



## Mangawhai Hills

### Engineering Report




**Prepared For:**  
Mangawhai Hills Ltd

**Chester Job Number:**  
15209

**Date:**  
23 February 2023

## Revision History

Revision No.	Prepared By	Description	Date
0	K. Abdullah	First Issue	23 February 2023

Action	Name	Signed	Date
Prepared by	K. Abdullah		23 February 2023
Reviewed by	S. Rankin		23 February 2023
Approved by	N Jull		23 February 2023



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# 1 Introduction

Chester Consultants Ltd (Chester) has been engaged by Mangawhai Hills Ltd to provide an Engineering Report with respect to the proposed private plan change (PPC) referred to herein as 'the PPC', the PPC area is approximately 225ha and comprised of multiple titles.

This report has been prepared solely for the benefit of this specific project, and the Kaipara District Council (KDC). Chester accepts no liability for inaccuracies in third party information used as part of this report. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

This report is based on development data provided by third party contributors to the private plan change application as well as data obtained from the KDC and Northland Regional Council (NRC) maps current to the site at the time of this document's production. All vertical levels stated in this report are in New Zealand Vertical Datum 2016 (NZVD2016) unless stated otherwise. Should alterations be made which impact upon the development not otherwise authorised by this report then the design / comments / recommendations contained within this report may no longer be valid.

In the event of the above, the property owner should immediately notify Chester to enable the impact to be assessed and, if required, the design and or recommendations shall be amended accordingly and as necessary.



## 2 Legal Descriptions

The PPC Area is comprised of multiple lots; Figure 2-1 shows the legal descriptions of each parcel that making up the area.

Table 2-1: Existing Parcel within the PPC Area

Parcel ID	Legal Description	Property Address
4818028	Lot 2 DP 172698	160 Tara Road
5203974	Allot 254 PSH of Mangawhai	160 Tara Road
8351500	Lot 2 DP 578282	196 Tara Road
8351501	Lot 1 DP 578282	196 Tara Road
5075209	Allot 247 PSH of Mangawhai	106 Moir Road
4789942	Lot 1 DP 206997	104D Tara Road
4886023	Lot 2 DP 206997	104C Tara Road
4782859	Lot 4 DP 206997	104B Tara Road
5129768	Lot 3 DP 206997	104A Tara Road
4818029	Lot 1 DP 135346	90 Tara Road
5000897	Lot 2 DP 135346	88 Tara Road
4866145	Lot 3 DP 135346	86 Tara Road
4771795	Lot 4 DP 135346	84 Tara Road
5075208	Lot 6 DP 135346	Local Purpose Reserve (Esplanade)
4915641	Lot 7 DP 125004	Local Purpose Reserve (Esplanade)
4737904	Lot 5 DP 135346	72 Tara Road
4677748	Lot 6 DP 125004	70 Tara Road
4898148	Lot 3 DP 139478	106B Moir Road
5041362	Lot 2 DP 139478	106 Moir Road
5158678	Lot 1 DP 139478	106 Moir Road
7867912	Lot 1 DP 521452	112 Moir Road
5038813	Lot 4 DP 125004	Local Purpose Reserve (Esplanade)
4781930	Lot 5 DP 125004	34 Tara Road
5035520	Lot 3 DP 107096	Local Purpose Reserve (Esplanade)
7867913	Lot 2 DP 521452	Moir Street
7653373	Lot 1 DP 490650	114 Moir Street
5183752	Lot 2 DP 125004	110 Moir Street
5048665	Lot 4 DP 139478	Moir Street
5042748	Lot 7 DP 139478	Moir Street
5170925	Lot 6 DP 139478	Moir Street



4791454	Lot 5 DP 139478	Moir Street
5019011	Lot 3 DP 154781	104B Moir Street
4761673	Lot 4 DP 154781	104C Moir Street
4754319	Lot 2 DP 154781	104A Moir Street
5022310	Lot 1 DP 154781	104 Moir Street
4765594	Lot 5 DP 154781	104B Moir Street
5185450	Lot 21 DEEDS W 38	96 Moir Street
4799656	Lot 17 DEEDS W 38	96 Moir Street
4916246	Lot 18 DEEDS W 38	96 Moir Street
4946787	Lot 20 DEEDS W 38	96 Moir Street
4905603	Lot 19 DEEDS W 38	96 Moir Street
5124736	Lot 1 DP 15117	30 Urlich Drive

The PPC Area is located north-west of the Mangawhai Township. Tara Road, Cove Road and Old Waipu (North) Road and Moir Road generally bound the west, north and north-eastern and southern sides of the area, respectively.

The topography in the PPC area is undulating with areas of moderate to steep slopes mixed with slight slopes. The north-western end of the area features a bowl contained by internal ridgelines which flows down to the southeast as the topography opens up to the Mangawhai Estuary.

The bulk of the PPC area is farmland with low density development near the southern corner with Tara Road and Moir Street.



Figure 2-1: Private Plan Change Area (boundary in red) - 225ha (Extracted from Barker & Associates)



## 3 Purpose

This purpose of this report is to inform the civil engineering matters for consideration as part of the proposed Plan Change.

This report is intended to support the proposed private plan change by reporting on the following:

- Natural Hazard (Flooding)
- Earthworks
- Erosion & Sediment Control
- 3 – Waters
  - Water Supply
  - Stormwater
  - Wastewater

The purpose of this report is to:

- Identify what infrastructure is necessary to allow development in line with the proposed zoning.
- Confirm if existing infrastructure has sufficient capacity, and if not, identify potential options to provide it.
- Identify the Kaipara District Councils commitments to bulk infrastructure upgrades (water & wastewater treatment) and convey how they relate to the PPC.
- Develop a stormwater management plan for the site that can be implemented under the proposed provisions in line with the national freshwater policy statement.
- Demonstrate that there are viable engineering solutions to support the application for the PPC.

It is not the intention of this report to propose final engineering solutions, rather to outline the solutions that are available to enable the PPC; the final engineering solutions will be detailed as part of future consents in line with the result decision.

## 4 Natural Hazards

This section of this report will comment on Flooding as a Natural Hazard both within the PPC area as well as downstream as the PPC area contributes to a larger catchment flow.

The key points being considered in this section are:

- Estimate the existing flood extents.
- Estimate the future flood extents.
- Identify any properties at risk from existing or future flooding.
- Provide recommendations on flood related stormwater management within the PPC area.

We have completed both a desktop assessment of the Flood Hazard using NRC data as well as completing a first principle 2D flood model; for the complete flood assessment please refer to the Flood Risk Assessment which is bound separately from this document.

### 4.1 Flood Risk – Desktop Assessment

The NRC provides regionwide Natural Hazard Mapping information which provides information on both fluvial flooding as well as coastal inundation; these maps are public information and can be accessed here: <https://www.nrc.govt.nz/environment/natural-hazards-portal/coastal-hazards/update-to-coastal-hazard-maps>

Figure 4-1 shows the current data generated from the NRC website for the PPC area.





