Ref: 215010

MEMORANDUM – S67 MATTERS

To:	Simon Ash, Chief Operating Officer – Winton
From:	Will Moore, Director – Maven Associates
Subject:	**Fast-Track Approvals Act 2024 (FTAA) – FTAA-2503-1039 - Sunfield Fast-track Proposal – section 67 matters (AC ref BUN60447430)**
Date:	17 June 2025

Purpose of this Memorandum in Relation to Section 67 of the Fast-track Approvals Act 2024

This memorandum has been prepared by Auckland Council to assist the Expert Panel and the Applicant by identifying the Council's initial concerns and information needs in relation to the current proposal. Its primary purpose is to support the Expert Panel in its consideration of whether any formal requests for further information or reports under section 67 of the Fast-track Approvals Act 2024 (**FTAA**) are warranted.

While only the Panel may issue a formal request under section 67, the Council has identified specific matters where additional clarity or further technical information may be beneficial to inform the Panel's assessment. These matters are raised for the Panel's consideration in determining whether a direction under section 67(1)(a) or (b) should be made.

The Council is also open to engaging directly with the Applicant's team to discuss any of the matters raised in this memorandum. Should the Applicant wish to meet to clarify or work through specific issues, Council officers are available to facilitate further discussion.

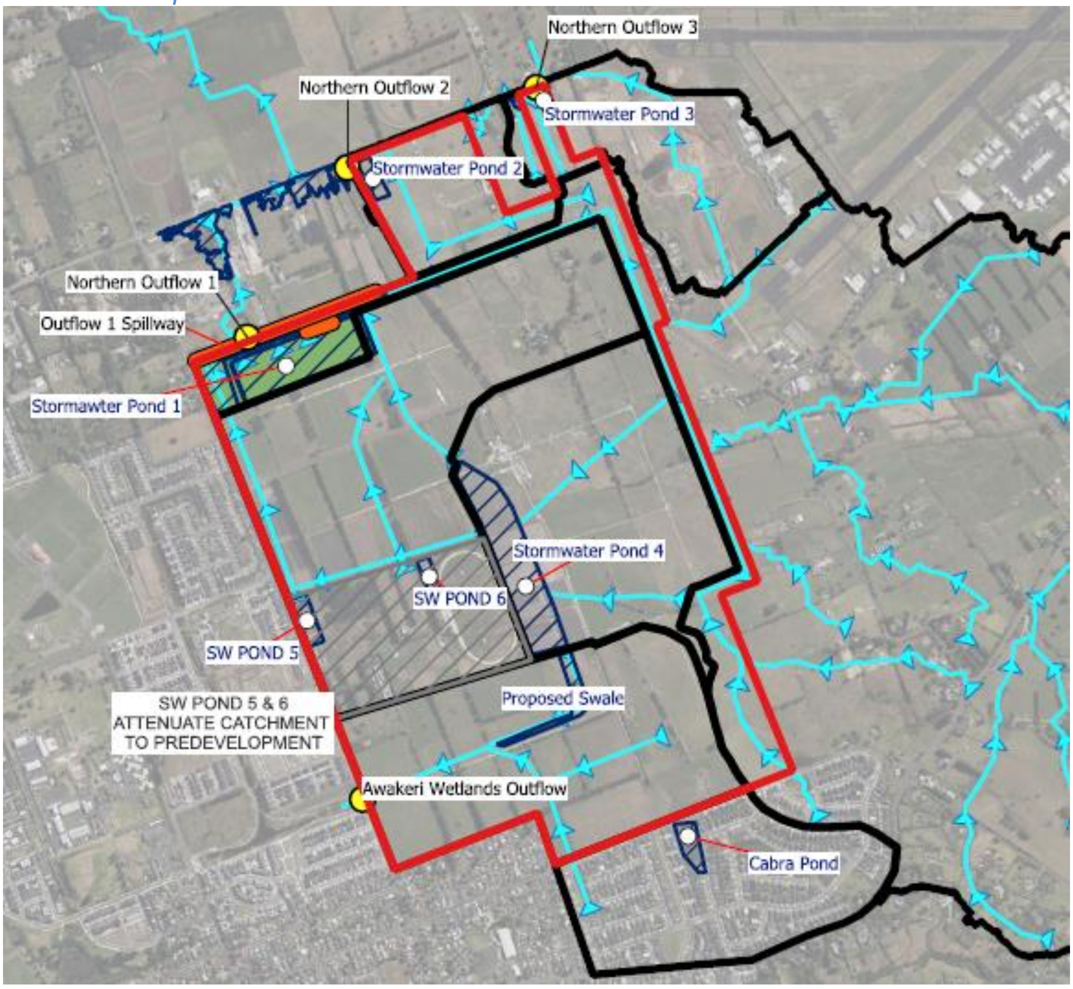
1. Stormwater and Flooding

1.1. Flood Assessment

Description of Missing Information

1.1.1. A complex arrangement of attenuation ponds and catchment diversions are proposed in an attempt to mitigate the development's effects on flooding, however information is missing that describes and demonstrates how the proposed Attenuation Ponds (including Attenuation Ponds 1, 2, 3 and 4) are intended to operate, and how flooding will be managed within these ponds during a range of design storm events. Due to the missing information there is insufficient evidence to support the Applicant's claim that the development will have no negative effect on flooding downstream of the Site.

How the Proposed Attenuation Ponds (including Attenuation Ponds 1, 2, 3 and 4) are intended to operate



Western Catchment – Discharge to Pahurehure Inlet Catchment

Stormwater Pond 4 (Catchment A3):

The function of the proposed stormwater pond 4 is to attenuate stormwater flows from the additional 54.9 ha catchment area introduced by the proposed development before discharging into the Awakeri Wetlands. The pond temporarily stores runoff during storm events (including 50%, 10%, and 1% AEP events, with climate change factors considered) and releases it at a controlled rate. This ensures that peak flows entering the downstream system do not increase, thereby preventing any adverse flooding impacts on upstream or downstream properties. The modelling confirms that, due to the pond's attenuation, peak flow levels within the already constructed Stage 1 of TSWCC either remain unchanged or are reduced as a result of the development.

