

MAR07 Growth Area Flood Risk

Rangitikei District Council

Quality Control			
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Reviewed by		Date Issued	05/10/2026
Approved by		Revision No.	2.0
Project Number	26501		
Document Name	26501 261005 MAR07 Flood Hazard Assessment		

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Executive Summary

The MAR07 Growth Area comprises approximately 43.5 hectares in northwestern Marton and is affected by stormwater flooding conveyed through existing overland flow paths and ephemeral watercourses. Available Horizons Regional Council modelling indicates generally shallow flooding but does not cover the full growth area or upstream catchment and is likely to underpredict flooding. GHD's 1% AEP climate-change model identifies a broader flood extent and is suitable for high-level hazard screening, but not for setting site-specific design flood levels. Overall flood risk is generally low, with isolated areas of medium risk concentrated along an ephemeral watercourse and near the western detention dam. Development should avoid these areas where practicable and be supported by detailed hydrological and hydraulic modelling of the 0.5% AEP event. The modelling should inform site layout, stormwater attenuation, minimum floor levels, and safe access and egress. Plan Change provisions should also protect the capacity and operation of Horizons Regional Council's Tutaenui Scheme detention dam by preventing additional stormwater storage within its existing ponding area and maintaining a 4 m access corridor and a 4 m development setback from the dam toe. Dam-break flooding from the Marton water supply dams is not considered a constraint on the proposed Plan Change. However, Horizons Regional Council's modelling indicates that a breach of Tutaenui Scheme Dam W3 could inundate land in the south of the growth area; this land should either be excluded from the growth area or be subject to provisions prohibiting development.

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1 The Site

The MAR07 Growth Area covers approximately 43.5 hectares in northwestern Marton. It is bounded by the MAR01 Growth Area to the east and the MAR02 Growth Area to the south. Existing access is from Milne Street at the southeastern corner. Figure 1 shows the location of the growth area.

This report provides a high-level assessment of flood risk within the MAR07 Growth Area to inform the Proposed Plan Change. It reviews available flood modelling, relevant policy requirements, the implications of Horizons Regional Council's Tutaenui Scheme detention dam, access constraints, and potential dam-break effects. The assessment identifies matters that should be addressed through Plan Change provisions and subsequent subdivision and development design; it does not establish site-specific design flood levels.



Figure 1 Location of MAR07 Growth Area

Ground levels range from approximately 164.52 m to 180.30 m NZVD2016 and generally fall towards the southeast. An ephemeral watercourse crosses the site from the racecourse to the northwest and discharges through a culvert beneath Watson Street. Figure 2 shows the site topography.

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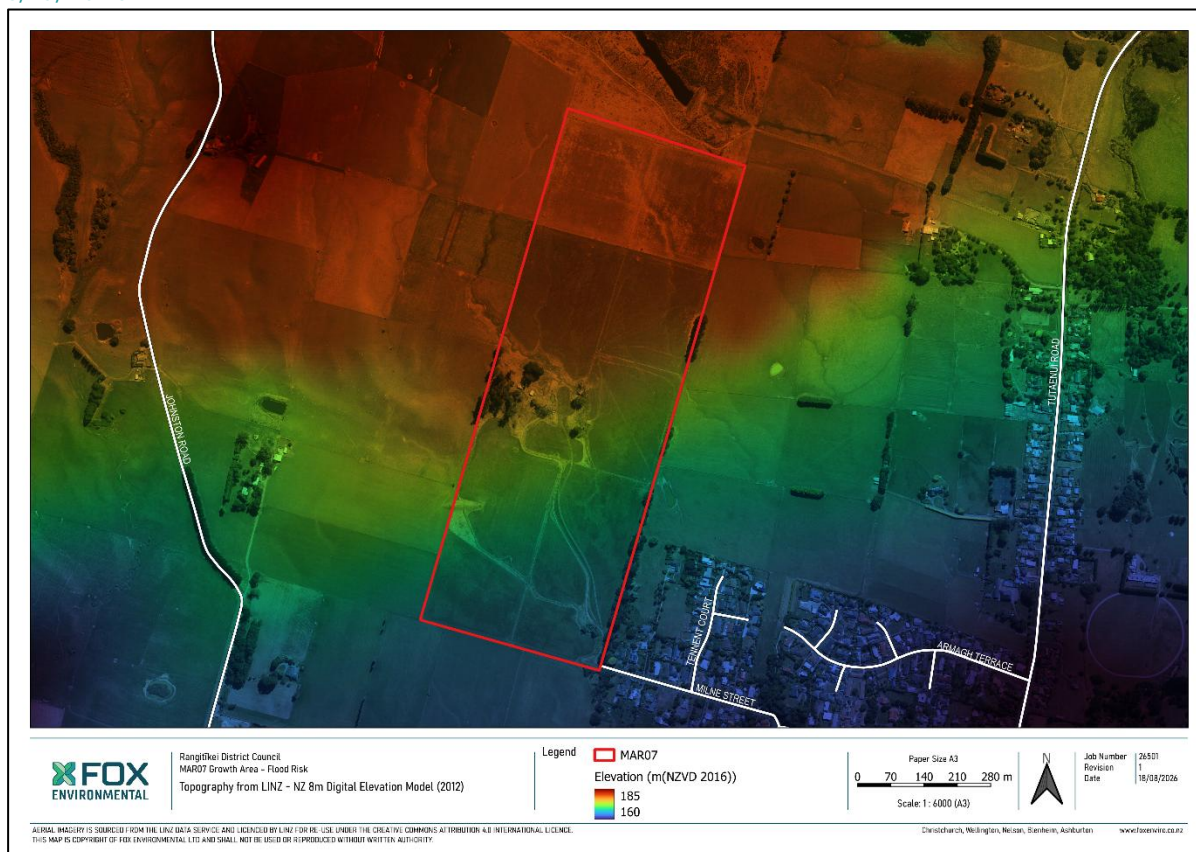


Figure 2 Topography of MAR07 Growth Area

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2 Background Information

In undertaking this assessment, the following information has been relied upon:

- 0.5% AEP¹ flood depth results from 2017 modelling, provided by Horizons Regional Council
- RDC 3 Waters Growth Strategy, Growth Assessment (GHD Limited, 2026).