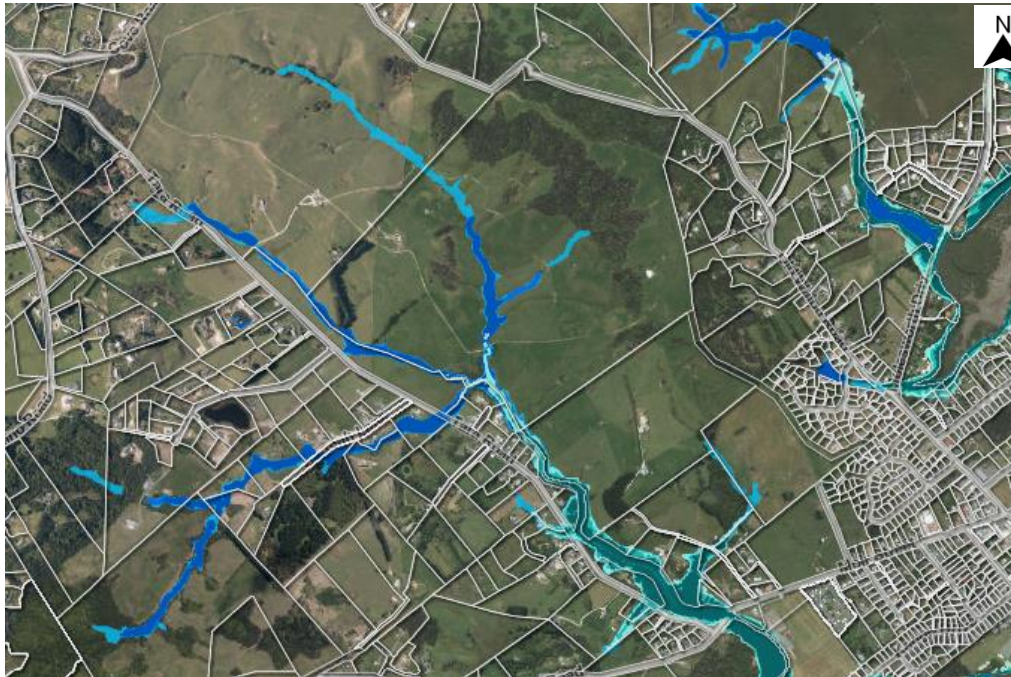


Figure 4-1: Snip of the NRC natural hazards regionwide flood model (accessed 12/12/2022)

The blues indicate the extent of fluvial flooding as the governing flood hazard in the top portion of the PPC area; this transitions into greens where flooding from Coastal inundation exceeds the Fluvial flood elevations. Using the NRC tool, we have reviewed the data to better understand the areas where flooding occurs near existing structures. Through this review it appears that the development that has been undertaken to date has been considerate of the flood hazard and development.

Using this desktop tool, it appears that no houses are currently constructed within the currently modelled scenarios, we have extracted some key areas of existing development vs the NRC model.



Figure 4-2: Existing developed area along Tara Road vs NRC Flood Model (accessed 12/12/2022)





Figure 4-3: Existing developed area along north of the intersection between Tara Road and Moir Street vs Flood Model (accessed 12/12/2022)



## 4.2 Flood Risk – First Principal Assessment

Working in parallel to the NRC data, we have prepared a first principal flood model to estimate the changes in the fluvial flooding that will occur when the catchment is developed. Within this assessment we have assessed three scenarios:

- Existing land zoning
- Future Zoning - KDC Spatial plan
- Future zoning - PPC

This step is critical when considering this PPC, this allows us to look beyond the modelling data provided by the NRC to identify risks that might arise from the future zoning as well as use the NRC data to validate our base model e.g., existing zoning.

We have extracted Figure 4-4 and Table 4-1 which illustrate the model results.

