Wiri to Quay Park

Stormwater Assessment for Notice of Requirement

001 | Rev A

14 July 2020

KiwiRail Holdings Limited

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1. Introduction

1.1 Overview

The Wiri to Quay Park Project (the "project") is to provide for the increased network capacity and resilience of the North Island Main Trunk Line (NIMT) between Wiri Junction and Quay Park. The project consists of four work packages:

- Package 1: *Wiri Junction* - Additional tracks and crossovers to improve the functioning of Wiri Junction.
- Package 2: *Wiri to Middlemore* - A new 3.6km section of track between Middlemore Station and Wiri Junction, as well as the upgrading of Middlemore Station. These works will increase the capacity of the NIMT and future proof Middlemore Station for 9-car services.
- Package 3: *Westfield Junction* - A new layover track on the NIMT eastern line to provide timetable flexibility to cross the Westfield Junction, as well as works within the Westfield Yard to ensure that freight operations do not foul the mainline and impact other rail services.
- Package 4: *Quay Park* - A 1 km track extension and mainline connections into the Ports of Auckland (POA) freight facility, thereby allowing for faster entry and exit into and out of the Port.

Each of these four work packages will include Outline Plans (given the presence of a designation for the NIMT) and resource consents for regional plan related matters (e.g. discharges) in the Auckland Unitary Plan (Operative in Part) (the AUP). In addition, Package 2 requires the preparation of a Notice of Requirement (NoR) given the need to incorporate additional land (not currently held by KiwiRail Limited) into the designated rail corridor.

This report provides a high-level flood hazard assessment to support the NoR for Package 2. The assessment has been undertaken using the flood maps available in the Auckland Council GEOMAPS website which have been prepared using flood models. Flood models play an important role for estimating cost of flood repairs, impact on service reliability, risk to private property and risk to public safety. Flood hazard maps produced from flood models are used for strategic planning purposes and they provide the basis for the decision making of flood risk management. For example, a culvert under the North Auckland Line (at New Lynn) failed causing a blow out and major damage to track and downstream properties that could otherwise have been avoided by implementing the appropriate mitigation measures beforehand.

1.2 Scope of this Report

The scope of this Report is to carry out a high-level flood risk assessment as required in Chapter E36 of the Auckland Unitary Plan (Operative in Part) (AUP(OP)) for the NoR for Package 2. The initial flood risk assessment is carried out using the flood information available for the project footprint. The assessment is two phased:

<u>Phase One</u>
Identify and assess flood risks associated with the land required for the NoR, while recognizing existing bulk stormwater infrastructure in the NIMT corridor (i.e.) Auckland Council managed culverts). This assessment will identify whether the land is suitable for inclusion from a flooding risk perspective and what, if any, mitigation is required as part of the NoR.

1.3 Limitations

The limitations of this flood assessment are:

- We have relied on the flood maps available from the Auckland Council GEOMAPS website that were produced from 2D flood models. The level of detail provided within the website is suitable for the purposes of this high-level assessment.
- The flood maps for this area are based on modelling that was carried out between 2008 and 2009. There may have been development or other changes since the modelling was done. There is a risk that overland flow volumes have changed due to trackside development, as well as further development outside the corridor. In both instances, this development has likely altered the area of impervious surfaces within affected catchments and any resultant stormwater flows.
- The available flood maps generally show flood risk areas for the 1% AEP event for current climate conditions only, although it is noted that climate change is expected to increase both the frequency and intensity of storms in Auckland.

Given these limitations, the following assessment has taken a conservative approach to potential flooding effects on surrounding properties.

2. Flood Risk Assessment Methodology

This Report identifies potential flooding issues and interfaces that might impact design development of the project.

There are three different types of flooding that were found to be applicable to the NoR land requirements properties:

- Fluvial flooding occurs when waterbodies break their banks and water flows out onto any low-lying areas (i.e. natural floodplains). This can arise when the runoff following heavy rain exceeds the natural capacity of the river channel and can be exacerbated where a channel is blocked or constrained.