Eastern Catchment - Discharge to Papakura Stream Catchment

Stormwater Pond 1, 2 & 3 (Catchment B, C1, D1 & D2):

The function of Stormwater Ponds 1,2 & 3 is to attenuate and control the peak flow rates from the upstream catchment and the proposed development, ensuring that stormwater is managed effectively during 50%, 10%, and 1% AEP storm events, with climate change factors considered. The pond temporarily stores stormwater runoff during rainfall events, allowing the water to accumulate and be released gradually at a controlled rate. This gradual release helps to reduce peak flows before the water is discharged downstream to the north, preventing any surge in flow that could cause flooding. By regulating the flow in this way, the ponds ensure that the peak flow levels at 3 Northern discharge points remain at or near pre-development *levels, even under extreme rainfall conditions. The attenuation process in the pond effectively slows down and controls the flow, which mitigates flood risks on-site and ensures that downstream properties are not adversely affected.*

Pond 1 services upstream catchment C1 and proposed catchment B.
Pond 2 services proposed catchment D1 and Pond 3 services proposed and upstream catchment D2.

How Flooding will be managed within these ponds during a range of design storm events.

The flooding management approach for all engineered stormwater ponds within the development has been developed in strict compliance with the Auckland Council Stormwater Code of Practice (SWCOP) and GD01 (Stormwater Management Guidelines). The design and management of stormwater ponds aim to mitigate flood risk, manage stormwater quality, and ensure that the infrastructure is resilient to a range of storm events, from minor to extreme. The following outlines the strategies for managing flooding across all ponds within the project.

1. Design Storm Events and Storage Capacity

To ensure optimal flood management, the stormwater ponds are designed to manage runoff from a range of design storm events, based on the SWCOP and GD01 requirements. The following design events are considered:

- ***Minor Storms**: 2-year, and 10-year return period storms, the ponds are designed to retain and slowly release stormwater to prevent downstream flooding.*
- ***Major Storms**: The ponds are also designed to handle more extreme storm events, such as the **50-year** and **100-year** return period storms, ensuring that the system can accommodate larger volumes of runoff without causing localized flooding.*

The storage capacity of each pond has been determined based on the expected runoff from these design storms. The storage volume ensures that the ponds can retain the necessary runoff while allowing for the controlled release of water to avoid exacerbating downstream flood risks.

2. Hydraulic Design and Outflow Control

The hydraulic design for all ponds has been developed using hydraulic modeling to predict how stormwater will behave during different storm events. This includes inflow rates, peak flow predictions, and storage volume requirements.

- ***Outlet Structures**: Each pond is equipped with outflow control structures, this includes scruffy dome outlets, weirs & orifices to regulate the discharge rate of stormwater. The design of these outflows ensures that water is released gradually. The details of these are included the stormwater modelling report and Maven Engineering plans.*

  Outflow control is critical to maintaining flood protection during minor storm events and ensuring that stormwater discharge does not exceed capacity during major storm events.

  For Ponds 1-3 the gradual release is to mimic pre-development hydrological conditions which mitigates flood risks on-site and ensures that downstream properties are not adversely affected.

  For Pond 4 the gradual release is to limit peak flow levels to baseline scenario (what the downstream conveyance infrastructure has currently been designed for) which mitigates flood risks on-site and ensures that downstream properties are not adversely affected.

- ***Peak Flow Reduction**: The primary objective is to attenuate peak flows by temporarily storing stormwater and releasing it in a controlled manner. This helps to mitigate the risk of downstream* *flooding and reduces the burden on existing drainage systems during extreme events like the* ***50-year*** *or* ***100-year*** *storms.*

3. Emergency Overflow Systems and Spillways

To manage extreme storm events that exceed the pond's design capacity, emergency overflow systems have been incorporated in accordance with the SWCOP and GD01. These systems are essential for safely managing runoff during large storms without causing damage to the pond or surrounding infrastructure.

- ***Spillways****: Each pond includes an emergency spillway designed to safely convey excess water away from the pond. The spillway is sized based on the anticipated runoff from the 100-year storm event, ensuring that water is discharged safely and preventing pond overtopping. The spillway is located in a way that minimizes risk to surrounding infrastructure.*
- ***Freeboard****: To account for wave action and extreme rainfall conditions, a suitable freeboard above the 100-year design water level has been incorporated into the design. This provides a buffer to prevent the pond from overflowing during exceptional storm events.*

4. Water Quality Considerations

In addition to managing flood risk, each stormwater pond is designed to meet the water quality objectives outlined in the SWCOP and GD01. These objectives include the removal of pollutants such as suspended solids, heavy metals, and nutrients, which can degrade downstream water quality.

- ***Sediment Settling****: During minor storms, the ponds are designed to allow sufficient detention time for sedimentation, helping to remove contaminants from the stormwater before it is released.*
- ***Water Treatment****: For larger storm events, the ponds are designed to retain pollutants that may be carried by the stormwater, particularly in the first flush. The stormwater ponds are intended to not only control flooding but also improve water quality through sedimentation and filtration processes.*

5. Flood Risk Management and Attenuation

All ponds are designed with the goal of flood risk reduction and attenuation. Specifically, the ponds are designed to:

- ***Control Runoff****: During minor storms, the ponds are designed to store and slowly release runoff, ensuring that flood risk is minimized in both the pond and downstream areas.*
- ***Slow Discharge During Major Storms****: During extreme storms (e.g., 50-year and 100-year events), the ponds release water at a controlled rate, ensuring that the peak flow is attenuated. This prevents downstream flooding by managing the release of stormwater in a manner that minimizes surges in flow.*

6. Long-Term Maintenance and Inspection

To maintain the effectiveness of the stormwater ponds in flood management, regular maintenance and inspection are critical. As outlined in SWCOP, ongoing management of sediment, vegetation, and structural elements is necessary to ensure that the ponds function as designed over the long term.

