Appendix A: Taupiri CMP Assessment

REPORT

Waikato District Council

Appendix **A**

Catchment Management Plan
Taupiri Structure Plan Area

Tonkin & Taylor

ENVIRONMENTAL AND ENGINEERING CONSULTANTS

REPORT

Waikato District Council

Appendix **A**

Catchment Management Plan
Taupiri Structure Plan Area

Report prepared for:

Waikato District Council

Report prepared by:

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1 Catchment description

1.1 Location

The Taupiri SPA surrounds the North Waikato township of Taupiri. The SPA is located adjacent the east bank of the Waikato River, approximately 7 km North East of Ngaruawahia. The location of the Taupiri SPA is presented in Figure 1. The SPA covers approximately 94 ha. The SPA is bordered by the Waikato River to the west, the Managawara Stream to the north and generally by rural land to the east and south punctuated by incised stream channels. The North Island Main Trunk railway line runs through the centre of the structure plan area, following Great South Road through the centre of Taupiri Township.

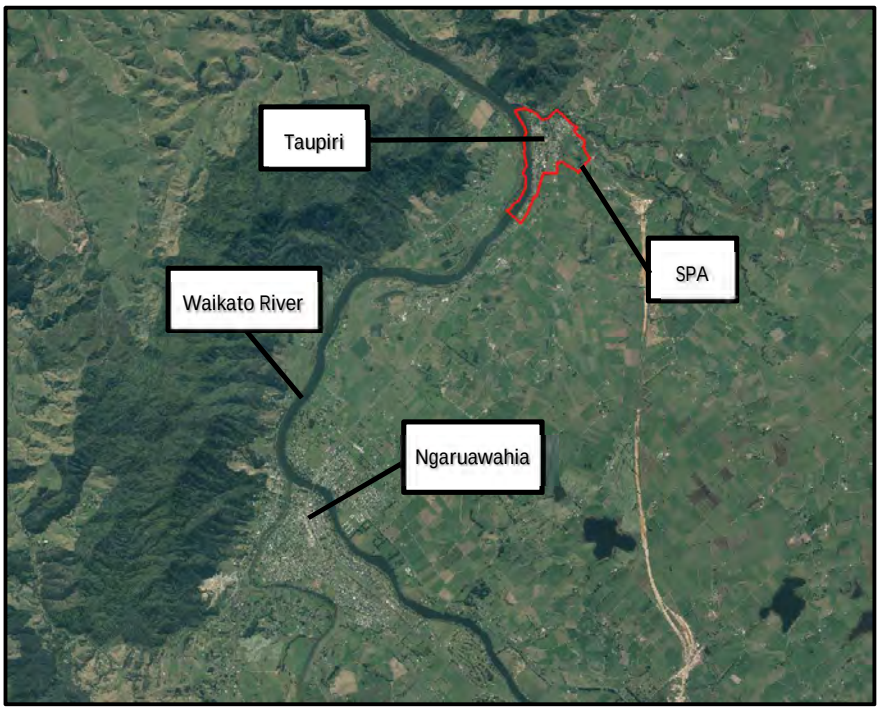

Figure 1. Taupiri SPA locations (Aerial sourced from WDC)

1.2 Topography

The topography of the catchment and SPA is typically gently undulating with relatively flat terraces with incised gullies which drain natural water courses. The SPA encompasses the Taupiri Township and some agricultural land to the south and the east. The area generally slopes to the north, towards the confluence of the Waikato River and the Mangawara Stream.

The upper catchment to the east is largely flat punctuated by managed farm drainage channels.

1.3 Geology and hydrogeology

The published geology of the area indicates that the majority of the Taupiri SPA is underlain by interbedded alluvial sands, silts and peats of the Hinuera Formation of the Piako Subgroup, overlying in places older sands, silts of the Walton Subgroup. Both the Pleistocene Age Walton Subgroup and the younger Holocene age Piako Subgroup are mapped as belonging to the Tauranga Group.

Recent alluvial sediments comprising sands, silts and peats are present in the bases of gullies or stream beds (Edbrooke S. W., 2005) as shown in the Geological map in Figure 2 below.

