Land Development Report

Private Plan Change – Awakino Views Dargaville

Prepared For:
Moonlight Heights Limited

Chester Job Number:
14974

Date:
31/05/2022

Revision History

Revision No.	Prepared By	Description	Date
0	N. Jull	First Issue	31 May 2022

Action	Name	Signed	Date
Prepared by	N. Jull		31 May 2022
Reviewed by	S. Rankin		31 May 2022
Approved by	N Jull		31 May 2022

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1 Introduction

Chester Consultants Ltd (Chester) has been engaged by Moonlight Heights Limited to provide a Land Development Report with respect to the proposed private plan change (PPC) referred to herein as 'the PPC' at Awakino Road, Dargaville, Kaipara District.

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 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 Site Description

The PPC Area is comprised of multiple lots located east off Awakino Road to the northwest of the Dargaville township. The site is primarily accessed from 163 Awakino Road, Dargaville. Table 2-1 below shows the legal descriptions of each parcel that makes up the PPC Area. The PPC Area is currently zoned Rural but abuts the Residential zone and is located within the Future Residential and Business Growth Area.

Table 2-1: Existing Parcels within the PPC Area

Parcel ID	Legal Description	Property Address	Note
4800834	Lot 1 DP 169115	115 Awakino Road	
4849026	Part Lot 12 DP 36083	117 Awakino Road	
5015743	Lot 2 DP 116318	163 Awakino Road	Part of Parcel
5073665	Lot 1 DP 201626	145A Awakino Road	
5073668	DP 36083	-	Parcel Intent: Road
5101990	Lot 1 DP 55899	161 Awakino Road	
5263453	-	-	Parcel Intent: Road
6783016	Lot 1 DP 355519	-	
6945183	Lot 1 DP 380979	145 Awakino Road	
6945184	Lot 2 DP 380979	135 Awakino Road	
7613209	Lot 1 DP 487184	151 Awakino Road	
7613210	Lot 2 DP 487184	153 Awakino Road	
7624332	Lot 2 DP 488951	-	Part of Parcel

7848567	Lot 2 DP 517950	123 Awakino Road	Part of Parcel
8132261	Lot 2 DP 553122	159 Awakino Road	
8132262	Lot 1 DP 553122	-	

The PPC Area is situated on an elevated flat area that projects eastwards from Awakino Road forming a peninsular surrounded by kumara fields and the Awakino flood plain. Its topography slopes gently away from the centre then steepens at the extents of the site down onto the lower surrounding areas. Various water courses originate within the PPC Area and flow off in each direction eventually becoming tributaries of the Awakino River.

The PPC Area is predominantly in pasture with little tree cover. There are a few existing houses and some ancillary farm buildings throughout. The figures on the following pages depict the site and some of the surrounding features.

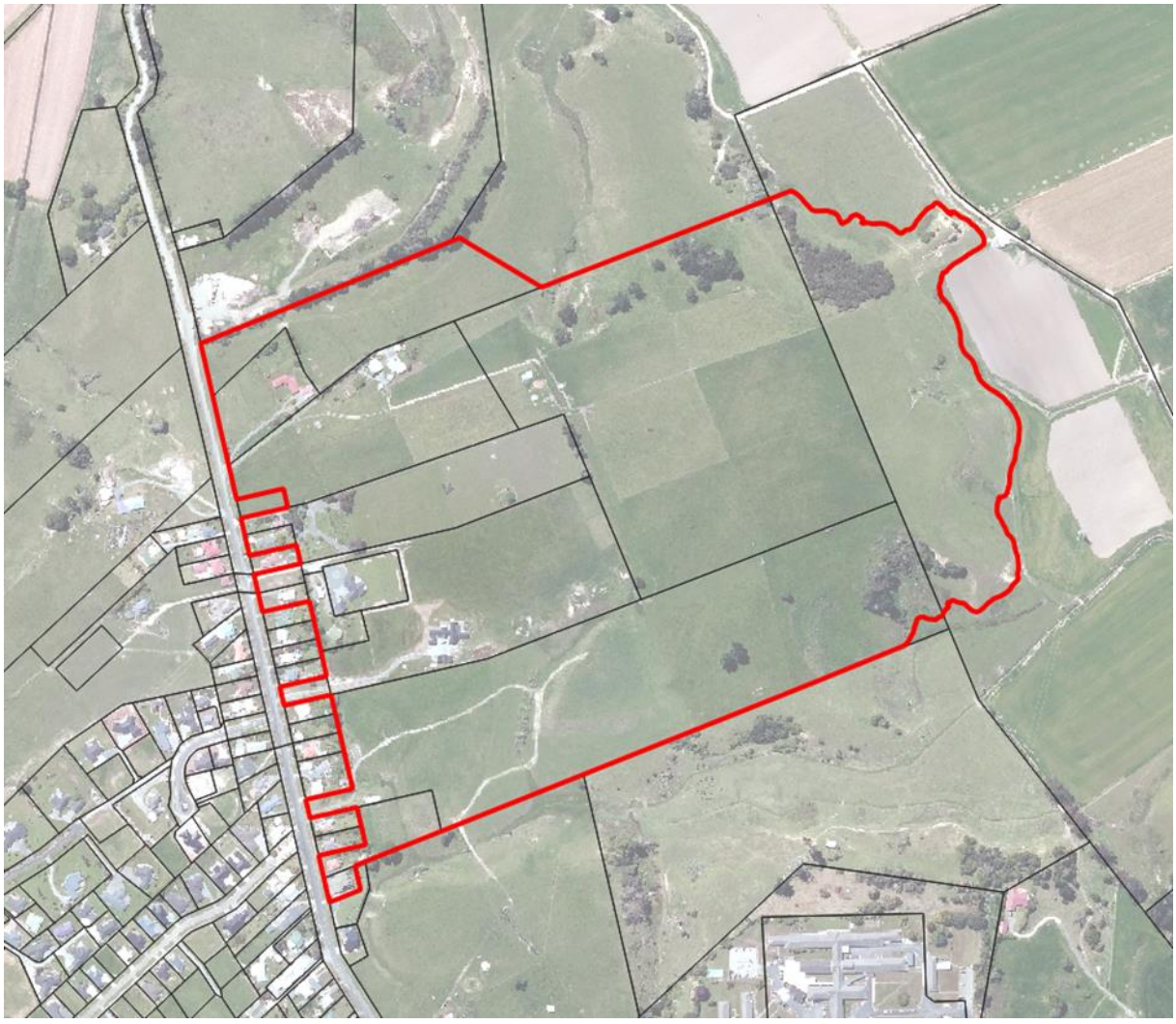

Figure 2-1 Private Plan Change Area

Figure 2-2: Photo looking northwest over the PPC Area (Taken 26/01/2022).

