PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Tel+64 3 345 7100
Web www.pdp.co.nz

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104 Ryans Road: Flood hazard assessment

TO	Tim Carter	FROM	Ben Throssell
	Carter Group Limited	DATE	12/02/2025
RE	Flood hazard assessment		

1.0 Background

Carter Group Limited (CG or "the applicant") is seeking resource consent and other approvals under the Fast-track Approvals Act 2024 for the construction of an industrial subdivision at 104 Ryans Road ("the site"). The subdivision will involve the development of:

- Approximately 126 lots (of varying size); and,
- Construction of public roading, footpath and berm areas.

The proposed development will provide land suitable for the establishment of logistics, warehousing, light manufacturing, and other airport-related businesses capable of providing significant regional/ national economic benefit.

Pattle Delamore Partners (PDP) have been engaged to conduct a technical assessment of the site's susceptibility to flood hazards, my qualifications and experience are appended to the end of this letter. This assessment is distinct from stormwater management, which typically considers events up to a 2% Annual Exceedance Probability (AEP).[1] Instead, it evaluates the site's suitability for development by analysing extreme flood events, including the 0.2% AEP event.[2] The focus is on identifying potential high-hazard classifications that could impact the feasibility of development. Our assessment evaluates potential flood hazards, with a focus on identifying high-hazard classifications that may impact site suitability for development. The primary flood sources considered include:

- Waimakariri River Flooding – As one of Canterbury's largest rivers, the Waimakariri presents a significant flood risk to surrounding areas, particularly in extreme events where stopbanks may overtop or fail. A breach could result in widespread inundation in certain areas, with high-velocity flows posing a severe hazard to structures and safety.
- Localised Flooding and Runoff – Intense rainfall events can overwhelm local stormwater infrastructure, leading to ponding and surface water accumulation. If the site is in a low-lying area with poor drainage, prolonged inundation could occur, impacting ground conditions and development feasibility.

1 Equivalent to a 50 year Average Recurrence Interval.
2 Equivalent to a 500 year Average Recurrence Interval.

- Overland Flow Paths – Natural and modified overland flow paths channel stormwater across the landscape during heavy rainfall. If the site is within a mapped overland flow corridor, floodwaters may exhibit high depths and velocities, increasing erosion potential and structural risk.

The assessment considers whether there are viable flood scenarios that could result in high-hazard classifications (as defined by the ECan Regional Policy Statement[3], ECan RPS). A high hazard classification means flood depth, velocity, or duration could present safety concerns.

2.0 Site and Surrounding Environment

The site of proposed works (104 Ryans Road) is split across three lots:

- Lot 4 DP 22679
- Part Lot 1 DP 2837
- Part Lot 3 DP 22679

The site borders the southern boundary of Christchurch International Airport, bound by Ryans Road to the south and mainly Grays Road to the south-east. The site is 57.6 hectares in area and is presently zoned as Rural Urban Fringe by the Christchurch City District Plan, with a single residential dwelling and associated infrastructure (shed structures, tanks) located on the south-east corner of the property. The site is not shown as being within any of the flood overlays within the District Plan. Figure 1 below shows the site location.