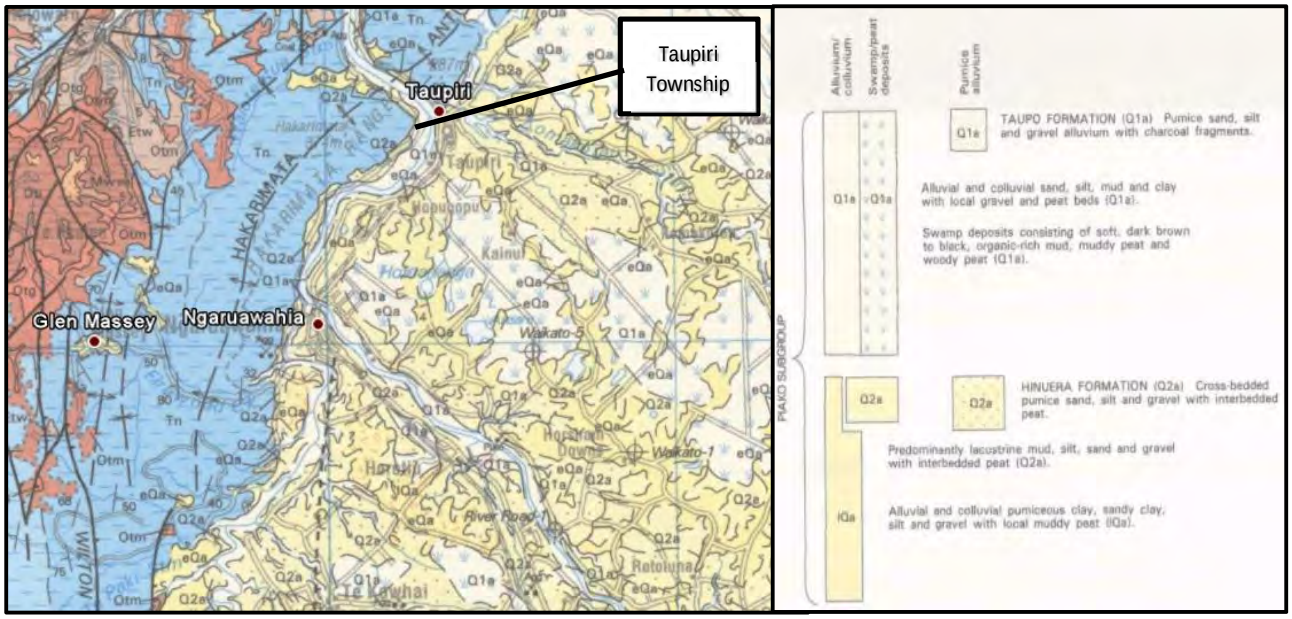

Figure 2. Geological map of Taupiri SPA

The SPA sits in northwest corner of the Hamilton Basin, where the basin abuts much older and much less permeable greywacke rocks of the Newcastle Group, and the Waikato River drains through the Taupiri Gap.

The hydrogeology of the Tauranga Group is characterised by a series of shallow unconfined and deeper semi-confined aquifers, which are variable in their horizontal and vertical distributions, and show varying degrees of connectivity with one another.

Groundwater is recharged from rainfall infiltration and a significant proportion of groundwater discharges to streams through the incised gullies. Marshall and Petch (1985) estimated that up to 85% of mean annual stream flow is sustained by groundwater discharges.

1.4 Watercourses

The village of Taupiri is situated on a low lying river terrace, lying south of the confluence of the Mangawara Stream with the Waikato River and southwest of the Komakorau stream and the Mangawara Stream.

The Mangawara and Komakorau Steams (and their tributaries) drain significant catchments to the east of the Taupiri Township.

An unnamed tributary of the Waikato River passes through the SPA including Growth Sectors A and B. The tributary receives runoff from farmland south of the SPA and is approximately 10km in length. The unnamed tributary runs south to north through the SPA and is conveyed under Te Putu Street via a 1300 mm diameter culvert and then under the NMTL via another culvert. It then passes under the Gordonton Road Bridge alongside the NMTL and discharges to the Mangawara Stream just upstream of the Waikato River confluence.

Another unnamed tributary of the Waikato River passes beneath the North Island Main Trunk Line and Great South Road to discharge to the river in the southern part of the SPA. The tributary receives runoff from rural land.