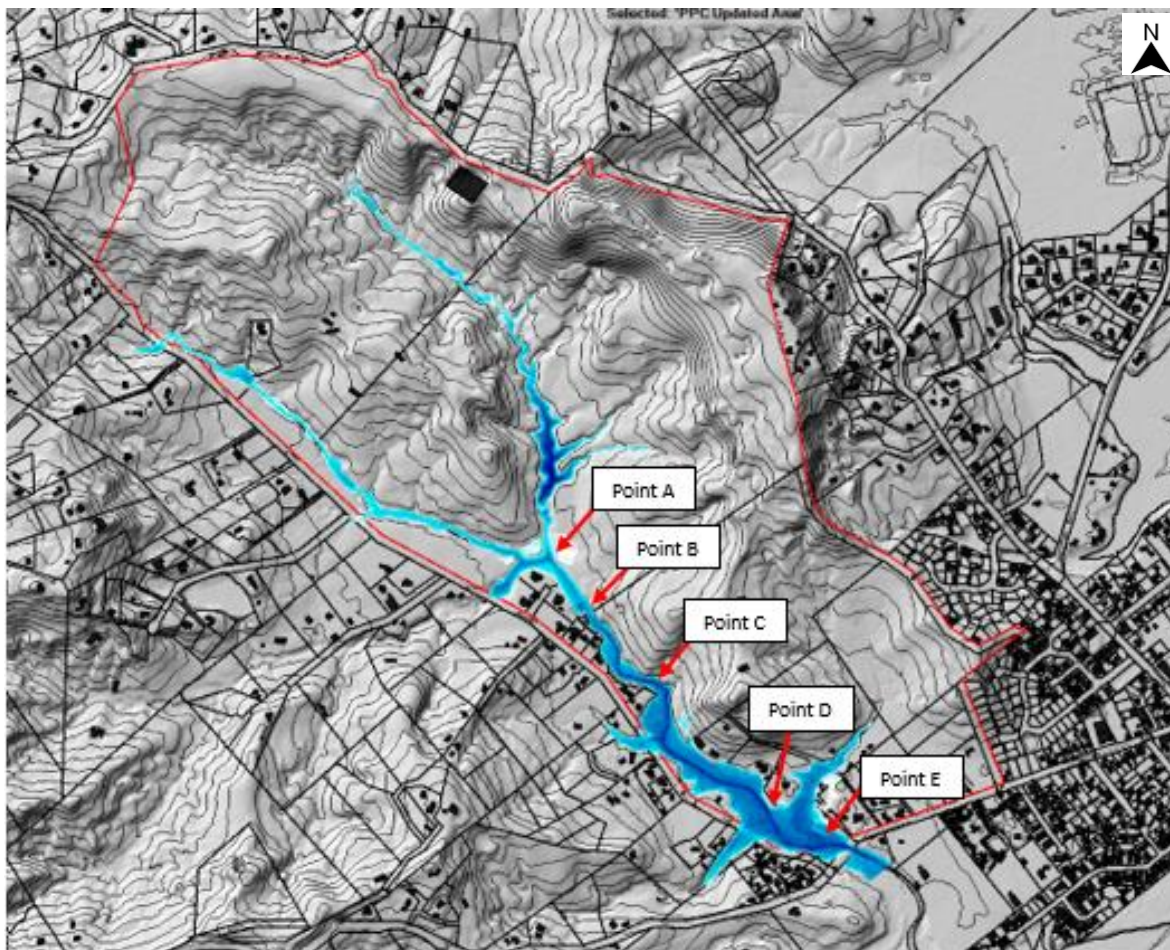


Figure 4-4: Locations of interest - from Chester Flood Risk Assessment



Table 4-1: Flood Results at the specified locations

		Existing Zoning			Future Zoning KDC MPD			Future Zoning PPC MPD		
		50% AEP	10% AEP	1% AEP	50% AEP	10% AEP	1% AEP	50% AEP	10% AEP	1% AEP
Point A	Depth (m)	0.96	1.25	1.77	1.11	1.37	1.86	1.17	1.45	1.92
	Velocity (m/s)	1.44	1.73	2.14	1.59	1.84	2.28	1.63	1.86	2.09
	WSE (m)	5.01	5.30	5.89	5.16	5.42	5.95	5.22	5.50	6.01
	Flow (m <sup>3</sup> /s)	8.94	16.84	43.75	12.59	21.20	50.83	14.12	24.12	53.58
Point B	Depth (m)	1.19	1.44	2.04	1.31	1.56	2.18	1.39	1.64	2.29
	Velocity (m/s)	1.19	1.43	1.80	1.33	1.51	1.86	1.26	1.45	1.80
	WSE (m)	3.88	4.13	4.75	4.00	4.25	4.87	4.08	4.36	4.99
	Flow (m <sup>3</sup> /s)	9.07	17.11	44.22	12.78	21.48	51.42	14.32	24.38	53.92
Point C	Depth (m)	2.65	2.73	3.07	2.69	2.80	3.22	2.76	2.93	3.44
	Velocity (m/s)	0.29	0.53	1.12	0.40	0.64	1.21	0.43	0.66	1.16
	WSE (m)	3.23	3.30	3.64	3.27	3.37	3.78	3.33	3.50	4.02
	Flow (m <sup>3</sup> /s)	9.1	17.09	43.73	12.79	21.49	50.66	14.19	24.12	52.45
Point D	Depth (m)	2.48	2.52	2.76	2.51	2.57	2.91	2.57	2.70	3.15
	Velocity (m/s)	0.11	0.20	0.41	0.15	0.23	0.43	0.19	0.28	0.45
	WSE (m)	3.22	3.26	3.50	3.25	3.32	3.65	3.30	3.44	3.89
	Flow (m <sup>3</sup> /s)	11.53	21.55	50.65	15.86	26.24	56.82	17.17	28.01	56.15
Point E	Depth (m)	3.15	3.19	3.40	3.18	3.30	3.54	3.23	3.35	3.78
	Velocity (m/s)	0.20	0.36	0.72	0.27	0.42	0.74	0.33	0.49	0.74
	WSE (m)	3.22	3.25	3.47	3.24	3.30	3.60	3.29	3.42	3.84
	Flow (m <sup>3</sup> /s)	13.19	24.25	55.40	17.75	29.14	61.73	19.10	30.65	60.45

Refer to the separate document for the full assessment and conclusions.



## 5 Earthworks, Erosion & Sediment Control

This section of this report will comment on Earthwork and Sediment and Erosion Control within the PPC area and provide a general comment on the Geotechnical Report provided by others.

### 5.1 Earthworks

Earthworks activities will be required to transform the existing rural land use to a residential land use. Typical earthwork operations to build internal roads, control stormwater and install in ground services will be required at subdivision stage with the potentially for building platform works at either the subdivisional stage or at the time of the dwelling being constructed.

#### 5.1.1 Earthworks Effects

Any effects within the PPC area through a planning lens is limited to the difference between the provisions of Rules 12.10.1a and 13.10.1a of the current KDC district plan. From an engineering perspective the existing rural zoning is more permissive so the up zoning of the area would result in the council having a more central role to manage the potential effects of earthworks operations as the trigger for needing a land use consent is reduced.

So, considering this additional discretion, it is our opinion that the potential earthworks effects are reduced. Future development applications to enable the residential development will trigger a requirement for an Excavation and Fill Management Plan being required under a resource consent.

### 5.2 Geotechnical

We have reviewed the Geotechnical Desktop Study prepared by Tetra Tech Coffey and we make the following general comments on how the Geotechnical Desktop study relates to the broader civil context. Slope stability needs to be addressed in the steeper portions of the site, as such we anticipate that ground water control will likely be required to achieve the necessary factor of safety in the steeply sloping areas.

This need for ground water management will need to be considered within the final stormwater management plan; specifically in areas where ground water needs to be controlled, stormwater devices will likely be lined and provide stormwater detention in lieu of stormwater retention. Further to this any ground water alterations will need to be considered against any existing wetland features being retained as the maintenance of existing baseflows is generally necessary to maintain the existing wetland feature.

Coordination between the Geotechnical engineer, stormwater / civil engineer and the ecologist is required to ensure the resulting development is stable whilst achieving the ecological and stormwater outcomes anticipated.

### 5.3 Erosion & Sediment Control

From an engineering perspective the means to manage the effects of any land disturbing activity relates to the applicability and the effectiveness of the Erosion and Sediment Control practices to be implemented.

The PPC area does not have any features or constraints that would prevent or limit the use of effective erosion and sediment control.

Best practice erosion and sediment control would be implemented as a standard requirement within a residential zone to mitigate the effect of the earthworks on the surrounding environment. The sediment control devices would be constructed in general accordance with the applicable engineering standard and may include, but not be limited to the following:



- Stabilised Construction Entranceways
- Silt Fences / Super Silt Fences
- Clean water diversion bunds
- Decanting earth bunds / Sediment Retention Ponds
- Progressive site stabilisation

## 5.4 Performance standards

We note that the provisions of the proposed residential zoning under the district plan refer to the Kaipara District Council Engineering Standards 2011 as the means to meet the relevant performance standards of the district plan.

The Engineering standards refer to the “*Auckland Regional Councils Technical Publication 90 (TP90)*” for Erosion, Sediment and Dust Control for guidance. TP90 has been updated and replaced by the document; “*Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*”, known as GD05. As a result, GD05 is the document that would be referred to for guidance on what the relevant performance standards are, and the best practical means of achieving them. GD05 is widely used in the Northland Region and is explicitly referenced in the Proposed Regional Plan for Northland (Appeals Version – March 2022) as being required for any earthwork activity.

We anticipate that this plan change area would apply the current best practice document as the required standard at the time of development, which is currently GD05 as sighted above.

## 6 Water Supply

This section of this report will comment on the water supply and firefighting water supplies strategy for the PPC area.

### 6.1 Mangawhai’s Existing Water Supply

Mangawhai is not currently serviced with a comprehensive public reticulated water network, a limited water supply network does exist which is feed from a bore near the end of Fagan Place and pumped to a reservoir near Greenview Drive. The groundwater undergoes simple chlorination by the addition of chlorine tablets prior to reticulation to a limited number of customers. Figure 6-1 below illustrates the general arrangement.



