REPORT

Tonkin+Taylor

Ngahinapouri village concept plan

Three waters assessment

Prepared for
Boffa Miskell Ltd
Prepared by
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Executive summary

The Waipa district has been identified as a high growth area. To provide for this growth, a village concept plan is required to support the development of three growth cells located in Ngahinapouri named N1, N2 and N3.

Tonkin & Taylor Ltd (T+T) have been appointed by Boffa Miskell Ltd (Boffa Miskell) to investigate and provide technical assessments of the stormwater, wastewater and water supply requirements for the growth cells. These assessments will support the Village Concept Plan being prepared by Boffa Miskell.

Existing three waters infrastructure, drainage and flood risk has been assessed as well as population demands and the required standards, criteria and best practice. The key conclusions and recommendations described in more detail within this report are as follows:

Stormwater

- Due to the catchment position of the growth cells, peak flow control of the 2 year ARI and higher magnitude events is not recommended to avoid coincidence with the larger flood peaks.
- Further assessment through modelling is recommended to ensure that the post development pass-forward flow approach does not have a negative impact on properties to the west of the growth cells between Ngahinapouri and the Waipa River.
- Retention, reuse and onsite soakage of the post-development water quality volume will be required to provide stormwater treatment and erosion control. Onsite soakage will need to be tested and designed on a lot by lot basis.
- Road berms need to be of sufficient width to accommodate swales and low impact stormwater treatment systems such as rain gardens and soakage basins if required. The sizing of such devices will be dependent on the final road layout and onsite soakage testing.

Wastewater

- On-site wastewater treatment and discharge systems.

Water supply

- Water supply will need to be managed through rainwater tanks and the bore water supply.
- Groundwater investigations will be required to ensure proposed lots can be serviced by the bore supply without having a negative impact on the existing supply.
- Water quality needs to meet standards.

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1 Introduction

The Waipa district has been identified as a high growth area in the National Policy Statement on Urban Development Capacity. The village of Ngahinapouri is forecast to grow by 380-650 people (+190%-225% growth) by 2050. To provide for this growth, a village concept plan for the growth cells located in Ngahinapouri are required, as identified in the Waipa2050 Growth Strategy (2017) and Waipa District Council (WDC) 2018 – 2028 Long Term Plan (Figure 1.1).

The extents of the 2035 growth cells shown in Figure 1.1 have since changed so that growth cell N1 covers the N1 and N2 area shown in this figure and N2 covers the area labelled as N3.

The growth cells have a total area of approximately 102 ha in size, to the west of SH39 on both the northern and southern sides of Reid Road.

Tonkin & Taylor Ltd (T+T) have been requested by Boffa Miskell Ltd (Boffa Miskell) to investigate and provide technical assessments of the stormwater, wastewater and water supply requirements for the growth cells. These assessments will support the village concept plan for each cell and Plan Changes to the District Plan.

The purpose of this assessment is to:

1 Identify the existing drainage, stormwater features and flood risk within, and associated with, the growth cell areas.

2 Recommend high level stormwater infrastructure and management requirements for development within the growth cell areas.

3 Identify existing wastewater and water supply networks and limitations associated with the growth cell areas.

4 High level assessment of population demands and recommendations for water supply and wastewater within the growth cell areas.