- ***Sediment Management****: Periodic sediment removal is required to maintain storage capacity. Over time, sediment accumulation can reduce the pond's effectiveness in managing runoff, so sediment levels will be monitored and removed as necessary to ensure that the pond continues to provide the required flood protection.*
- ***Vegetation Management****: Invasive vegetation and plant overgrowth are monitored and managed to ensure that inflows and outflows are not obstructed, and the pond's hydraulic performance is not compromised.*

7. Compliance with SWCOP and GD01

The design and management of the stormwater ponds strictly adhere to the requirements and standards set out in the Auckland Council SWCOP and GD01. This includes:

- *Ensuring that all ponds meet the required design criteria for stormwater storage, outflow control, and flood risk management.*
- *Designing emergency overflow systems to handle the 100-year storm and reduce flood risk.*
- *Implementing water quality management features to control pollutants in stormwater runoff.*
- *Maintaining regular monitoring, inspection, and maintenance to ensure long-term performance.*

Conclusion

In Conclusion, the stormwater ponds across the development site have been designed in strict accordance with the Auckland Council SWCOP and GD01, ensuring that flooding is effectively managed across a range of storm events, from minor to extreme. Through careful design of storage capacity, outflow control, emergency overflow systems, and water quality treatment, these ponds will mitigate flood risks, protect downstream areas from flooding, and improve stormwater quality. Additionally, long-term maintenance practices will ensure that these ponds continue to function effectively, protecting the surrounding environment and infrastructure from the adverse effects of flooding.

1.1.2. Given the very flat topography and downstream flooding constraints, there is insufficient information provided on the feasibility of stormwater infrastructure to provide primary drainage for the 10% Annual Exceedance Probability (AEP) storm event. The assessment provided is incomplete and does not describe the methodology, assumptions made, nor the effect of groundwater and other tailwater constraints.

The proposed development manages the 10% Annual Exceedance Probability (AEP) storm event through a combination of piped reticulation and swale systems for primary stormwater conveyance.

Stormwater runoff from the site is discharged either to a detention pond within the Eastern Catchment or to the Awakeri Wetlands/TSWCC in the Western Catchment. Hydraulic and hydrologic modelling has been undertaken using HEC-RAS and HEC-HMS to determine existing tailwater levels at these discharge locations. These tailwater conditions have been retained in the modelling and have informed the design of the stormwater infrastructure across the site, including ponds, swales, and the piped network. Downstream constraints have been incorporated to ensure appropriate representation of tailwater effects.

Given the large size of the site and its predominantly flat topography, in some instances, site levels are set based on achieving the minimum pipe cover requirements outlined in the Stormwater Code of Practice (SWCOP). While the current network design does not surcharge under the modelled 10% AEP event, the use of controlled surcharging should be considered a viable design option during detailed design. This approach could significantly reduce the amount of fill required, delivering cost savings, minimising environmental impacts, and improving overall constructability.

The importance of managing overflow and minimising flood risk in urban areas is acknowledged. Should surcharge be incorporated, mitigation measures such as stormwater detention, floodable open spaces, and clearly defined overland flow paths will be included in the design to safely convey excess runoff and protect public and private assets.

The hydraulic and hydrologic modelling undertaken using HEC-RAS and HEC-HMS includes assumptions based on design rainfall intensity, catchment imperviousness, runoff coefficients, and pipe and channel roughness. Existing tailwater levels were applied at discharge locations to account for downstream conditions. The potential impact of a high groundwater table is considered minimal, as the proposed stormwater network is generally shallow and not expected to be significantly influenced by groundwater interactions.

Further details on the modelling methodology, assumptions, and outputs are contained within the Stormwater Modelling Report submitted in support of the application.

1.1.3. There is no information or assessment of the impact of the proposed development on downstream infrastructure in terms of peak flows and volumes during a range of design storm events, due to the modified catchments and increased impervious coverage. In particular, assessment of impacts on the below infrastructure is missing:

a) The McLennan Dam is a High Potential Impact Classification (PIC) Dam, which has been designed to manage specific flows and volumes for various storm events in accordance with its associated resource consents. There is no assessment on the frequency or duration that the spillway would activate under a range of design storm scenarios.

Stormwater modelling of the Western catchment for the 2yr, 5yr, 10yr, 20yr, 50yr and 100yr storms with Climate change factors in accordance with the Auckland Council Stormwater Code of Practice version 4 has been undertaken.

Modelling shows flood volumes are contained within the McLennan Wetland for the 2yr, 5yr, 10yr, 20yr and 50yr storms.

Modelling shows the spillway to be activated only for the 100yr storm event with 3.8 degrees climate change, in which the spillway is activated for 60 minutes. Flow across the spillway is shown to decrease in the post development scenario, where peak flow decreases from 14.71 m3/s to 13.10 m3/s (a reduction of 10%).

b) The conveyance infrastructure in the Pāhurehure Inlet catchment including the Grove Road Box Culverts and the Artillery Drive Stormwater Tunnel.

The assessment of existing infrastructure was incorporated within the stormwater modelling report submitted as part of the FTA. The proposed stormwater strategy for the development controls peak discharge to pre-development conditions through the implementation of attenuation measures. These measures effectively manage and temporarily store stormwater runoff, thereby regulating the flow rate released from the site. As a result, there is no additional loading on the downstream infrastructure, ensuring that the existing system is not adversely impacted by the development.

c) Stage 1 of the Awakeri Wetland, including weirs and boardwalks which are currently designed with a 2-year ARI level of service.