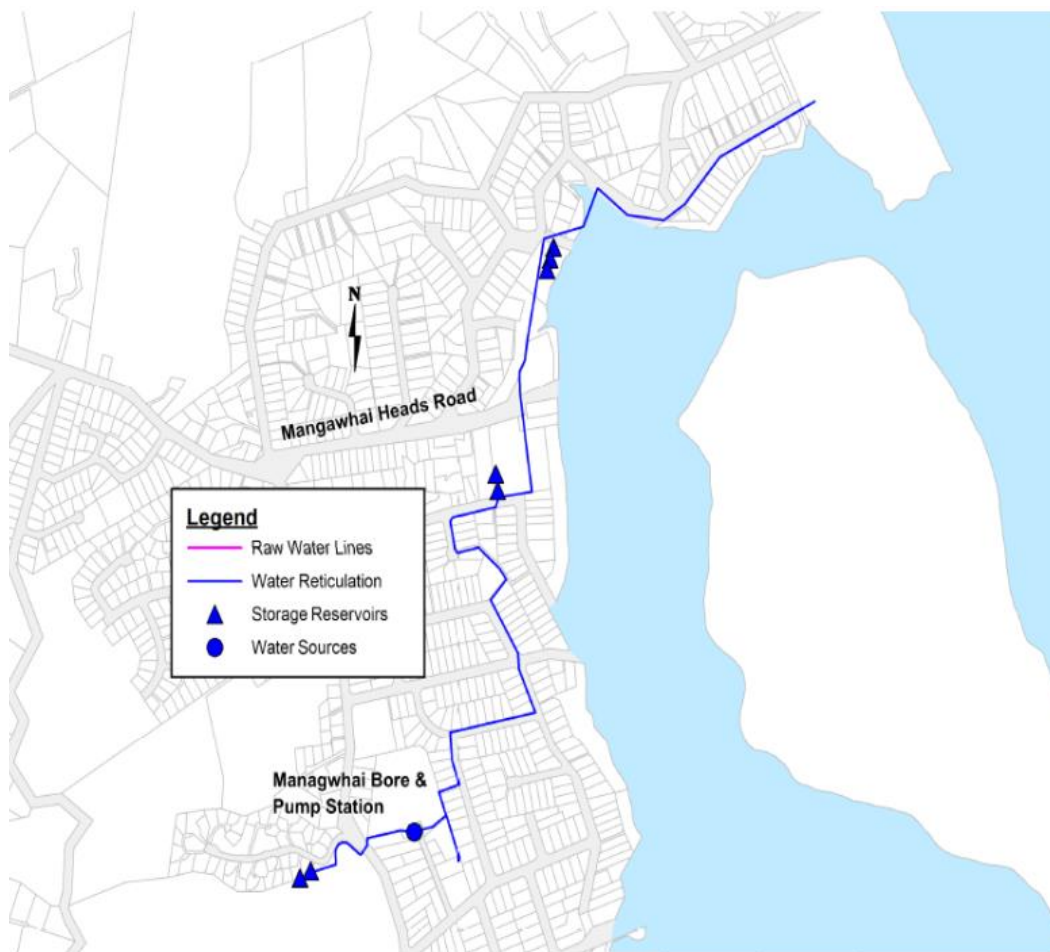


Figure 6-1: Existing Water Supply reticulation (KDC Asset Management Plan 2015)

In addition to this limited network, we are aware that a water supply and reticulation network maybe constructed as part of the Mangawhai Central development Private Plan Change 78 (PPC78); as we understand this network is intended to service specific zones within the PPC78 where reticulation was favoured over tank supplies; the balance of PPC 78 it was to be serviced via water tanks.

In general, the majority of Mangawhai’s water supply is from water tanks being feed from roof runoff, with firefighting water supplies being legislated in addition to the potable supply for general use since Plan Change 4 took effect on 18 December 2018. In general Plan Change 4 requires 10,000L of dedicated water be provided per house for firefighting water supplies unless agreed otherwise with Fire & Emergency New Zealand (FENZ). Further information on Plan Change 4 is available on the KDC website; with this link providing overview.

<https://www.kaipara.govt.nz/services/district-plans/plan-changes/plan-change-4-fire/plan-change-4-fire-fighting-faqs>

## 6.2 Proposed Water Supply

The intended water supply strategy for the PPC area is to comply with the existing provisions and the generally adopted approach in Mangawhai; however, we have looked to provide more clarity and strengthen the minimum water supply volumes and fixtures required to help define what an adequate water supply is.

Currently the KDC district plan sights the New Zealand Building Code with respect to onsite water supply; specifically, Clause G12. The Functional requirement of a water supply system is defined by G12.2 which states, “Buildings provided with water outlets, sanitary fixtures, or sanitary appliances must have safe and adequate water supplies.”



The key word in this requirement in the context of a plan change is adequate; the associated Acceptable Solutions and Verification Methods for Clause G12 does not provide a definition of what is considered to be “adequate”. Previously we have sought clarification from the Ministry of Business, Innovation and Employment (MBIE) and we were advised that the Territorial Authority / Consenting Authority defines what is considered to be adequate in that region.

The plan change process allows the opportunity for adequate to be defined as well as require more sustainable technologies when it comes to water supply.

We are aware of the limitations of the local water supply system; specifically:

- Reliance on rainwater tanks feed from roof runoff,
- Limited local bore water supplies to top up wants,
- Need to import water from outside the community.

The proposed Mangawhai Hills Development Area Provisions seek to define what an adequate supply is by specifying minimum tank sizes and also require the use of water saving fixtures and captured water in the most efficient manner possible.

Firefighting water supplies are proposed to be consistent to Plan Change 4.

Additionally, the provisions do not preclude the implementation of a reticulated water supply network being used to service the development, however it is not the vision or intention of this plan change. We expect that any water reticulation scheme would be led by the council or a water authority.

### 6.2.1 Full Potable On-Site Supply

On-site potable water supply tanks are proposed to be implemented which would be supplied by rainwater harvesting from the roof and supplemented by tanker truck as/if required on a house-by-house basis. From an engineering perspective the effectiveness of this approach is influenced by many factors including, water demand, catchment/roof area, rainfall, and storage volume. Table 6-1 below has been taken from the ARC Countryside Living Toolbox and is what we recommend as minimum rainwater tank volumes to provide adequate supply for residential dwellings.

