. Note there is only one large raingarden which already has two inlets, and the remainder are much smaller and as such this should only apply to a few devices.	Accepted.	Closed
SW5	Confirm how treatment of all impervious surfaces is to be achieved or provide evidence of a BPO that is to be applied to the Fast Track application.	Within the provided drawing set, there are a few discreet areas within the Fast Track development that do not appear to receive treatment or hydrology mitigation. Examples are JOAL 01, JOAL 016 and ROAD 01. To comply with the RWNDC it is necessary for the applicant to provide justification why in a greenfield environment it is not possible to meet the minimum requirements.	All impervious surfaces within the development—both public and private—will receive appropriate water quality treatment and hydrology mitigation through a combination of communal and at- source devices. *Public Roads and JOALs* Public roads and JOALs are treated via communal raingardens, each designed and sized in accordance with GD01 requirements. Specific allocations include: • JOAL 1 → RG04 • JOAL 16 → RG14 • Road 1 → RG02 and RG12 Treatment catchments and associated impervious surface areas have been confirmed via design drawings 3725-1-4310 and 3725-2-4310, and calculations demonstrating the assumed runoff coefficients and sizing methodology. *Private Lots* Private lots are managed at source through the installation of: • First flush diversion devices and retention/detention tanks;	DWG 3725-1-4003 rev E shows JOAL 1 will be treated by a Stormwater360 Device or similar. The SMP has not been updated to reflect this, and states that JOALs will be treated in the communal rain gardens. • Confirm that the device will be privately owned. • Confirm who will be responsible for the ongoing operation and maintenance. • The device will need to be sized for the lot driveways. • The device selected will need to provide an equivalent of GD01 treatment and be approved under the Auckland Council NPM process. JOAL 016 is now called JOAL 34 in DWG 3725-1-4003 rev E but is still JOAL 016 on DWG 4000 rev 4. JOAL 16 does not appear to discharge to RG14, as RG14 is part of Stage 2. Plan 3725-1-4340 shows JOAL016 as a 'discharging to stream' catchment. • Confirm how JOAL 016 is treated. DWG 4003 rev E and 4004 rev E show JOAL 03 is treated by two Stormwater360 devices, but also still discharges to the network which discharges into RG06. • Confirm how JOAL 03 is treated. • Update the SMP as required.	Open

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			• Driveway treatment devices (e.g., GD01-compliant stormfilters or small on-lot raingardens); • Consent notices on each title requiring installation and long-term maintenance of these devices. This dual app roach ensures that all impervious surfaces—public and private—achieve full compliance with treatment and hydrology mitigation requirements. The proposed solution reflects the Best Practicable Option (BPO) for the site, balancing performance, feasibility, and ongoing operability.		
SW6	Confirm the design catchments that are connected to each raingarden and confirm how the treatment and hydrology mitigation outcomes are being provided.	The SMP and Stormwater Report both identify that roof runoff is to be directed to on-lot tanks, whilst the driveway for each lot is to be connected to the communal raingarden. Whilst the drawing set indicates that a splitter box will be constructed upstream of the raingardens the applicant is to confirm the drainage area that has been considered for each of the devices, together with any assumptions of impervious area connection. It should be noted that the use of splitter boxes can create issues as some areas of the connected catchment may not receive treatment due to the timing of flows within the network. It would be preferred that detailed modelling of the Fast Track stormwater infrastructure be modelled to confirm that the outcomes of the hydrology mitigation are being met, and the design is not just balancing volumes.	The communal raingardens have been designed to manage stormwater runoff from defined road and JOAL catchments, with treatment and hydrology mitigation outcomes tailored to the contributing area. Each raingarden is connected to a splitter manhole, which diverts flows up to the water quality volume (WQV)—generally equivalent to the 95th percentile storm—into the bioretention device. Flows beyond this threshold bypass the raingarden to avoid overloading. The catchment areas for each raingarden are illustrated in plans 3725-1-4340 and 3725-2-4310, confirming the delineation between public and private impervious areas. Dynamic hydraulic modelling will be undertaken during the Engineering Plan Approval (EPA) phase to confirm that the splitter manholes and raingarden devices meet both treatment and conveyance performance expectations. Although some runoff from private lots may enter the public stormwater system, these flows are already mitigated at source through on-lot retention/detention systems. As such, their contribution to the peak design flow entering the communal devices is minimal, and conservative sizing has been applied to account for this. Notably, JOALs 01 and 03 cannot connect to raingardens due to topographic constraints and will instead be managed via on-site treatment and hydrology mitigation, consistent with GD01. This comprehensive, distributed approach ensures that all contributing catchments are accounted for, and that both treatment and hydrological outcomes are achieved in accordance with regional standards.	Noted. Drawing 3725-2-4310 has not been provided within the response information.	Open
SW7	Confirm how runoff from private lots from flow spreader units interact with the proposed communal devices.	Drawings 3725-2CDE-4503 and 4505 indicate that runoff from private lots will discharge down a steep escarpment to communal raingarden devices. Due to the nature of the subsoils in this area, there needs to be careful consideration of providing protection to the escarpment and the device. The applicant is required to demonstrate how the stormwater management in these areas will work and how the communal device will be protected from inflows from the private lot areas to ensure that it does not become overloaded and that overflows from the	The proposed flow spreader units from private lots are not intended to discharge to the communal raingardens. Where private lot runoff may flow downslope near communal raingardens or access tracks, we propose the following: - A swale or shallow channel will be constructed alongside the access track to intercept and redirect any overland flow, preventing uncontrolled inflow into the raingarden; - Where necessary, subsurface piping may be introduced to convey runoff away from the raingarden, ensuring it is discharged to the streams in a controlled manner, and in accordance with GD01 energy dissipation guidelines;	Accepted.	Closed