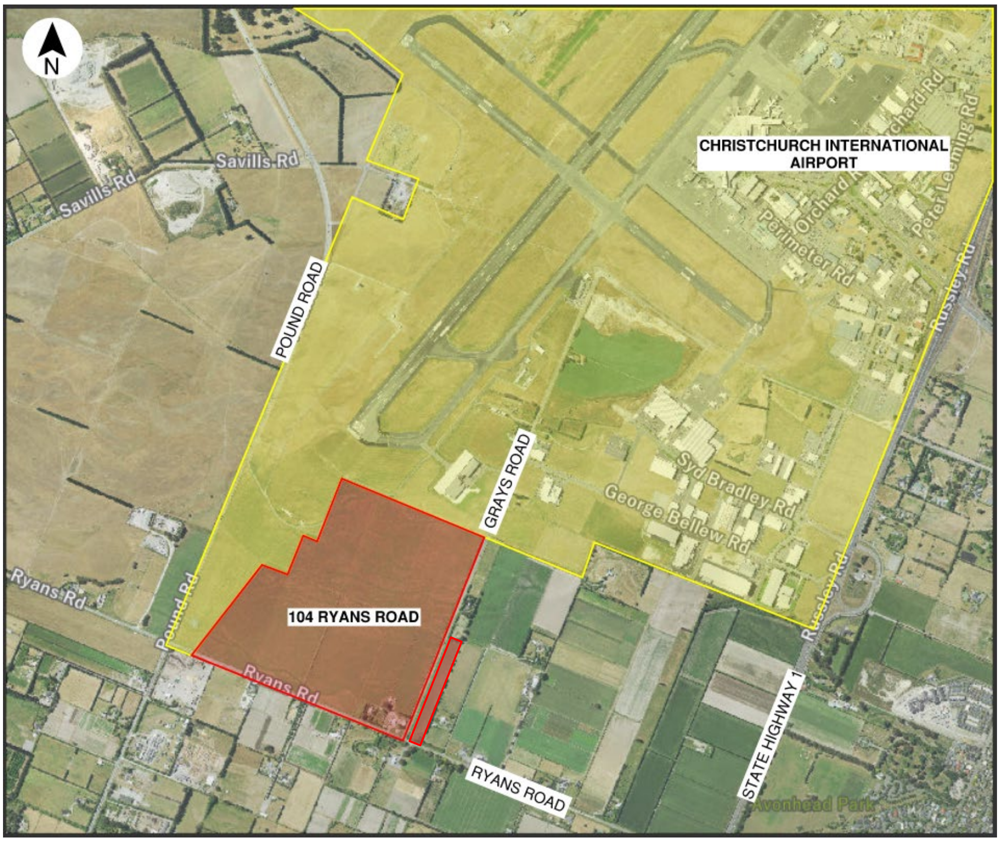

Figure 1: 104 Ryans Road site location (aerial courtesy of 'Canterbury Maps')

[3] https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-regional-policy-statement/

3.0 Flood hazard assessment

The flood hazard assessment has been assessed against the ECan RPS policy 11.3.1. This policy states that development should be avoided in high hazard areas where high hazard (in relation to flooding) is defined as either:

- Flood depths greater than 1 metre; or,
- The product of flood depth and velocity as greater than or equal to 1.

The ECan RPS states that these high hazard criteria should be assessed for the 0.2% AEP (500-year) event).

3.1 Historic flooding

ECan maintains a flood imagery register of historic flood events. There is minimal documented flooding for 104 Ryans Road, only one image (Figure 2) which shows no flooding for the site in question.