Table 6-1: Recommended Tank Volumes for On-site Residential Supply

Roof Catchment (m <sup>2</sup> )	Bedrooms				
	1	2	3	4	5
100	20m <sup>3</sup>	50m <sup>3</sup>			
120	15m <sup>3</sup>	35m <sup>3</sup>			
140	10m <sup>3</sup>	30m <sup>3</sup>	75m <sup>3</sup>		
160		20m <sup>3</sup>	60m <sup>3</sup>		
180			50m <sup>3</sup>	75m <sup>3</sup>	
200			45m <sup>3</sup>	65m <sup>3</sup>	
220			35m <sup>3</sup>	55m <sup>3</sup>	90m <sup>3</sup>
240			30m <sup>3</sup>	50m <sup>3</sup>	80m <sup>3</sup>
260			30m <sup>3</sup>	45m <sup>3</sup>	70m <sup>3</sup>
280				40m <sup>3</sup>	65m <sup>3</sup>
300				35m <sup>3</sup>	60m <sup>3</sup>





As shown above a typical 1000m<sup>2</sup> site with a 240m<sup>2</sup> roof area and nominal 4-person house would require 50m<sup>3</sup> of on-site storage. This could be provided by two 25m<sup>3</sup> above ground tanks which would typically take up 20 - 30m<sup>2</sup> of a sites area. This is practical on a 1000m<sup>2</sup> site which would be the minimum site size expected.

The table provides a link between the size of the roof and the number of people in the household by way of bedroom numbers; this approach is consistent with onsite wastewater disposal design where design flows need to be estimated from the house population which is derived from the number of bedrooms.

### 6.2.2 Water Reduction

Coupled with the requirement for the minimum water tank size is the requirement for households to use water saving devices and fixtures in accordance with AS/NZS 6400/2016 otherwise known as WELS. A minimum WELS rating of 3 is required.

### 6.2.3 Fire Fighting Water Supply

In the absence of a reticulated water supply network firefighting water supplies will be provided in accordance with Plan Change 4, which requires a minimum dedicate firefighting water supply of 10,000L per household or an alternative approved in accordance with Plan Change 4.

## 7 Stormwater

This section of this report will comment on the stormwater management for the PPC area. It addresses both stormwater quality and quantity.

### 7.1 Adoption of Chapter 13 Stormwater Rules

With respect to stormwater, the potential effect the development could have on the receiving environment is limited to the differences between the existing Chapter 12 provisions in the district plan and the proposed Chapter 13, Mangawhai Hills Development Area provisions for stormwater and how they control development. Table 7-1 identifies the most relevant rules.

*Table 7-1: Relevant District Plan Rules to Stormwater*

Chapter 12 – Rural - Existing Condition	Chapter 13 – Residential – Proposed Condition
12.10.8 Permeable Surfaces	13.10.12 Permeable Surfaces - Modified
12.15.5 Stormwater Disposal	13.14.5 Stormwater Disposal – Modified

### 7.2 Permeable Surfaces

When comparing the rules, a notable difference is that in the rural zone a 10% impermeable coverage within any one hectare of a site is considered a permitted activity when the Harbour Overlay is considered, where in the proposed residential Mangawhai Hills Development Area zone this is increased to 50% of the net site area.

The change in zoning does give rise to additional potential stormwater effects. In our opinion the management of those effects are suitably addressed within the proposed provisions of the Mangawhai Hills Development Area Plan; specifically, any development must comply with the proposed rules relating to stormwater. Because the proposed provisions impose what we consider to be best practice stormwater management for all impermeable areas, irrespective of permitted impermeable allowances, the effects of development with respect to stormwater will be managed.

The purpose of the permeable surfaces rules in this context is to guide catchment planning and ensure that future land uses stay within the limits allowed for. An example is, where a subdivision proposes a



catchment stormwater device to protect the receiving environment, that device would be designed to allow for the permitted impermeable allowance of its catchment. What the rule does is ensure that future Lot owners in that subdivision don't increase their impermeable coverage over what has been allowed for.

Given the above, we hold the opinion that applying the proposed Mangawhai Hills Development Area rules to the PPC Area will be sufficient to mitigate the potential effects on the receiving environment from residential development.

### **7.3 Best Practice Stormwater Management**

It is acknowledged that Chapter 13 of the current district plan has been in effect within other residential areas of Kaipara District and has not always resulted in what is now considered best practice stormwater management with the associated outcomes. This is because what is considered best practice stormwater management or water sensitive design (WSD) has advanced beyond the current published engineering standards.

To ensure current best practice stormwater management outcomes are achieved in the PPC Area, specific stormwater management provisions are proposed for the Mangawhai Hills Development Area to advance the stormwater approach to current best practise.

We have developed these provisions by first, developing a Draft Stormwater Management Plan (SMP) for the PPC area, then drafting provisions that impose the outcomes of that SMP. The SMP considers the Proposed Regional Plan for Northland, and the existing Chapter 13 provisions, therefore the proposed provisions are also aligned.

We are of the opinion that the Draft SMP (completed as a separate document) demonstrates that best practice stormwater management for the PPC area and the desired outcomes can be achieved under the proposed provisions. Please refer to the Draft SMP accompanying the plan change application for further information.

Note the SMP is provided as a Draft to signal as to how compliance can be achieved; final SMP(s) would be submitted, reviewed, and approved through a resource consent application.

We have extracted the key points related to Stormwater Management from the SMP to provide an overview of the general approach.

#### **7.3.1 Stormwater Quality**

Provide water quality treatment via biofiltration devices for all impervious areas that experience vehicle traffic. Inert building materials are to be utilised for surfaces that are exposed to rainfall to prevent leaching of contaminants.

#### **7.3.2 Stormwater Quantity**

Provide retention of the first 5mm, via infiltration or water reuse, for all impervious areas and provide detention of 1/3 of the 2 Year ARI 24-hour rainfall depth for stream protection.

#### **7.3.3 Stormwater Discharge**

Utilise soakage systems wherever possible as a primary means of stormwater disposal even if the full design soakage is not achievable.



## 8 Wastewater

### 8.1 Mangawhai's Existing Wastewater Network

Mangawhai has an existing reticulated wastewater network made up of approximately 68.3km of pipeline (includes rising main and gravity lines) and 12 Wastewater Pumpstations (WWPS). The reticulated network conveys wastewater to the Mangawhai community Wastewater Treatment Plant (CWWTP). The treated wastewater is pumped to Brown Road irrigation farm for land disposal of treated wastewater. Figure 8-1 below illustrates the general arrangement.