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		device will not have negative impact on the long-term stability of the devices.	- In all cases, these flow paths will be separated from the operational zone of the communal raingardens, with erosion protection and safe flow conveyance addressed through detailed design. These solutions are intended to minimise hydraulic loading on the communal devices while protecting baseflow for adjacent streams and wetlands. Final design will be developed in coordination with Healthy Waters at the EPA phase, with appropriate erosion control and hydrology management measures confirmed as part of the detailed stormwater design.		
SW8	Confirm that raingarden design will provide the necessary treatment function and be hydraulically sized to adequately manage the inflows throughout a design storm.	Some of the raingardens indicated on the submitted plans appear to be small and shaped to fit into the urban layout. As a result, there could be issues of these devices for treatment performance and flow distribution. Raingarden sizing is based on a 60% imperviousness for the contributing catchment. This is considered to be too low based on the zoning and roading that is proposed. The designs should be updated to reflect the actual connected catchment land uses. Section 9.4 of the SMP states that the communal raingardens will provide treatment, retention and detention of the "public roads and JOALs that do not discharge to streams". How will flows from the lot areas interact with the flows from the roads? Please confirm, catchment area managed and hydraulic sizing calculations of all public stormwater infrastructure.	The stormwater network has been structured to ensure that the communal raingardens provide effective treatment performance and are hydraulically sized to manage inflows over the full design storm duration. - Public roads and JOALs discharge directly to communal raingardens, each of which has been sized to treat the first flush (water quality volume) in accordance with GD01 design standards. These devices have been modelled to receive undiluted runoff from high contaminant load surfaces, ensuring maximum treatment efficiency during the critical early portion of storm events. - Private lot runoff is treated and mitigated at source using: o First flush diverters, o Retention/detention tanks sized to manage the 95th percentile storm volume, o On-lot GD01-compliant treatment devices such as stormfilters or small-scale raingardens. The hydrological sequencing has been determined to demonstrate that the timing and magnitude of tank discharges from private lots are delayed, such that they do not interfere with or dilute the first flush entering the communal raingardens. Specifically; - Even with a conservative scenario where private lot catchments are twice the area of road catchments, a 10-minute overlap would result in <1% dilution of the road first flush. - This overlap is further reduced in reality due to the initial 5mm retention in private tanks, ensuring near-zero early discharge during the critical pollutant-laden initial storm period. - This confirms that the communal raingardens are functionally and hydraulically separated from private lot contributions during the first flush window, and are treating high-risk runoff independently and effectively. We consider this approach to meet or exceed GD01 performance requirements for both treatment and hydrological control. A dynamic hydraulic analysis will be finalised at the EPA stage to confirm the sizing and performance of all devices through full storm events.	The updated rain garden calculations (dated 2/7/2025) show that the road catchment has been given a 60% impervious area. JOALs have been given 90%. Driveways are no longer included in the calculations. The Stormwater Report Section 9.3 states 'The communal raingardens have been sized to accommodate runoff from the driveways from these lots'. • Confirm whether the rain garden sizing has accommodate runoff from the driveways. Update the sizing calculations as required. • An impervious area of 60% for roads is considered too low. Update the sizing calculations as required.	Open
SW9	Where are the GPTs located upstream of the communal raingardens. It is assumed that these GPTs are to be provided as none of the	Drawing 3725-4500 Rev B includes a generic section of a Hynds First Defence High Capacity 1200DN GPT (or similar) that is assumed to be located upstream of the communal raingardens, as recommended in GD01.	The Stormwater plans show the locations of the proposed Gross Pollutant Traps (GPTs), which are positioned downstream of the splitter manholes and upstream of the communal raingardens. These GPTs are included to	Noted.	Closed

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	raingardens have forebays (as stated in the Stormwater Report). How will these interact with the hydraulics of the splitter box. The outgoing pipe will need to be sized for the detention flows.	These devices are not indicated on the stormwater layout plans. The generic section indicates that outflows from the GPT will be for the WQV Flow; however, these outflow pipes will need to be sized for the appropriate detention flows. The inclusion of the GPT will introduce further head loss into the network and detailed hydraulic modelling is recommended to demonstrate that the network will perform as intended.	capture gross debris and sediment prior to inflow into the bioretention media, and serve the same pretreatment function, as required under GD01. The hydraulic interaction between the splitter box and GPT will be considered in more detail and EPA phase design process: - The GPT introduces a hydraulic head loss which is beneficial to the system, as it reduces flow velocity entering the raingarden, helping to minimise scour, media disturbance, and erosion at the surface; - This arrangement ensures both the first flush diversion to the treatment device and pre- treatment of coarse material without compromising flow capacity; and - The outlet pipe downstream of the splitter will be appropriately sized to convey both the detention volume and high-flow bypass scenarios, consistent with GD01 hydraulic modelling principles. Final confirmation of sizing, head loss allowances, and detention performance will be undertaken as part of the Engineering Plan Approval (EPA) phase, including dynamic hydraulic modelling of the full system.		
SW10	The SMP recommends that raingardens are used due to their ability to provide retention (infiltration) management. This is contrary to the recommendations of the Geotechnical report included in the submission information.	The geotechnical report (Appendix 08) indicates that any device would need to be lined to prevent infiltration. If this is to be applied the raingarden will not be providing a retention function. It is suggested that there may be a more cost-effective construction, operation and maintenance solution to be provided.	While the Geotechnical Report initially advised caution regarding infiltration in certain areas due to localised soil instability (e.g., presence of Northland Allochthon), this advice is not intended to preclude all use of retention (infiltration) within the site. Following further consultation, the project geotechnical engineer, James Beaumont of Riley Consultants, has confirmed that infiltration suitability will be assessed on a case-by-case basis at the detailed design stage. Where retention via infiltration is proposed: • A site-specific geotechnical review will be undertaken of each raingarden location; • Appropriate factors of safety will be applied based on soil profile, slope stability, and groundwater conditions; • Infiltration zones will be restricted to locations where adequate setback, soil strength, and slope conditions can be verified; and • Where retention is unsuitable, raingardens will still provide water quality treatment and detention, with infiltration bypassed or underdrained in accordance with GD01, or including this volume with the detention volume. This approach allows the stormwater design to align with the SMP's intent to maximise retention where safe and feasible, while also respecting the geotechnical limitations and ensuring slope stability is not compromised. The Engineering Plan Approval (EPA) phase will include confirmation of infiltration feasibility and supporting geotechnical input for each device.	Deferring infiltration feasibility to the EPA stage may result in changes to the rain garden design/sizing which then may result in changes to the overall road/lot layout. Infiltration suitability should be confirmed at Resource Consent stage to ensure integration with the overall development layout.	Open
Catchment Planning – Flood Hazards					
SW11	Correct the use of 'inert' to low contaminant generating' building materials.	The use of inert building materials, is misleading. Studies have shown that commonly used inert materials are actually sources of heavy metals in stormwater runoff. Therefore, it is requested that 'low contaminant generating' building materials are used	Noted. The stormwater management approach for individual lots has been updated in the relevant reports to clarify the treatment sequence in accordance with GD01.	Noted. No further action	Closed