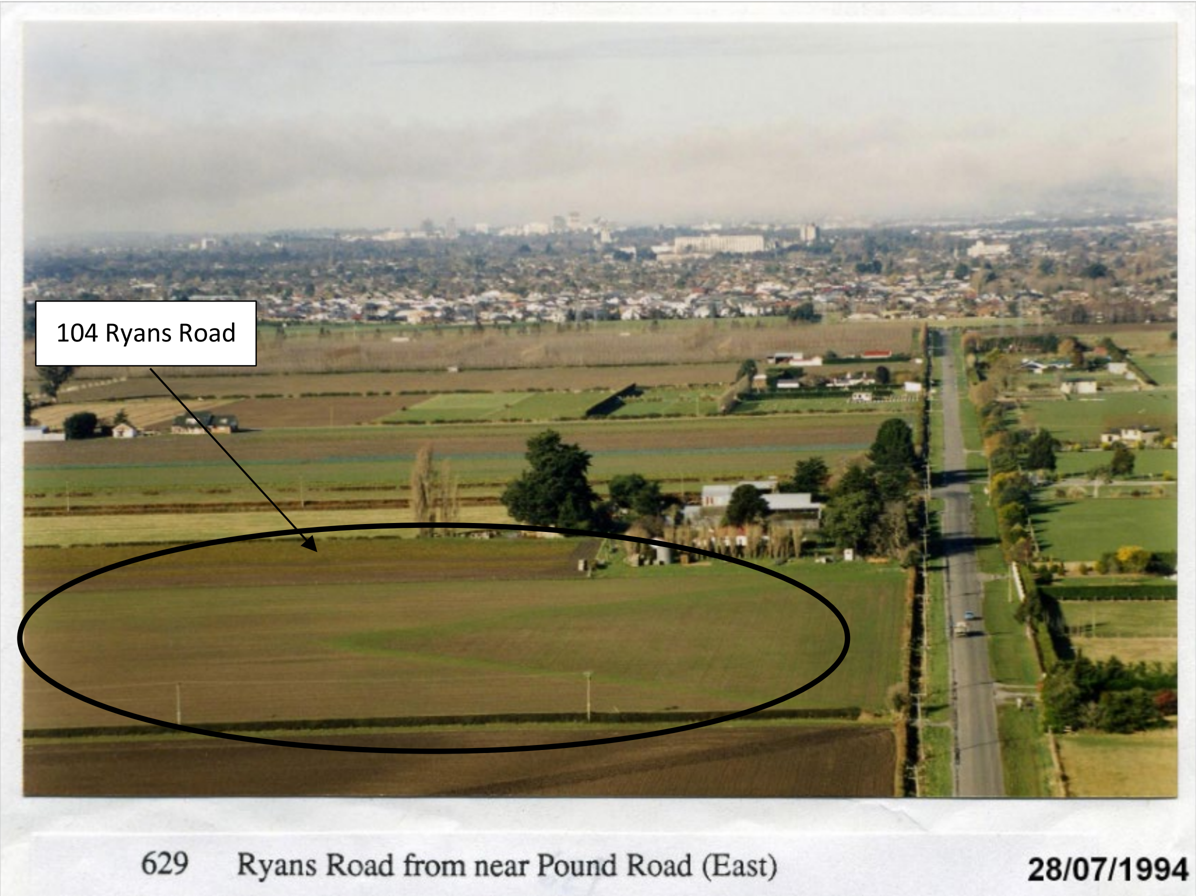

Figure 2: Obtained from the ECan Flood Imagery Register. 104 Ryans Road is in the foreground.

3.2 Waimakariri River

Whilst the Waimakariri River presents a historically significant flood risk, extensive flood protection works, including upgraded primary stopbanks and a secondary stopbank system, now provide a high level of protection against major flood events. The primary system provides protection for a flow event[4] of up to 5,500 m^3/s. To give context to this flow magnitude, the largest recorded historic event occurred on

[4] https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/waimakariri-flood-protection-project/

December 26, 1957. The ECan report[5] noted "*This flood event is the largest recorded on the Waimakariri since at least 1930, when flow records commenced*" and NIWA report[6] that the "*Waimakariri River rose to the highest level in over 34 years and probably the highest for nearly 50 year*". The event had a flow of 3,169 m^3/s (NIWA) or approximately 4000 m^3/s (ECan), well below the design flow of the primary stopbank system. The secondary stopbank system is designed to mitigate the effects of primary stopbank failure (overtopping or breaching).

Therefore, the Waimakariri River is not considered a viable source of flood hazard for this site.

3.3 Localised flooding

Localised flooding, where the rainfall intensity exceeds the drainage capacity of the soil typically only results in nuisance and low hazard flooding. It does not generate high hazard flooding which typically results from the spilling of a large watercourse. For completeness, we have considered localised flooding. The ECan soil drainage maps[7] show that the entire site and upstream catchment is classified as 'well drained'. This drainage classification is consistent with geotechnical investigations conducted by Tetra Tech Coffey (9 December 2024) which found the following subsurface profile:

- 0 to 300 mm topsoil; followed by,
- Between 1000 and 1500 mm sand; and finally,
- sandy gravels for a further 14 m+.

Flooding will therefore be controlled by infiltration through the shallow topsoil with the infiltration rate of the substrate below (sand - 230 mm/hr[8]), well in excess of any extreme rainfall intensity. Whilst rainfall may generate some localised flooding, this will be low hazard flooding (generally safe for people) and will be mitigated by the proposed stormwater design as covered in the PDP report by Cameron Swales.

3.4 Overland flow paths

Overland flow paths represent natural or engineered channels that convey flood water in a significant flood event. They can spend much of the time dry, activating only in a significant flood event. The degree of flood hazard associated with an overland flow path is a function of the contributing catchment characteristics. In particular, area and land cover.

Overland flow paths can be identified from LIDAR using GIS tools. Using the latest 2020/21 LIDAR dataset[9], the largest overland flow path that intersects the site has a catchment area of 0.3 km^2. The overland flow paths (including the one assessed below) are shown in Figure 3.

The ECan RPS states that a high hazard classification is achieved when depth exceeds 1, or, depth x velocity equals or exceeds 1, in a 0.2% AEP flood event. The slope of the terrain is approximately 1 in 200 which is unlikely[10] to be steep enough to generate velocities greater than 1 m/s. Therefore, the high hazard classification will be predominantly determined by the flood depth.