- Pluvial flooding occurs when the amount of rainfall exceeds the capacity of an urban stormwater network or the ground to absorb it. This excess water flows overland, ponding in hollows, low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall, before the flood waters eventually enter a piped or natural drainage system. This type of flooding is driven by short, intense storms.

- Artificial Drainage Systems flooding occurs as a result of surcharging or blocking of drainage networks.

The climate change expected over the lifetime of the project may affect flood risk to the project. Rainfall depths and intensities are expected to increase, and mean sea level is expected to rise. These effects may increase the frequency and/or severity of flooding if no other changes in the project environment occur (e.g. improvements to flood defences and drainage systems).

2.1 Analysis of Existing Information: Auckland Council GEOMAPS

The Auckland Council GEOMAPS is a GIS Viewer developed by Auckland Council. It contains spatial and non-spatial data from across the Auckland region, including the four layers described below which have been used to inform the W2QP Flood Risk Assessment:

Flood Prone Areas

- Flood prone areas are topographical depressions. The areas occur naturally or are created by dammed gullies created by man-made features such as roads and railway embankments. The flood prone extent is the area water will pond up to in a 1% AEP[1] extreme rainfall event assuming the outlet to the topographical depression is blocked[2].

  An example of a Flood Prone Area is shown in Figure 2-1 for clarity.

Flood Plains

- Indicates the extent predicted to be covered by flood water as result of a rainstorm event of a scale that occurs on average once every hundred years. These extents have been produced from hydraulic modelling. The floodplain layer contains the most up to date information for each of the 23 Stormwater Catchments in the Auckland region. Summary data for each catchment is attributed against each floodplain[2].

[1] Annual Exceedance Probability (AEP). The Probability of exceeding a given storm discharge or flood level within a period of one year. For example, a 1% AEP floodplain is the area that would be inundated in a storm event of a scale that has a 1 per cent or greater probability of occurring in one year. (Auckland Council Code of Practice for Land Development and Subdivision. Chapter 4 – Stormwater. Version 2.0, 1 November 2015)

[2] Definition extracted from Auckland Council GeoMaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

An example of Flood Plains is shown in Figure 2-2 for clarity.

Overland Flow Paths[3]

- Low point in terrain, excluding a permanent watercourse or intermittent river or stream, where surface runoff will flow, with an upstream contributing catchment exceeding 4,000m².

  Excludes the following areas:

  - Constructed depressions and pits within Special Purpose - Quarry Zone.

  Note

  The Council holds publicly available information showing the modelled Overland Flow Paths in its GIS viewer for specific properties. The Overland Flow Path map is indicative only. A party may provide the Council with a site-specific technical report prepared by a suitably qualified and experienced person to establish the location, depth or flow characteristics of the Overland Flow Path. Council will continually update the Overland Flow Path map to reflect the best information available.

- The Auckland Council GEOMAPS website shows the predicted path stormwater takes, as it flows downhill over the land. This layer is also classified into 3 different groups by catchment areas: 3 ha and above (thick blue line), 4000m^2 to 3 ha (thin blue line) and 2000m^2 to 4000m^2 (dashed blue line).

  An example of Overland Flow Paths is shown in Figure 2-3 for clarity.

Underground Services – Stormwater

- Pipelines form part of a reticulated stormwater network that includes pipelines, culverts and subsoil drains to drain stormwater runoff from roads, property and open areas to receiving environments.

- The Existing Stormwater Network has been considered when assessing potential flood issues from the proposed works (i.e. backflow effects and sufficient inlet capacity).

By comparing the location of the proposed works from the Scope Definition drawings with the flood areas from the Auckland Council GEOMAPS, three land requirement locations were identified to have existing flood hazards on or adjacent to the NoR extents. A brief description of the existing flood hazards is provided in Sections 3 for each of the identified land requirement locations.