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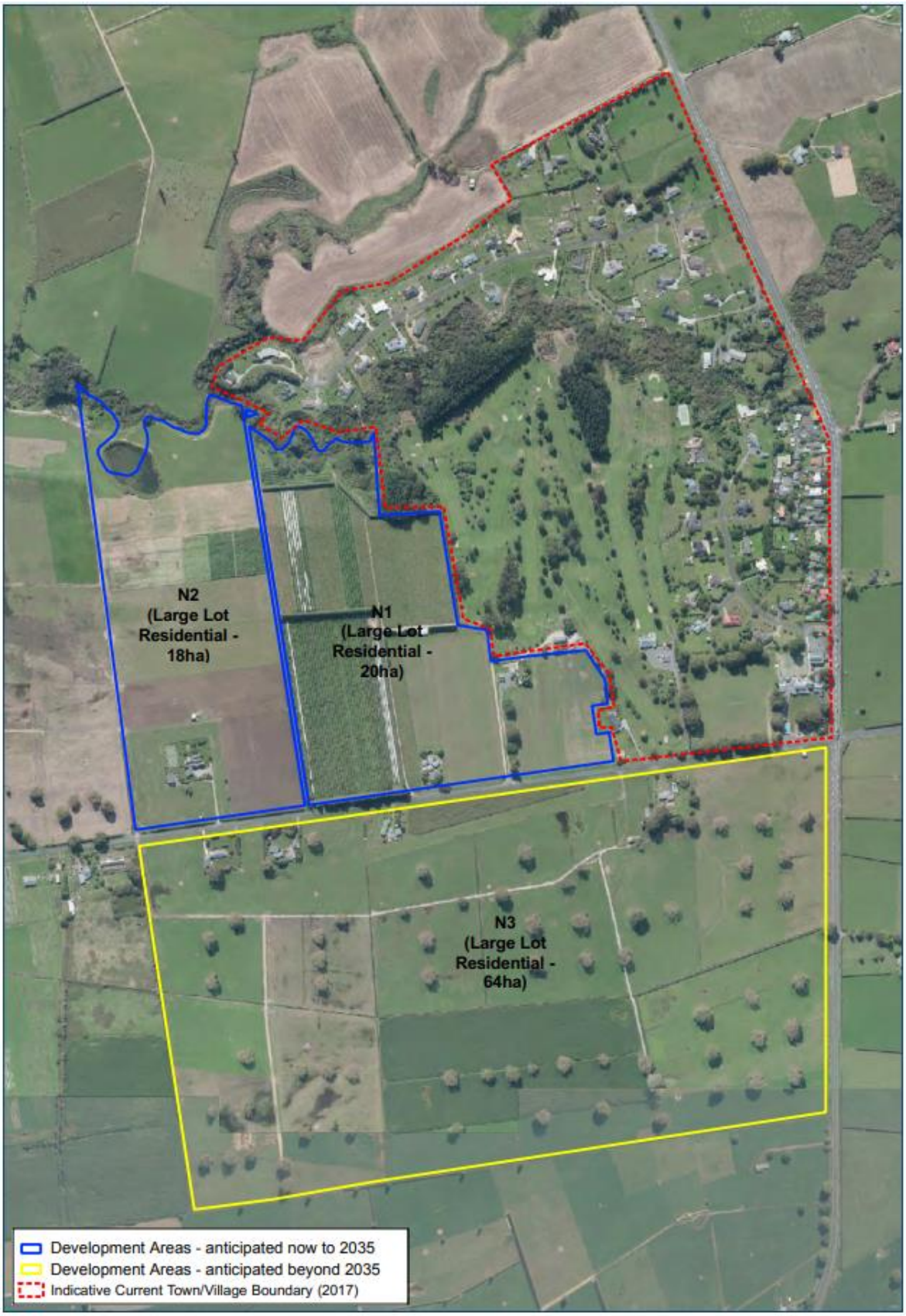


Figure 1.1: Ngahinapouri growth cells (Figure from Waipa2050 Growth Strategy 2017). The extents of the 2035 growth cells have since changed so that growth cell N1 covers the N1 and N2 area shown in this figure and N2 covers the area labelled as N3.

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2 Stormwater assessment

2.1 Catchment descriptions

2.1.1 Topography

The existing topography (2007-2008 LiDAR data) within the growth cells is shown in Figure 2.1. The land around the growth cells is predominantly flat with a sharp drop in elevation within the natural floodplain of the Mangahia stream at the northern edge of the growth cells.