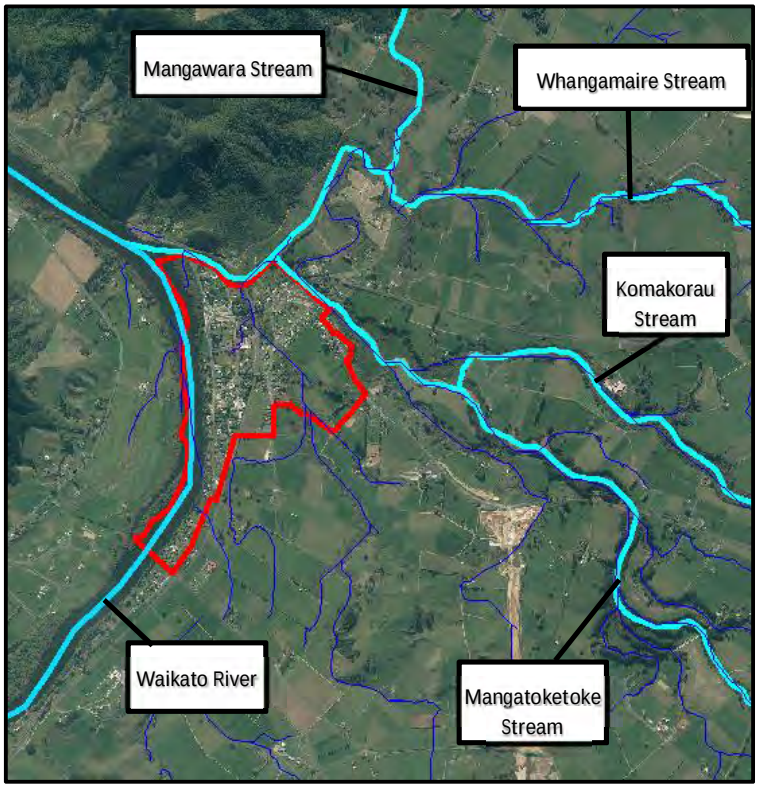

Figure 3. Main water courses (light blue) and tributaries (dark blue) surrounding the SPA.

1.5 Receiving environments

The identified surface water receiving environments within or adjacent to the Taupiri SPA include:

- An unnamed tributary of the Mangawara River.
- Mangawara Stream.
- Komakorau Stream.
- Mangatoketoke Stream.
- Waikato River.
- Unnamed tributaries of all of the above.

1.6 Existing WRC resource consents

1.6.1 General

WRC's online database has been used to broadly identify the types of resource consents held within the SPA and these are summarised in Table 1 below.

Table 1. WRC Resource Consents

Resource Consent Type	Number	Growth Sector
Discharge - Air	0	-
Discharge - Land	4	-
Discharge - Water	3	-
Land Use – Bore/Well	0	-
Land Use – Other	3	-
Water Take - Ground	0	-
Water Take - Surface	2	-
Water Take - Other	2	-

1.6.2 Comprehensive stormwater discharge consent

Waikato District Council holds Resource Consent No. 105651, being a Comprehensive Stormwater Discharge Consent (CSDC) associated with urban Taupiri.

Relevant extracts from the resource consent are reproduced below:

Consent Type: Discharge permit

Consent Subtype: Discharge to land and water

Activity authorised: To divert and discharge urban stormwater and associated contaminants at multiple locations to land and an unnamed tributary of the Waikato River, and use discharge structures, within the Taupiri urban area.

Consent duration: Granted for a period expiring on 22 September 2028

It is noted that the extent of the above consent (reticulated urban area of Taupiri) is somewhat smaller than the extent of the SPA, with the SPA extending further south and northeast.

2 Land use in Taupiri

2.1 Current land use

Land use within the SPA is dominated by residential areas and agricultural land uses. Other land uses currently occurring within the SPA include rural residential and a small urban (rural town) area.

The North Island Main Trunk Line (NMTL) railway line runs through the middle of the SPA and the centre of Taupiri Township. Key arterial routes run through the SPA, including state highway 1 (SH1) and Great South Road.

Outside of the township, the SPA is dominated by pastoral land with some rural residential development. Individual blocks of horticultural land use are present within the rural parts of the SPA.

2.2 Future land use

Future growth within the SPA has been provided by WDC and is shown in Figure 4 below. The figure shows that the future land use is anticipated to be only residential zones.

For reporting purposes, the growth areas defined by WDC have been categorised into “Growth Sectors” A and B. These are also presented in Figure 4.