As per the above, the assessment of existing infrastructure was incorporated within the stormwater modelling report submitted as part of the FTA. The proposed stormwater strategy for the development controls peak discharge to pre-development conditions through the implementation of attenuation measures. These measures effectively manage and temporarily store stormwater runoff, thereby regulating the flow rate released from the site. As a result, there is no additional loading on the downstream infrastructure, ensuring that the existing system is not adversely impacted by the development.

d) Private farm drains and culverts downstream of the site within the Papakura Stream

The development proposes to maintain peak flow rates and flow levels at pre-development conditions through the use of attenuation ponds, a widely accepted and common practice in urban stormwater management within Auckland and New Zealand. Attenuation ponds temporarily store stormwater runoff during peak rainfall events and release it at a controlled rate, preventing sudden surges that could overwhelm downstream drainage infrastructure. For the Papakura Stream Catchment, this approach effectively protects private farm drains and culverts located downstream. While the total volume of runoff may increase due to the development, controlling the discharge rate ensures that flow velocities and peak loads remain consistent with pre-development conditions, thereby *mitigating risks of erosion, flooding, and structural damage. In accordance with the Auckland Council Stormwater Code of Practice 2025 (Version 4) and supported by the NIWA Stormwater Management Devices Design Guidelines (2003), maintaining peak flows at or below pre-development levels is a key measure to prevent adverse downstream impacts. Given that existing downstream infrastructure has the capacity to accommodate these controlled flows, further detailed assessment of private farm drains and culverts is not warranted. This approach aligns with best practice and regulatory requirements, supporting sustainable stormwater management and protecting downstream infrastructure integrity. The modelling included assessments for the 1%, 10%, and 50% Annual Exceedance Probability (AEP) events, providing a comprehensive understanding of stormwater behavior under a range of rainfall intensities. While these key design storms have been addressed, additional simulations, for example, 2%, 5%, or 20% AEP events—can be conducted if deemed necessary to further support the assessment.*

e) Catchment. The Applicant has not provided hydraulic modelling results for the downstream private farm drains and culverts, nor has it assessed the impact of discharging a greater volume of runoff to these drains. Additionally, the approved stormwater discharges from Ardmore Airport will need to be accounted for as part of the assessment for this sub-catchment.

Stormwater modelling has been undertaken as part of the development assessment, demonstrating that peak flow rates downstream are maintained at or below pre-development conditions through the implementation of attenuation ponds. The modelling included assessments for the 1%, 10%, and 50% Annual Exceedance Probability (AEP) events, providing a comprehensive understanding of stormwater behavior under a range of rainfall intensities. While these key design storms have been addressed, additional simulations, for example, 2%, 5%, or 20% AEP events—can be conducted if deemed necessary to further support the assessment.

This approach aligns with established best practices and the Auckland Council Stormwater Code of Practice 2025 (Version 4), as well as the NIWA Stormwater Management Devices Design Guidelines (2003). Although the total runoff volume may increase due to development, the controlled release of stormwater ensures that downstream private farm drains and culverts are not subjected to higher peak flows or velocities that could cause erosion, flooding, or structural damage.

Given that the stormwater strategy maintains peak flows to pre-development levels and existing downstream infrastructure has sufficient capacity to accommodate these flows, further detailed hydraulic modelling of private drains and culverts is not considered necessary at this stage. Regarding the stormwater discharges from Ardmore Airport, the current modelling has accounted for catchment conditions and downstream capacity; however, if additional data on these discharges become available, it can be incorporated to refine the assessment as required. Overall, the proposed stormwater management strategy effectively mitigates potential adverse impacts on the downstream drainage network while complying with relevant regulatory frameworks.

1.1.4. The hydraulic model that has been described in the application in insufficient for providing a robust assessment of downstream effects and is missing the following considerations:

a) The Applicant has not assessed the development's potential impact on the frequency of predicted flood hazard for downstream properties (including back yard flooding, road flooding / overtopping and building footprints). To properly quantify potential increases in flood frequency, additional AEP scenarios should be analysed to assess more frequent flooding.

The applicant acknowledges the importance of assessing the development's potential effects on the frequency and extent of downstream flood hazards, including back yard flooding, road overtopping, and potential inundation of building footprints. To support this, hydraulic modelling has been undertaken for key storm events at the 1%, 10%, and 50% Annual Exceedance Probability (AEP) levels, which together represent a wide *range of flood scenarios, spanning both frequent and extreme rainfall events commonly used in flood risk analysis.*

The modelling confirms that peak flow rates downstream of the site will be maintained at or below pre-development levels through the use of attenuation ponds. These ponds temporarily store excess runoff and release it at controlled rates, ensuring downstream infrastructure is not subjected to increased peak discharges or velocities. This approach prevents sudden flow surges that can exacerbate flood frequency or severity, and is consistent with the requirements of the Auckland Council Stormwater Code of Practice 2025 (Version 4) and NIWA Stormwater Management Devices Design Guidelines.

It is acknowledged that, while peak flows are controlled, the total runoff volume from the site will increase as a result of urbanisation. This may lead to a marginal increase in the duration of flows downstream. However, this extended duration occurs at a lower, controlled rate, meaning that while water may remain in the system slightly longer, it does not result in greater flood depth or hazard to downstream properties. The longer, flatter hydrograph is a well-understood and accepted outcome of peak flow attenuation and does not typically cause adverse effects in open-channel or rural drainage environments, provided peak capacity is not exceeded.

Should further refinement be required, the model can be readily extended to assess additional intermediate AEP events (e.g., 2%, 5%, or 20%) to provide a more detailed understanding of potential impacts during more frequent rainfall events. The modelling already incorporates current downstream conditions and drainage characteristics, and shows that the stormwater management system is functioning within accepted performance thresholds.

Overall, the proposed attenuation strategy provides effective mitigation of downstream flood risks. The applicant remains open to undertaking supplementary modelling or analysis, if required, to confirm that the development will not increase the frequency, severity, or material duration of flooding to downstream properties. This ensures a robust, site-specific, and policy-aligned approach consistent with best practice engineering and regulatory expectations.

b) The Applicant has used “reservoirs” in HEC-HMS (Hydrologic Engineering Center’s Hydrologic Modeling System) to model ponds 2 and 3. The Applicant does not clearly state how the discharges from these ponds are linked to the downstream water level, but these are typically represented in HEC-HMS as inlet-controlled structures (e.g. orifices). This is a concern for the validity of the modelling of these ponds in larger events, where backwater may be significant. Industry best practice would be to use alternative methods, such as modelling the ponds in HEC-RAS (Hydrologic Engineering Center - River Analysis System) to represent the complex relationship of storage, pond outflow and downstream conditions.

Tailwater has been accounted for in the stormwater modelling report will be updated to outline how tailwater accounted for in input into the HEC HMS model.

c) The Applicant has not assessed the potential impact on maximum / frequency of predicted flood hazard for storms which are not homogenous across the entire catchment, but which still present potential flood risk, especially where a storm event is located over the lower half of the catchment. This is considered important as storms which vary across catchment can result effects which would otherwise not be apparent if the analysis uses a homogenously distributed storm.