¹ Annual Exceedance Probability (AEP) refers to the likelihood that a specific flood event will be equalled or exceeded in any given year, expressed as a percentage. For example, a 1% AEP event has a 1 in 100 chance of occurring in any year.

3 Modelled Flood Risk

3.1 Horizons Regional Council Modelling

Horizons Regional Council has modelled the 0.5% AEP (200-year) flood event for the Tutaenui Stream. The results are shown in Figure 3. Within the MAR07 Growth Area, the mapped flooding appears to be associated primarily with stormwater generated across the site during the 0.5% AEP event, and much of the predicted inundation is less than 200 mm deep.

The model shows limited flooding in four ephemeral watercourses in the eastern half of the site. However, the model extent does not cover the full MAR07 Growth Area or its entire upstream catchment. The results are therefore likely to underpredict flood extent and depth within the growth area.

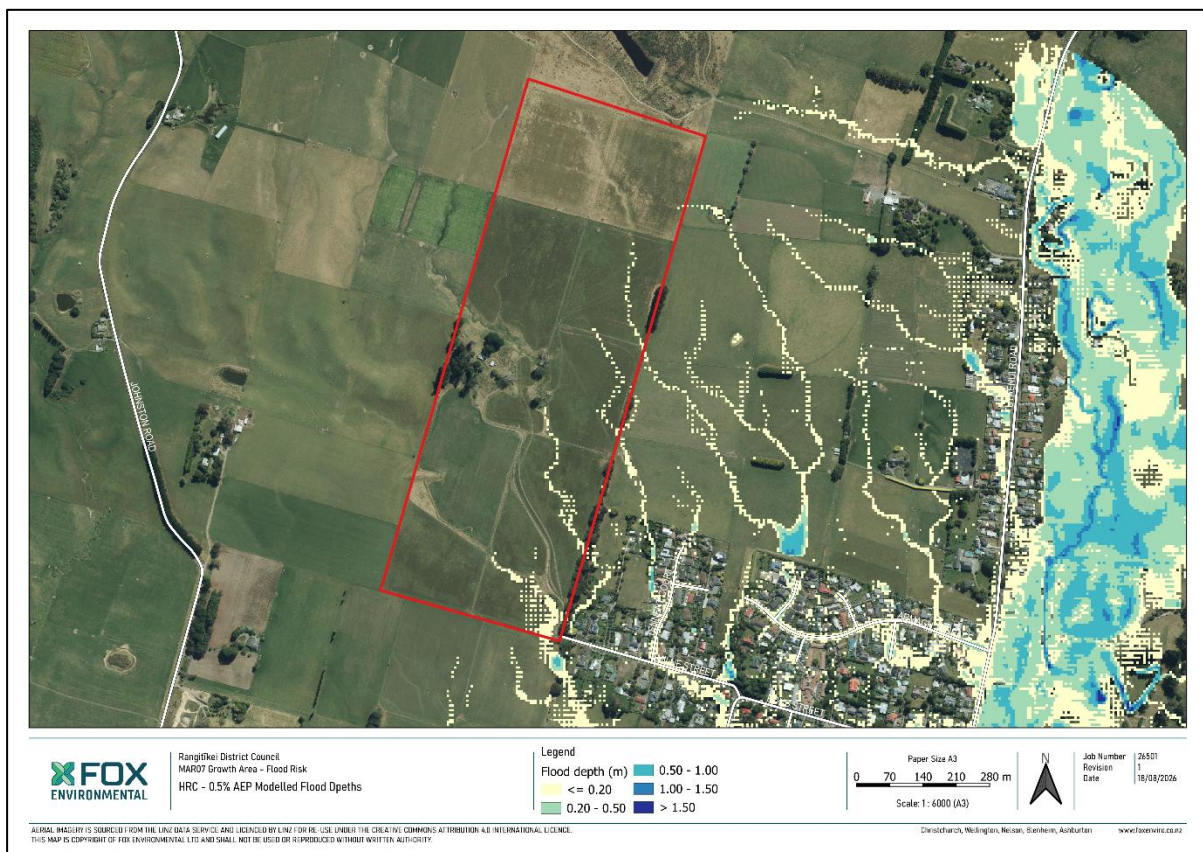


Figure 3 HRC - 0.5% AEP Modelled Flood Depths

3.2 GHD Modelling

GHD modelled stormwater flooding for the 1% AEP event with climate change under RCP 6.0 to inform the three waters growth assessment. The model results are shown in Figure 4.

The GHD model represents stormwater generated across the site and its upstream catchment during the 1% AEP event with climate change under RCP 6.0. It identifies a greater proportion of the growth area as flood-prone than the HRC model, probably because the GHD model includes a larger part of the upstream catchment.

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Because the GHD model represents stormwater entering the growth area from a larger upstream catchment, it provides a conservative basis for identifying the extent and general pattern of flood hazard for the Proposed Plan Change. However, it is not suitable for establishing site-specific design flood levels.

The GHD model includes an allowance for climate change but represents a 1% AEP event, rather than the 0.5% AEP event required to be considered under the One Plan, as discussed in Section 4. It is also understood to have been developed as a rapid hazard model.