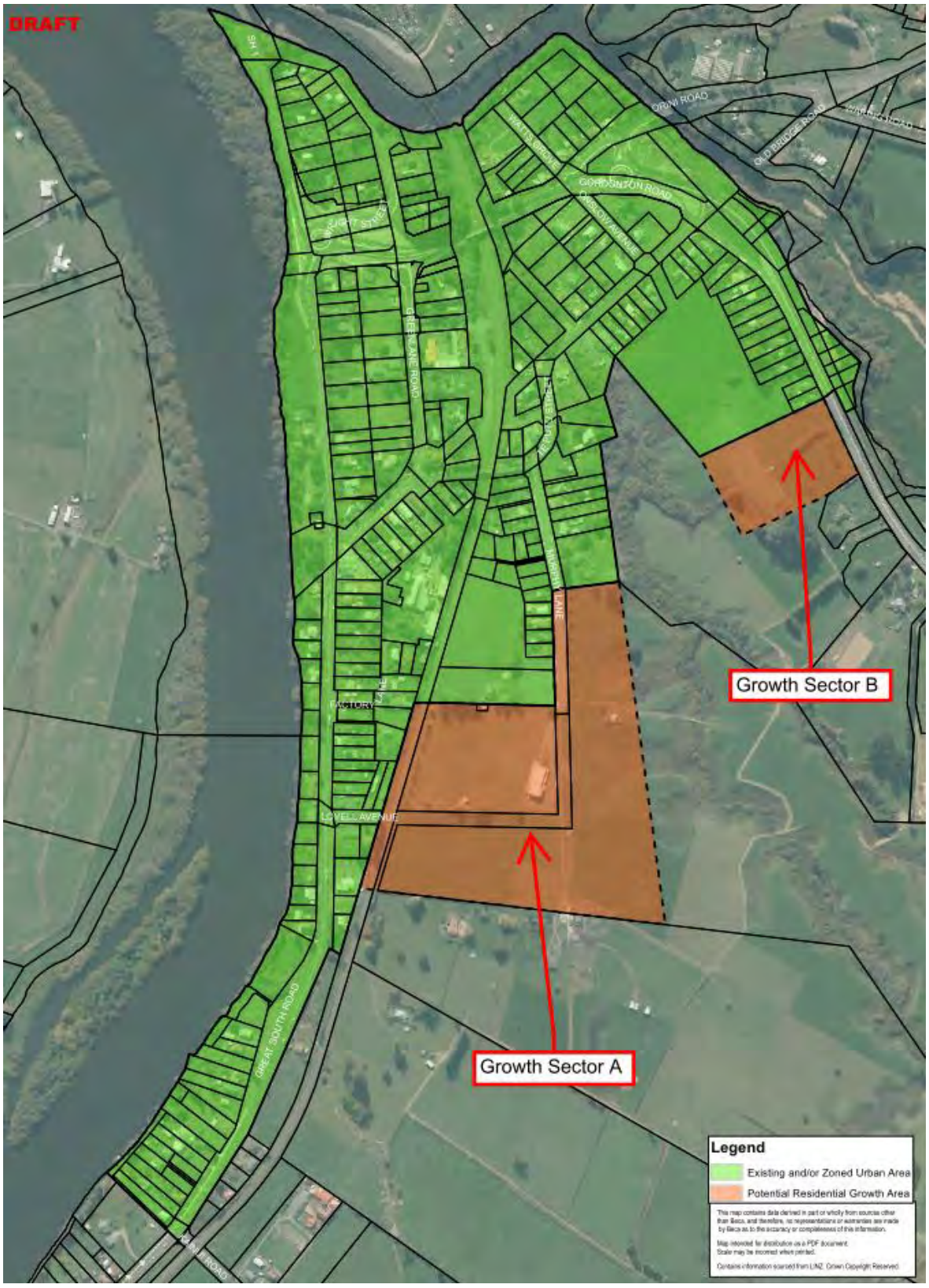

Figure 4. Taupiri growth plan provided by WDC and Growth Sectors used for reporting.

3 Ecological review

This section presents the results of our review and assessment of the ecological status of stream resources in the Taupiri SPA. The assessment is based on a review of existing ecological information with a walkover site visit to publicly accessible parts of the SPA. Important terrestrial and wetland values recorded in the district plan are also briefly described.

3.1 SPA overview

3.2 Assessment methods

There has been no ecological assessments of Taupiri and its surrounds provided by Waikato District Council. Our assessment has reviewed the information available within national and regional ecological databases.

In addition, a site walk over of streams at publicly accessible locations was conducted by a T&T ecologist on 9 April 2014 to confirm levels of development, observe in stream structures, assess fish passage conditions and visually assess habitat condition. The sites assessed during the field assessment are shown on Figure 232 in Appendix AA.

3.3 Summary of existing ecological information

3.3.1 Operative District Plan

The Operative Waikato District Plan and associated maps were reviewed for any ecological features of note. The Taupiri SPA is included on Planning Map 20.5. There were no ecological features of note within the Taupiri SPA.

3.3.2 Waikato Regional Plan maps

Waikato Regional Plan (WRP) water management and stock exclusion maps were reviewed to check for any specific values that apply to SPA streams.

The Waikato River, Mangawara Stream and Whangamarie Stream are classified as Indigenous Fish Habitat Areas (Map S14). This classification is applied to significant habitats or areas that are characterised by high water quality. The Waikato River is also designated as Trout Habitat and Contact Recreation.

All other permanent watercourses within the area are classified as Waikato Surface Water (Map S14) and will be subject to the relevant standards in Section 3.2 of the WRP in regard to discharges of contaminants.