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		instead. The following consent condition can be used to assist in the control of building at the next stage of development and has been included within **Appendix D**. *Stormwater Quality* *X.1 New buildings, and additions to buildings, must be constructed using cladding, roofing and spouting building materials that avoid the use of contaminant generating building products which have:* i. *exposed surface(s) or surface coating of metallic zinc or any alloy containing greater than 10% zinc; or* ii. *exposed surface(s) or surface coating of metallic copper or any alloy containing greater than 10% copper; or* iii. *exposed treated timber surface(s) or any roof material with a copper containing or zinc-containing algaecide.* It should also be noted that in the Greenfield environment, the use of low contaminant generating materials is not considered a sufficient 'treatment' method and must be accompanied by a GD01 complaint device either at source or communally located. Where roof runoff utilizes either a first flush diversion device, or internally plumbed, non-potable reuse	Each lot will include the following features: • A leaf diverter and first flush device installed upstream of any on-lot storage; • A retention/detention tank to manage both water quality and hydrological mitigation; and • A driveway treatment device, such as a 1m² on-lot raingarden or another GD01-approved alternative, to manage contaminants from hardstand areas. This sequence ensures the first flush is captured and treated prior to detention, and that all lot-derived impervious surfaces receive appropriate treatment and mitigation in accordance with best practice. A consent notice will be registered on each title requiring installation, operation, and maintenance of these systems.		
SW12	Confirm whether reuse tanks for internal, non-potable reuse are to be provided for each lot.	Appendix A of the SMP identifies that reuse tanks are 'optional'., Please review this against the SMP text and if tanks are optional, ensure that the design of the communal devices is updated to reflect the roof area inclusion for treatment.	Every lot will be required to provide at-source retention, detention, and water quality treatment, consistent with GD01 and the stormwater management strategy for the development. To clarify, the rainwater tank infrastructure itself is mandatory on every lot. This includes provision for retention (first 5mm) and detention (difference between the pre and post-development 95th percentile storm) as part of on-lot stormwater management. The earlier reference to "optional" applies only to whether the retained water is reused internally (e.g. for toilet flushing or irrigation). This internal reuse is encouraged but not required. The retention volume and outlet structure will be provided regardless of plumbing configuration. Updated wording in the stormwater reports confirms this position to ensure consistency across the application documentation.	The required retention volume of runoff from roof areas must be achieved via non-potable reuse for this solution to be acceptable as the BPO for water quality treatment of runoff from roof areas. An additional condition of consent ensuring this has been recommended.	Closed
SW13	Confirm whether infiltration is to be used or not.	Appendix 8 of the SMP indicates that support for raingardens results from the ability to achieve infiltration. With the erosive nature of the subsoil on this site, and from evidence of device failure in the neighbouring subdivision due to seepage at a device outlet, infiltration is not recommended. This may influence the device type that is to be proposed and also the calculations for each device.	Infiltration is not assumed as a default approach across the development due to geotechnical sensitivities (e.g. Northland Allochthon soils and steep slopes). However, it is proposed on a case-by-case basis where site-specific geotechnical assessments confirm it is appropriate and safe to do so.	Noted. Provided that the communal devices are designed assuming no infiltration from the upper catchment then HW is conformable that a conservative approach has been taken.	Closed

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		It would be advantageous for the proposed stormwater management be defined now, based on available information, with guidance and direction to future users with regard to what investigations are required t the next stage of development.	This approach has been confirmed through further discussion with the Riley Consultants geotechnical engineer. Infiltration will only be enabled in locations that: - Are set back from steep or unstable slopes; - Have confirmed soil profiles and some infiltration capacity; - Meet minimum factors of safety for slope stability and ground saturation. Where infiltration is not suitable, stormwater devices (e.g. raingardens) will be constructed with underdrains and impermeable bases to maintain treatment and hydrology performance without promoting infiltration. The retention volume will be added to the detention volume. This approach allows the design to remain adaptive, safe, and compliant with GD01, while protecting site stability.		
SW14	Include relevant drawings and calculations of stormwater infrastructure in the SMP.	Drawings and calculations appear to be missing from the SMP appendix. It is important that these are included with the SMP to assist in the review to ensure that what is being proposed has been designed correctly and complies with the Code of Practice.	Refer to the updated 'SMP' with all references bound. We note - we are not looking for adoption of an SMP at this stage, it is provided in this format as a framework for future adoption at time of future re- zoning by council.	Noted.	Closed
SW15	Confirm the design parameters and device sizing.	The calculations that are set out in Appendix B of the Stormwater Report appear to be based off an impervious area of 60%. This value is too low and needs to be revised to be more representative of the road and lot areas. In addition, the calculations in Appendix B of the Stormwater Report appears to suggest that the catchment connected to each rain garden is 90% impervious. This is not correct and needs to be addressed.	Design parameters and sizing for stormwater treatment devices have been calculated from typical roading cross sections and site impervious data from the architect and urban designer. - Road catchments: 60% impervious (including carriageways and footpaths), with the remaining 40% grass berms; - JOAL catchments: 90% impervious, reflecting their predominantly hardstand nature. All assumptions and calculations are provided in the submitted stormwater management plans and design spreadsheets. Final sizing will be confirmed at the EPA stage with detailed hydraulic modelling factors referred to are based off the actual road catchments calculated at 60% impervious (grass berm area 40%) and the JOAL catchments (mostly impervious) at 90%. Note this is very conservative for the JOALs as the larger JOALs have grass berms. Exact sizing will be refined at EPA phase.	Noted.	Closed
SW16	Public stormwater assets located within private lot areas and JOALS should be relocated within public space to allow long-term maintenance.	Some public lines (for example in the vicinity of JOAL04a) are located to the rear of private lots. There are issues that can arise from an ongoing operation and maintenance perspective of this arrangement, even when easements are applied. It is requested that the alignments of the public infrastructure be reconsidered as far as possible to reduce this situation occurring.	Where possible the lines have been located in the road reserve or public reserves. However due to layout and topography this is not always possible and practicable. A more refined adjustment of selected lines can be realigned in collaboration with Healthy Waters at EPA stage if required.	We acknowledge that, due to site layout and topographical constraints, locating all public stormwater lines within road reserves or public reserves is not always feasible. However, it remains a priority that public stormwater infrastructure be located within public space wherever possible to facilitate efficient, long-term operation and maintenance. Public stormwater lines situated behind private lots, such as those near JOAL 04a, can create significant challenges for ongoing access, maintenance, and potential future upgrades even where easements are in place. This arrangement often results in increased complexity and risk for council and property owners alike. Given this, we strongly encourage you to undertake further refinement of the stormwater infrastructure alignment to minimize the extent of public lines within private lots. This should be	Open