Figure 2-3: Photo looking northwest at the PPC Areas north-western boundary (Taken 26/01/2022).

Figure 2-4: Photo looking south across the development site (Taken 26/01/2022)

Figure 2-5: Photo looking north over the edge of the PPC Area.

3 Proposal

A private plan change is proposed to rezone the plan change area from Rural to Residential and overlay a Precinct.

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
- Utilities (Energy Supply & Telecommunications)

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.

Figure 3-1 and Figure 3-2 below shows the proposal. The Rural Zoning is green and the Residential Zoning is Yellow.

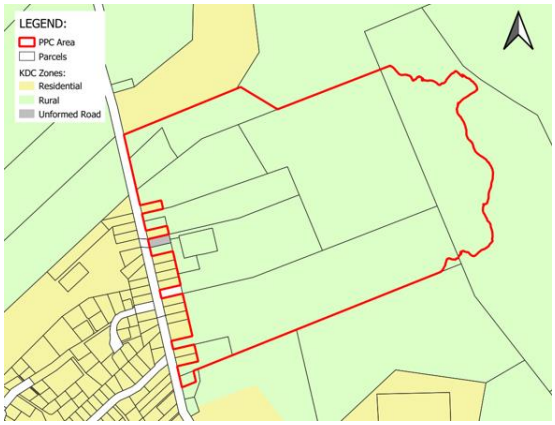

Figure 3-1: Existing Zoning

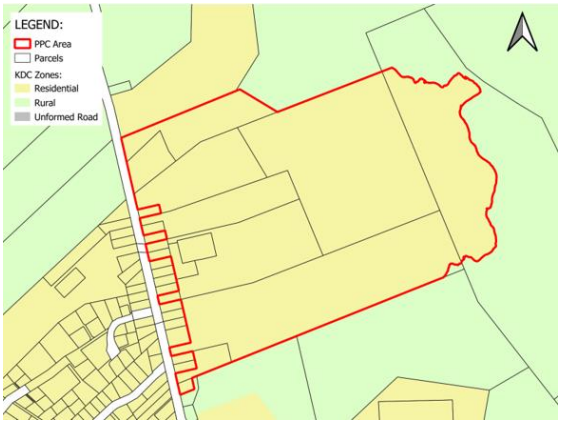

Figure 3-2: Proposed Zoning

3.1 Other Development

We understand that a separate Private Plan Change in the Dargaville area known as the Racecourse PPC is currently being developed by other. At the time of this report, we understand the Racecourse PPC has been lodged with council but has not yet been accepted, rejected, or adopted. Therefore, we have not considered the Racecourse PPC as part of the existing environment of Dargaville.

4 Flood Risk Assessment

The PPC area is located clear of any known flood risk as shown in Figure 4-1 & Figure 4-2 below. For further details regarding flooding, please refer to the accompanying Stormwater Management Plan.

Figure 4-1: Snip of the NRC natural hazards priority rivers flood model – wider context (accessed 03/03/2022)

Figure 4-2 Snip of the NRC natural hazards priority rivers flood model – Close Up (accessed 03/03/2022)

5 Earthworks, Erosion & Sediment Control

5.1 Earthworks

The envisaged earthworks required to enable residential development within the plan change area is not expected to significantly modify the topography / landform of the environment. Typical earthwork operations to build roads, control stormwater and install in ground services will be required however they will be minor in nature given the site is flat and ready to receive development without substantial modification to the existing landform.

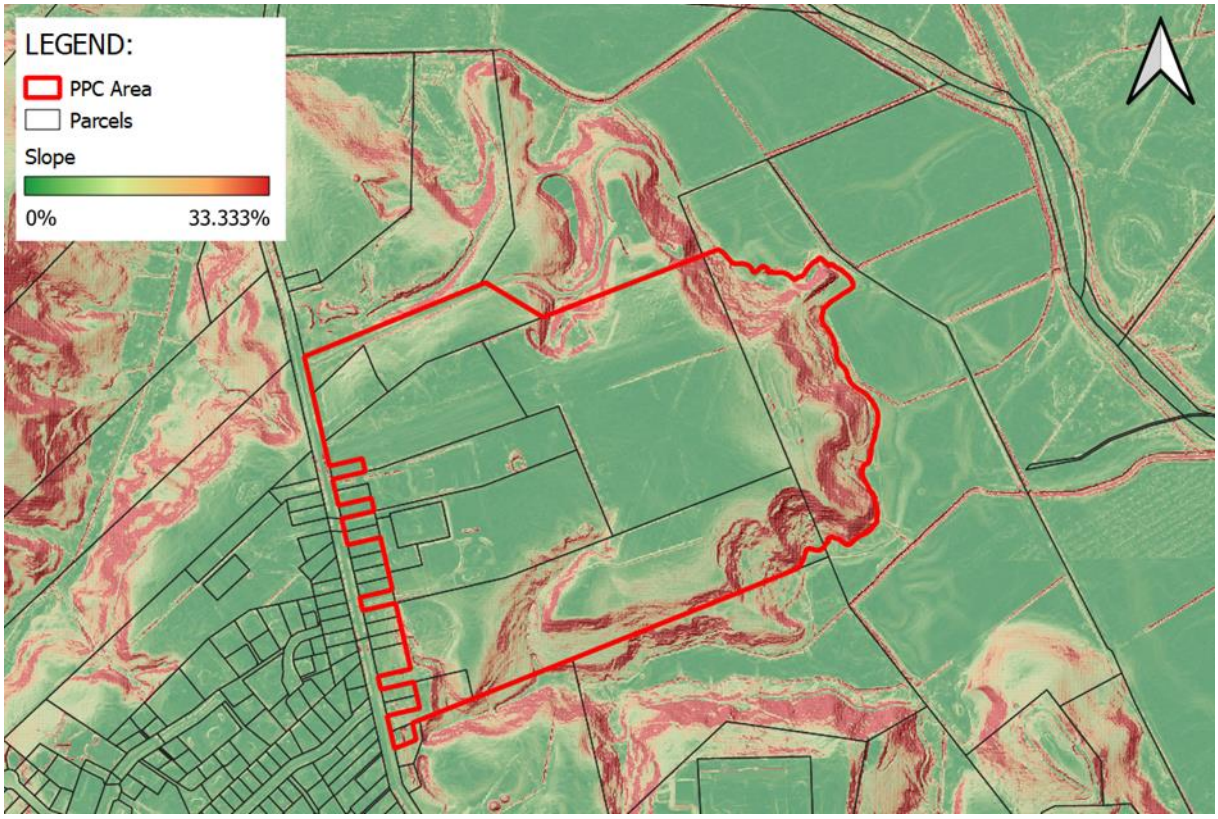

Figure 5-1: Slope map showing the different slope areas for the land within and adjacent to the PPC.

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

For further geotechnical information please refer to the accompanying geotechnical reporting prepared by soil and rock.