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[5] https://api.ecan.govt.nz/TrimPublicAPI/documents/download/908527 (Waimakariri Flood Protection Project, Hydraulic Modelling)
[6] https://hwe.niwa.co.nz/event/December_1957_West_Coast_and_Canterbury_Flooding
[7] https://gis.ecan.govt.nz/arcgis/rest/services/Public/Landcare_SMap_Layers/MapServer
[8] Table 21-11 of the Christchurch City Council Waterways Wetlands and Drainage Guide
[9] https://data.linz.govt.nz/layer/109641-canterbury-christchurch-1m-dem-2020-2021/
[10] Table 21-4 of https://ccc.govt.nz/assets/Documents/Environment/Water/waterways-guide/21.RainfallAndRunoff.pdf

Applying the rational method outlined in the Christchurch City Council Waterways Wetlands and Drainage Guide to estimate a flow for the 500-year event gives a flow of 1.8 m^3/s. This value is obtained using the following parameters:

- Runoff coefficient = 0.4 (predominantly rural);
- Rainfall intensity = 53.8 mm/hr (HIRDS 500-year event with climate change, RCP 8.5 2080 to 2100); and,
- Area = 30 hectares.

The LIDAR shows that this overland flow path has the following channel characteristics:

- 180 mm depth;
- Triangular shape; and,
- 35 m width.

Therefore, a 500-year flow, at a velocity of 1 m/s, would be comfortably contained within this flow path (capacity of 3.15 m^3/s) and the maximum depth would be less than the depth of the channel (180 mm). In conclusion, overland flow paths are not expected to generate any high hazard classifications for the proposed development site.