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				addressed early, with a view to optimizing layouts and considering practical alternatives. We understand that some adjustments can be further discussed and potentially resolved at the Engineering Plan Approval stage in collaboration with Healthy Waters. However, the resource consent application should clearly demonstrate efforts to locate public stormwater assets within public spaces as far as practicable and provide justification where this is not achievable. The stormwater plans and documentation should be updated accordingly to reflect these expectations.	
SW17	Confirm what newly created impervious areas are not receiving treatment or hydrology mitigation and provide a justification why they are not. Where areas are connected to the public network, demonstrate that they are accounted for in the appropriate raingarden.	Within the drawing set included in Appendix 12-3 there appears to be areas of new impervious coverage that are not receiving any treatment or hydrology mitigation. A relatively large area of Road 01 on the eastern side of Stage 1 appears to discharge untreated runoff to a stream gully, adjacent to a communal raingarden constructed on Road 09. This area of Road 01 contains two intersections and a change in grade. As a result, this area of the road will be subject to manoeuvring, braking and acceleration; all activities that increase the risk of contaminants being deposited on the road. There are also some JOAL areas that appear to not be accounted for in the raingarden design despite being connected to the public network.	As per response to SW5 above. All new impervious areas across the development are accounted for in the stormwater management design and receive appropriate water quality treatment and hydrology mitigation in accordance with GD01. Public roads and JOALs are treated via communal raingardens, each sized to manage the Water Quality Volume (WQV) and mitigate the 95th percentile storm event: • JOAL 1 → RG04 • JOAL 16 → RG14 • Road 1 → RG02 and RG12 Private lots are managed at source, with each lot required to: • Treat runoff via first flush diversion, • Provide on-lot retention/detention tanks, and • Incorporate a GD01-compliant driveway treatment device (e.g. stormfilter or raingarden). No new impervious areas are proposed that bypass treatment. The catchment plans (Drawings 3725- 1-4310 and 3725-2-4310) and the stormwater calculations attached confirm that all impervious surfaces are directed to appropriate treatment devices and sized using confirmed runoff coefficients. This ensures full compliance with treatment and hydrology mitigation requirements for both public and private components of the development.	Refer SW 5.	-
SW18	Splitter boxes are presented upstream of each communal device. There should be a detailed hydraulic analysis undertaken of the entire public network to confirm that it operates as intended.	The use of a splitter box upstream of the raingardens is assumed to be there to enable low flows (up to the 95th percentile event) to discharge to the device, with higher flows diverted direct to the gullies. Careful consideration needs to be made of the design of the diversion structure to ensure that the driving head generated within the manhole does not increase velocities to the raingarden and that energy losses will not impact the performance of the upstream pipe network. It is recommended that detailed hydraulic modelling of the subdivision, including pipe networks, splitter boxes and raingardens is completed once the final site layout is confirmed and this modelling will be reviewed and	Noted. We confirm that this will be provided at EPA stage. This will be done with dynamic analysis and show hydraulic grade on all long sections. Splitter box hydraulic losses will only affect storms above 95%ile and up to 10y. Detailed design pipe sizing will account for the losses through these devices.	Noted.	Closed