The stormwater system has been designed in accordance with the Auckland Council Stormwater Code of Practice 2025 (Version 4), which accepts the use of homogeneous storm distributions for flood hazard assessment.

In this case, the system attenuates flows to match pre-development peak flow rates under fully homogeneous storm conditions. This modelling approach represents a conservative, worst-case scenario for the catchment, where rainfall occurs evenly across all contributing areas.

While it is acknowledged that spatially varied storms may influence localised flood behavior, the post-development discharges are throttled through attenuation ponds and released at controlled rates. This means that any increase in downstream flooding due to storm spatial distribution would be less severe than the fully contributing homogeneous storm scenario already assessed.

Given this, further modelling of spatially varied storm patterns is not considered necessary, as it is not expected to alter the conclusions regarding downstream flood hazard or system performance.

d) The Applicant has not assessed the potential impact on maximum / frequency of predicted flood hazard for shorter duration storms, i.e. which are not 24 hours in length, especially where the duration of the event is aligned with the time of concentration (**ToC**) of the development site. This is considered important as the storm related to the ToC of the development is expected to be most likely to have effects on downstream flooding.

The applicant acknowledges the concern regarding shorter-duration storms aligned with the site's time of concentration (ToC). However, the stormwater modelling follows the Auckland Council Stormwater Code of Practice 2025 (Version 4), which uses a 24-hour design storm as the standard for flood hazard assessment. This duration is widely accepted because it captures the full runoff response, encompassing shorter, high-intensity events, thus providing a conservative, worst-case scenario.

The development includes attenuation ponds that regulate peak flows to match pre-development conditions across key AEP events (1%, 10%, and 50%). This attenuation smooths flow peaks and controls discharge rates, effectively decoupling site runoff peaks from specific storm durations, including those aligned to the ToC.

Shorter duration storms generally produce lower total runoff volumes than 24-hour storms of the same AEP, and the attenuation system manages these flows to prevent downstream flooding. Given this, and the conservative nature of the modelling, further assessment of shorter duration storms is not considered necessary.

If required, the model can be adapted to simulate shorter storm durations, but such analysis is unlikely to materially change downstream flood risk outcomes.

1.1.6. Clarification is required of the vertical datum used in design: NZVD2016 or AUK46. The engineering drawings contain conflicting vertical datums - some sheets state levels are in NZVD2016, while others state AUK46. Given the flatness of the Site, even small differences between these datums could significantly affect hydraulic performance. Provision of the Digital Elevation Model (**DEM**) used in the Applicant's analysis is required as we are getting significant discrepancies between our generated DEM and the culvert invert information provided.

All proposed levels are in accordance with NZVD2016. All sheets will be updated accordingly.

1.1.7. The flood modelling lacks sensitivity analysis of key design parameters, such as Curve Number (CN) and other catchment parameters. Given the existing extensive and significant flood risk, a sensitivity analysis is required to understand the appropriateness and range of likely outcomes based on realistic upper and lower bound design parameters. In particular, the underlying peat soils are known to have extremely high variability in infiltration rates.

A Curve Number (CN) value of 74 has been adopted in the flood modelling not only to maintain consistency with the design parameters used in the design of existing stormwater infrastructure, including the Awakeri Wetlands Stage 1, and the Papakura Integrated Catchment Management Plan (ICMP), but also because it appropriately reflects the hydrological response of the underlying peat soils. Geotechnical observations indicate that the top crust of the peat soil can harden when exposed to oxygen, reducing infiltration and causing surface runoff to increase. This behavior supports the use of a relatively high CN value of 74, which accounts for the tendency of these soils *to shed water rather than absorb it. This CN value is based on calibrated modelling inputs previously accepted by Auckland Council and other regulatory authorities, developed from local land use, soil characteristics, and hydrologic conditions. The application of CN 74 in existing infrastructure such as the Awakeri Wetlands Stage 1 has demonstrated effective performance under a range of storm events. Maintaining this value ensures alignment with catchment-wide planning assumptions and provides a realistic, conservative basis for runoff estimation.*

Papakura ICMP screenshot below

Runoff Curve Numbers

Typical runoff curve numbers were provided in TP108 for a range of land cover types and typical soils in the Auckland Region. At Central Papakura, typical surficial soil types include the Puketoka Formation and the Takanini Black Swampy Peat. The Puketoka formation is of alluvium including volcanic ash, sands, gravel and East Coast Bays Formation soils. The Takanini Black Swampy Peat is known to have the characteristics of typical silty clay soil, with typical hydraulic conductivity K values ranging from 1 x 10^{-8} to 1 x 10^{-9} m/s from on site tests undertaken recently. A runoff curve number of **61** was selected for the Puketoka Formation soils and **74** for the Peat soils. A runoff curve number of **98** was chosen for all impervious surfaces.

In the TP108 runoff model, the runoff hydrograph is calculated using the standard SCS synthetic unit hydrograph as in the original TR55.

U:\COO\IES\StormWaterModels\NewStructure\Modelling Office\Larry Shui\Papakura_Legacy_CMP\ICMP_Rev\Central_Papakura\Central Papakura ICMP - FHM Publication Final.doc

Awakeri Wetland Stage 1 Design report

Design curve numbers

An SCS Curve Number (CN) of 74 has been used for peat soils for the predevelopment scenario as per the Papakura ICMP, as per TP108. The post-developed scenario also uses a CN of 74 for pervious areas based on likely imported fill characteristics or existing peat soils as per above.

This aligns with the curve numbers being used by developers in the catchment.

Geotechnical observations indicate that the top crust of the soil can harden when exposed to oxygen and sheds water. This gives further support to using a curve number of 74.