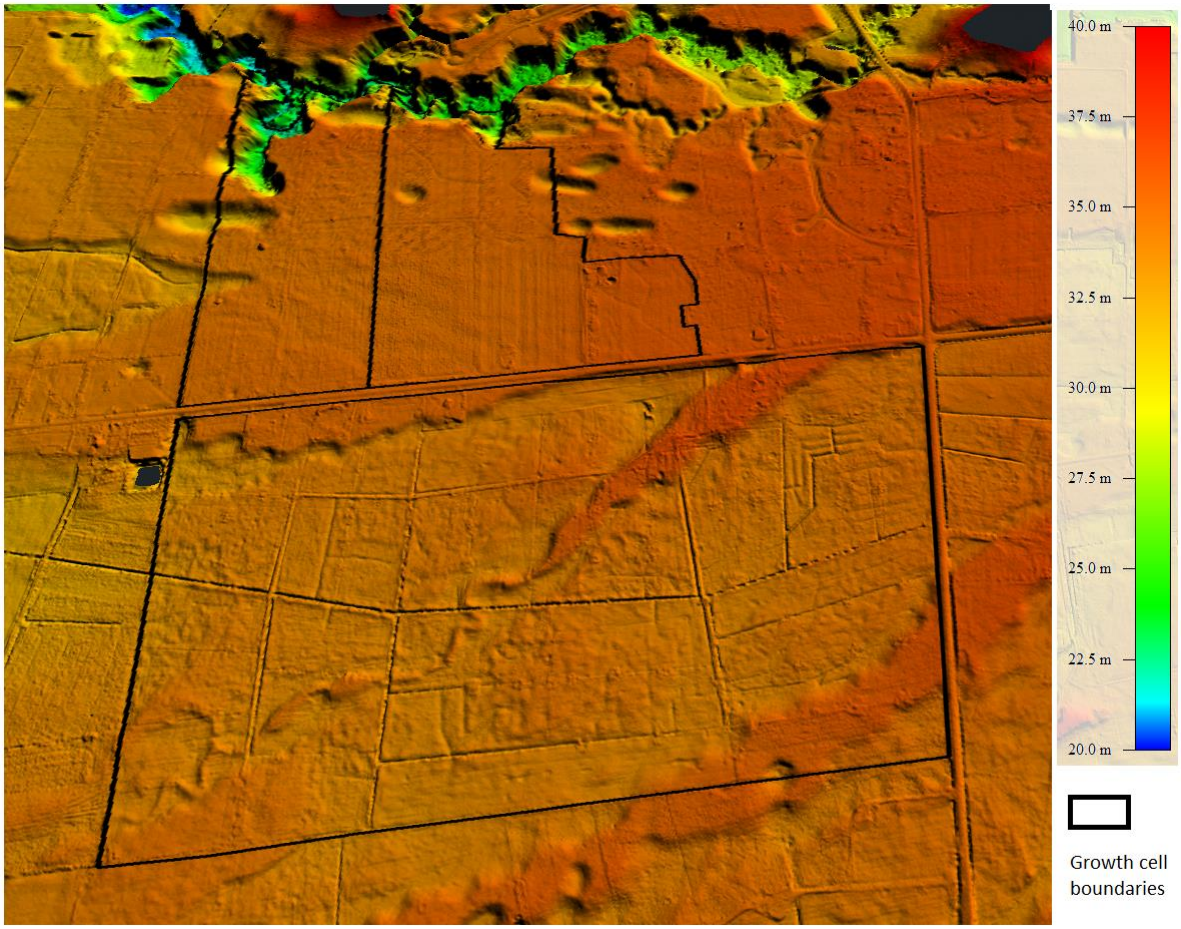


Figure 2.1: Ngahinapouri existing topography (2007-2008 LiDAR)

2.1.2 Existing watercourses and drainage

Figure A1 in Appendix A shows the existing watercourses and drainage within and surrounding the growth cell, generated from 2007-2008 LiDAR.