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		approved by Healthy Waters prior to Engineering Plan Approval being sought.			
SW19	Provide more detail on the discharge locations of overland flowpaths to the gullies, together with flows, velocities and any erosion protection required to the gully and receiving watercourse.	It is not clear from the drawings provided where overland flowpaths will discharge to the gullies and watercourses. In addition, there appears to be no calculations to support the flow or velocities expected. Due to the sensitivity of the receiving environment this information should be provided, together with detailing appropriate erosion mitigation.	Refer to the Overland Flow Path Memo, which contains OLFP routes, flow data and calculations for rip rap outlets.		
SW20	The modelling used to support the Application should be supplied to Healthy Waters for review and confirmation that the results are appropriate and acceptable.	The current modelling is assumed to be simplistic lumped catchments connected directly to the gully network, with the watercourses represented as 2D only. It is recommended that this model be supplied to Healthy Waters for review to confirm if the detail and modelling parameters are considered appropriate. Due to the complexity of the proposed stormwater network, it is recommended that more detailed hydraulic modelling be undertaken of the proposed infrastructure and submitted to Healthy Waters for review and approval prior to Engineering Plan Approval being sought.	This has been provided, and responses received back from the HW modelling team. A Memo responding to these queries is attached.	The memo itself is not considered acceptable without the provision of an updated flood model. From a technical standpoint, the memo references assessments and conclusions that are based on assumptions or modelling outputs which we are unable to independently verify. Without access to the updated model, Council cannot confirm whether the proposed changes adequately account for flood risk, downstream effects, or compliance with applicable flood hazard management standards. The rain on grid model using the post development terrain is to be provided to verify the overland flow path design, so that the flood risk associated with the future overland flow path can be assessed and managed including floor level restrictions.	Open
Healthy Waters Operations					
SW21	Provide evidence that the proposed maintenance access associated with each raingarden device can be built and meets the necessary requirements for safe vehicle access and activities.	Whilst it is acknowledged that most of the raingarden devices have a maintenance access allowed for, this is effectively just a buffer applied to the top of the device. Safe operation of the devices is required to be assessed now so that Healthy Waters can understand how the maintenance tracks will be incorporated into the step topography that is present. The maintenance access allowance should include for all the regular functions that are carried out, including set down areas. Due to the relatively large mature of the raingardens, all maintenance activities should be assumed to be undertaken outside of the road reserve and activities should not include Traffic Management Plans being required.	Raingarden plans have tracking curves applied to them to show how a truck may manoeuvre down and around the raingardens. A cross section showing how an excavator could also undertake maintenance work is included also. This can be worked through in more detail during EPA phase.	Additional detail is required to confirm that all raingarden access tracks are functional. Tracking curves should extend around the full perimeter of each device, and access down into the raingardens must be shown. It must also be demonstrated that excavators can load material directly into drying areas or trucks.	Open
SW22	Provide appropriate areas for lay down / sediment drying areas with the device accessways.	Include appropriately sized lay down / sediment drying areas in addition to the accessway to facilitate ongoing maintenance of the devices.	Sufficient space for laydown areas have been considered, and should be evident on the drawings. This detail can be worked through with the Healthy Waters team at EPA phase.	Sediment drying areas are not identified or labelled on the submitted drawings 3725-1-4301 to 3725-1-4312. These should be clearly shown at resource stage to ensure sufficient space is allocated, rather than retrofitted at EPA. It is preferable that this is addressed prior to resource consent approval.	Open
SW23	Reconsider the widespread application of private flow spreader bars discharging flows direct to gullies.	There are a number of private flow spreader bars proposed for discharging lot areas direct to the gulley system. Flow spreaders have a number of issues associated with them, primarily being the potential risk of destabilising the banks and the inherent risk of failure due to lack of maintenance. Where erosion risks are present and high, it is recommended that these are	The spreaders are proposed to feed water into the streams, so that the entire catchment is not drained to the bottom. Most of the slopes they are discharging onto, are reinforced earth walls, and as such destabilisation should not be an issue. These will be private devices, and will be the responsibility of the owners to maintain.	Concern remains with private flow spreaders due to high failure rates, lack of maintenance, and potential for slope destabilisation. These devices are not considered appropriate in this setting and should be replaced with more robust, publicly managed stormwater solutions. The number of private spreaders should be reduced. Refer also to the response under SW3.	Open

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		consolidated and connected to the public stormwater network.		Council will not be responsible for any slope remediation or repair of private property.	
SW24	Clarify if the intention of maintaining stream base flow is realised by the proposed stormwater design.	Section 9.3 of the SMP explains that the design intent includes "maintaining stream baseflows". Where communal devices are proposed, please clarify whether the headwaters of the streams are bypassed or whether sufficient recharge is provided by the T-Bar outlets.	Yes, the proposed stormwater design intentionally supports the maintenance of stream baseflow conditions, particularly in areas discharging to downstream wetlands and natural channels. This is achieved through a combination of design strategies aimed at preserving catchment hydrology and promoting slow, distributed flow discharge: • **On-Lot Retention and Detention Tanks**: Each private lot includes a combined retention/detention tank. These tanks capture the first flush (5 mm retention) and slowly release detention volumes over a 24-hour period, mimicking natural hydrological response and contributing to sustained baseflow discharge. • **T-bar Spreader Systems:** These devices disperse tank overflow and stormwater overland via vegetated slopes and bunds, replicating diffuse sheet flow. This reduces flow concentration and encourages shallow infiltration and subsurface flow pathways, which support localised baseflow recharge. • **Hydrological Balance Confirmation:** Catchment modelling has been used to compare pre- and post-development flows upstream of the wetland areas. This analysis confirms that flow volumes and timing remain within natural ranges, ensuring the downstream baseflow regime is protected. Together, these design measures ensure that stream baseflow is supported through both preservation of contributing catchment areas and the implementation of slow-release, distributed stormwater controls.	See comment in relation to T-Bar outlets under response to SW23 above.	-
Flood Model Review					
FR01	• There are noticeable increase of flood depth and extent at some downstream and upstream properties. The most significant effect will be increased flooding at the trafficable lanes and northbound off ramp at SH1. The post development peak depth at the upstream side of SH1 is predicted to reach more than 10m with an increase of 0.31m. This is due to the limited capacity of the 2.05m ID culvert. Please consider options to improve the culvert capacity. • The increased flood depth at the upstream property at 180 Upper Orewa Road is counter-intuitive, it is mostly likely a model data issue unless it is specifically designed to provide flood attenuation at this location. Please clarify.	Adverse effects on downstream properties	- - The increased depth at the northbound lane is due to a localized inflow being applied at that location. This should not differ between pre- and post-development. The updated model will correct this anomaly. - Regarding the culvert, the design has been developed through an iterative modelling process to balance upstream storage and ensure post-development conditions match pre-development flood levels. In the latest version, the redesigned Culvert 11 achieves this balance, and the model now shows no increase in flood level at 180 Upper Orewa Road. - The revised model indicates that, under the 1% AEP event with a 3.8°C climate change uplift, there is approximately 10 m of freeboard at the upstream side of Culvert 11, with no overtopping observed. Increasing the culvert capacity beyond this point would result in higher downstream discharges and potentially adverse effects on downstream properties.	The causes for the increased flooding at the off ramp will need to be verified by the updated model which has not yet been provided. The culvert capacity remains as a concern, due to the significant ponding depth upstream and the implications on the long term stability of the slope and motorway embankment under a rapid draw down scenario. The frequency of ponding will also likely increase post development. The consequences of increased flooding from an upgraded culvert can be investigated to balance the risks upstream and downstream the culvert.	Open