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 development site lends itself to the effective implementation of erosion and sediment controls because:

- Topography – the development site has a gentle slope and is relatively short, thus reducing the potential for high velocity and concentrated run-off of flows.
- Erosion-prone Land – the development site is not identified as being on erosion prone land.
- Flood hazards – the development site is located clear of flood hazard areas.

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

6.1 Dargaville's Existing Water Supply Network

Dargaville collects its raw water supply from the Waiparataniwha Stream in the Kaihu Forest with a secondary intake (Rotu) along the Kaihu River. The raw water is treated at the Dargaville Water Treatment Plant (WTP) off Hokianga Road and reticulated throughout Dargaville by a local network. Figure 6-1 below illustrates the general arrangement.

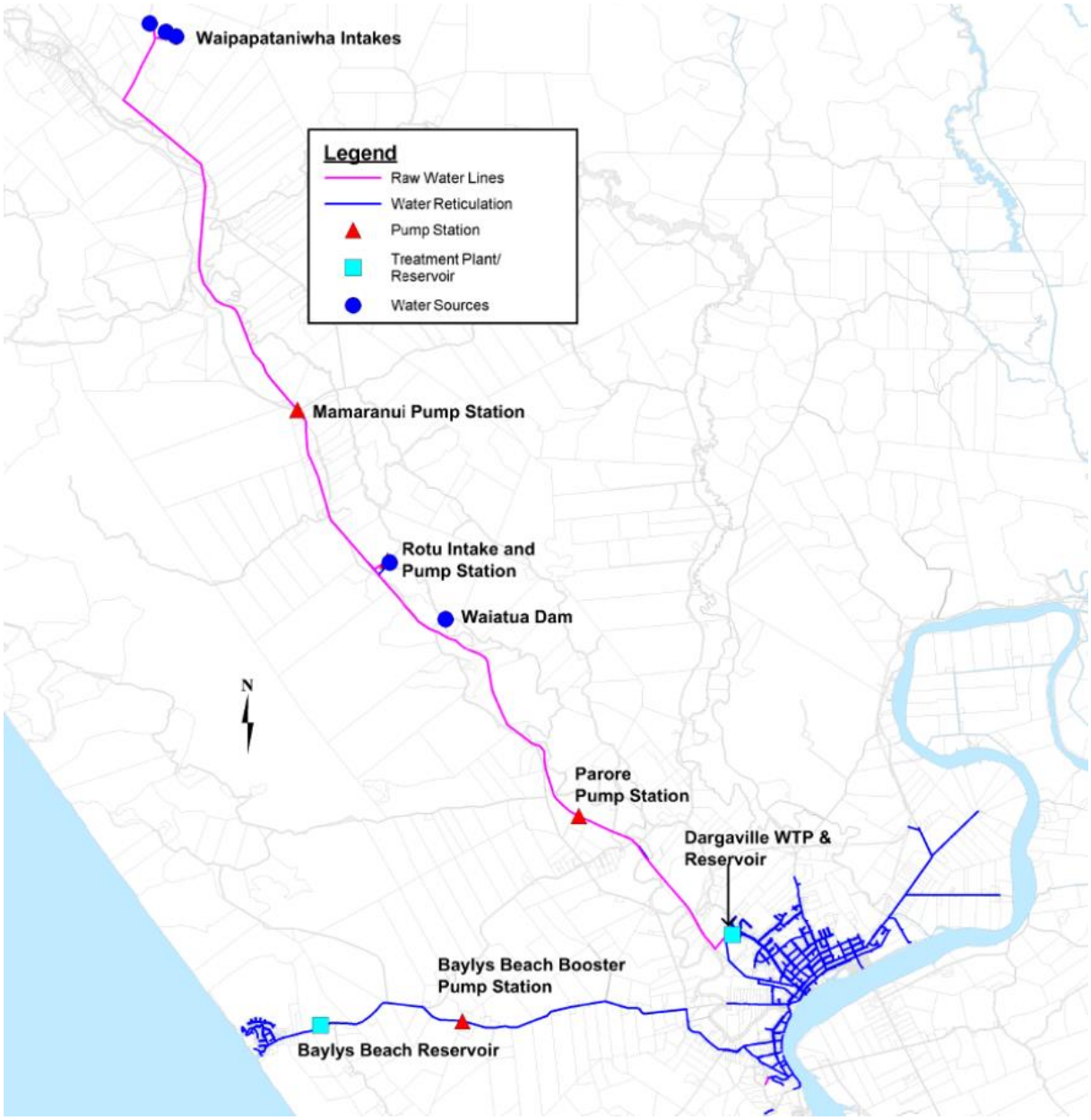

Figure 6-1: Existing Water Supply reticulation (KDC Asset Management Plan 2015)

6.1.1 Existing Network Conditions

As part of our reporting discussions have been undertaken with representatives of the Kaipara District Council. We have also reviewed documentation made available to us by the Council[1][2].

From our investigations we make the following comments with respect to Dargaville's current water supply situation and how it relates to the PPC.

6.1.1.1 Water Treatment Plant (WTP)

- The WTP is currently producing at an average flow rate of 2000 – 3000 m^3/d.
- The WTP is currently capable of treating approximately 4000 m^3/day (equivalent to 182 m^3/h @ 22 h/d) with an instantaneous discharge of up to 58 L/s over a finite period.
- This results in a reserve treatment capacity of approximately 1000 m^3/d.

6.1.1.2 Raw Water Network Scheme

- Using a current average flow rate of 3000 m^3/d plus a 20% allowance for growth in Dargaville (e.g., this PPC) the average demand is approximately 111,000 m^3/month or 3600m^3/day which is 90% of the potential treated water available.
- The current raw water supplies are known to be sensitive to seasonal droughts at which times the average demand of 111,000 m^3/month may not be sustainable.
- The Kaipara District Council infrastructure strategy has budget allocated to investigating raw water storage options to improve the schemes resilience and allow for growth to effectively bridge supply deficits due to seasonal fluctuations.
- Preliminary Investigations to date have identified improvements to the Waiatua Dam as being the best practical option to achieve the necessary resilience.
- Detailed investigation, design and construction of the Waiatua Dam upgrades are not yet committed to in the Kaipara Districts Long Term Plan.

6.1.1.3 Reticulation Network

- The Council has advised that an existing water network model completed by a sub-consultant exists. We have requested the results of this model as well as the provided flow scenarios to be tested in this model. At the time of this report (April 2022) this information had not been provided.

[1] Waiatua Dam Upgrades Feasibility Assessment, version 1, dated 01/07/2021, by Awa
[2] Capacity Assessment Report – Dargaville Water Treatment Plant, revision 0, dated June 2021, by APEX

6.1.2 Existing Network Constraints Summary

From our investigation we conclude that there are no known treatment or distribution constraints within the existing water supply network that could not be overcome with typical infrastructure upgrades as part of a subdivision process. However, the raw water supply is constrained and although there are viable solutions, and general acceptance that these will be implemented, there is not a definite commitment in the councils' long-term plan to implement these within the next 10-year horizon.