Runoff within the cells to the north of Reid Road, flow in either a northerly direction to the Mangahia stream, or west directly to the Waipa River. Runoff to the south of Reid Road flows west and south-west directly to the Waipa River. Flows from the Mangahia also discharge to the Waipa River. There are no existing stormwater utilities within the village according to the Waipa DC GIS portal.

2.1.3 Geology

The Landcare Research Soil Permeability Map (https://soils-maps.landcareresearch.co.nz) shows that soils around Ngahinapouri have a moderate permeability.

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2.1.4 Existing flood risk and hydrology

The WDC GIS portal does not identify a flood hazard risk at Ngahinapouri. The northern boundaries of the growth cells are within the natural floodplain of the Mangahia stream however and there is a small area of flood hazard defined within the channel gully at the north-west corner of the growth cells. This area is defined at open space/reserve in the latest village concept plan.

2.2 Stormwater standards and criteria

2.2.1 Waikato Regional Council guidelines

Waikato Regional Council (WRC) released two new guideline documents in June 2018 to address stormwater management: Waikato stormwater management guideline (TR2018/01) and Waikato stormwater runoff modelling guideline (TR2018/02).

The stormwater management guidelines includes best practice low impact design approaches and devices for stormwater treatment. It also includes techniques and recommendations for minimising imperviousness and disturbance. These best practices and recommendations should be used throughout the planning and design stages of development.

Within the guideline documents there are five requirements related to peak flow control criteria:

1 Rainfall data used for all rainfall events shall have 24-hour rainfall distribution.

2 The rainfall data for the 2, 10 and 100-year ARI events should be increased for the post-development scenario to allow for predicted climate change.
Where there are existing downstream flooding issues, depending on the site's position in the catchment, it is recommended that the post-development peak discharge for the 100-year ARI rainfall event for a new development be limited to 80% of the pre-development peak discharge (unless there is a catchment study that demonstrates that this is not required).

3 In terms of intermediate storm control, depending on the site's position in the catchment, the 2 and 10-year ARI post-development peak discharges shall not exceed the 2 and 10-year ARI pre-development peak discharges.

4 Peak flow control is generally only recommended for projects located in the top half of catchments so as to avoid concerns over coincidence of peaks aggravating downstream flooding concerns.

Developments will also need to be designed to retain (reuse or soak) the initial abstraction volume of runoff.

The guidelines also include the following requirements for water quality treatment:

1 The water quality volume is the runoff volume from the 1/3 of the 2-year 24 hour rainfall event at a given location.

2 The water quality volume should be used to determine storage volumes and flow rates to size stormwater management devices.

3 In areas where the water quality event rainfall is greater than 30 mm, water quality treatment should be designed using a rainfall depth of 30 mm to determine the water quality volume. This only applies to water quality criteria. Extended detention will require design for the full, un-adjusted volume.

4 Where nutrients are a contaminant of concern, for example in contained lake catchments, a treatment train approach must be used to improve nitrogen and phosphorus removal efficiencies. This is due to the limited ability of individual stormwater management devices to achieve significant removal of nitrogen and phosphorus on their own.

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The WRC guidelines recommends the protection of first and second order streams and the piping natural water courses is not supported.

2.2.2 Regional Infrastructure Technical Specification (RITS)

The Regional Infrastructure Technical Specification (RITS) includes documentation on how to design and construct stormwater infrastructure in the participating councils' areas. Section 4 of RITS sets out requirements for the design and construction of stormwater systems for land development and subdivision.

The primary objective of the stormwater system is to manage stormwater runoff to minimise flood damage and adverse effects on the environment. The stormwater system design philosophy aims to protect people, properties and ecological values by preventing or mitigating the quality and the quantity effects of stormwater on the built and natural environment.

New stormwater systems shall achieve the following minimum standards:

1 The stormwater system shall operate by gravity. Pumped systems are not acceptable due to ongoing maintenance costs.

2 The primary stormwater system shall be capable of conveying the design storm event without surcharge.

3 The secondary stormwater system shall be capable of conveying the 100 year ARI storm event within a defined path and without causing undue risk or damage to persons or property.