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	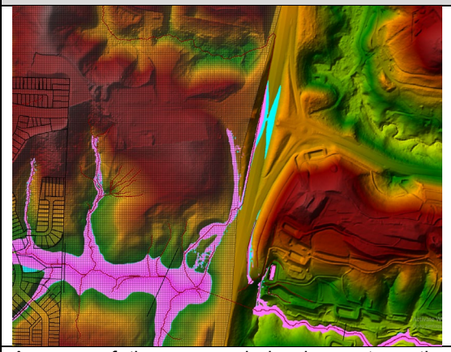		Accordingly, we do not support increasing the culvert capacity, as the current design achieves the required performance without introducing additional downstream impacts. 		
FR02	An area of the proposed development on the northern side is predicted to be extensively flooded in shallow depth possibly due to inadequate provision of overland flow path. Please check. CM comment - Any portion of the development footprint intersecting the floodplain must be designed to safely accommodate and proposed habitable floor levels development must be outside any floodplain. Where flood hazards cannot be mitigated through appropriate design development in those areas is unlikely to be supported. 	Post Development flood risk	This is attributed to an anomaly in the design DEM. The proposal includes diversion of upstream flow to the eastern stream. The updated model will demonstrate this diversion. 	This is to be verified with the updated model.	Open
FR03	A normal depth water level boundary is adopted in the HEC-RAS model with a hydraulic gradient of 0.02 or 2% assumed for the receiving estuary channel. A constant tidal level boundary which takes into account of Sea Level Rise (SLR) and Vertical Land Movement (VLM) is considered more appropriate. The SLR scenario should be as per the Coastal Hazards and Climate Change Guideline (July 2024, MfE) for up to year 2130.	Tidal level can have an impact on flood levels.	The model has applied an initial tide level condition of 3.1mRL which comprises of a mean high water springs (2.1m) plus 1m in sea level rise. The MHWS level was obtained from Council RFHA Model Build with values ranging from (1.11mRL – 2.0mRL – NZVD2016) The SLR with an allowance for VLM based on the 50th Percentile is as follows	This is to be verified with the updated model	Open

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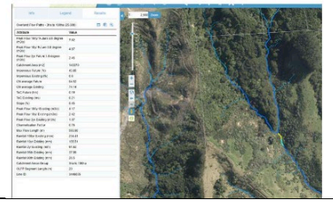
			• SSP2-4.5 – 1.01m • SSP2-8.5 – 1.44m  Assuming the worst-case scenario, this brings the total tide level to 3.54mRL We believe given the invert measured at the motorway is at RL 6.3, the tidal level is well below the invert level, the backwater effect outlet of the culvert at this area will be negligible. The model is currently being updated with downstream condition applied as a stage hydrograph representing the tidal condition.		
FR04	The inflows from subcatchments have been modelled using HEC-HMS for both the existing and post development scenarios. For the post development scenario, the urbanised subcatchment should be modelled as Heterogeneous Catchment as per TP108 with the pervious and the drained impervious areas modelled separately with separate time of concentrations.	Modelling pervious and impervious area separately can impact peak flows	The HEC-HMS model was re-run using heterogeneous catchment methodology. While most subcatchments showed reduced peak flows, minor increases occurred in three. The original model applied conservative flows. The hydraulic model will be updated accordingly. Refer to Attachment A for a comparison of flows and time of concentration values, Between the submitted model and the updated model based on the Heterogeneous method.	This is to be verified with the updated model.	Open
FR05	The existing development at CMT PD 19 and CMT PD 1, including added impervious area and terrain changes due to earthwork should be take into account for hydrological and hydraulic modelling for this development. The ultimate zoning or land uses in the overall catchment area for the future 50yr beyond the development sites should be taken into account for hydrological modelling, to ensure the flood risk is not under -estimated for the life of the development. CM - Please also confirm whether the land use assumptions reflect Council's preferred growth strategy and align with the 50-year adaptive planning horizon	Change of roughness value can impact flood depth	- The pre-development model is being updated to reflect existing earthworks, based on EPA plans of the neighbouring development. - The model includes maximum probable development based on Unitary Plan zoning and the Delmore Masterplan.	The flood management scheme and model need to look at the most probable development scenario in the future 50 plus years, further beyond the AUP planning window. The existing development at CMT PD19 and PD1 are to be included in the updated model.	Open
FR06	A runoff curve number of 75.7 is used for existing catchment. The land cover type, e.g. forest land and presence of good top soil should be taken into account when determining the pre-development runoff curve numbers.	Excessive flood depths at some nodes can distort the model results.	Curve Numbers were determined based on the Geotech report assessment and are consistent with values adopted in Council's RFHA modelling (GeoMaps). The CN is considered appropriate for the site conditions. 	The land cover condition should be taken into account together with soil types to determine the predevelopment runoff curve numbers.	Open