6.2 Water Supply Demand

The PPC seeks to enable residential development that will increase the demand on the existing Dargaville Water Supply Scheme. Table 6-1 below summarises the estimated water supply demand.

Table 6-1: Estimate water supply demand as per KDC & Watercare Standards

Scenario	Household Equivalent	Number of Persons per Household Equivalent	Catchment Design Population	Design Daily Consumption (L/p/day)*	Daily Peaking Factor*	Hourly Peaking Factor*	Average Daily Demand (m3/d)	Peak Day Demand (m3/d)	Average (Hourly) Demand (L/s)	Peak (Hourly) Demand (L/s)
Proposed Plan Change Based on 600m2 minimum lot sizes	348	4	1392	220	2	2.5	306.24	612.5	7.09	17.72
Possible Alternative Based on 450m2 minimum Lot sizes	465	4	1860	220	2	2.5	409.2	818.4	9.47	23.68

**Where the KDC Engineering Standards do not have guidance and refers to NZS4404, the Watercare Code of Practice for Land Development and Subdivision has been used instead.*

We note that the demands in Table 6-1 above are indicative demands the re-zoning could enable. We have outlined two scenarios. The 'Proposed Plan Change' scenario' is the maximum yield possible with what is proposed (i.e., aligns with the proposed provisions of the Awakino Precinct). The possible alternative allows for a higher density development which we understand is anticipated in the future KDC plan change.

6.2.1 Gradual Demand Increase

The increased demand on the water supply network will be gradual and cumulative through the wider water catchment due to the significant lag between zoning, development, and the occupation of the resulting dwellings. Additionally, land is released in stages to control supply and capital. So, the typical process buffers any sudden demand for capacity allowing time for upgrades to be planned and implemented prior to the actual demand being required.

Beyond the business-as-usual scenario outlined above there are also other mechanisms through the resource consent process that can restrict development to align with the required infrastructure improvements. Assuming that there are no restrictions to development, Table 6-2 below shows the fastest likely demand increase scenario.

Table 6-2: Estimated Water Gradual Demand Increase

Development Stage	Timing	Additional Connections	Cumulative Connections	Average Daily Demand (m3/d)	Peak Day Demand (m3/d)	Percentage of Reserve Water Treatment *
Plan Changed Approved	Early 2023					
First Resource Consent Approved	Late 2023					
First Subdivision Stage Complete (To be completed/released in 50 Lot Stages)	Late 2024					
Actual Sites Connecting to Network (i.e., Account for house building and deliberate staging)	2025	50	50	44	88	9%
	2026	50	100	88	176	18%
	2027	50	150	132	264	26%
	2028	50	200	176	352	35%
	2029	50	250	220	440	44%
	2030	50	300	264	528	53%
	2031	**48**	**348**	**306**	**612.5**	**61%**
Possible Alternative (Maximum yield based on 450m2 lots)	n/a	n/a	465	409.2	818.4	82%
** Based on 1000 m^3 / day*						

6.3 Firefighting Water Supply

Firefighting water supply requirements are set out in the Engineering Standards and SNZPAS4509:2008. For the residential type of development that this PPC would enable the firefighting water supply requirement is that set out Table 6-3 below.

Table 6-3: SNZPAS4509:2008 firefighting water supply requirements

Fire Water Classification	Reticulated water supply			Non-reticulated water supply	
	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of hydrants to provide flow	Minimum water storage (within 90m)	
				Time (firefighting) (min)	Volume (m^3)
FW2	750 L/min	750 L/min	2	30	45

To service the development area for firefighting water supply there are two viable solutions:

6.3.1 Reticulated Water Supply

Extend the reticulated network from Awakino Road and provide hydrants where necessary to meet the standard. Minor upgrades within the existing reticulated network may be required to ensure that an adequate level of service is maintained throughout Dargaville during hydrant flow. However, these sorts of upgrades are typical and would be completed as part of the subdivision process under the proposed residential provisions and in line with the Engineering Standards. Given the reservoir at the WTP has a storage volume and instantaneous discharge capacity greater than the requirements above, there are no known constraints at a plan change level limiting this option.

6.3.2 Non-Reticulated Water Supply

As an alternative to a reticulated water supply network, dedicated firefighting water supply storage tanks can be situated throughout a subdivision. Normally, these would be underground, located within widened road reserves and be easily accessible for Fire and Emergency personal to access. Water would typically be extracted from the tanks using a portable pump or fire appliance. Flow diversions from the reticulated stormwater network would be routed through the tanks to provide intermittent circulation and re-filling. This option is unlikely to be needed for the PPC Area but is an alternative that is used in the Kaipara District if extending the reticulated water supply network is not viable.

6.4 Potential Water Supply Strategies

It is acknowledged that the PPC inadvertently creates an expectation that water supply infrastructure will be provided to enable residential development. As indicated in the sections above there are constraints with respect to the raw water supply and there is currently no documented commitment from the council to improve the raw water supply capacity. This begs the question is it appropriate to zone this land residential when there is a lack of resilience in the existing raw water supply, and the wider question of what comes first; the known demand (the development) or the residual capacity (completed capital works to enable future development).

6.4.1 Proposed Provisions

We note that with the proposed provisions for the PPC the council is not obliged to ensure there is raw water capacity and there are engineering solutions to either minimise effects on the existing water system or provide a standalone alternative. This would be addressed through rule 13.14.4 Water Supply.

1. **Where a Council water supply is available:**

a. The written approval of Council's Asset Manager is obtained and provided with the application to confirm that the Council water supply can be extended to serve the subdivision; and
b. All allotments are provided, within their net site area, with a connection to the Council water supply; and
c. All water pipelines vested with Council shall be protected by an Easement in favour of Council.

2. **Where a public supply is not available, water supplies to all developments shall:**

a. Meet the requirements of the **Building Act**.

Figure 6-2: Rule 13.14.4 Water Supply

When an application for a subdivision is made the provision above means council can decline the consent on the basis of a suitable water supply not being available if the subdivision was based on

utilising the existing reticulated network. In our opinion the main issue for this PPC is timing because there is undoubtedly a need and longer-term requirement for the raw water supply to be improved.

We present the following options that could be considered for water supply as/if required at subdivision or land use consent stage.

6.4.2 Timing Restrictions

Through the resource consent process, actual approval of resource consents or subsequent s224c certificates can be controlled to force development to align infrastructure readiness.