[3] Definition extracted from RC3.2.18 E36 Overland Flow Paths – Auckland Design Manual

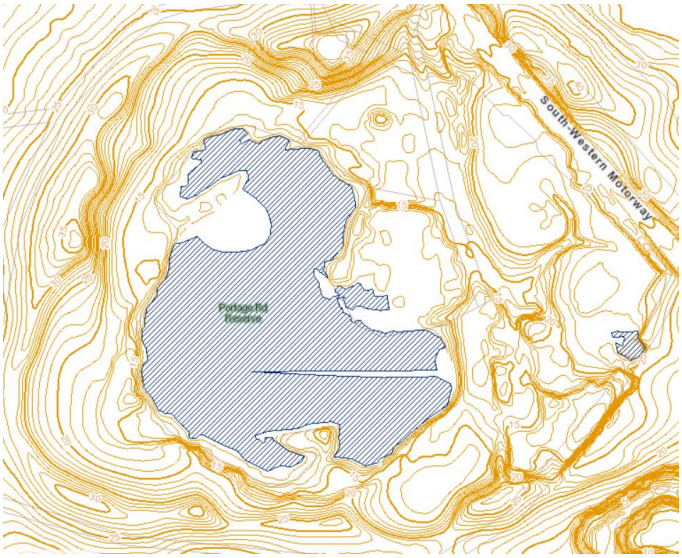


Figure 2-1: Example of Flood Prone Area shown as a dashed blue line boundary. The contour lines are shown as orange lines. It can be seen that the Flood Prone Area boundary is located in a topographical depression and it is constituted by lines of equal elevation.

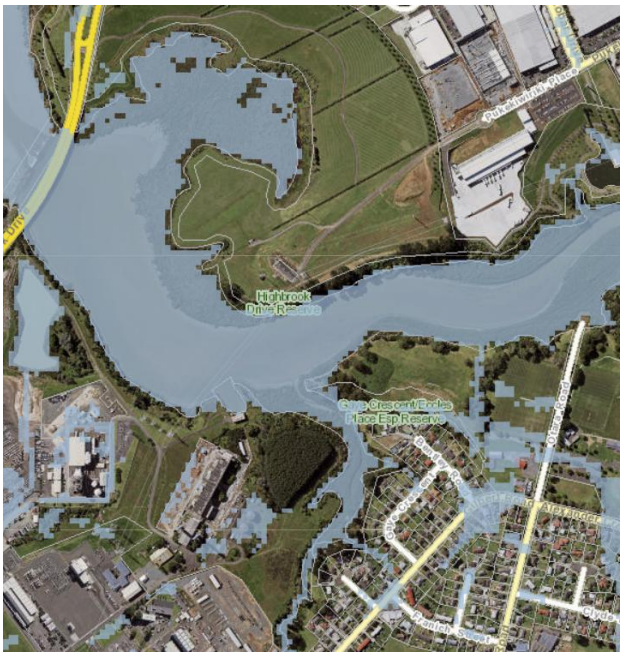


Figure 2-2: Example of Flood Plain shown as a semi-transparent light blue solid boundary.

Figure 2-3: Example of Overland Flow Path shown as dashed (2000m^2-4000m^2), thin (4000m^2-3ha) and thick (>3ha) blue lines according to the contributing catchment area.

3. Existing Stormwater Management

3.1 Flood Hazards and Existing Issues

This Section identifies the land requirement locations and the sites external to the land take that are likely to be affected by the proposed works. Refer to Appendix A for details of the flood areas for each of the land requirement locations.

i. 100 Hospital Road and 64 Rosella Road

The flood risk in the catchment where the land takes are located is likely due to the flat topography, the urban land use and proximity to the coastal margins of the Tamaki River. Water ponds on the upstream side of the culvert under the railway line with the DN600 and DN1300 existing culverts acting as a restriction on flow during high flow events. The restriction of through flow at these culverts may be intentional to manage downstream flows. The culverts under the rail corridor DN600 and DN1300 are council assets with a deed of grant in place. They are linked to a council owned open channel in the rail corridor which also has a grant in place. There is a risk that the deed of grants that cover this area may limit the changes that can be made and will necessitate engagement with the council as asset owner. The land takes at 64 Rosella Road and 100 Hospital Road are located within a flood prone area.