1.1.10 Given the insufficient hydraulic analysis presented in the application, Healthy Waters department of Auckland Council is currently updating the catchment-wide flood models to assess the effects of the development. However, as described above, there is missing information which prevents the Healthy Waters department from understanding the details of the Applicant's proposal, which limits their ability to prepare the model. We therefore request that the Applicant either provides:

a) their hydraulic model files and Digital Elevation Model; or

b) provide all of the hydraulic model input information and assumptions in a suitable format that can be used to prepare an independent hydraulic model of the Applicant's development.

Please refer to the following OneDrive Link for requested data: https://ipccnz-my.sharepoint.com/:f:/g/personal/yotsakw_maven_co_nz/EuDLdd-iZE1JsG_r1OoRj0MBDUnx99oSqSkbTi1uqdoFyQ?e=4TkLq0

1.2. Stormwater Assets

Description of Missing Information

1.2.6. The proposed earthworks include the redistribution of large volumes of cut and fill materials across the Site. Much of the proposed development will be supported on peat soils that are highly susceptible to consolidation settlements. There is no assessment of settlement caused by the proposed earthworks – the Applicant has only presented information on possible settlement effects from building loads. There is brief mention of this risk in Section 8.4.1 of the geotechnical report which recommends that an assessment is undertaken at the EPA application stage, however this assessment has not yet occurred and is fundamental to understanding the effects of the proposed development and the impact on the long-term performance of stormwater assets, infrastructure and properties.

1.2.7. There are discrepancies between the visuals shown in the Masterplan compared to the Engineering drawings which are misleading. The masterplan shows a meandering stream-like feature running through the centre of the development, whereas the engineering drawings show this as a long, flat, wide, bare area utilised for stormwater attenuation. It may be envisaged that during the implementation stage the engineering design would be developed to create something resembling the masterplan, however this would require adding some gradient to the green corridor, which will reduce the storage volume, significantly change the earthworks levels and therefore could compromise flood management or require the green corridor to be much wider than shown which could affect the feasibility of the development. The engineering drawings should be updated to reflect a feasible waterway design to demonstrate that there is available space and capacity in the corridor provided.

The proposed low-flow channel is intended to be located below the invert level of the main channel and therefore is expected to retain permanent water, except where infiltration occurs prior to discharge. As it sits below the main channel's invert, the presence of the low-flow channel will not affect the overall conveyance capacity or hydraulic performance of the main channel.

1.3. Water Quality

Description of Missing Information

1.3.1. An assessment of effects on downstream water quality treatment devices such as the McLennan Wetland is required. No such assessment has been undertaken as yet. The McLennan Wetland provides water quality treatment for a large portion of the Pahurehure Inlet catchment. The Applicant proposes to increase the catchment draining to the McLennan Wetland significantly (by approximately 55 hectares). Although the Applicant proposes to treat stormwater on-site, increasing flows to downstream treatment devices can reduce their efficiency, therefore having adverse effects on the water quality of downstream receiving environments.

The Existing McLennan Upper Wetland has been constructed to provide water quality treatment to 326ha of catchment. 57.3ha of this includes a portion of the proposed Sunfield development site that is situated in the existing FUZ zone. The development proposes to add an additional 54.9ha (Catchment A3) to the McLennan Upper Wetland. Water quality treatment to GD01 standard for this additional catchment will be provided by Stormwater Pond 4 with the proposed development, therefore the additional catchment discharging to the McLennan Upper Wetland is considered to be clean water and therefore doesn't need to be treated for water quality by the McLennan Wetland.

The existing wetland can continue to provide its intended level of water quality treatment when additional volume of clean water is added upstream, as long as the flow rate into the wetland remains unchanged. This arrangement maintains pollutant load, improves dilution, preserves retention time, *and enhances the physical and biological treatment capacity of the wetland system.*

1. No Increase in Pollutant Load

Since the flow rate of pollutant-bearing water remains constant, the total mass of pollutants entering the wetland does not change. The wetland is therefore treating the same contaminant load as before, and its treatment systems (e.g., vegetation, microbes, sedimentation zones) are not stressed beyond their design capacity.

2. Enhanced Dilution and Lower Concentrations

The upstream addition of clean water reduces the concentration of pollutants in the mixed water entering the wetland. This dilution effect improves treatment efficiency:

- *Biological processes (e.g., microbial degradation, plant uptake) perform better at lower pollutant concentrations.*
- *Sedimentation of particulates is often more effective when fine particles are less densely packed or flocculate more easily.*

3. Stable Hydraulic Retention Time (HRT)

Because the flow rate into the wetland remains the same, the hydraulic retention time does not decrease. Retention time is critical for effective treatment, as it governs how long water remains in the system for settling, biological uptake, and transformation processes.

4. No Hydraulic Overloading or Short-Circuiting

With no increase in total flow entering the wetland, there is no risk of bypass, short-circuiting, or reduced residence time that could otherwise compromise treatment performance.

1.3.2. An options assessment must be provided, detailing the options explored to determine the Best Practicable Option (BPO) for stormwater quality for each catchment area. This should include:

a) An evaluation of the various stormwater management devices and strategies.

Evaluation of Stormwater Management Device and Strategies

Water quality treatment for Papakura Stream – Eastern Catchment

Stormwater Devices Toolbox for Water Quality		
Activity	Water quality treatment target	Recommended devices
Residential communal car park or COAL	• Heavy metal, grease and oil • Suspended solids • Water Temperature	Catchment wide stormwater management device ➢ Wetland
Residential and commercial / industrial roof area	• Metal from roofing material • Organic debris from natural sources	Catchment wide stormwater management device ➢ Wetland
High contaminant generating car park (high-traffic industrial / commercial)	• Heavy metal, grease, and oil • Suspended solids • Water Temperature	Catchment wide stormwater management device ➢ Wetland
Public local Road	• Heavy metal, grease and oil • Suspended solid removal	Catchment wide stormwater management device ➢ Wetland

	• Water Temperature	
High use road	• Heavy metal, grease and oil • Suspended solid removal • Water Temperature	Catchment wide stormwater management device ➢ Wetland

Water quality treatment for Pahurehure Stream catchment – Western Catchment

Stormwater Devices Toolbox for Water Quality		
Activity	Water quality treatment target	Recommended devices
Residential communal car park or COAL	• Heavy metal, grease and oil • Suspended solids • Water Temperature	Catchment wide stormwater management device ➢ Wetland
Residential and commercial / industrial roof area	• Metal from roofing material • Organic debris from natural sources	Catchment wide stormwater management device ➢ Wetland
High contaminant generating car park (high-traffic industrial / commercial)	• Heavy metal, grease, and oil • Suspended solids • Water Temperature	Catchment wide stormwater management device ➢ Wetland
Public local Road	• Heavy metal, grease and oil • Suspended solid removal • Water Temperature	Catchment wide stormwater management device ➢ Wetland
High use road	• Heavy metal, grease and oil • Suspended solid removal • Water Temperature	Catchment wide stormwater management device ➢ Wetland

a) An assessment of the lifecycle costs of each option, including capital, maintenance, and rehabilitation costs over a 100-year period.