6.4.3 Supplemented Water Supply

To reduce the demand on the council water supply network, on-site water storage can be used to supplement the supply. As documented in the legacy Auckland Regional Councils (ARC) Technical Publication 10 (TP10), approximately 65% of household water demand is made up by non-potable uses like toilet, laundry, and gardening. An option to manage the wider networks lack of raw water capacity is that the residential development must have on-site water retention for non-potable re-use via rainwater harvesting. This also aligns with best practice stormwater management and could be adopted as a resource consent notice condition e.g.,

a) *non-potable water supply shall be provided for any residential dwelling on the lot with a minimum volume sized to supply at least 80% of the yearly non-potable water demand as calculated using Table 11-5 of Auckland Regional Councils TP10.*

On a typical 600m2 site with a 240m2 roof area and nominal 4-person occupancy that shown in Table 6-4 below would apply.

Table 6-4: Typical non-potable water supply example

Average Daily Household Demand (L/d) *	Non-potable demand (L/d) **	Tank Volume (m3)	Supplied by 25m^3 tank (L/d) ***	Average Yearly % of Non-potable Demand provided on-site	Average Yearly % of Total Demand provided on-site
880	572	25	514.8	90%	59%

** Based on 4 persons at 220 L/p/d*

*** 65% of average daily demand*

**** The amount shown has been interpolated from table(s) 11-5 of ARC TP10*

As demonstrated above, this would result in tanks of a practical size (25m^3) and supplement the supply by more than 50%. This would result in the 2031 timing scenario in Table 6-2 above only requiring 25% of the reserve treatment capacity and largely reduce the demand on the raw water supply.

6.4.4 Water Reduction Fixtures

To further reduce the demand on the council network, water reduction fixtures can be used. As documented in AS/NZS 1547:2012 standard water reduction fixtures can reduce wastewater flows and therefore water supply demand by up to 20%. Like the supplementary supply, it could be volunteered by the applicant that residential development must have water reduction fixtures. This could be enforced as a resource consent notice condition e.g.,

a) *Any dwelling on the lot shall be fitted at a minimum with standard water reduction fixtures as outlined in AS/NZS 1547:2012.*

In general, this would reduce the daily design consumption from 220 L/p/d to more like 180 L/p/d. This option could reduce the Daily Demand on the council network for the proposed 348-household equivalent scenario to that shown in Table 6-5 below.

Table 6-5: Alternate water demand considering water reduction fixtures

Household Equivalent	Design Daily Consumption (L/p/day)	Average Daily Demand (m3/d) *	Peak Day Demand (m3/d)
348	180	125.28	250.56
** Reduced by 50% to account for supplementary supply*			

When comparing Table 6-5 with Table 6-1, a combination of supplementary supply and water reduction fixtures could have a cumulative average daily water demand reduction of 180.72 m3/day (306 – 125.28) or 60% on the council network. Also, by employing water reduction fixtures a 9000 L tank could achieve the 80% yearly non-potable water demand requirement making that more practical.

6.4.5 Full Potable On-Site Supply

As an alternative to extending the councils water reticulation network, on-site potable water supply tanks may be implemented which would be supplied by rainwater harvesting and supplemented by tanker truck as/if required on a house-by-house basis. This is widely used in the Kaipara District in both the residential and rural environment. The proposed provisions would require that this meets the requirements of the building act which refers to 'adequate supply' as being the performance criteria. What 'adequate supply' means is somewhat subjective. From an engineering perspective this is influenced by many factors including, water demand, catchment/roof area, rainfall, and storage volume. Table 6-6 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 6-6: Recommended Tank Volumes for On-site Residential Supply

Roof Catchment (m2)	Bedrooms				
	1	2	3	4	5
100	$20m^3$	$50m^3$			
120	$15m^3$	$35m^3$			
140	$10m^3$	$30m^3$	$75m^3$		
160		$20m^3$	$60m^3$		
180			$50m^3$	$75m^3$	
200			$45m^3$	$65m^3$	
220			$35m^3$	$55m^3$	$90m^3$
240			$30m^3$	$50m^3$	$80m^3$
260			$30m^3$	$45m^3$	$70m^3$
280				$40m^3$	$65m^3$
300				$35m^3$	$60m^3$

As shown above a typical 600m2 site with a 240m2 roof area and nominal 4-person house would require 50m^3 of on-site storage. This could be provided by two 25m^3 above ground tanks which would typically take up 20-30m^2 of a sites area. This is practical on a 600m^2 site which would be the typical site size expected. We do note that the practicality of full on-site potable water supply could limit integrated developments seeking Lot sizes down to 375m^2 which is the minimum site size enabled by the chapter 13 provisions as a discretionary activity.

6.5 Best Practical Water Supply Strategy

Considering the potential strategies above we believe that a combination of supplemented water supply and water reduction fixtures would be best to implement on this site at subdivision or land use consent stage. This is assuming that development progresses ahead of councils' raw water supply upgrades. What this option provides is lower potential impact with on-site storage buffering the demand whilst creating connections to the council network and therefore financial contributions assisting in funding the capital projects. This option provides a gradual but definite growth in the short term and provides clarity on what Dargaville's infrastructure needs are whilst minimising the potential affect.

7 Stormwater

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, Awakino Precinct provisions for stormwater and how they control development. Table 7-1 below 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 15% impermeable coverage within any one hectare of a site is considered a permitted activity, where in the proposed residential Awakino Precinct zone this is increased to 60% 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 Awakino Precinct; specifically, any development must comply with the proposed rules relating to stormwater. Because the proposed provisions impose what we consider best practice stormwater management for all impermeable area, 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 Chapter 13 Awakino Precinct 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 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 Awakino Precinct. We have developed these provisions by first, developing a Stormwater Management Plan (SMP) for the PPC area, then, drafting conditions that impose the outcomes of that SMP. The SMP considers the National Freshwater Policy Statement, Proposed Regional Plan for Northland, and the existing Chapter 13 provisions, therefore the proposed provisions do also.

We are of the opinion that the 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 SMP accompanying the plan change application for further information.

8 Wastewater

8.1 Dargaville's Existing Wastewater Network

Dargaville has an existing reticulated wastewater network made up of approximately 40 km of pipeline and 15 Wastewater Pumpstations (WWPS). The reticulated network conveys wastewater to the Dargaville Wastewater Treatment Plant (WWTP) which is situated on the eastern outskirts of Dargaville, behind Silver Fern Farms, adjacent to where the Awakino and Northern Wairoa Rivers converge. Figure 8-1 below illustrates the general arrangement.