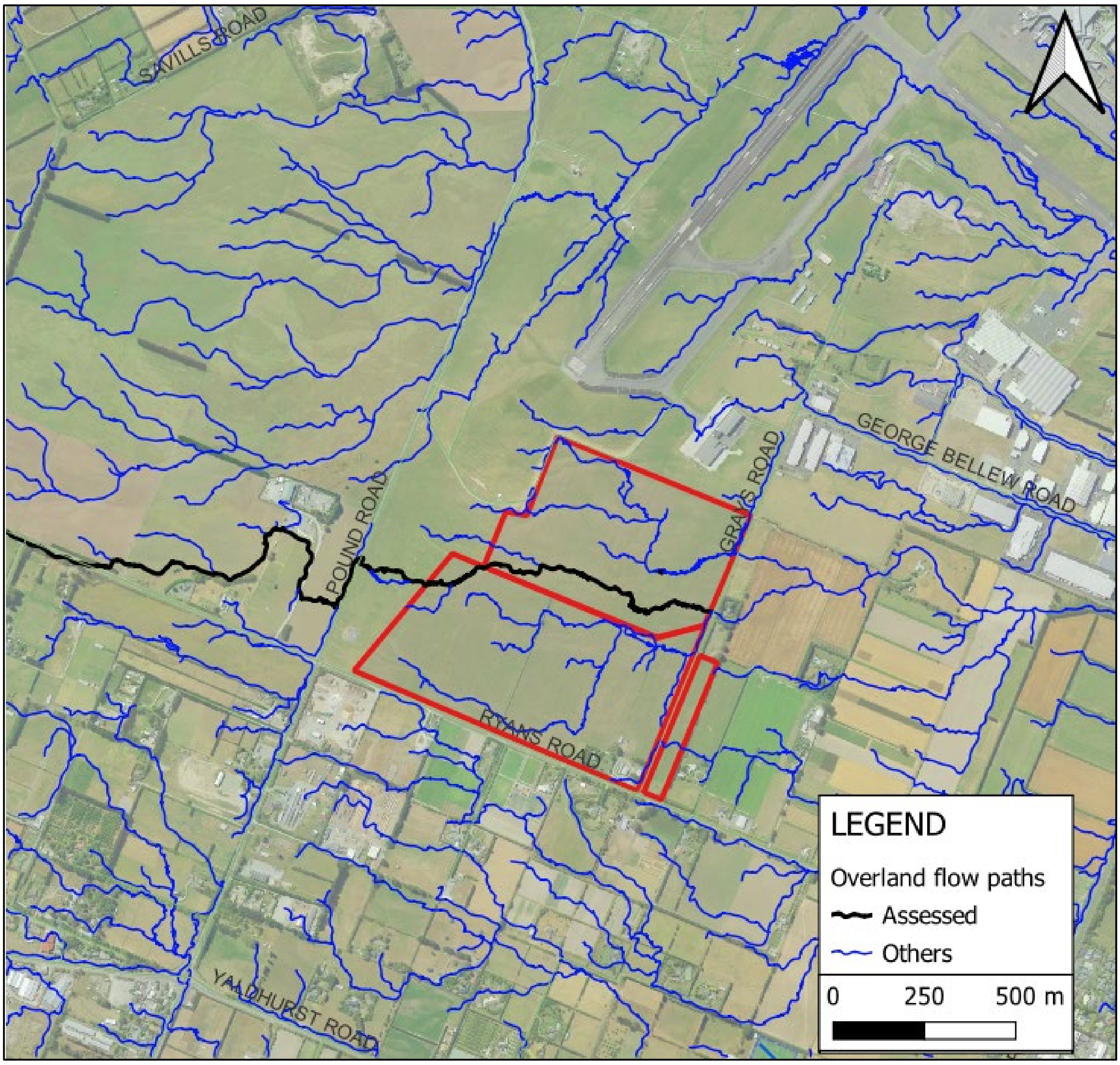

Figure 3: Overland flow paths derived from LIDAR.

4.0 Conclusion

Our flood hazard assessment for 104 Ryans Road has been conducted in accordance with ECan RPS Policy 11.3.1, which defines high hazard flooding as either flood depths exceeding 1 metre or a depth-velocity product greater than or equal to 1, assessed for the 0.2% AEP (500-year) event.

A review of historic flooding records shows no documented instances of significant flooding at the site. While the Waimakariri River has historically posed a flood risk, extensive flood protection measures—including upgraded primary stopbanks and a secondary stopbank system—now provide a high level of resilience. The primary stopbank is designed to contain a 5500 m^3/s event, significantly exceeding the largest recorded historical flood of approximately 4000 m^3/s. Given these measures, the Waimakariri River is not considered a viable source of high hazard flooding for the site.

Localised flooding, resulting from intense rainfall exceeding soil drainage capacity, is not expected to present a high hazard. The site's well-drained sandy gravel substrate, with high infiltration rates, minimises the risk of significant ponding. Any localised flooding is anticipated to be of low hazard and effectively managed through stormwater design.

Overland flow paths at the site have been analysed using LIDAR and the rational method. The largest identified flow path, with a contributing catchment area of 0.3 km^2, is expected to convey a 500-year event within its natural channel without exceeding a depth of 180 mm. Given the gentle terrain slope (1 in 150) and calculated flow characteristics, this flow path is unlikely to generate high hazard flooding as per ECan RPS criteria.

In summary, the flood hazard assessment indicates that none of the identified flood sources—including the Waimakariri River, localised flooding, or overland flow paths—are expected to result in high hazard classifications for the site. Based on this assessment, the site is considered suitable for development from a flood hazard perspective.

5.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Carter Group Limited and others (not directly contracted by PDP for the work), including Environment Canterbury Regional Council, National Institute of Water and Atmosphere, Land Information New Zealand, and Landcare Research. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Carter Group Limited for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Prepared by

Ben Throssell
Service Leader Water Resources

Approved by

Eoghan O'Neill
Technical Director Water Infrastructure

Qualifications and Experience

My full name is Benjamin Graham Throssell. I am a Senior Engineer with Pattle Delamore Partners Limited (*PDP*), an environmental consulting firm specialising in water matters.

I hold a Bachelor of Engineering (Hons) (Natural Resources Engineering) from the University of Canterbury. I have 13 years of experience specialising in water resources engineering, with particular expertise in assessing flood hazard and constructing 2D hydraulic models. I have prepared and presented expert evidence at fast track, council and district hearings on flood hazard matters around New Zealand. Recently I prepared flood hazard and mitigation models for the Esk Valley following the catastrophic Cyclone Gabrielle flood events in 2023 and completed investigations to quantify the severity of the Auckland Anniversary flood events on behalf of Auckland Council. I am currently leading a team tasked with defining and predicting the consequences of extreme events in the Wellington Region.