Kaipara District Council

MANGAWHAI PLANNING ASSESSMENT

WWTP EFFLUENT RE-USE AT MANGAWHAI GOLF COURSE

14 SEPTEMBER 2021

CONFIDENTIAL

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ABBREVIATIONS

CWWTP	Community Wastewater Treatment Plant
GC	Golf Course
KDC	Kaipara District Council
NRC	Northland Regional Council
MoU	Memorandum of Understanding

EXECUTIVE SUMMARY

Mangawhai Community Wastewater Treatment Plant (CWWTP)currently produces a treated effluent that meets international standards for beneficial reuse. The criteria given in the Environment Protection Authority Victoria Australia effluent standards for reuse show that the effluent is suitable for use as irrigation on recreational areas, provided that public access is restricted during and immediately following application. This is Class C, which makes it ideal for Golf Course irrigation, where irrigation can be overnight, with several hours before the course is used.

Kaipara District Council (KDC), local iwi and Mangawhai Golf Course (GC) have been in discussion and agree in principle that the community and KDC will mutually benefit by reusing effluent for irrigation.

The main benefits to KDC are;

— Benefits to community facility

— 15 ha of land not required for irrigation and associated infrastructure

— long term potential for greater volumes

This document presents the concept of an effluent reuse system for the CWWTP and an anticipated budget cost for the pumping, transfer pipelines and storage system required. Within the system a new golf course irrigation system is required

Alternative locations for a 500m^3 storage tank that will be the link between CWWTP and GC is discussed in the report. Consideration was given to access, safe construction, suitable ground conditions and visual impacts in the community. The preferred site is located at the end of an overflow carpark adjacent to the Mangawhai Golf Club and Mangawhai Bowls Club. This provides a safe working area for long term storage, accessibility to golf course, and minimal visual impact.

A pipeline route has been nominally selected from the CWWTP to the storage tank, which passes through bush and the Mangawhai Golf Course practice area.

Cost for the scheme is estimated ranges from $4.5 million - $6.3 million depending on the transfer pipe installation method and includes the cost for the irrigation system.

1 INTRODUCTION

1.1 BACKGROUND

The Mangawhai CWWTP is predicted by 2043 to be treating the wastewater from approximately 6,000 connections, a population of approximately 15,000 people. This is three times the current flow which will result in a daily average flow of around 1,800 m^3/d. Summer peak population will be greater, with flows of 2,500 m^3/d or more in peak dry conditions.

The current disposal route for treated effluent is thorough the irrigation system at the Browns Road site, with 65.5 ha available for irrigation. Current estimates indicated that the irrigation system will reach capacity at approximately 3,000 connections, which is estimated to be reached at or near 2028. Therefore, to accommodate the future growth an alternative discharge location(s) or approach is required.

The Mangawhai GC have been in discussion with KDC and local iwi exploring the opportunity. This approach brings several benefits to the community including:

- Increased availability of water, currently limited by bore water
- Improved amenity value from the irrigation of the course
- Beneficial reuse of effluent is a sustainable practice endorsed by many of the community

The benefits identified from golf course irrigation include:

- Approximately 100 days of irrigation
- Up to 500 m^3/d irrigation of effluent
- Equivalent of 10 ha of land under disposal irrigation (15 ha land purchase)

The use of treated effluent for beneficial reuse is part of the long-term strategy for disposal of effluent from the Mangawhai CWWTP. Reuse at the golf course will permanently defer land purchase by approximately 15 ha and associated infrastructure.

As part of the next planned plant upgrade to provide treatment for 5,000 connections, estimated to be required by 2028 (WSP, 2019) () and included in the long term plan, one possible option is to include membrane treatment which will enable effluent of a consistently higher quality (Victorian Class A Standard) suitable for irrigation with no restrictions. This water will be available to the golf course and potentially other users of water across the catchment.

This report has been prepared to support the investigation and planning of the application of the Mangawhai CWWTP treated effluent to the Mangawhai GC and the preparation of the business case to be presented to Council.