3.4 T&T's 2014 field assessment

A site inspection of publicly accessible locations on the streams within the SPA was conducted on 9 April, 2014. Locations inspected are shown on Figure 232 in Appendix AA. Observations from site inspections concluded that the unnamed stream within the Taupiri SPA was a small stream with flow attenuated by excessive infestation of Crack Willow (*Salix fragilis*) throughout the entire observed length of stream. Stream habitat at the sites inspected was generally limited to slow moving runs and pools with undercut banks, root mats and overhanging vegetation present. No barriers to upstream fish habitat were identified although due to difficulties with access, the culvert under the North Island Main Trunk line was not inspected.

The Waikato River and Komakorau Stream run along the boundary of the Taupari SPA. Both these water courses provided aquatic habitat.

4 Ecological assessment

4.1 Introduction

This section provides an assessment of the potential effects of development of the Taupiri SPA on surface water resources. The assessment has considered the general issues outlined within Section 2 of the main report. This section provides an assessment of the significance of these issues for each of the growth areas identified by WDC.

4.2 Assessment of effects

The main ecological issues associated with future urban development in the Taupiri SPA are described below and the significance of proposed development to a range of issues for each growth area is presented in Table 2.

Table 2. Significance of potential adverse effects from proposed development

Growth Sector / Issue	A - Low density residential	B - Low density residential
Stormwater		
Contaminants	Low	Low
Increase in peak flows leading to stream bed/bank erosion	Low	Low
Hydrological		
Reductions in base flow	Low	Low
Reduction in flow variability leading to reduced habitat quality	Low	Low
Habitat		
Culverting or infilling of perennial streams reducing habitat	Low	Low
Protection of riparian margins	Low to medium	Low to medium
Barriers to fish movement	Low	Low
Overall potential adverse effect on surface water	Low	Low

5 Flooding assessment

5.1 Introduction

A ponding map of the Taupiri SPA has been produced. The purpose of the ponding map is to determine the areas which may be inundated if no pipe network is available. The ponding map is a valuable tool to provide an indication of where potential flooding hazards may occur and where future modelling efforts should be concentrated. This approach assumes that the reticulated network (pipes, culverts and catchpits) are blocked but does include rainfall-runoff analysis.

5.2 Methodology

To create the ponding maps, a GIS tool has been used to infill and map all topographic depressions based on the LiDAR survey provided. We note that LiDAR provided was collected in 2007 and 2008 so is considered somewhat out of date. The mapped depressions represent all areas where stormwater could *potentially* pond.

A key issue is that the mapping does not allow for culverts or other sub-surface drainage features which could convey stormwater and reduce or eliminate ponding. Overall the largest ponding areas are generally caused by road embankments, bridges or culverts.

From the ponding maps, critical areas have been identified and a field assessment has been undertaken to identify sub-surface drainage features that could significantly affect the ponding areas shown.

The key culverts that may influence the ponding areas have been identified on the Figure 222 in Appendix AA and also in Table 3.

5.3 Information provided by WDC

5.3.1 Waterway and reticulated assets

WDC did not provide any information on any bridges or significant culverts within the catchment.

Some stormwater reticulation data was provided but in general layout information only was provided and infrastructure elements such as pipe sizes, lengths, and invert levels were generally not provided. It is also noted that road culverts were generally not shown on the stormwater asset layer provided and we understand that culvert information may be available on WDC's RAMM database but these were not available at the time of this assessment.

5.3.2 Buildings

WDC provided building footprints within the Waikato but no information on any floor levels.

5.3.3 Drainage operational issues

No drainage issues or flood reports were noted or provided by WDC.

The town is located within the Lower Waikato Waipa Control Scheme, Section B (Waikato River Channel) administered by Waikato Regional Council.

5.3.4 Waikato River flooding, 2009.

T&T has liaised with WRC to obtain flood model data for the Waikato River.

Waikato River 1D flood model (MIKE 11) cross sections including 1% AEP (with no climate change) flood levels from the Karapiro Dam to Port Waikato were available as well as an interpolated 2D flood extent.

The interpolated 2D extent of 1% AEP flooding for both rivers was undertaken by WRC by interpolating the 2009 MIKE 11 1D models on to a LiDAR derived topography using WaterRide Software.

The WRC cross sections indicate that the Waikato River 1% AEP (with no climate change) flood level ranges between approximately 12.9 m RL and 13.2 m RL within the Taupiri SPA. The WRC interpolated 1% AEP river flood extent (with no allowance for climate change) has been presented in Figure 222 in Appendix AA.

WRC were not able to provide any flood level or extent information for the Mangawara River.

5.4 Reporting

For reporting purposes, the areas of potential growth has been broken up into "Growth Sectors". Within the Taupiri SPA, there are two Growth Sectors – A and B. The locations of the Growth Sectors are shown in Figure 222 in Appendix AA and also Figure 4. Both Growth Sectors contain only proposed residential land.