4 The stormwater system shall not connect or be able to overflow to the wastewater system.

5 Development shall not increase peak discharge rates for design events to the receiving waters. However an increase may be acceptable for:

   a Large events where it is demonstrated that there are no additional adverse effects, which are no more than minor, on the environment or downstream properties as a result of the increase, or

   b Where at source mitigation is not practicable but an offset mitigation is used.

6 Development shall prevent, or minimise, any increase in discharge volumes to receiving waters to the extent reasonably practicable.

7 The stormwater system shall provide the required amount of treatment (section 4.2.3 in the RITS document).

The RITS document also sets out a stormwater management disposal hierarchy to mitigate downstream flooding, scour and water quality impacts:

1 Retention of rainwater/stormwater for reuse on site.

2 Soakage techniques.

3 Treatment and detention and gradual release to a watercourse.

4 Treatment and detention and gradual release to a piped stormwater system.

The RITS guideline acknowledges that it may differ to the WRC guidelines and that the WRC document prevails.

2.3 Stormwater management approach

2.3.1 Flood and erosion risk

Due to the sites position within both the Mangahia stream and the Waipa River catchments peak flood flow control of runoff directly from the cells in the 2 year ARI and higher magnitude events

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would not be appropriate, to avoid coincidence of peaks aggravating downstream flooding concerns (see WRC peak flow control criteria point 5, section 2.2.1).

Following a rainfall event runoff directly from the growth cells are expected to discharge to the Waipa River before the flood hydrograph from the upper catchment arrives. It is therefore likely to be more appropriate to pass forward flows from the growth cells with regards to flood risk.

For the flowpaths that currently drain west, there are properties between the growth cells and the Waipa River however. It is therefore recommended that further assessment through modelling is undertaken to ensure that the post development pass-forward flow approach does not have a negative impact on these properties.

The Mangahia stream channel is an incised gully so erosion control is required and points of discharge to the stream need to be managed so velocities do not exceed the maximum permissible values stated in the WRC guidelines.

In terms of volume control for downstream erosion prevention, it is recommended that the difference between pre and post-development total volume for smaller storms up to the 2-year ARI event be retained (rainwater re-use, soakage or bio-retention) where possible. Given the size of the growth cells and that post-development impervious surfaces are limited, it is likely that the pre to post-developed 2 year ARI volume difference will be smaller than the post-developed water quality volume (1/3 of the 2 year ARI 24 hour rainfall) and erosion volume can therefore be managed through stormwater treatment. The ecological corridor at the Mangahia stream should be improved where possible.

2.3.2 Stormwater treatment

The receiving environments for the growth cells are the Mangahia stream and the Waipa River which are natural streams and water quality treatment will be required for the post-developed water quality volume (1/3 of the 2 year ARI 24 hour rainfall) including extended detention (1/2 of the water quality volume).

Retention, reuse and onsite soakage of the water quality volume will therefore be required to provide stormwater treatment and erosion control. Impermeable surfaces should be minimised where possible using techniques and recommendations in the WRC guidelines to reduce the post-developed volume.

Water tanks for each lot are recommended so rainfall runoff is reduced and water can be stored for household water supply, as a water supply will not be provided to the growth cell.

Onsite soakage will need to be tested and designed on a lot by lot basis by a suitably qualified stormwater engineer using site specific investigation data. If on-site soakage investigations show that the post-developed water quality rainfall volume cannot be achieved through water tanks and soakage then bio-retention devices or a suitable wetland will need to be designed.

Vegetated swales are recommended as appropriate devices to convey overland flows using the best practice methods in the WRC guidelines. These should be aligned adjacent to roads in the berm area of the road where possible.