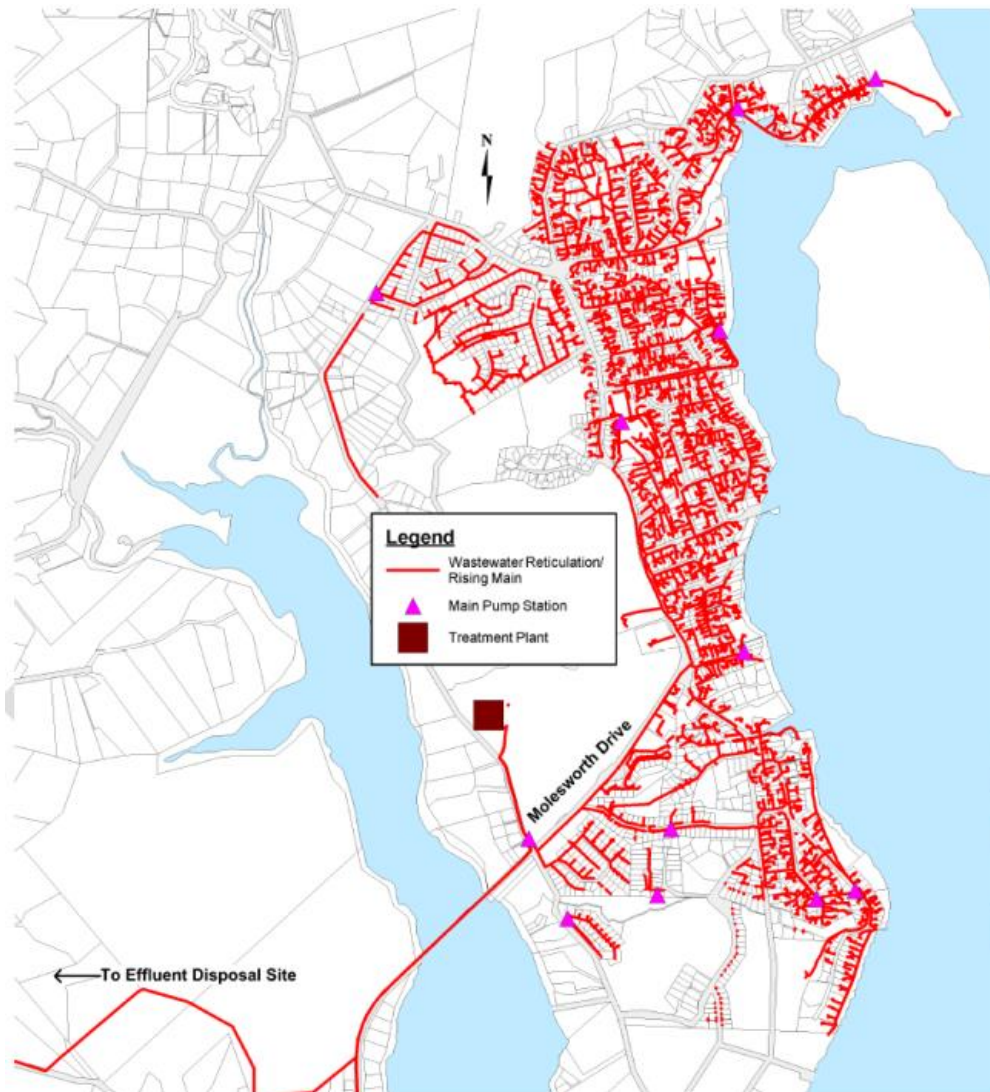


Figure 8-1: Existing Wastewater Network (KDC Asset Management Plan 2015)



## 8.2 Existing Network Conditions

From our investigations we make the following comments with respect to Mangawhai's current wastewater treatment capacity and how it relates to the proposed plan change area.

### 8.2.1.1 Wastewater Treatment Plant

The treatment plant utilises a CASS system with 2 CASS tanks followed by pressure filtration and disinfection. Sludge is dewatered via belt press and disposed of to the landfill. The treated wastewater is sent to an irrigation farm in Browns Road, 12km from the plant where the water is stored in a buffer Dam and irrigated to a portion of the farmland. Figure 8-2 below is an aerial of the CWWTP.



Figure 8-2: Mangawhai CWWTP layout (KDC Maps accessed 25/11/2022)

We understand the following with respect to the WWTP:

- Based on Mangawhai Community WW system Master Plan Strategy Report by WSP, the CWWTP has a capacity limit inflow peak flow rate of 70l/s, Browns Road farm disposal field (65.5ha) in operation and Consented Discharge Rate of 5000m<sup>3</sup>/ha/yr irrigation.
- The WWTP is currently being upgraded with a balance tank that will increase the peak flow capacity to 100l/s with a new inlet screen, flow control system and provide 900m<sup>3</sup> of storage. The balance tank and Thelma Road upgrade will be complete end of 2022.
- The WWTP is on a parcel of land 32ha in area which is largely un-utilized by the WWTP. Consequently, we presume that area availability would not be a constraint for potential future expansion of the WWTP.

### 8.2.2 Existing network Constraints Summary

In our opinion because the land area does not appear to be a constraint, there is likely to be viable solutions to increase WWTP capacity as required, and the general acceptance is that the existing WWTP will need to be upgraded to accommodate the future growth being planned for in Mangawhai.

Neither of these constraints in our opinion prevent the re-zoning of the land as the remedies in general terms are timing and funding. Both these can be co-ordinated with planned development to utilise the funding available from more connections.

### 8.2.2.1 Kaipara Infrastructure Strategy

We note that in revision 6 of the Draft Kaipara Infrastructure Strategy published February 2021 there is a Major Capital Expenditure allowance of \$37M for Wastewater Growth in Mangawhai which confirms the commitment of capital expenditure to increase the capacity of the existing wastewater network and disposal system.

Further to the Draft Kaipara Infrastructure Strategy the council website is an accessible public resource for all the information pertaining to Mangawhai Wastewater and particularly the CWWTP, the site contains an extensive library of relevant documents.

<https://www.kaipara.govt.nz/services/water-services/wastewater/mangawhai-wastewater>

Major Capital Expenditure								
Description	2021/26	2026/31	2031/36	2036/41	2041/46	2046/51	Key Driver	Uninflated Cost (\$m)
Te Kōpuru Wastewater treatment upgrade							LOS+Growth	0.35
Dargaville wastewater treatment plant upgrade							Growth	2
Dargaville wastewater growth							Growth	12.75
Dargaville wastewater renewals							LOS	2.7
Maungatūroto renewals							LOS	2.84
Maungatūroto Growth projects							Growth	1.94
Mangawhai upgrade existing reticulation and disposal options							Growth	15.5
Mangawhai Capacity upgrades to 5,000 connections							Growth	20.3
Mangawhai wastewater small extensions right of ways							Growth	1.2
Kaiwaka wastewater growth							Growth	3
Kaiwaka wastewater renewals							LOS	1.32

Figure 8-3: Significant Wastewater Capital Projects 2021-2051 (extracted from Table 16 Kaipara Infrastructure Strategy, Rev 6)

## 8.3 Wastewater Demand

The PPC seeks to enable residential development that will increase the demand on the existing Mangawhai Wastewater Network if it were to connect. Table 8-1 below summarises the estimated Wastewater demand.



Table 8-1: Estimated Wastewater demand as per KDC & NZS4404 Standards.

Scenario	Household Equivalent	Number of Persons per Household Equivalent	Catchment Design Population	Average Dry Weather Flow Allowance (L/d/p)	Dry weather diurnal PF	Dilution/Infiltration Factor	Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)	Peak Wet Weather Flow (L/s)	Daily Design Volume (m3)
<b>Proposed Plan Change</b>  (Based on 1000m <sup>2</sup> minimum lot sizes)	600	3	1800	145 <sup>1</sup>	2.5	2 <sup>2</sup>	3.02	7.55	15.10	261

### 8.3.1 PPC Area vs Mangawhai CWWTP

We have reviewed the most recent data related to the CWWTP and it is important to note that the 160 Ha Freck Farm in the PPC area has not been identified within the future possible wastewater service boundary, 60 Ha of land in the PPC area has been identified within the future possible wastewater service boundary. Figure 8-4 below illustrates the indicative future wastewater servicing boundaries.