Growth Sector A is outside the SPA. The SPA boundary may need to be extended to encompass this area. Growth Sector A has an approximate area of 13 ha. It is bound by the railway line to the west, and generally rural farmland to the north, east and south. There currently appears to be two buildings in Growth Sector A.

Growth Sector B is smaller than A, with an approximate area of 1.3 ha. It is bordered to the east by the Waikato Expressway and to the north, west and south by farmland. There appear to be no existing buildings within Growth Sector B, and it looks to be currently used as farmland.

5.5 Results

The results from the ponding assessment are presented in Figure 222 in Appendix AA. The ponding assessment entails a high level overview of the ponding extent shown in these figures and reviews the constraints to the proposed residential area.

Flooding of each Growth Sector has been reviewed separately and discussed in the following sections. The areas within the SPA but outside of the proposed growth areas have not been specifically considered as no growth has been proposed.

The ponding map does not account for culverts, road embankments or bridges. There is seen to be extensive and significant ponding upstream of where the unnamed tributary appears to be conveyed under the NMTL (which coincides with the location of the Gordonton Road Bridge). The LiDAR data has been reviewed, and the contour information for Gordonton Road Bridge, directly above the NMTL railway line has been excluded to give a more accurate flood map. However, the NMTL railway line has an approximately 3.5 m high embankment and there is expected to be a culvert (cTAU101 on Figure 222 in Appendix AA) underneath the railway line at the location of the Gordonton Road Bridge, but this was not identified in our site visits.

This appears to have an effect on the upstream overland flow paths which demonstrate significant ponding up to 1.8 km south of the bridge. Some of these overland flow paths are within the boundaries of both Growth Sectors A and B. This should be considered when assessing the ponding in these areas.

5.5.1 Growth Sector **A**

There is localised ponding within Growth Sector A, as seen in Figure 222 in Appendix AA. There is an overland flow path running east through the middle of Growth Sector A. Further downstream, this joins with other overland flow paths and is conveyed under Te Putu Street via a 1300 mm diameter concrete culvert (cTAU100). The flow path is then assumed to pass under the NMTL railway before the Gordonton Road Bridge via a culvert (cTAU101) and discharges to the Mangawara Stream.

The overland flow path running through Growth Sector A is affected by the downstream culverts cTAU100 and cTAU101, and therefore the ponding shown on the eastern side of Growth Sector A may be less significant if the bridge and culvert were included in a detailed flood model.

However, is also important to note that if Growth Sector A is developed, the area will become more impermeable and result in greater runoff flows to both cTAU100 and cTAU101. Both of these culverts should be investigated further to ensure they have adequate capacity for the 1% AEP storm event in the future, including development of Growth Sector A.

5.5.2 Growth Sector **B**

The potential ponding within Growth Sector B is extensive as shown in Figure 222 in Appendix AA, and covers approximately 40% of the Growth Sector. As discussed, there are two culverts downstream of Growth Sector A that may be causing an unfair representation of the extent of flooding. A more detailed analysis should be produced, including the bridges and culverts within the Taupiri SPA, to further assess whether Growth Sector B will be affected by flooding.

5.5.2.1 Infrastructure

Table 3 below summarises the existing critical infrastructure within the Taupiri SPA which is considered a potential restriction on the flow of major overland flow paths, watercourses or streams. Refer to Figure 222 in Appendix AA which shows the locations of these restrictions. The ponding model was used to determine which infrastructure assets were considered 'restrictions'. WDC have provided stormwater asset details but unfortunately this did not include the majority of culverts identified as constrictions.

Table 3. Summary of critical infrastructure

Infrastructure ID	Length (m)	Diameter (mm)	IL's – US/DS	Capacity check required?	Other notes
cTAU100	No data	1300	No data	Yes	-
cTAU101	No data	No data	No data	Yes	-

5.6 Summary of flooding issues

This section provides an assessment of the potential effects of flooding on the Taupiri SPA. The assessment includes an evaluation of ponding areas on potential future residential development, and on the capacity of infrastructure critical to managing flood hazard within the SPA.

A summary evaluation of the issues is presented in Table 4.

In this table we have made the following assumptions on the constraint that flooding might pose to development in each Growth Sector:

- Low constraint to development have been categorised as Growth Sectors with large areas not affected by flooding, and overall no significant flood mitigation required.
- Medium and high constraints to development would probably need to be managed through land use policies, and/or rules in the District Plan, or modifications to the Development Manual.
- For critical infrastructure, those structures that are unable to pass the 1% AEP peak flow (without heading up to above road crown level and/or causing upstream flooding) would likely pose a significant constraint to development.