Rapid hazard models are generally developed for broad-scale screening and the strategic identification of potentially flood-prone areas, rather than for establishing site-specific design flood levels. Their simplified representation of catchment hydrology, drainage infrastructure, hydraulic controls and local topography introduces uncertainty into predicted peak water levels. Results may also be sensitive to assumptions about rainfall inputs, boundary conditions, surface roughness, culvert capacity, buildings and flow paths. The GHD model is therefore suitable for identifying the likely extent and general pattern of flooding, but its results should not be relied on for detailed development design or for setting minimum floor levels.

Accordingly, subdivision and development within the MAR07 Growth Area should be supported by detailed hydrological and hydraulic modelling that represents the 0.5% AEP event and informs site layout, stormwater management, floor levels and safe access and egress.

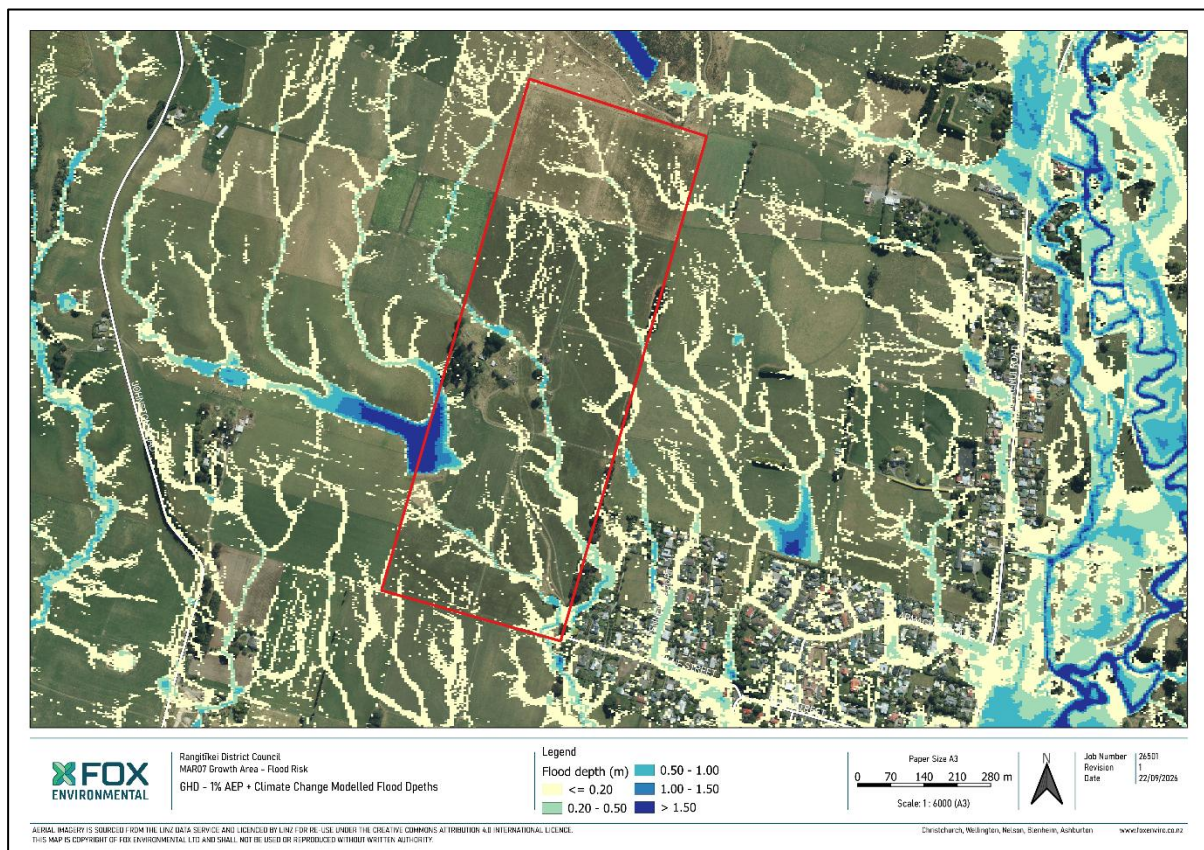


Figure 4

GHD - 1% AEP with Climate Change Modelled Flood Depths

4 Horizons Regional Council – One Plan Policies

Horizons Regional Council's information sheet, Flood Hazards and the One Plan, supports territorial authorities in implementing the natural-hazard policies in the One Plan. It states that subdivision in flood-prone areas without protection from at least the 0.5% AEP event should be avoided. The information sheet identifies Bulls as an example where subdivision in flood-prone areas is strongly discouraged, as shown in Figure 5.

EXAMPLE		OCCUPIED STRUCTURE		NON-HABITABLE STRUCTURE		SUBDIVISION
		NEW	INCREASE SCALE	NEW	INCREASE SCALE	NEW
FLOODWAYS	Mākirikiri, Moutoa, Reids Line, Taonui Basin.	Avoid	Avoid	Avoid (unless functional necessity)	Avoid (unless functional necessity)	Avoid
INUNDATED IN A 0.5% AEP (1:200 YR) FLOOD EVENT	Urban ≥ 0.5% AEP flood protection, e.g. Palmerston North, Balgowie Industrial.	Allow	Allow	Allow	Allow	Allow
	Urban ≥ 1.0% AEP ≤ 0.5% AEP flood protection, e.g. Lower Manawatu Scheme, Ashhurst.	Allow (with floor level and access mitigation)	Allow (minor extensions or larger extensions with floor level and access mitigation)	Allow (recommended floor level)	Allow (recommended floor level)	Discourage (advocate to avoid)
	Urban ≤ 1.0% AEP flood protection, e.g., Marton, Bulls, Ohakune.	Discourage (except in established residential areas with floor level and access mitigation)	Allow (minor extensions or larger extensions with floor level and access mitigation)	Allow (recommended floor level)	Allow (recommended floor level)	Discourage (strongly advocate to avoid)
	Rural ≥ 0.5% AEP flood protection	Allow	Allow	Allow	Allow	Allow
	Rural ≥ 1.0% AEP ≤ 0.5% AEP flood protection	Allow (with floor level and access mitigation)	Allow (minor extensions or larger extensions with floor level and access mitigation)	Allow (recommended floor level)	Allow (recommended floor level)	Discourage (advocate to avoid)
	Rural ≤ 1.0% AEP flood protection	Discourage (except with floor level and access mitigation)		Allow (recommended floor level)	Allow (recommended floor level)	Discourage (strongly advocate to avoid)