The inclusion of the entire PPC area in the wastewater service boundary would alter the reporting completed to date as the PPC area does represent a significant area of land not currently accounted for regardless of the reduced density proposed.

<sup>1</sup> Based on the implementation of the WELS water saving fixtures.

<sup>2</sup> Note, this peaking factor is high, new wastewater infrastructure would not typically experience this level of infiltration.



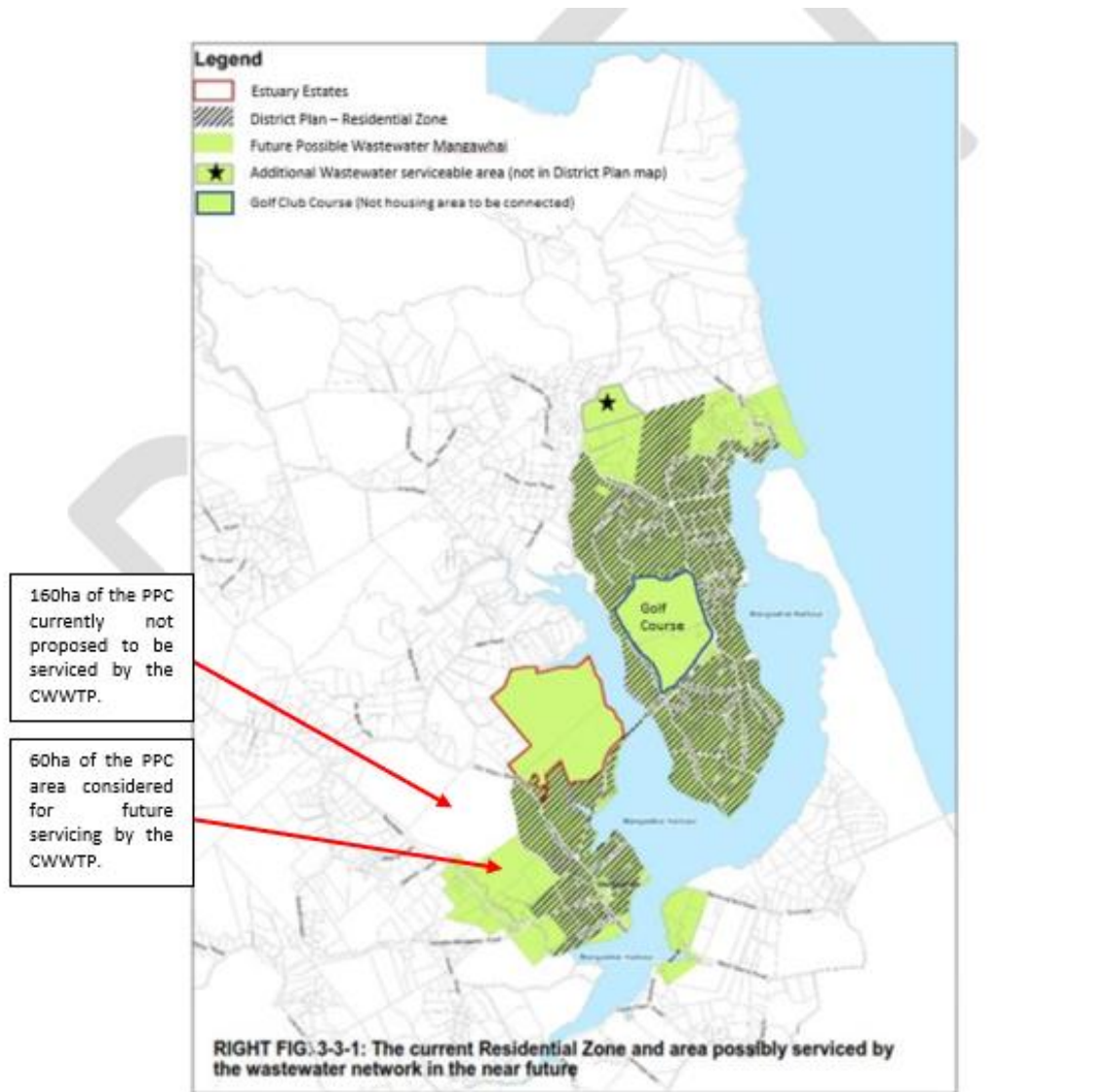


Figure 1: Areas connected to MCWWS (grey) and areas to be connected (figure from the Mangawhai Spatial Plan)

Figure 8-4: Potential Mangawhai Wastewater Service Area (extract from Page 6, Mangawhai Community Wastewater Scheme - Master Plan Strategy, Prepared by WSP, dated 21 January 2022)

## 8.4 Potential Wastewater Strategies

It is acknowledged that the PPC inadvertently creates an expectation that wastewater infrastructure will be provided to enable residential development. As documented above the Council has a commitment to the continued upgrades of the existing wastewater infrastructure to enable development, but 160ha of the PPC area has not been currently allowed for in the plans prepared to date.

So, considering the constraints opportunities in this space, it is our opinion that the PPC area has three possible wastewater strategies.

### 8.4.1 Individual Onsite Wastewater Disposal

A large lot lifestyle approach could be utilised with individual standalone onsite wastewater disposal systems. This would eliminate reliance on the council or third parties to manage wastewater from the individual lots. The drawback of this approach is the reduction in density and the inefficient utilisation of suitable land for residential use. The density reduction is necessary to accommodate onsite



wastewater disposal as the individual lots need to generally be larger to accommodate both the primary and reserve wastewater disposal fields; typically, site sizes would be a minimum of 2500m<sup>2</sup>.

#### 8.4.2 Connection to the Council Wastewater Network

Connection to the existing council wastewater network and disposal to the existing CWWTP is feasible; the network as we understand has capacity and as detailed prior the upgrades of the plant are to be phased against development to enable future development capacity.

Given the 160ha of the of the PPC area is currently not anticipated to be connected to the network an additional assessment would need to be undertaken with the Council to understand the implications.

Given the technical works completed to date, we do not foresee an engineering limitation that would prevent the CWWTP being able to receive the 600 additional connections from the PPC area , the main current constraint the Council needs to address is the capacity of the disposal area with either additional land purchased or a coastal discharge; these works are already underway. We would expect with the discharge location resolved we expect the additional connections would not be a significant challenge to increase the plant capacity.

It is important to note that any connection would be subject to specific approval from KDC at the time of the application being made in accordance with Rule 13.14.6 of the operative district plan as well as the proposed Mangawhai Hills Development Area Provisions.

In order to obtain approval from KDC, suitable capacity would need to be available at the time of the subdivision consent being granted.