Lifecycle Cost

Raingarden (Bioretention Device)

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	\$450–\$750/m²	Includes design and construction
Maintenance	Annual	\$15–\$30/m²/year	Weeding, replanting, sediment removal, inspection
Rehabilitation	Every ~30 years	\$250–\$400/m²	Media replacement, pipe rehab, replanting

Wetland

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	\$200–\$400/m²	Includes design and construction
Maintenance	Annual	\$3–\$10/m²/year	Sediment removal, vegetation management, inspections
Rehabilitation	Every ~30 years	\$100–\$200/m²	Dredging, replanting, bank stabilization

Vegetated Swale

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	\$100–\$250/m²	Includes design and construction
Maintenance	Annual	\$3–\$8/m²/year	Mowing, weed control, sediment removal
Rehabilitation	Every ~ 30 years	\$50–\$100/m²	Soil restoration, replanting, sediment removal

Stormwater Filtration Systems

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	\$20,000–\$35,000 per unit	Includes Design and Construction
Maintenance	Annual	\$1,500–\$2,500 per unit/year	Cartridge replacement, sediment removal, inspection, cleaning, traffic control
Rehabilitation	Every ~50 years	\$20,000–\$30,000 per unit	Vault replacement or major refurbishment (structural + system components)

Cost Summary

Device Type	Capital	Maintenance (100 yrs)	Rehab	Total (100 yrs)
Raingarden (per m²)	\$450 – \$750	\$1,500 – \$3,000	\$750 – \$1,200	**\$2,700 – \$4,950**
Wetland (per m²)	\$200 – \$400	\$300 – \$1,000	\$300 – \$600	**\$800 – \$2,000**
Vegetated Swale (per m²)	\$100 – \$250	\$300 – \$800	\$150 – \$300	**\$550 – \$1,350**
Stormwater Filter System (per unit)	\$20,000–\$35,000	\$150,000–\$250,000	\$40,000–\$60,000	**\$210,000 – \$345,000**

1.3.3. The stormwater treatment proposal proposes a primary, secondary, and tertiary treatment train approach. It is noted that Awakeri Wetlands and the Existing McLennan Wetland is proposed for providing tertiary treatment for the catchment draining to the Pahurehure Inlet.

However, Stage 1 of the Awakeri Wetlands is not designed for water quality treatment and the McLennan Wetland was not designed for treating the additional catchment area proposed.

An assessment is needed to demonstrate how the primary, secondary, and tertiary water quality treatment options will be GD01 compliant to meet water quality objectives.

Proposed Stormwater Pond 4 provides water quality treatment in accordance with GD01 to the additional catchment discharging to the McLennan Wetland.

1.4. Stream Works

A large conveyance channel and secondary swales are being proposed to contain flood flows within the site. Containing 100-year flows into a single channel can create a massive amount of energy for erosion potential both within the channel and at the downstream receiving environment. The proposed development layout is based on the current size, location, and capacity of the constructed stream network. However, stream networks are dynamic and will respond to changes in hydraulics over time, by deepening, widening, and meandering. There is no consideration of these effects in the application.

It is unclear if the request is for the proposed internal SW network or the existing receiving environment SW network, or both.

It is also unclear what is being requested and how this fits into accepted best practice assessment criteria. The basis for mitigating stream and channel erosion for the Sunfield project has been meeting the requirements for SMAF 1. The applicant contends that this is sufficient to address the potential issue of instream/channel erosion.

The risk of erosion in stream channels is predominantly linked to velocity of flow, both the internal and external stormwater networks a very low velocity environments and therefore should not be at risk of accelerated erosion.

The development proposes to maintain the flow rate, water level, and flow cross-sectional area at the discharge points at levels equal to or lower than existing conditions. As such, no additional erosion risk is anticipated at the downstream receiving environment.

We note that a Geomorphic Risk Assessment was not carried out for Stage 1 of the Awakeri Conveyance Channel nor was this requested as part of the Resource Consent assessment for Stages 2 and 3.

For within the site, given that the site is predominantly flat, accordingly the proposed channel gradients are also relatively flat, resulting in low flow velocities that are unlikely to cause significant internal erosion. Nevertheless, to address any potential erosion risks, the detail design could incorporate energy dissipation measures such as grade control structures, check dams, and appropriately sized riprap at strategic locations. In addition, the channels will be stabilized using engineered linings or vegetation, as appropriate, to reduce shear stress along the channel surfaces.

Proposed strategies should:

a) Specify the type and scale of instream and stream margin work required to manage ecological and geomorphological impacts and ensure resilience to future flow changes.

b) Ensure that instream and stream margin work improve degraded channels over time or maintains high-value stream conditions where they exist.

c) Prioritise nature-based solutions and green infrastructure that are resilient and adaptable to climate and flow changes, rather than relying on permanent hard engineering solutions.

The applicant has confirmed they are happy to meet with Auckland Council to understand and discuss the request ahead of submitting a Stormwater Management Plan for the *development.*

1.4.1. The Applicant proposes to divert a 350 hectare upstream catchment around the proposed development site using a large open swale. The swale has a proposed width of 20-40m, 2.2km long, a 10m wide base, depth of between 2.18m - 7.36m, and an average longitudinal gradient of 0.4%. The swale has a flat base and 1:3 side slopes. The channel is proposed to be grassed, with subsoil drains under the base.