The proposed works will cause a change in soil permeability and a displacement of flood volume which may cause changes to the flow paths. The flood volume displacement from the proposed works at the abovementioned land takes could increase the flood extent area and the flood depth at 60-62 Rosella Road and possibly cause backwater effects upstream of the existing DN600 culvert crossing Rosella Road, thus affecting the properties at 39-47 Rosella Road. In addition, the proposed extension of the two existing culverts crossing the railway line will potentially make the culverts less hydraulically efficient, thus, increasing the upstream headwater levels. However, further, more detailed assessment is required to confirm the likelihood and magnitude of the flooding effects to the sites external to the land take.

Mitigation measures will be provided to avoid significant impacts to the surrounding residential and commercial developments and ensure that any flooding effects of the works are less than minor.

ii. 18R Gordon Road

The temporary land take at 18R Gordon Road is expected to have less than minor flooding effects, although this is dependent on the scale and nature of the proposed temporary works. The site is to be used for construction access and as a site yard. While construction access works are not expected to cause significant change of flood levels at 18R Gordon Road and the surrounding properties, if the site yard occupies a significant part of the site footprint then mitigation will be provided to ensure that flooding is not increased off-site.

iii. Station Road and Wylie Road

The permanent land requirements at Station Road and Wyllie Road were assessed and determined to have nil to less than minor flooding effects. We do not expect the works to increase flood levels. Furthermore, the properties are currently not flooded, and the land takes are at least 1m above the flood levels.

iv. Puhinui Station

The permanent land take and the construction access road at Puhinui Station shown in Appendix A.5 were determined to have less than minor flooding effects. The proposed construction access is not expected to cause significant change of flood levels at the surrounding properties. However, localized flood volume displacements

are likely to happen due to changes in soil permeability throughout the reserve. Mitigation measures will need to be provided if significant earthworks are to be undertaken within the land take to ensure that flood levels are not increased at the surrounding properties.

v. Cavendish Drive

The land take at 212 Cavendish Drive for construction access utilizes an existing road as shown in Appendix A.6 and is expected to have nil flooding effects, as no earthworks or modifications of soil permeability are proposed.

vi. Southwest Motorway

The additional designation area under the SH20 is expected to have nil flooding effects as no earthworks or modifications of soil permeability are proposed at this location.

vii. Langley Road

The construction access through the existing car park between the properties at 12 Langley Road and 24-44 Langley Road shown in Appendix A.7 is expected to have nil flooding effects as no earthworks or modification of soil permeability are proposed at this location.

4. Proposed Stormwater Management

This Section summarizes the proposed stormwater management approach for the project at the affected land requirement locations described in Section 3.1.

4.1 Design philosophy

4.1.1 Overview

The construction of the Project will alter the hydrological flows that have potential to impact the receiving environments.

The design objectives for stormwater management and stormwater infrastructure design are as follows:

- To attenuate stormwater flows and not exacerbate existing flooding issues through efficient road drainage, preservation of existing overland flowpaths, and runoff volume detention where possible.
- To minimise the effects of stormwater discharges on the receiving environments from any newly formed impermeable surfaces.
- Ensure stream outfalls and culverts do not cause erosion and are designed using green infrastructure principles.
- To provide a sustainable and resilient stormwater system that will incorporate the effects of climate change.

4.1.2 Stormwater Discharge and Diversion

Following the identification of the flooding issues in Section 3.1, hydrological mitigation is recommended for the works on 64 Rosella Road and 100 Hospital Road as the project's detailed design is undertaken. As such, three flood mitigation approaches could be considered:

- Appropriate hydraulic design of the extension of the two existing culverts DN600 and DN1300 under the rail corridor at the north end of 100 Hospital Road to reduce impacts on upstream headwater level. If the flood volume displacement caused by the proposed works at 64 Rosella Road and 100 Hospital Road are deemed to be significant to the land takes and the surrounding properties, the design should seek to compensate for the displaced volume to reduce effects. Extended detention and flood mitigation structures such as a wetland pond may be suitable.

Maintenance of existing overland flowpaths as much as possible. For the temporary land take at 18R Gordon Road if the site yard is expected to occupy a significant proportion of the property with temporary buildings or other works that are determined to displace flood volume then mitigation measures should be considered:

- Compensation for displaced volume
- Maintenance of existing overland flowpaths as much as possible.