Road berms need to be of sufficient width to accommodate vegetated swales and low impact stormwater treatment systems such as rain gardens and soakage basins if required. Onsite soakage will need to be tested and if water quality treatment of the final road layout cannot be achieved within the berm space then a suitable wetland will need to be designed. Given the current topography and overland drainage paths (Figure A1 in Appendix A), the east or northern areas of the growth cells would be an appropriate location for such a device. The WRC and RITS guideline documents should be used for best practice design.

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An allowance for swales is included in the collector road cost estimate as presented in the Tonkin and Taylor Transportation Assessment for Ngahinapouri. It is assumed that the construction and design costs of other stormwater treatment devices within the growth cell will be the responsibility of the developer(s).

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3 Wastewater and water supply assessment

Ngahinapouri lies outside of any reticulated water supply or reticulated wastewater network. The Waipa2050 Growth Strategy (2017) vision for Ngahinapouri states that the village will remain un-serviced in terms of both wastewater and water supply.

3.1 Wastewater

The large lot residential zone has an average lot size of 5000 m^2 (Part E Section 15 Rule 15.4.2.1 (n) of the District Plan) whilst the WRC requirements for on-site wastewater treatment includes a minimum effective effluent disposal area of 2,500 m^2. Therefore, subject to the soakage capacity of the prevailing soil conditions, large lot residential development with on-site wastewater treatment would comply with the WRC requirements. Other interactions with groundwater, flood plains and overland flow paths would also need to be considered in the design.

The design of such devices is covered in the Waikato Regional Plan, Section 3.5.7 Implementation Methods – Onsite Sewerage Discharges and the Auckland Regional Council 2004 On-site Wastewater Systems Design and Management Manual – Technical Publication Third Edition (TP58). TP58 states that a soil profile determination should be undertaken to determine soakage rates and the document provides guidance on how this assessment should be undertaken.

Key design criteria for such systems are listed in Table 3.1.

Table 3.1: Key wastewater design criteria

Item	Waikato Regional Plan, Section 3.5.7 Implementation Methods – Onsite Sewerage Discharges	Comments
Effluent volume	Maximum 1,300 l/day	Averaged over any one month
Septic Tank Size	Minimum 3,000 litres	
Effective disposal area onto or into land	Minimum 2,500 m^2	

Each lot will therefore need to be of sufficient size to accommodate an effective disposal area. The siting of such systems on each lot must avoid interaction with streams, flood waters, overland flow paths and avoid risks of groundwater contamination. To achieve this, the Regional Plan stipulates separation distances from wastewater effluent fields and these environments. The soil profile and soakage capacity will need to be determined on a lot by lot basis in accordance with TP58 to determine appropriate on-site wastewater treatment devices.

3.2 Water supply

As the village will remain un-serviced, water supply will need to be managed through rainwater tanks and private bore water supplies.

Groundwater investigations will be required to ensure proposed lots can be serviced by bore supply without having a negative impact on the existing bores in the village. Rainwater tanks for each lot are recommended to reduce pressure on the bore supply and help meet stormwater treatment requirements.

Water quality will need to be tested to ensure that it meets the requirements of the Ministry of Health's Drinking Water Standards for New Zealand 2005 (revised 2008) and any potential updates to these standards following proposed national reforms on potable water supply.

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4 Conclusions and recommendations

Ngahinapouri is identified for growth in the Waipa2050 Growth Strategy (2017) and Waipa District Council (WDC) 2018 – 2028 Long Term Plan.

The key conclusions and recommendations from the technical assessments of the stormwater, wastewater and water supply requirements to support the village concept plan for the growth cells are as follows:

Stormwater

- Due to the position of the growth cell within the wider Mangahia stream and Waipa River catchments, peak flow control of the 2 year ARI and higher magnitude events is not recommended to avoid coincidence with the larger flood peaks.
- There are properties between the growth cells and the Waipa River and it is recommended that further assessment through modelling is undertaken to ensure that the post development pass-forward flow approach does not have a negative impact on these properties.
- Retention, reuse and onsite soakage of the post-development water quality volume will be required to provide stormwater treatment and erosion control. Water tanks for each lot are recommended to help meet these requirements and water supply demands.
- Onsite soakage will need to be tested and designed on a lot by lot basis. If on-site soakage investigations show that the post-developed water quality rainfall volume cannot be achieved through water tanks and soakage then bio-retention devices or a suitable wetland will need to be designed.
- Road berms need to be of sufficient width to accommodate swales and low impact stormwater treatment systems such as rain gardens and soakage basins if required. The sizing of such devices will be dependent on the final road layout and onsite soakage testing.
- An allowance for swales is included in the collector road cost estimate as presented in the Tonkin and Taylor Transportation Assessment for Ngahinapouri. It is assumed that the construction and design costs of other stormwater treatment devices within the growth cell will be the responsibility of the developer(s).

Wastewater

- The growth cell will not be provided with a public wastewater system and hence is required to be serviced by on-site wastewater treatment and discharge systems.
- The design of these devices need to comply with the Waikato Regional Plan, Section 3.5.7 Implementation Methods – Onsite Sewerage Discharges and the Auckland Regional Council 2004 On-site Wastewater Systems Design and Management Manual – Technical Publication Third Edition (TP58).
- The soil profile and soakage capacity will need to be determined on a lot by lot basis in accordance with TP58 to determine appropriate on-site wastewater treatment devices.

Water supply

- Water supply will need to be managed through rainwater tanks and the bore water supply.
- Groundwater investigations will be required to ensure proposed lots can be serviced by the bore supply without having a negative impact on the existing supply.

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5 Applicability

This report has been prepared by Tonkin & Taylor Limited (T+T) for Boffa Miskell Ltd pursuant to the terms of engagement (Contract) between T+T and Boffa Miskell Ltd in relation to the Ngahinapouri Village Concept Plan project. T+T agrees this report may also be used by Waipa District Council (WDC) for the purposes set out in, or able to be reasonably inferred from, the Contract, on the basis that the aggregate liability of T+T to Boffa Miskell Ltd and WDC in respect of any such use or reliance is subject to the limitations and exclusions of liability set out in the Contract. This report may not be relied upon in other contexts or for any other purpose, or by any person other than Boffa Miskell Ltd and WDC, without T+T's prior written agreement.

Tonkin & Taylor Ltd

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.....	.....
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Appendix A: Stormwater Figures

- **Figure A1: Ngahinapouri drainage map**

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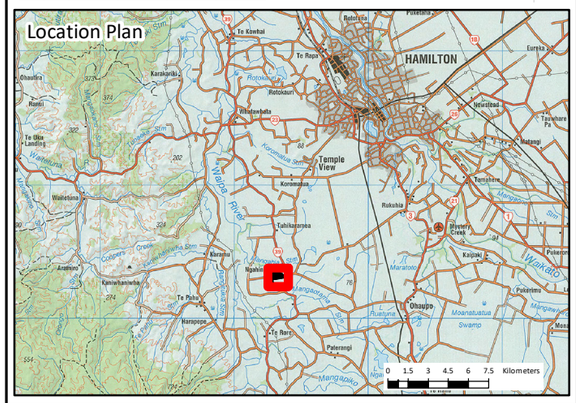
Overland Flowpaths

Ngahinapouri Growth Cells

A3 SCALE:1:5,000

0 40 80 120 160 200 Meters

N



Notes:
Topo map and aerial sourced from LINZ Data (Crown Copyright Reserved).

Applicability:
This figure has been prepared with respect to the particular brief given to Tonkin + Taylor.
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Flowpath routes generated using 2008-2009 LiDAR topographical data

DRAWN	JMOR	May.19
CHECKED	JJBR	Aug.19
APPROVED	GGN	Aug.19
ARCFILE FigureA1_Ngahinapouri_drainage_map.mxd		
SCALE (AT A3 SIZE) 1:5,000		
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BOFFA MISKELL

WAIPA STRUCTURE PLAN

Ngahinapouri Town

Drainage map

FIGURE A1

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