Table 4. Summary of flooding issues

Flooding Assessment	Growth Sector A - Residential	Growth Sector B - Residential
Existing buildings affected by ponding?	Yes	Yes
Existing potentially critical infrastructure	cTAU100, cTAU101	cTAU100, cTAU101
Overall constraint[1]	Low	Medium to High

1. Based on area affected by ponding and ability of the land use type to avoid or mitigate the adverse effects of flood hazards on the built environment.

5.7 Information gaps

Through our review of available information and our assessment of issues and constraints we have identified the following information gaps:

- Information about existing culvert levels, diameters, lengths and materials. This information would be useful in verifying the capacity of existing culverts that are of concern and is essential for more detailed modelling efforts.
- Existing building floor levels to clarify potential flood vulnerability.
- More detailed information on future growth areas including road layout and waterway crossings.

6 References

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7 Applicability

This report has been prepared for the benefit of Waikato District Council with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
.....	.....
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Civil Engineer/Project Manager	Project Director

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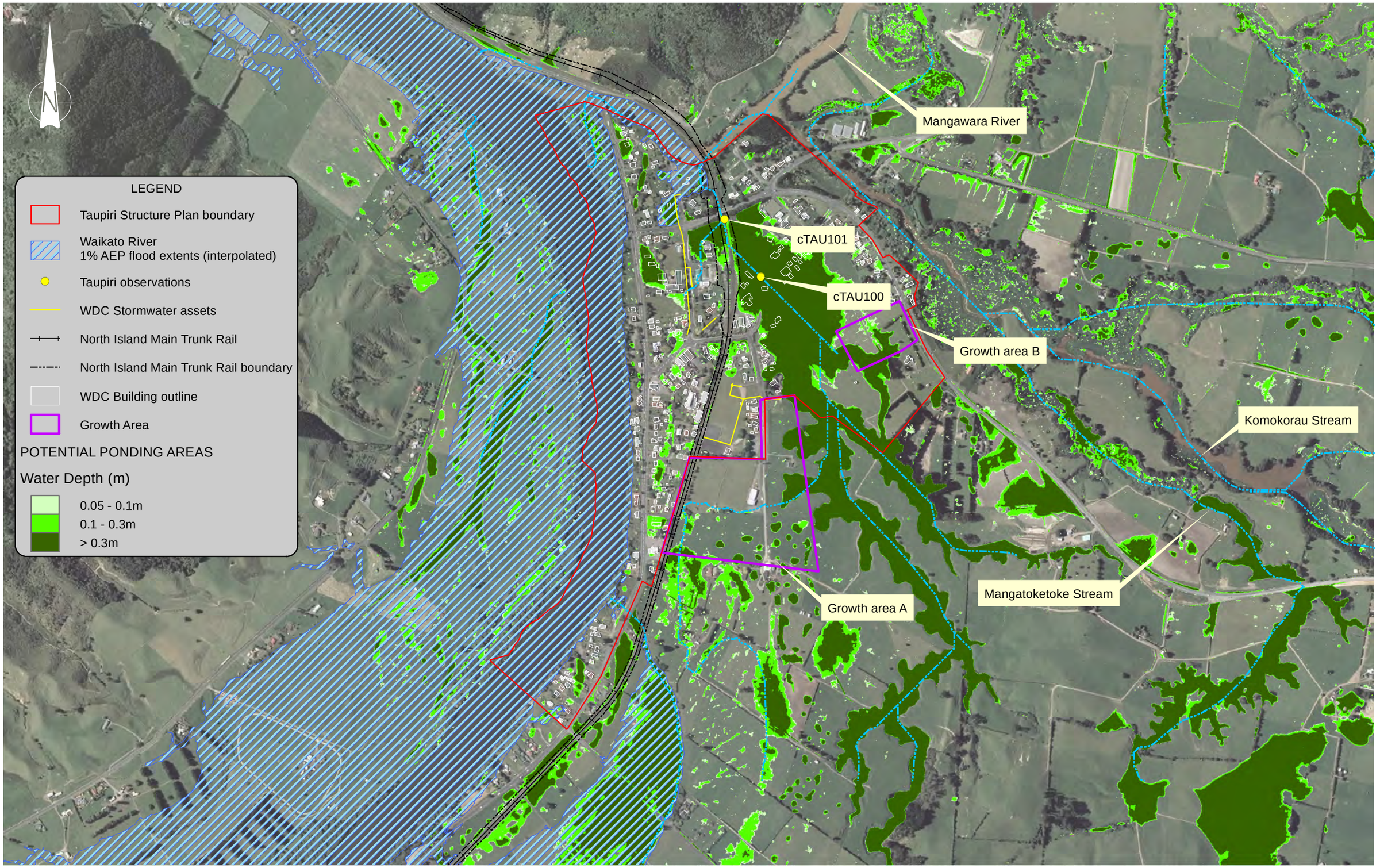
Appendix AA: Figures