#### 8.4.3 Mangawhai Hills WWTP

The combination of scale, low density and open space enable the development to construct a standalone wastewater treatment system. The southern slopes of the bowl area are remaining undeveloped and provide an area to enable discharge to land within the PPC area.

At the time of preparing this document we are in discussions with two Wastewater specialists who could design, construct, and operate the potential Mangawhai Hills WWTP.

The two specialists are currently Apex Water and Innoflow, both have directly relevant project experience with designing, constructing and operating wastewater treatment plants of the scale required. Current projects include Mount Cardrona Station and Jacks Point. Both companies have provided a concept solution that support the development proposed across the PPC area.

As proof of concept, we have carried out a preliminary assessment of the on-site wastewater in accordance with AS/NZS 1547:2012 to understand the amount of land required to service 600 lots, Table 8-2 below steps through the considerations to estimate the land area required.

*Table 8-2: Indicative on-site wastewater disposal area design*

No. of bedrooms	3	
Design occupancy	4	
Water supply	On site roof tank water supply	
Typical design flow	145	L/p/Day
Total design discharge rate	580	L/day
Soil category	5	





Dispersal field slope	10% to 20%	
Treatment	Secondary	
Disposal method	Subsurface drip irrigation	
Design irrigation Rate	2.8	mm/day
Primary dispersal field	207	m <sup>2</sup>
Reserve area	62	m <sup>2</sup>
Total area per house	269	m <sup>2</sup>
Total overall area for 600 houses	16.14	ha

Figure 8-6 illustrates an indicate land disposal area to service 600 lots as well as the location of the WWTP.

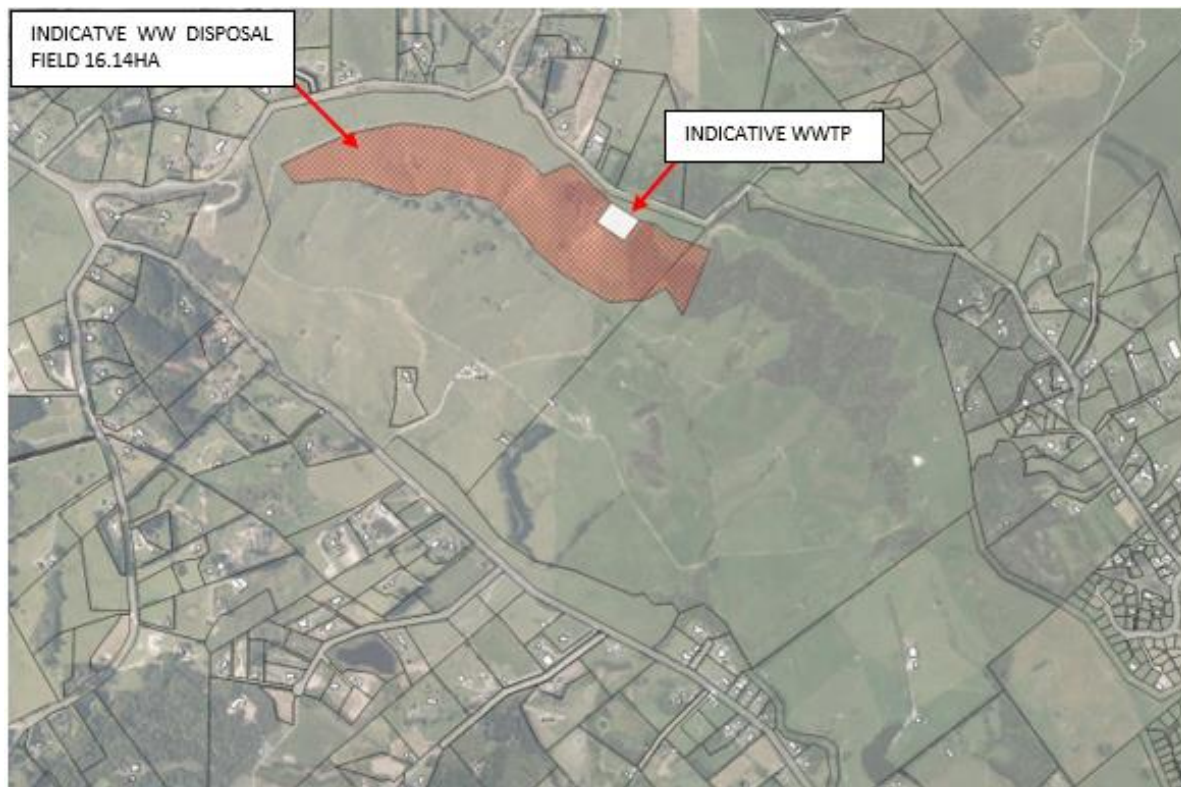


Figure 8-5: Indicative WW disposal field and WWTP design

## 8.5 Preferred Wastewater Strategy

Considering the potential strategies above we believe that onsite wastewater disposal using a communal privately owned wastewater treatment plant is the preferred wastewater strategy. What this option provides is reduced demand on the existing council reticulation and the CWWTP whilst at the same time allowing the Mangawhai Hill's vision to be achieved.



## 9 Summary

In Section 3 of the report the purpose was outlined as below.

1. Identify what infrastructure is necessary to allow development in line with the proposed zoning.
2. Confirm if existing infrastructure has sufficient capacity, and if not, identify potential options to provide it.
3. Identify the Kaipara District Councils commitments to bulk infrastructure upgrades (water & wastewater treatment) and convey how they relate to the PPC.
4. Develop a stormwater management plan for the site that can be implemented under the proposed provisions in line with the national freshwater policy statement.
5. Demonstrate that there are viable engineering solutions to support the application for the PPC.

In this section we provide commentary back to this purpose.

1. Wastewater Treatment is the key infrastructure element required to enable development.
2. The existing Mangawhai CWWTP has capacity which is being aligned to the rate of development; however, the PPC area is not currently entirely within the wastewater service boundary.
  - a. The preferred option is to construct a new private WWTP to service the PPC area.
3. KDC has an ongoing commitment to the Mangawhai CWWTP with funding allocated; no funding is being sought from the council for the construction of a new WWTP to service the PPC area.
4. A Draft SMP has been prepared and is provided separately which aligns to the various standards.
5. Sections 4-8 above detail how PPC area can be serviced and developed.

## 10 Conclusion

We do not believe there is any engineering limitation discussed within the scope of this report that would prevent the future development of the area in accordance with the proposed zoning and the associated provisions.



## 11 Limitations

- This assessment contains the professional opinion of Chester Consultants as to the matters set out herein, in light of the information available to it during the preparation, using its professional judgement and acting in accordance with the standard of care and skill normally exercised by professional engineers providing similar services in similar circumstances. No other express or implied warranty is made as to the professional advice contained in this report.
- We have prepared this report in accordance with the brief as provided and our terms of engagement. The information contained in this report has been prepared by Chester Consultants at the request of Mangawhai Hills Limited and is exclusively for its client use and reliance. It is not possible to make a proper assessment of this assessment without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Chester Consultants Ltd. The assessment will not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this assessment by any third party.
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