Figure 5

Examples from HRC's "Flood Hazards and the One Plan"

Horizons Regional Council have advised that:

"Horizons [One Plan](#) Policy [RPS-HAZ-NH-P10](#) (Policy 9-2) generally discourages new habitable buildings or extensions to existing habitable buildings in areas that are likely to be inundated during a 0.5% AEP flood event. Where the flood hazard cannot be avoided, Policy [RPS-HAZ-NH-P10](#) (Policy 9-2) states that the risk must be mitigated. Flood mitigation for habitable dwellings (including attached garages) includes having a finished floor level that includes reasonable freeboard of 500mm above the 0.5% AEP flood surface, and ensuring that there is safe access to and from the property during a flood event. Reasonable freeboard is considered for habitable dwelling to be 500mm as per New Zealand Standard 4404:2010 – Land Development and Subdivision Infrastructure. This freeboard requirement is to account for factors which cannot be included in the model, such as waves and debris effects. If the water flow paths cannot be avoided, then Horizons recommends that the finished floor levels for habitable dwellings to be elevated to be 500mm above the 0.5% AEP

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surface. The finished floor level needs to be based on the original ground level prior to any land disturbance works. Safe egress and access will need to be easily achieved for habitable dwellings and workplaces. Access between habitable structures and an identified safe area, where safe evacuation may be carried out (preferably ground that will not be flooded), must be a safe wading zone in a 0.5% AEP flood event. This would normally be an access way that would not be covered by more than 0.5 m of water in a 0.5% AEP flood event, but the depth of the water will vary depending on the speed of the flood flow. Please note that as per the Standard, reasonable freeboard for a commercial and industrial buildings is a minimum height of 300mm and reasonable freeboard for non-habitable residential buildings and detached garages is a minimum height of 200mm."

5 Mitigations Required to Address Flood Risk

The identified flood risk is associated with stormwater flooding rather than fluvial flooding from the Tutaenui Stream or Rangitikei River. GHD identified the following stormwater management requirements:

"There are existing overland flow paths from the northwest to southeast that need to be addressed during the development of the area.

There is a large existing ponding area located on the western boundary of the MAR07 growth area that may be formalised as a detention area prior to development

MAR07 growth area contains a total flood volume of 18,186 m³ within the growth area boundary. This flood volume and any additional runoff volume generated due to the development to be managed within the growth area utilising new attenuation pond(s) to minimise flood effects on the downstream urban area"

The ponding area noted by GHD is associated with one of Horizons Regional Council's Tutaenui Scheme Detention Dams and is discussed in more detail in Section 7.

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6 National Policy Statement for Natural Hazards (NPS-NH)

The National Policy Statement for Natural Hazards (NPS-NH) took effect on 15 January 2026. It requires a risk-based, proportionate approach to managing natural hazards associated with land use, subdivision and development. Natural hazard risk must be assessed by considering:

- The likelihood of a natural hazard event occurring, in accordance with Figure 7; and*
- The consequence of a natural hazard event for life and property, in accordance with Figure 8"*

		Likelihood Level						
		Almost Certain	Very Likely	Likely	Possible	Unlikely	Rare	Very Rare
ARI (years)		up to 10	10-20	20-50	50-100	100-500	500-5000	> 5000
AEP		10% or more	10% to 5%	5% to 2%	2% to 1%	1% to 0.2%	0.2% to 0.02%	< 0.02%
Consequence Level	Catastrophic	Very High	Very High	Very High	High	Medium	Medium	Medium
	Major	Very High	Very High	High	High	Medium	Medium	Medium
	Moderate	High	High	High	Medium	Medium	Low	Low
	Minor	Medium	Medium	Medium	Medium	Low	Low	Low
	Negligible	Low	Low	Low	Low	Low	Low	Low

Figure 6 Risk Matrix (reproduced from [National Policy Statement for Natural Hazards 2025: December 2025 | Ministry for the Environment](#))

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Likelihood level	Annual exceedance probability (AEP)	Average recurrence interval (ARI) or 'return period'
Almost certain	10% or more	Up to and including 10 years
Very likely	10% to 5%	Over 10 and up to and including 20 years
Likely	5% to 2%	Over 20 and up to and including 50 years
Possible	2% to 1%	Over 50 and up to and including 100 years
Unlikely	1% to 0.2%	Over 100 and up to and including 500 years
Rare	0.2% to 0.02%	Over 500 and up to and including 5,000 years
Very rare	less than 0.02%	More than 5,000 years

Figure 7 Likelihood Table (reproduced from [National Policy Statement for Natural Hazards 2025: December 2025 | Ministry for the Environment](#))

Consequence level	Damage to property	Potential for injury or fatalities
Catastrophic	Severe damage to land and building(s), potential for collapse or total destruction of structures. Building(s) need to be demolished, rebuilt or relocated.	High threat to life safety, with probable fatalities and/or critical injuries.
Major	Major damage to land and building(s), including structural damage. Loss of use and substantial repair required.	Unsafe for people, with potential for many injuries, or critical injuries and/or fatalities.
Moderate	Some damage to land and non-structural damage to building(s). Limited loss of use, repairs required.	Unsafe for people, with potential for injuries, although expected to be minor.
Minor	Minor damage to land and building(s). No loss of use, minimal repairs required.	Isolated minor injuries possible.
Negligible	No loss of use, no building repairs required.	No injuries.