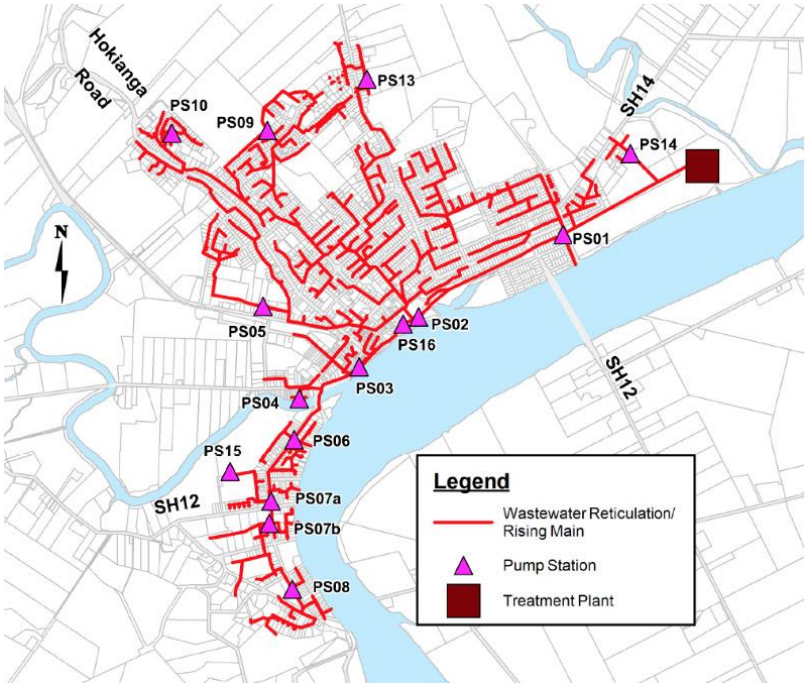

Figure 8-1: Existing Wastewater Network (KDC Asset Management Plan 2015)

8.2 Existing network Conditions

As part of our reporting discussions have been undertaken with representatives of the Kaipara District Council regarding wastewater and the wastewater treatment plant (WWTP).

From our investigations we make the following comments with respect to Dargaville'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 consists of a 4.7ha facultative oxidation pond and a 2ha maturation pond. Wastewater receives initial treatment in the oxidation pond, and it is then pumped into the maturation pond to circulate for additional polishing. The treated effluent is then discharged via spray irrigation onto the riparian strip of the Northern Wairoa River. Figure 8-2 below is an aerial of the WWTP.

Figure 8-2: Dargaville WWTP layout (KDC Asset Management Plan 2015)

We understand the following with respect to the WWTP:

- It was last upgraded in 2007 from the original constructed wetlands to the current configuration.
- According to KDC's 2015 Wastewater Asset Management Plan the WWTP received an average dry weather flow of 1,340 m^3/day.
- The current wastewater treatment capacity of the plant is unknown.
- At the time of this report (April 2022) KDC has an investigation underway into the condition and the treatment capacity of the WWTP. It is anticipated that this study will be complete by the end of July 2022.
- The WWTP is on a parcel of land circa 28 ha in area which is largely un-utilized by the WWTP and has been maintained in grazing pasture. Consequently, we presume that area availability would not be a constraint for potential future expansion of the WWTP.

8.2.1.2 Reticulation Network

- The Council has advised that a network model completed by a sub-consultant exists. We have requested the results of this model as well as the provided flow scenarios to be tested in this model. At the time of this report (May 2022) this information had not been provided.

8.2.2 Existing network Constraints Summary

There is a knowledge gap with respect to the condition and treatment capacity of the WWTP. The Kaipara District Council has budget in the Long-Term Plan for investigation which it is currently utilising. Until the current investigations are complete, the need for upgrades, and the details of what those upgrades might be are unknown.

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 Dargaville.

Simply put, there are two potential constraints to service the PPC Area with reticulated wastewater:

1. Capacity constraints in the councils existing pipe network and wastewater pump stations
2. Capacity limitations at the Dargaville WWTP

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 $14.75M for Wastewater Growth in Dargaville. Given the coinciding spatial plan for Dargaville identifies the PPC area as residential this does indicate a potential commitment of capital expenditure to service the PPC Area.

Major Capital Expenditure								
Description	2021/26	2026/31	2031/36	2036/41	2041/46	2046/51	Key Driver	Uninflated Cost ($m)
Bridges and Structures							Renewals	72.903
Slip Repairs							LOS	53
Pouto Road Phase 1							LOS	3.2
Road Works - Unsealed road metalling							Renewals	97.48
Road works -Sealed pavement Rehabilitation							Renewals	56.142
Road works - Sealed resurfacing							Renewals	64.05
Dargaville water treatment plant upgrades in response to growth investigation, design and construction							LOS & Growth	2
Dargaville Growth Projects							Growth	2.15
Dargaville wastewater treatment plant upgrade							Growth	2
Te Kōpuru Wastewater treatment plant upgrade							LOS+Growth	0.35
Dargaville wastewater growth							Growth	12.75
Dargaville Climate Change upgrades to network							Growth	2
District-wide land drainage - Awakino East stopbanks							LOS	7
District-wide land drainage - Eastern Wairoa stopbanks							LOS	30
District-wide land drainage - Kaihu stopbanks							LOS / Growth	20
District-wide land drainage - Te Kōpuru stopbanks							LOS / Growth	8.5
Raupo land drainage - stopbank upgrades							LOS	15
Raupo land drainage - internal stopbanks							LOS	2.5
Raupo land drainage floodgates							LOS	0.9
Dargaville composting plant							LOS+Growth	0.15

Figure 8-3: North Kaipara Agriculture Delta major Capital Expenditure Table (Draft Kaipara Infrastructure Strategy)

8.3 Wastewater Demand

The PPC seeks to enable residential development that will increase the demand on the existing Dargaville 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	Catchment Design Population	Average Dry Weather Flow	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)
Proposed Plan Change (Based on 600m2 minimum lot sizes)	348	4	1392	210	2.5	2	3.38	8.46	16.92	292.3
Possible Alternative (Maximum yield based on 450m2 minimum lot sizes)	465	4	1860	210	2.5	2	4.52	11.30	22.60	390.6

Like Water Supply, the demands in the table above are indicative demands the re-zoning could enable. We have outlined two scenarios. The 'Proposed Plan Change' scenario' is the maximum yield possible with what is proposed (i.e., aligns with the proposed provisions of the Awakino Precinct). The possible alternative allows for a higher density development which we understand is anticipated in the future KDC plan change.

8.3.1 Gradual Demand Increase

The increased demand on the wastewater network will be gradual and cumulative through the wider water catchment due to the significant lag between zoning, development, and the occupation of the resulting dwellings. Additionally, land is released in stages to control supply and capital. So, the typical process buffers any sudden demand for capacity allowing time for upgrades to be planned and implemented prior to the actual demand being required.

Beyond the business-as-usual scenario outlined above there are also other mechanisms through the resource consent process that can restrict development to align with the required infrastructure improvements. Assuming that there are no restrictions to development, Table 8-2 above shows the fastest likely demand increase scenario.