- Figure 222 Flooding Map
- Figure 232 Ecological Map



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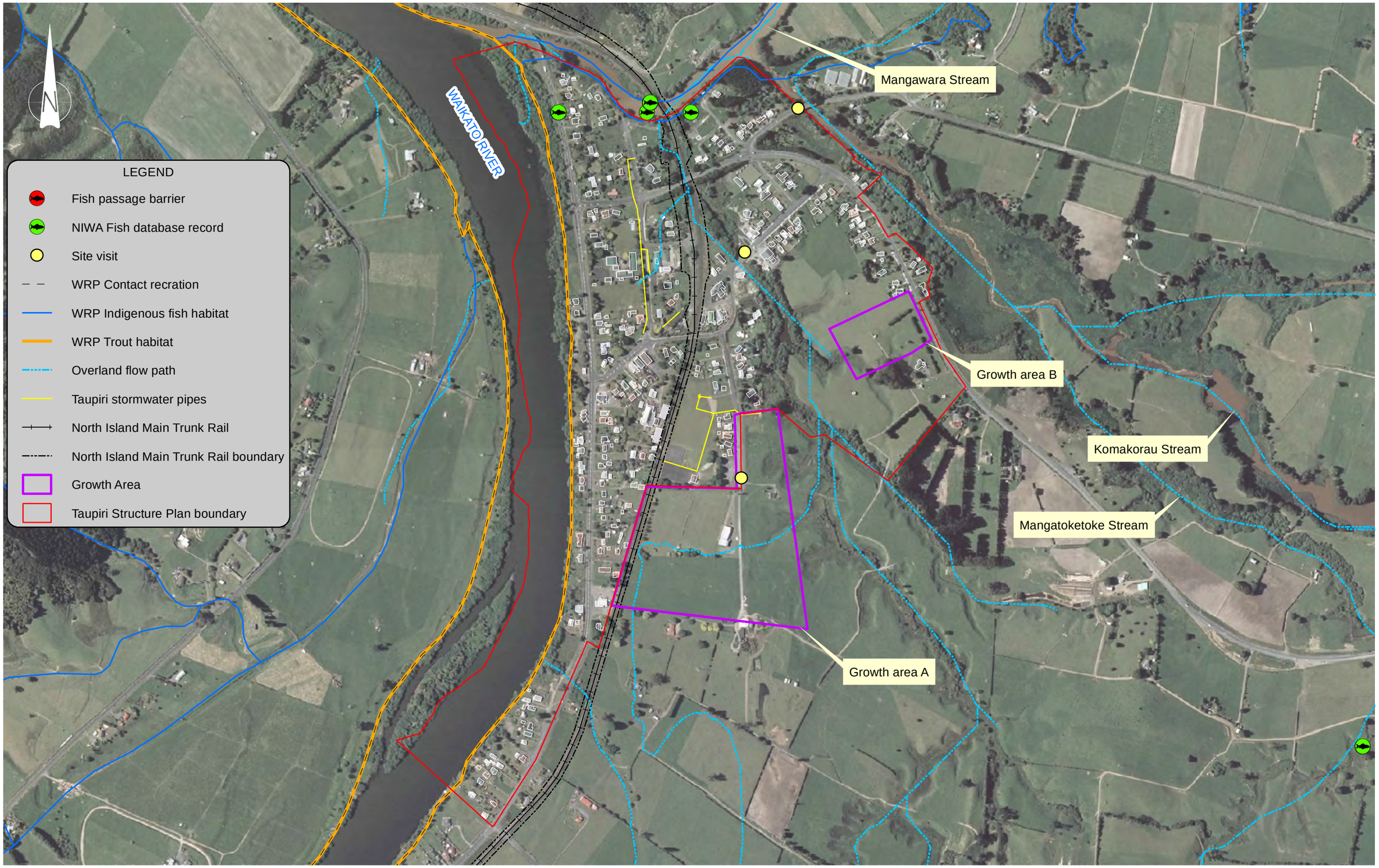
WAIKATO DISTRICT COUNCIL
CATCHMENT MANAGEMENT PLAN OF TAUPIRI STRUCTURE PLAN AREA
Flooding Map

FIGURE No. Figure 222 | Rev. 0



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WAIKATO DISTRICT COUNCIL
CATCHMENT MANAGEMENT PLAN OF TAUPIRI STRUCTURE PLAN AREA
Ecological Map

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