Appendix A. Land Requirement Flood Maps

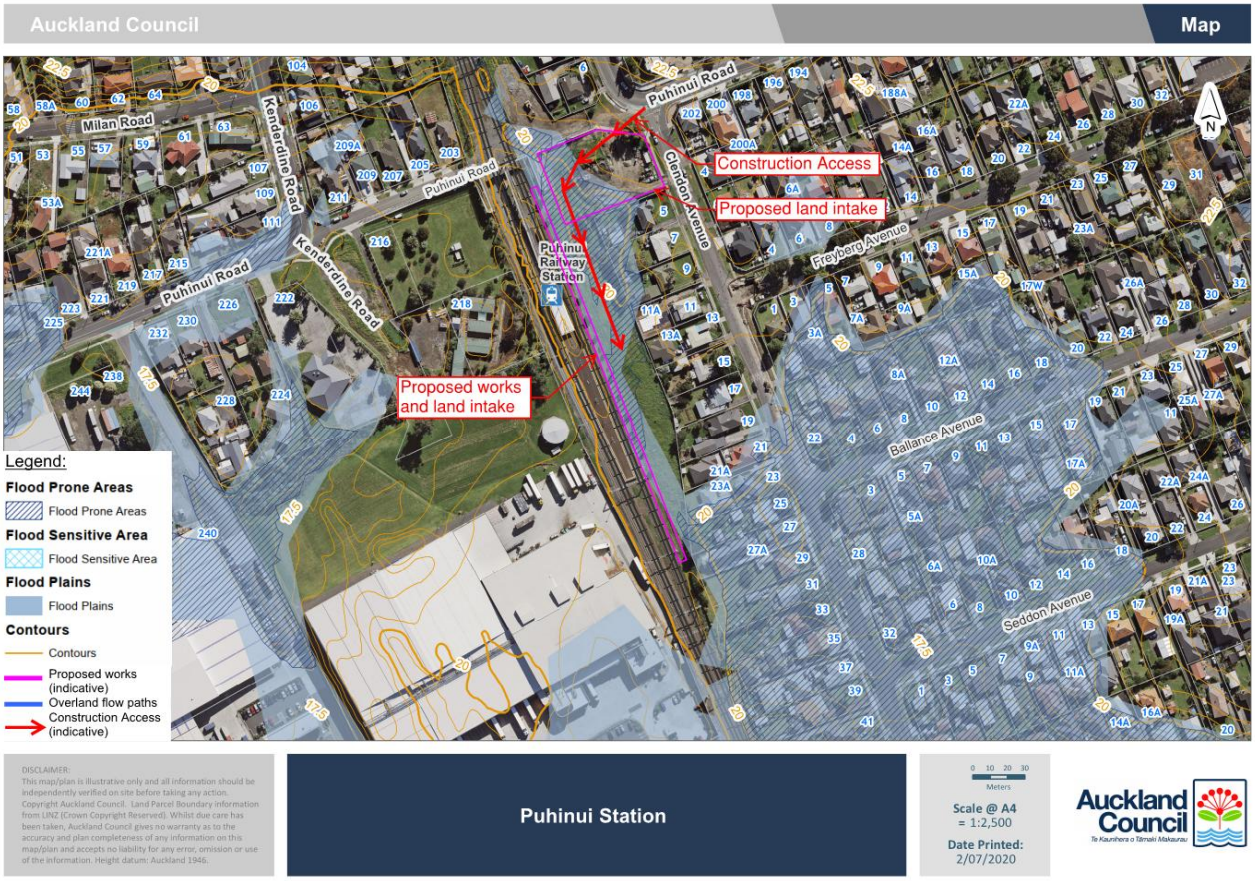
A.1 100 Hospital Road & 64 Rosella Road

A.2 18R Gordon Road

A.3 1-21R Station Road

A.4 12 and 14 Wyllie Road

A.5 Puhinui Station



A.6 Cavendish Drive

A.7 Langley Road