Table 8-2: Estimated Wastewater Gradual Demand Increase

Development Stage	Timing	Additional Connections	Cumulative Connections	Peak Dry Weather Flow (L/s)	Peak Wet Weather Flow (L/s)	Daily Design Volume (m3)
Plan Changed Approved	Early 2023					
First Resource Consent Approved	Late 2023					
First Subdivision Stage Complete (To be completed/released in 50 Lot Stages)	Late 2024					
Actual Sites Connecting to Network (i.e., Account for house building and deliberate staging)	2025	50	50	1.22	2.43	42
	2026	50	100	2.43	4.86	84
	2027	50	150	3.65	7.29	126
	2028	50	200	4.86	9.72	168
	2029	50	250	6.08	12.15	210
	2030	50	300	7.29	14.58	252
	2031	48	348	8.46	16.92	292.32

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 indicated in the sections above there is limited information available regarding both the reticulation network and the WWTP capability in Dargaville. It is anticipated that this information will be available by the end of July 2022, however; this could identify bulk and local infrastructure constraints. This begs the question is it appropriate to zone this land residential if there are capacity constraints in the existing wastewater network, and the wider question of what comes first; the known demand (the development) or the residual capacity (completed capital works to enable future development).

8.4.1 Proposed Provisions

We note that with the proposed provisions for the PPC the council is not obliged to ensure there is wastewater capacity and there are engineering solutions to either delay discharge into the existing wastewater system or provide a standalone alternative. This would be addressed through rule 13.14.6 Wastewater Disposal.

1. **Where a Council reticulated wastewater system is available:**

a. The written approval of Council's Asset Manager is obtained and provided with the application to confirm that the Council wastewater system can be extended to serve the subdivision; and
b. All allotments are provided, within their net site area, with a connection to the Council reticulated wastewater system; and
c. The reticulated wastewater system is designed and constructed in accordance with the specific requirements of the Council wastewater system; and
d. All water pipelines vested with Council shall be protected by an Easement in favour of Council.

2. **Where a community wastewater system is proposed, the system shall be designed in accordance with AS/NZS1547:2008 "Onsite Wastewater Management Standards"**
3. **Where no Council system is available, all allotments are provided, within their net site area, with:**

a. 1,500m^2 area of land per household for wastewater disposal within the boundaries of the site. The area shall be clear of building sites, driveways and manoeuvring areas; and
b. The applicant must demonstrate that an on-site disposal system meeting the requirements of the Regional Water and Soil Plan for Northland can be installed; and
c. Applicants shall demonstrate that any effluent discharges comply with the requirements of the Regional Water and Soil Plan for Northland (or consent for discharges from the Northland Regional Council has been obtained).

Note 1: Effluent discharges may require Resource Consent under the Regional Water and Soil Plan for Northland. Applicants should contact the Northland Regional Council to determine whether or not a Resource Consent is required.
Note 2: Where parallel Resource Consent for effluent discharge is required from the Northland Regional Council, Kaipara District Council will seek to undertake joint processing of both applications, via delegated authority from the Northland Regional Council.

Figure 8-4: 13.14.6 Wastewater Disposal (Chapter 13 - Kaipara District Plan)

When an application for a smaller lot (i.e., <2500m^2 as per the Awakino Precinct proposed provisions) subdivision is made the provision above means council can withhold written approval that the council wastewater system can be extended to service the site. In our opinion the main issue for the PPC Area is timing because there is undoubtedly a longer-term need for the PPC Area to be serviced by the Dargaville Wastewater Scheme.

We present the following options that could be considered for wastewater if required at subdivision or land use consent stage.

8.4.2 Timing Restrictions

Through the resource consent process, actual approval of resource consents or subsequent s224c certificates can be controlled to force development to align infrastructure readiness.

8.4.3 Reticulation Network Upgrades and Alternate Alignments

We have identified two preliminary options to provide reticulated wastewater to the PPC Area:

1. Extend the existing network from wastewater pumpstation PS13, or,
2. Provide a new wastewater alignment direct from the industrial area adjacent to the WWTP to the PPC Area.

Both these options are shown on drawing 500 attached in the appendix and discussed further below.

8.4.3.1 Option 1 – Extend Existing

It would be practical to extend a gravity wastewater network from PS13 to service the PPC Area. The lid level of PS13 is RL 25.69 and the majority of the PPC Area is at or at or above RL 30.00 providing 4m of fall. Assuming a 225 main at 0.33% as per the KDC Engineering Standards, a pipe range of 1.2 km is possible which can service the majority of the PPC Area. Where the ground levels fall away at the extremities of the PPC Area, private low pressure sewer pumps can be utilised.

The main constraint with this option is the capacity and condition of the existing network. Under the proposed provisions, this would need to be assessed and any capacity issues addressed at land use or subdivision consent stage. Upgrading pipes and wastewater pumpstations to provide network capacity or providing development contributions to support upgrades is typical of the scale of residential development this PPC would enable.

8.4.3.2 Option 2 – New Alignment

As an alternative to extending the wastewater network from PS13 a new WWPS and alternate wastewater alignment more direct from the industrial area adjacent to the WWTP can be extended. We have completed a preliminary concept design for this option and can confirm that it is practical.

There are several potential connection points for an alignment including pumping direct to the WWTP. The most likely option would be to extend from the existing line in front of 102 Jervois Street, Dargaville which drains direct to PS01.

The obvious constraint with this option is that its alignment and new WWPS is in private land. Fortunately, this is not a constraint with respect to the PPC Area because stakeholders of Moonlight Heights Limited are the relevant landowners.

An added benefit of this option is that it provides an opportunity for PS13 to be decommissioned and its catchment diverted into this line. This would reduce demand on the rest of the network.

8.4.4 Large Lot Development – On-Site Wastewater Disposal

As an alternative to providing reticulated wastewater, on site wastewater disposal can be utilized instead. In this case the proposed Awakino Precinct provisions would require that Lot sizes be at least 2500m^2. To demonstrate that a 2500m^2 site within the PPC Area can accommodate on-site wastewater in accordance with AS/NZS 1547:2012, we provide the following table.

Table 8-3: Indicative on-site wastewater disposal design

Selected Soil Category	6 – Medium to Heavy Clays*
Number of bedrooms	4
Design occupancy	7
Water supply	Reticulated Community Supply
Typical design flow	200/L/person/day
Total design discharge rate	1400L/day
Dispersal field slope	<10%

Treatment	Advanced primary treatment
Disposal method	Dose Loaded Drip Irrigation
Design Irrigation Rate (DIR) in 100-150mm of good quality topsoil	2mm/day
Primary Dispersal field	700m^2
Reserve area (30%)	210m^2
Total Area	910m^2
** Selected as worst case, likely category 5.*	

As demonstrated in the table above, a typical 4-bedroom house can be accommodated on the lot with over 1500m^2 to spare. We note that the figures used in the table above are conservative and have been selected based desk top study only.