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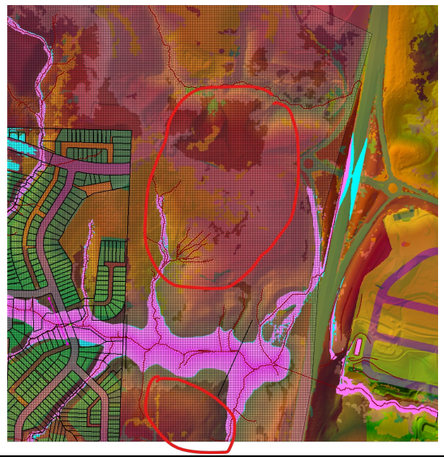
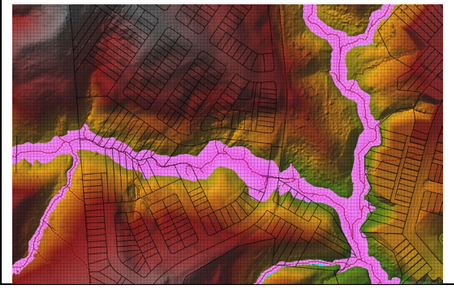
FR07	The land cover data for the proposed development scenario does not cover the new development to the west of SH1 and south of Grand Drive. Please check. 		The lumped inflow does not traverse this area as it is applied directly to the stream west of the Ara Hills development. Changing the land cover in this area will not alter the results of the lumped hydraulic model. This will be amended for the Rain on Grid model requested.	This will be verified after the rain on grid model has been provided.	Open
FR08	The subcatchment sizes are fairly large ranging from under 10 hectares to over 40 hectares. The flood flow from these subcatchments are loaded into the streams directly. The flood risk associated with overland flow paths within the subcatchments have not been modelled. It is recommended a post development scenario with rain on grid approach should be run to understand the overland flow flood risk with the proposed development terrain.	Need to understand flood risk along future overland flow paths.	Rain on Grid model will be provided as part of a sensitivity check.	This is to be verified with the updated model.	Open
FR09	The design terrain for the portion of development at the western appears to be incomplete. 	Future design terrain should be used in the model.	The latest tin surface has included this area, this will be part of the updated hydraulic model. 	To be verified with the updated model	Open

APPENDIX B: ADDITIONAL RECOMMENDED CONDITIONS REGISTER

#	HEALTHY WATERS COMMENT	ADDITIONALLY RECOMMENDED CONDITION
1	A condition outlining the design intent of the proposed raingardens ensuring that the raingardens will be designed in accordance with GD01 requirements and will provide water quality mitigation, retention, and detention is recommended.	**Raingarden Design Requirements** The detailed design of all proposed raingardens shall be carried out in accordance with Auckland Council's GD01 – *Guidance Document for Stormwater Management Devices in the Auckland Region* and Auckland Council's Stormwater Code of Practice (Version 4) The raingardens shall be designed to: (a) Provide water quality treatment in accordance with the requirements of GD01; (b) Achieve stormwater retention and detention volumes as required to meet the hydrology mitigation requirements for the development; and (c) Maintain the design intent as presented in the application, including integration into the streetscape or landscape design where relevant. Evidence demonstrating compliance with these requirements shall be submitted to and certified by Auckland Council prior to lodgement of Engineering Plan Approval.
2	Additional condition require to ensure new and modified buildings use materials that prevent contaminants from zinc, copper, or treated timber entering the stormwater system.	**Stormwater Quality** New buildings, and additions to buildings, must be constructed using cladding, roofing and spouting building materials that avoid the use of contaminant generating building products which have: (a) exposed surface(s) or surface coating of metallic zinc or any alloy containing greater than 10% zinc; or (b) exposed surface(s) or surface coating of metallic copper or any alloy containing greater than 10% copper; or (c) exposed treated timber surface(s) or any roof material with a copper containing or zinc-containing algaecide.
3	A condition requiring a pre-construction meeting for any devices intended to be vested as public stormwater management devices should be included.	**Pre-Construction Meeting – Public Stormwater Assets** A pre-construction meeting must be held by the consent holder, prior to commencement of the construction of any stormwater devices intended to be vested as public, that: (a) Is arranged five working days prior to initiation of the construction of any intended public stormwater devices on the site; (b) Is located on the subject area; (c) Includes representation from the Council, including but not limited to Healthy Waters Operations Team; and (d) Includes representation from the site stormwater engineer (or) contractors who will undertake the works and any other relevant parties. The following information must be made available before or at the meeting: (e) Timeframes for key stages of the works authorised under this consent; (f) Contact details of the site contractor and site stormwater engineer; and (g) Construction plans approved (signed/stamped) by the Council. Advice Note: To arrange the pre-construction meeting required by this consent, please contact the Council on email at monitoring@aucklandcouncil.govt.nz.
4	A condition is recommended specifying raingarden media compliance and verification requirements. These requirements will ensure that the media of any communal raingardens meets council standards and that its infiltration performance is verified before final planting and ongoing use.	**Raingarden Media Specification** The media of the proposed communal raingardens must comply with the following: (a) The consent holder must provide raingarden media specification along with lab test results conforming the media to be compliant with the GD01 requirements. The media specification must be provided at least 5 (five) working days prior to placing the material within the constructed raingarden, to obtain Healthy Waters confirmation on the media material. (b) Upon completion of the bio-filtration media placement, the consent holder must organise for infiltration testing of the bio-filtration media at developers costs to conform minimum required infiltration rate is achievable. The infiltration testing must be undertaken by a third-party engineer and in accordance with '*Adoption Guidelines for Stormwater Biofiltration Systems Appendix I – Measurement of hydraulic conductivity – Using in situ and ex-situ (laboratory) sampling methods, produced by CRC for Water Sensitive Cities, Belinda Hatt, Sebastien Le Coustumer June 2009 (updated April 2015)*' or similar testing guidelines document, as agreed by Healthy Waters. The infiltration testing must be performed in presence of a Healthy Waters specialist or as agreed by Healthy Waters at time of the Pre-Construction Meeting. (c) The consent holder must provide mulch layer and raingarden planting after obtaining clearance from Healthy Waters on acceptance of the infiltration testing results. The mulch material and planting must conform to GD01 or as specified by the Council landscape specialists