Figure 8 Consequence Table (reproduced from [National Policy Statement for Natural Hazards 2025: December 2025 | Ministry for the Environment](#))

The Australian Rainfall and Runoff (ARR) Guidelines Book 6 – Flood Hydraulics (Coombes & Roslyn, 2019) discusses flood hazard in terms of floodplain management. It states that “the primary hazard is the result of a flood event that

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has the potential to cause damage or harm to the community.” In this regard the magnitude of a flood hazard can be influenced by several factors, including:

- Depth of floodwaters;
- Velocity of floodwaters;
- Combination of depth and velocity of floodwaters;
- Isolation during a flood;
- Effective warning time; and
- Rate of rise of floodwater

The ARR suggests that the Combined Flood Hazard Curves (Smith, Davey, & Cox, 2014), shown in Figure 9, can be used as a general classification of flood hazard on a floodplain.

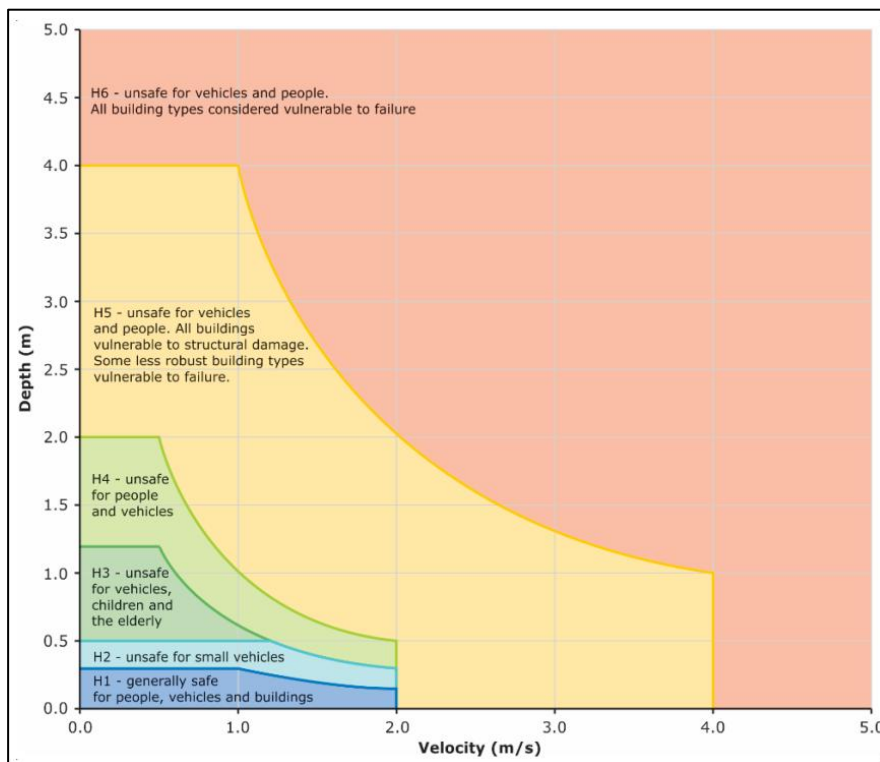


Figure 9 Combined Flood Hazard Curves (Smith et al., 2014)

The combined curves in Figure 8 are divided into hazard classifications linked to specific vulnerability thresholds, as described in Table 1. The corresponding depth, velocity, and depth-velocity limits are provided in Table 2.

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings
H2	Unsafe for small vehicles
H3	Unsafe for vehicles, children and the elderly
H4	Unsafe for vehicles and people
H5	Unsafe for vehicles and people. All buildings subject to structural damage. Some less robust buildings subject to failure
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

Table 2

Combined Flood Hazard Curves - Vulnerability Thresholds Classification Limits

(Smith et al., 2014).

Hazard Vulnerability Classification	Limiting Still Water Depth – D (m)	Limiting Velocity – V (m/s)	Classification Limit (D and V in combination)
H1	0.3	2.0	$D*V \leq 0.3$
H2	0.5	2.0	$D*V \leq 0.6$
H3	1.2	2.0	$D*V \leq 0.6$
H4	2.0	2.0	$D*V \leq 1.0$
H5	4.0	4.0	$D*V \leq 4.0$
H6	-	-	-

Both the NPS-NH and ARR describe vulnerability and consequence in terms of risks to people and property. Table 3 compares the two frameworks and indicates that the ARR hazard vulnerability classifications are broadly analogous to the NPS-NH consequence levels.