It is unlikely that such a channel would be feasible given that the 350 hectare upstream catchment is expected to have a permanent baseflow which has not been allowed for. There is mention that a low flow channel will be added during detailed design to form a natural stream. This is not something that can be left to detailed design because designing this corridor as a naturalised stream is likely to significantly change the dimensions, scale and form of the corridor, which will impact on the layout of the development. A design of the diversion stream is required which should include the considerations highlighted above in the Geomorphic Risk Assessment.

The primary function of the diversion channel is to serve as an engineered conveyance for stormwater. It is not intended to function as a stream with ecological value; therefore, we do not consider a baseflow channel to be necessary. The current channel cross-section is designed to accommodate any storm events up to the 100-year. If a low-flow channel is proposed during the detailed design phase, it would be situated below the invert level of the main channel and would retain water continuously, unless infiltration occurs prior to discharge.

5. Earthworks

5.1. Erosion and Sediment Control

Description of Missing Information

5.1.1. Details regarding the excavation / construction of the stormwater channels and Awakeri Wetland infrastructure through the site. Stages 2 and 3 are proposed by others, but it appears that stage 4 is part is this application.

Why is this Information Essential?

Construction of the stormwater channels associated with the Awakeri Wetlands project will impact a contractors' ability to appropriately manage construction water. i.e., clean and dirty water management via the construction & application of erosion and sediment control measures. Can the Applicant confirm the "status" of these works? i.e., will the earthworks for stages 4 and 5 of the wetlands project be done at the same time as the earthworks for the any of the 25 stages of this project? A clearer understanding of how the earthworks for the wetland areas affect the earthworks and any erosion and sediment control measure for the main project, is required to better understand how the overall ESCP will work.

Description of Missing Information

5.1.2. There are no staging details for the earthworks. The overall ESCP indicates six (6) stages, but the boundaries of these stages are not clear, nor is it clear whether how the cut-fill for each stage is determined. Further, the AEE states there will be approx. 25 stages with each stage taking approximately 12 months to complete, however, no earthworks specific details have been provided. Lastly, it is unlikely that an earthworks contractor will complete the cut to fill in either 6 or 25 stages.

It is likely that six stages of earthworks will be required to complete the bulk earthworks and land modification works.

The applicant has proposed a flexible delivery model that allows for staging boundaries to be modified to adapt to changing external factors through the life of the project.

Specific details will be provided for each stage through the submission of a stage specific Erosion and Sediment Control Plan as proposed in Conditions 22 – 26.

5.1.3. There's insufficient detail on the ESCPs for approximately half of the project. i.e., 21 sediment retention ponds are proposed in stages 2, 4 and 5 but no ponds are proposed in stages 1, 3 and 6.

Specific details will be provided for each stage through the substantive application of a stage specific Erosion and Sediment Control Plan as proposed in Conditions 22 – 26.

5.1.4. There is no comment regarding adaptive management of the overall earthworks area which is considered significant.

An Adaptive Management Plan can be included as an appendix to the ESCP or as a stand-alone document.

The applicant confirms acceptance of a condition to require this or the modification of an existing proposed condition to reflect the request.

Why is this Information Essential?

A more accurate estimate of the overall earthworks will allow proper assessment of the earthworks proposal.

5.2. General Comments

The proposed chemical treatment management plan (ChTMP) must also include how "pumped" water will be managed as pumping to SRPs or other treatment devices has been highlighted as a requirement due to the flat topography of the overall site.

This can be considered within both the Chemical Treatment Management Plan and the Erosion and Sediment Control Plan which would be submitted as per conditions 25 and 26.

There are typically two Erosion and sediment Control stages to a residential earthworks project. The first stage is bulk earthworks which is cut and fill to prepare the land for the second stage which is civil earthworks (minor cut and fill road and footpath construction, install services such as lighting and telecommunications, and stormwater and wastewater etc.). On a site with 25 "civil" stages, I would expect at least 25 different erosion and sediment control plans (one for each civil stage), and at least one for each of the 6 bulk earthworks stages. The plans provided barely scratch the surface of what is required. Will the Applicant agree to conditions that address the requirement for ESCPs for each area / stage of earthworks?

As per the response to 5.1.2, the applicant has proposed a flexible delivery model that allows for staging boundaries to be modified to adapt to changing external factors through the life of the project.

Specific details will be provided for each stage through the submission of a stage specific Erosion and Sediment Control Plan as proposed in Conditions 22 – 26.

This has been factored into the proposed conditions, with condition 8 outlining that the management plans may be submitted in parts or stages.

The cut fill plans are for the entire 244 ha but the staging plans are for areas much smaller than that. How does the proposed staging of the project work in relation to the overall cut and fill? This relates to my query above about "earthworks staging".

Please refer to the above response.

It would be ideal if the Applicant acknowledged that this is a significant project that will occur over 10-15 years, and that adaptive management is required. Conditions to this effect can be recommended. Alternatively, the Applicant could prepare an adaptive management plan (AMP) based on Auckland Council's Erosion and Sediment Control Adaptive Management Plan Guidance Document.

Please refer to the response to Item 5.1.4.

Overall, there is no clear methodology for the proposed earthworks, in particular with regard to the staging required. A significant portion of the site will require pre-loading and how this is to be done and how it relates to other areas of earthworks is also unclear. The application also states that stages of works may be undertaken concurrently, but again, no details are provided.

Please refer to the response in Item 5.1.2.

The erosion and sediment control methodology is extremely light on detail, is very generic and there is no supporting information to indicate that what is proposed from an erosion and sediment control point of view, can be done. The ESCP also shows dirty water diversions within stream channels. The plan is draft and very high level and therefore unlikely to ever be referred to, but it shows a lack of understanding of construction water management.

Please refer to the previous response and notwithstanding the information contained within the application, the proposed conditions, particularly condition 22 to 26, require an Erosion and Sediment Control Plan and a Chemical Treatment Management Plan require to outline the proposed works, requirements and monitoring regime. These plans will incorporate staging and methodologies.

Kind Regards

W. Moore

Will Moore
DIRECTOR
MAVEN ASSOCIATES LIMITED