8.4.5 Communal Wastewater Treatment Plant

Wastewater technology has progressed significantly in recent times, with one of the most significant changes being the introduction and widespread use of Membrane Bioreactor Wastewater Treatment Plants commonly known as MBR Treatment.

MBR Treatment allows for high quality wastewater treatment with a small footprint; containerised units are commonly used throughout the Pacific as well as providing capacity in existing wastewater treatment plants. Watercare Services Limited has introduced containerised MBR treatment plants in the existing Warkworth WWTP to increase the capacity and the quality of the plant prior to the Snells Beach Plant being commissioned.

Alternatively, some residential developments that cannot be readily serviced for wastewater are constructing communal owned MBR plants which will be in private ownership long-term.

Although it is not preferred, a development centric MBR WWTP is possible to service the PPC Area in either a short-term capacity until the Council WWTP has capacity or as a permanent solution with the MBR plant remaining in private common ownership in perpetuity.

8.5 Best Practical Wastewater Strategy

Considering the potential strategies above we believe that extending a new alignment coupled with timing restrictions on actual connections would be the best practical wastewater strategy. This is assuming that the WWTP does have some residual treatment capacity but will require upgrading to service the full future demand of Dargaville. What this option provides is reduced demand on the existing council reticulation network whilst at the same time creating new connections to the wider council network and therefore financial contributions assisting in funding the capital projects (e.g., WWTP upgrades). This option provides a gradual but definite growth in the short term and provides clarity on what Dargaville's infrastructure needs are whilst minimising the potential affect.

9 Utilities

As part of our assessment, we have coordinated with the relevant service providers and requested comment with respect to servicing the PPC Area for new residential connections. The following summarises our findings, for the correspondence please refer to the appendix.

9.1 Energy Supply

We have consulted with Northpower, and they have confirmed that the PPC Area can be serviced with power without any large network upgrades being required.

The design would be created when the development plan is known.

9.2 Telecommunications

Both Chorus and Northpower have confirmed that they can service new connections at the development site for fibre. It is likely that as part of the development a new 'backbone' cable would need to be installed along Awakino Road from an access point to the existing exchange. Once at the development site, reticulation throughout would be straight forward air blown fibre.

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 Moonlight Heights 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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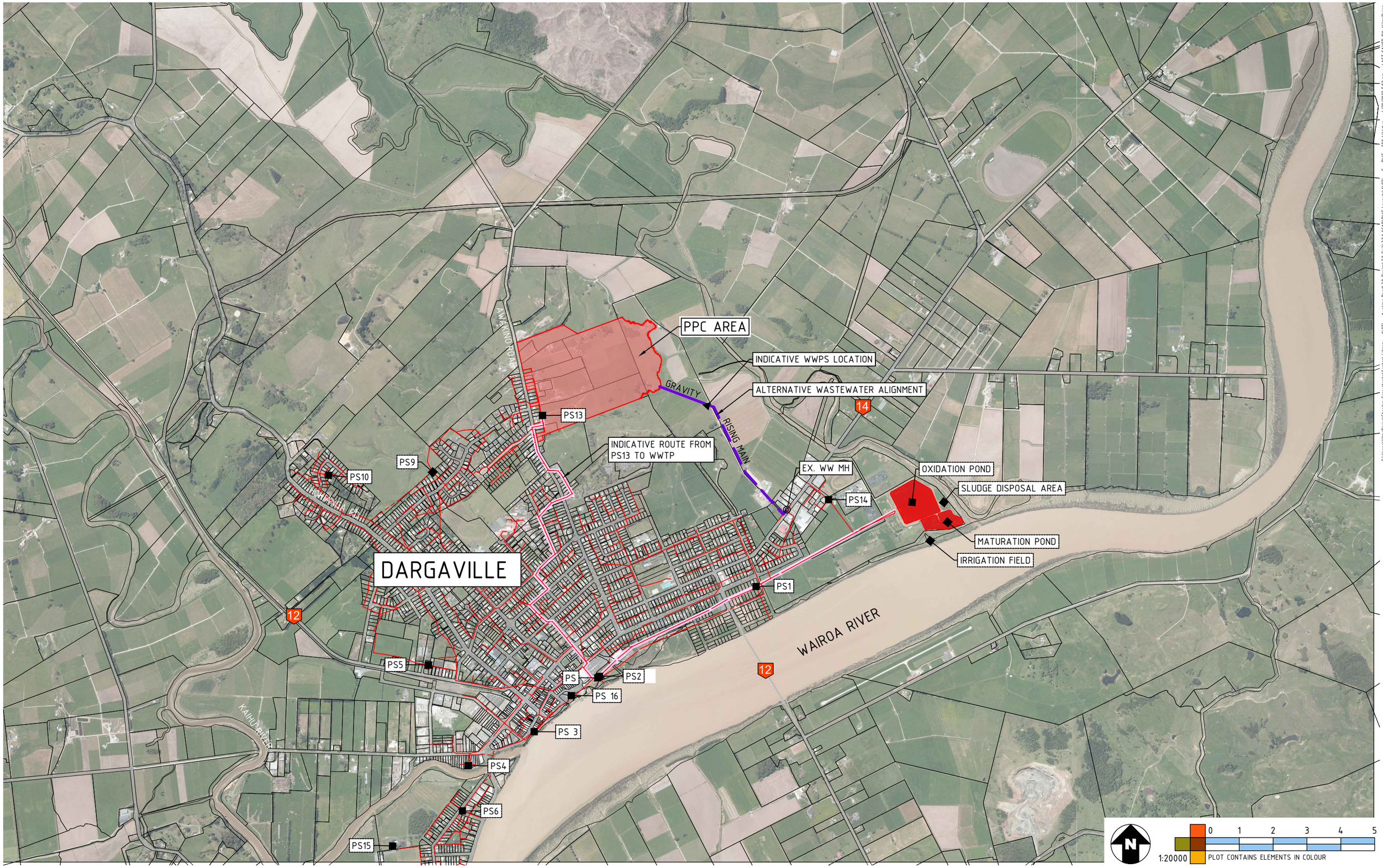
12 Appendix

Appendix A

Concept Wastewater Servicing Options



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Rev	Date	Amendments	By

Drafter:	V. RIVIER	Job Title:	PRIVATE PLAN CHANGE - AWAKINO VIEWS DARGAVILLE
Desiger:	N. JULL	Client:	MOONLIGHT HEIGHTS LIMITED
Checker:	N. JULL	Address:	AWAKINO ROAD, DARGAVILLE
Date:	29/04/2022	Drawing Title:	CONCEPT WASTEWATER SERVICING OPTIONS

Drawing:	500	Rev:	0
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Project:	14974		
Issue:	PLAN CHANGE		

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