NPS-NH			ARR	
Consequence Level	Damage to Property	Potential for injuries or fatalities	Hazard Vulnerability Classification	Description
Catastrophic	Severe damage to land and building(s), potential for collapse or total destruction of structures. Building(s) need to be demolished, rebuilt or relocated.	High threat to life safety, with probable fatalities and/or critical injuries.	H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.
Major	Major damage to land and building(s), including structural damage. Loss of use and substantial repair required.	Unsafe for people, with potential for many injuries, or critical injuries and/or fatalities.	H4 & H5	H4 - Unsafe for vehicles and people H5 - Unsafe for vehicles and people. All buildings subject to structural damage. Some less robust buildings subject to failure
Moderate	Some damage to land and non-structural damage to building(s). Limited loss of use, repairs required.	Unsafe for people, with potential for injuries, although expected to be minor.	H3	Unsafe for vehicles, children and the elderly
Minor	Minor damage to land and building(s). No loss of use, minimal repairs required.	Isolated minor injuries possible.	H2	Unsafe for small vehicles
Negligible	No loss of use, no building repairs required.	No injuries.	H1	Generally safe for vehicles, people and buildings

6.1 1% AEP + Climate Change Flood Risk

Under Figure 6, the likelihood of a 1% AEP flood event with climate change is classified as “unlikely”. The GHD model results were used to classify flood consequences using the criteria in Tables 2 and 3. These consequence classifications were then combined with the likelihood classification using the NPS-NH risk matrix in Figure 5. The resulting flood risk classifications are shown in Figure 10.

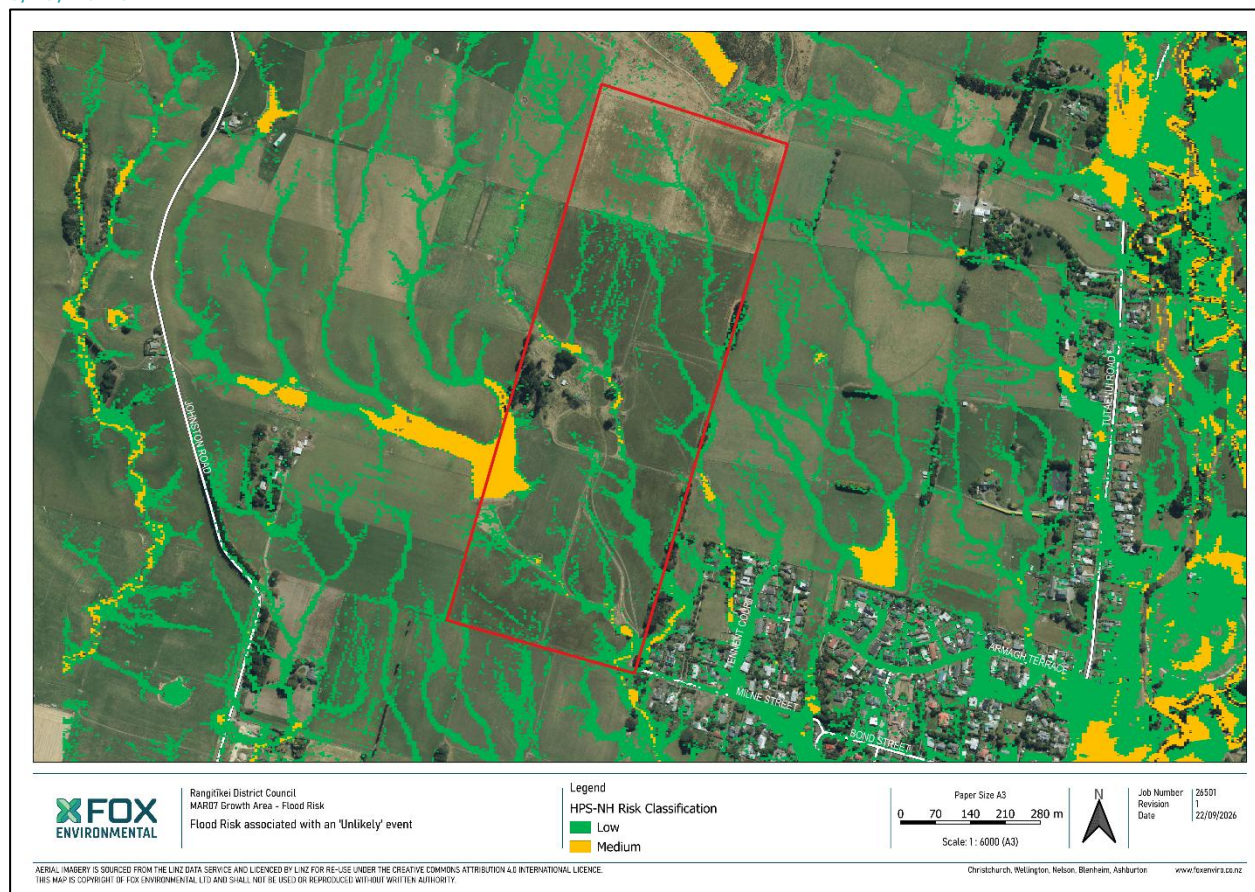


Figure 10 Flood Risk Classification, Unlikely Scenario

6.2 Flood Hazard Classification Discussion

The flood hazard was classified for the NPS-NH “unlikely” likelihood category. More frequent events have not been modelled; however, the available modelling indicates generally shallow flood depths, and their risk classifications are not expected to exceed those assigned to the “unlikely” scenario. More extreme events have not been assessed because information on their likely extent, depth, velocity and consequences is unavailable. The classifications should therefore be treated as a high-level indication of risk and not as a substitute for the detailed 0.5% AEP assessment required to support development design.

Figure 10 indicates that flood risk is generally low across the MAR07 Growth Area. Isolated areas of medium risk occur primarily along an ephemeral watercourse and should be avoided or specifically addressed through site layout and detailed design.

An area of ponding on the western boundary has a medium risk classification. It is associated with a detention dam managed by Horizons Regional Council and is discussed further in Section 7.