#	HEALTHY WATERS COMMENT	ADDITIONALLY RECOMMENDED CONDITION
		Advice Note: All infiltration tests results must be reported in 'mm/hr' and certified by a Chartered Professional Engineer.
5	A condition requiring an Operation and Maintenance Plan be provided for approval of HW Operations Team at the time of lodgement of EPA us recommended.	**Operation and Maintenance Plan – Public Stormwater Assets** An Operation and Maintenance Plan (OMP) for all stormwater management devices proposed to be vested in Council shall be submitted to Auckland Council Healthy Waters Operations Team for certification at the time of Engineering Plan Approval. The OMP must comply with Healthy Waters Operation and Maintenance Plan Template.
6	The following recommended condition will ensure any communal stormwater devices are properly maintained during development and handed over to Council in a functional and compliant state.	**Maintenance of Communal Stormwater Management Devices** The consent holder must maintain the communal stormwater management devices serving the subdivision in accordance with the following requirements: (a) The consent holder must maintain the communal devices until the earlier of: (i.) 80% of the building sites discharging to the devices have been developed, or (ii.) A period of five (5) years has passed from the date of issue of the final section 224(c) certificate under the Resource Management Act 1991 for the subdivision, (b) The consent holder must remove any sediment from the communal device that has resulted from development activities within the subdivision, if required by the Council, prior to acceptance of the device(s) by Council for ongoing maintenance. (c) At the time of transfer of any stormwater management devices to Council for ongoing maintenance, all planted areas associated with the stormwater management devices must achieve a minimum plant survival rate of 95%. (d) Updated Operation and Maintenance Manuals for all communal stormwater management devices must be provided to the Council at the time of transfer of any stormwater management devices to Council for ongoing maintenance. (e) A bond must be provided at the time of application for the section 224(c) certificate to ensure the ongoing maintenance of the communal stormwater management devices until transfer of any stormwater management devices to Council for ongoing maintenance.
7	A condition requiring establishment of a bond will secure proper maintenance and completion of any communal raingarden devices, protecting the Council from costs if the consent holder fails to meet their obligations.	**Requirement for Bond** Prior to the issue of the section 224(c) certificate under the RMA, the consent holder must provide a bond to the Council in accordance with Section 222 of the RMA to ensure the performance of the raingardens. The bond must: (a) Be calculated at a rate of communal raingarden area; (b) Be provided in the form of a cash deposit, a bank bond guaranteed by a New Zealand-registered bank, or another form of security (e.g., an encumbrance) as agreed with the Council. (c) Be documented and executed by the Council's solicitor. All legal and administrative costs associated with preparation, execution, variation, administration, or release of the bond must be met by the consent holder. (d) Be released once the relevant condition(s) have been satisfied and all associated Council costs have been paid. *Advice Notes:* *The Council may use the bond to restore the communal stormwater device(s) to comply with Auckland Council's GD01 standards if the consent holder fails to meet the condition requirements.* *The final bond amount will be confirmed and agreed by Council prior to Engineering Plan Approval. It will be calculated based on a per-square-metre rate of communal raingarden area, with the rate to be determined at that time. The bond value will be adjusted for inflation using the Reserve Bank inflation calculator or another method agreed with Council*.
8	A condition clarifying ownership of retaining walls is important to ensure that long-term ownership and maintenance responsibilities are clearly defined. Retaining structures are not stormwater assets and are not maintained by Healthy Waters due to their structural complexity, ongoing maintenance requirements, and associated liability.	**Exclusion of Retaining Walls from Vesting** No retaining walls shall be vested in Auckland Council's Healthy Waters department. All retaining structures shall remain in private ownership and maintenance responsibility unless otherwise agreed in writing by Auckland Council (Healthy Waters).
9	This condition will ensure that the development does not exacerbate flooding on neighbouring properties, maintain existing levels of flood risk, and protect both public and private assets from adverse effects during a range of storm events.	**Flood Risk and Nuisance** The consent holder must ensure that the development does not result in any increase in flood risk or flood nuisance to upstream or downstream properties, measured against the existing rainfall and land use conditions for the 50% AEP, 10% AEP, and 1% AEP storm events.

#	HEALTHY WATERS COMMENT	ADDITIONALLY RECOMMENDED CONDITION
10	This condition will ensure that any stormwater management devices intended for public ownership and maintenance are assessed and accepted by Auckland Council's Healthy Waters team before progressing to detailed engineering design or legal subdivision.	**Stormwater Asset Acceptance** Prior to the submission of any Engineering Plan Approval and prior to Auckland Council approving a survey plan pursuant to s223 of RMA for any stage, the consent holder must confirm and agree with Auckland Council Healthy Waters, acceptance in respect of all stormwater devices proposed to vest to Healthy Waters. Should any stormwater devices not been accepted by Healthy Waters for vesting, the relevant plan must be updated, and it must show was a separate allotment on the survey plan and must be owned by a common entity as outlined in the conditions.
11	This condition is important to ensure that all permanent structures within the development are designed and located in a way that avoids long-term erosion risk, protecting both public safety and infrastructure integrity.	**Erosion Risk Assessment** The consent holder must demonstrate, to the satisfaction of the Healthy Water's, Waterway's Planning Team Leader, that all permanent structures associated with the development including buildings, stormwater outfalls, retaining walls, and other infrastructure are not at risk of being undermined by erosion over their intended design life (50 to 100 years). This must be confirmed through a geotechnical and/or hydraulic assessment prepared by a suitably qualified and experienced professional, taking into account site-specific erosion potential, hydrological conditions, and the effects of climate change.
12	This condition is necessary to ensure that stormwater effects are managed at source in accordance with best practice, reducing demand on downstream infrastructure, minimising runoff volumes and contaminant loads, and supporting water efficiency through non-potable reuse. It aligns with GD01 principles and the stormwater management strategy for the development.	**Stormwater Management Condition** Each residential lot within the development shall provide at-source stormwater retention, detention, and water quality treatment measures in accordance with GD01, including: (a) The retention component must be achieved through plumbed non-potable reuse. (b) The design and implementation of these stormwater management devices shall be certified by a suitably qualified engineer to demonstrate compliance with these requirements prior to issuing a certificate of compliance or subdivision consent completion.