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7 Horizons Tutaenui Scheme Detention Dams

A detention dam managed by Horizons Regional Council as part of the Tutaenui Scheme is located on the western boundary of the MAR07 Growth Area. Figure 11 shows the dam and the associated ponding area currently designated in the District Plan.

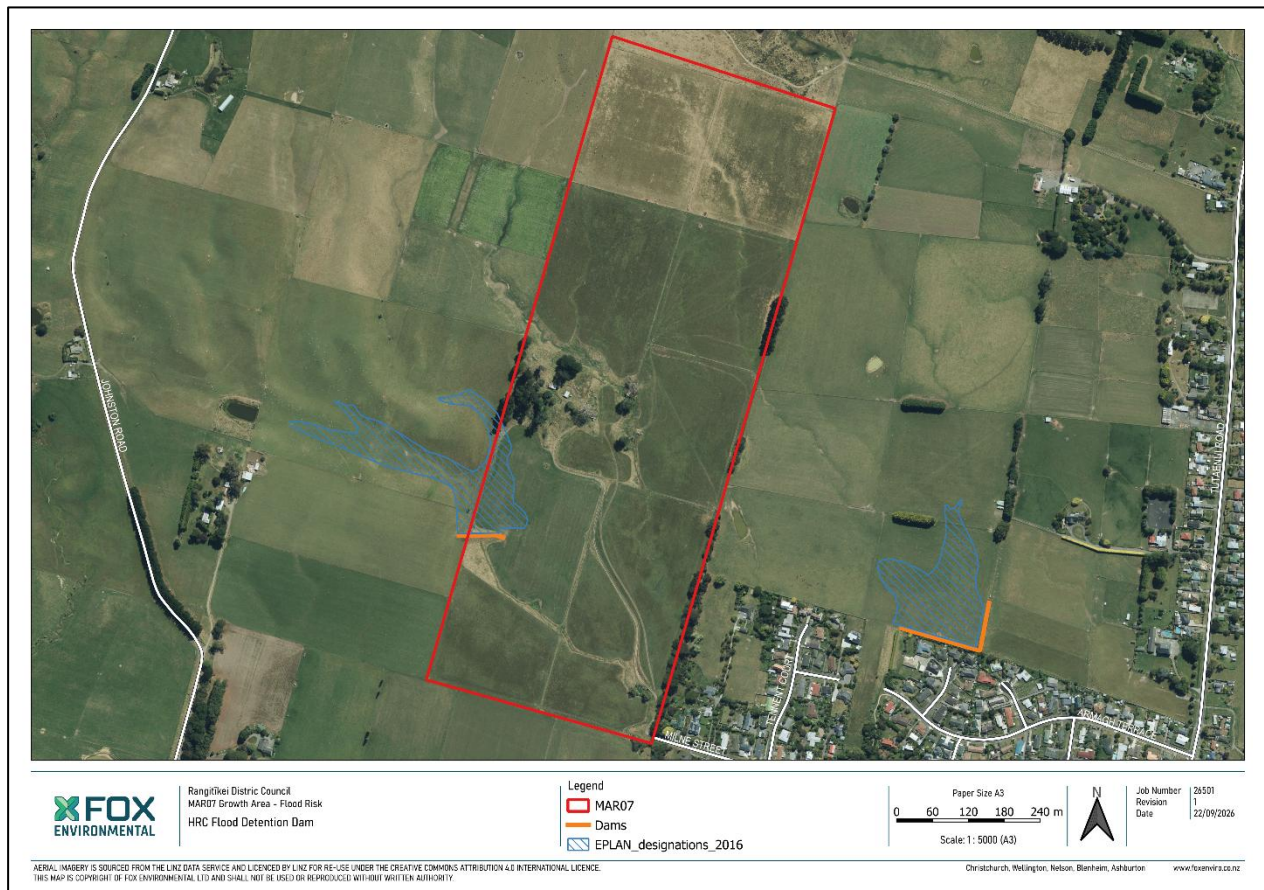


Figure 11 HRC Flood Detention Dam

The ponding area behind the dam is referred to by GHD where it is stated:

“There is a large existing ponding area located on the western boundary of the MAR07 growth area that may be formalised as a detention area prior to development”

Horizons Regional Council’s submission on the Proposed Plan Change indicates that the dam forms part of the Tutaenui Scheme flood-management infrastructure protecting urban Marton. Plan Change provisions should therefore ensure that development does not reduce the dam’s capacity or effectiveness. In particular, the existing ponding area behind the dam should not be used to manage any additional stormwater generated by development.

Horizons Regional Council also requires safe and practical access for operation and maintenance of the detention dam to be protected through the Plan Change provisions. Discussions with HRC indicate that this requires a 4 m-wide access corridor and a 4 m development setback from the toe of the dam.

8 Site Access

Horizons Regional Council's One Plan requires flood risk to people and property to be avoided or mitigated. Where development is proposed within an area affected by the 0.5% AEP flood event, this includes ensuring that safe access to and egress from habitable buildings and workplaces can be achieved during the flood. The access route should connect each development site to an identified safe area and must be assessed having regard to both the depth and velocity of floodwater, rather than flood depth alone.

Accordingly, the Plan Change provisions should require subdivision and development proposals to demonstrate, through detailed flood modelling and design, that safe access and egress will be available during the 0.5% AEP flood event. The assessment should cover the full route between proposed habitable buildings or workplaces and an identified safe area. Roads, crossings, earthworks and other mitigation measures should maintain overland flow paths and flood-conveyance capacity and should not increase flood risk elsewhere.

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9 Flood Hazard Associated with Breaches of the Marton Dams

The potential flood hazard associated with breaches of the Marton water supply dams has also been considered. Stantec (2025) modelled a range of dam-breach scenarios and found that none would inundate or otherwise affect the MAR07 Growth Area. Dam-break flooding is therefore not considered a constraint on the proposed Plan Change.

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10 Flood Hazard Associated with Breaches of Horizons' Tutaenui Scheme Dams

Horizons Regional Council has modelled a breach of Tutaenui Scheme Dam W3 as part of its dam safety assurance programme. Figure 12 shows the modelled inundation extent relative to the MAR07 Growth Area.

Figure 12 indicates that a breach of Dam W3 could inundate land in the south of the MAR07 Growth Area. It is recommended that this area should either be excluded from the growth area or be subject to provisions prohibiting development.

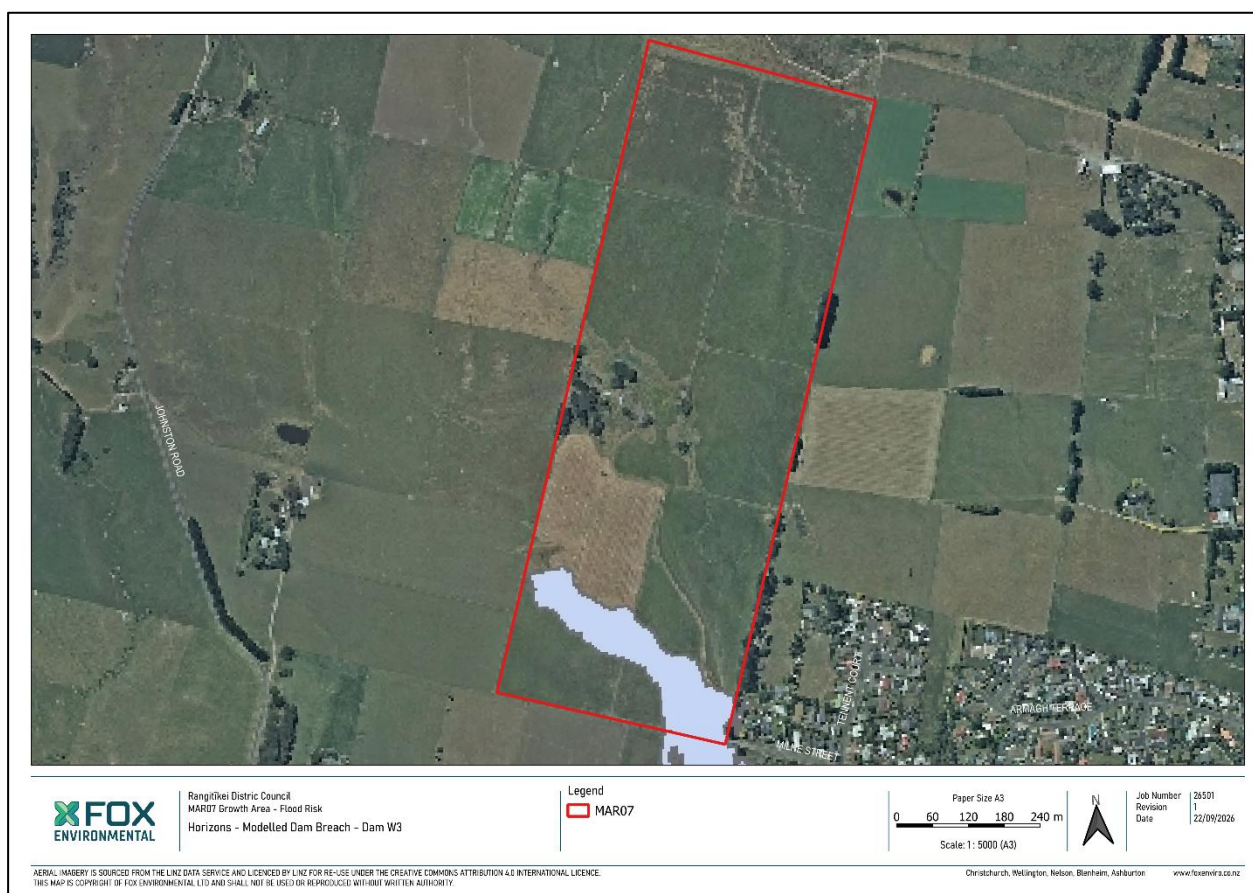


Figure 12

Dam Breach Modelling – Horizons' Tutaenui Scheme Dam W3

11 Summary

The available modelling indicates that flood risk across the MAR07 Growth Area is primarily associated with stormwater runoff, overland flow paths, ephemeral watercourses, and ponding behind the Horizons Regional Council detention dam. The HRC model is likely to underpredict flooding because it does not cover the full growth area or upstream catchment. The GHD model provides a conservative basis for strategic hazard mapping but is not suitable for establishing site-specific design flood levels. Flood risk is generally low, with isolated areas of medium risk that should be avoided or addressed through site layout and detailed design. Plan Change provisions should require detailed hydrological and hydraulic modelling of the 0.5% AEP event for subdivision and development, including assessment of climate change, upstream catchments, drainage infrastructure, culverts, overland flow paths, stormwater attenuation, minimum floor levels, and safe access and egress. Development should not reduce the capacity or effectiveness of the Tutaenui Scheme detention dam, should not rely on its existing ponding area for additional stormwater management, and should maintain a 4 m access corridor and a 4 m development setback from the dam toe. Modelling by Stantec indicates that breaches of the Marton water supply dams would not affect MAR07 and are not a constraint on the Proposed Plan Change. However, Horizons Regional Council's modelling indicates that a breach of Tutaenui Scheme Dam W3 could inundate land in the south of the growth area; this land should either be excluded from the growth area or be subject to provisions prohibiting development.

12 References

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