The report provides a conceptual level solution and a cost estimate (-30%/+50%) of the system required to enable irrigation of the golf course with the treated effluent

2 CONCEPTUAL SOLUTION

2.1 OVERVIEW

The system required to enable irrigation of the golf course with treated effluent consists of:

- Transfer pumps (at the CWWTP)
- Transfer pipeline
- Storage tank
- Pump shed for the irrigation pumps and controls
- Irrigation pumps (to be provided by Puddicombe Golf)
- Irrigation system (to be provided by Puddicombe Golf

2.2 EFFLUENT QUALITY

The effluent quality from the Mangawhai CWWTP has previously been found to be of a suitable quality for effluent reuse in a restricted manner (WSP, 2020). The effluent quality from the Mangawhai CWWTP is of a high standard and meets Class C requirement as defined by the Environment Protection Authority Victoria Australia. This means a low level of suspended solids, low levels of organic matter and E. coli <1000 cfu/100ml.

The Victorian Standard states that this water quality is suitable for irrigation of recreational areas provided there is restricted public access during irrigation, and for a period of 4 hours after application. This makes it ideally suited for irrigation of a golf course where irrigation can be undertaken on a timed basis around midnight, with a 4-hour exclusion period before use of the course at 6AM.

Usually the CWWTP passes all flow through the treatment stream to the balance tank and through the sand filters. Sodium hypochlorite dosing provides robust disinfection after the sand filters, and E coli results show < 10 cfu/100ml as average water quality. However, when high flows occur, or for operational reasons the sand filters are running on reduced capacity, effluent is bypassed, and quality will not be maintained. Continuous monitoring be will be in place to monitor this (e.g. turbidity meter) which can prevent transfer to the Mangawhai GC if the effluent quality deteriorates. The effluent will in these instances be transferred to the current disposal field (at the Browns Road site.

Some regrowth of bacteria may occur in the proposed system, the solids formed in the tank will settle and can be removed through periodic cleaning of the tank, the transfer pipeline will be sized to have a self-cleaning velocity.

Higher effluent quality requirements can be achieved by the Mangawhai CWWTP through the reduction in the suspended solids. The effluent quality from the CWWTP normally meets Class A requirements, but due to the capacity of the sand filters, the effluent periodically bypasses the tertiary filters which elevates the suspended solids. To achieve Class A requirements the effluent from the CWWTP will require additional solids removal and a higher standard of disinfection. Class

A effluent can be re-used without any restrictions. This standard will be achieved in a later capital project.

2.3 VOLUME AND RATES

On a dry weather, off peak day flow through the Mangawhai CWWTP is 450 m^3/d, with typical flow around 600 m^3/d. Some of the flow will still need to be diverted to the current irrigation site (Browns Road), to sustain the established grass.

The Mangawhai GC is estimated to require irrigation for only 100 days per year. When the storage tank is full at the Mangwhai GC, no further effluent can be reused. In spring and autumn the Mangawhai GC may have a small daily volume requirement, or none in wet weather. At these times, or when flow is greater than the transfer to the GC can sustain, treated effluent will be passed to Browns Road for storage and irrigation, as per the existing system.

Typically, 400 – 500 m^3/d is available for golf course irrigation, this allows for 4 hours of night-time irrigation at 120 m^3/h and a further 4 hours of restricted public access (as required for Class C effluent). However, as the CWWTP will produce little effluent during the night, and is subject to diurnal and seasonal flow variations, a storage tank is required to fill and store effluent for reuse

A 500 m^3 storage tank is proposed, giving ~1 day of storage. While a larger tank will provide more buffer, 500 m^3 is considered the most economical option at this stage. Given that Class A effluent requirements will likely be achieved at the CWWTP as a result of future upgrades, with no exclusions or limitations on irrigation (i.e. little to no storage requirements) a larger volume tank may become redundant.

2.4 STORAGE TANK

A 500 m^3 glass coated steel tank is proposed (see Figure 1). For aesthetic reasons a forest green tank is proposed to blend in with surrounding trees and shrubs.

The tank will have a roof with ladder access and an access hatch, it will be equipped with an ultrasonic level transmitter, a float switch and an air vent. The tank will have an overflow and a drain, which will be routed to a soakage pit located next the tank. See Figure 7 for a conceptual layout of the tank and soakage pit. The tank is to be specified with manway access on the side of the tank for cleaning purposes.

The roof is necessary to prevent windblown leaves and other debris entering the system and to prevent the growth of algae that can cause system blockage.

Figure 1 Forest green glass-fused-steel tank.

2.5 TANK LOCATION

During a site visit to the Mangawhai GC with KDC four possible storage tank locations were identified as shown in Figure 2.

The red area indicated in Figure 2 is an area of steep ground with limited space between the course features and the bush. This area is a key access route for construction that will be difficult to access without extensive work and disruption to the course.

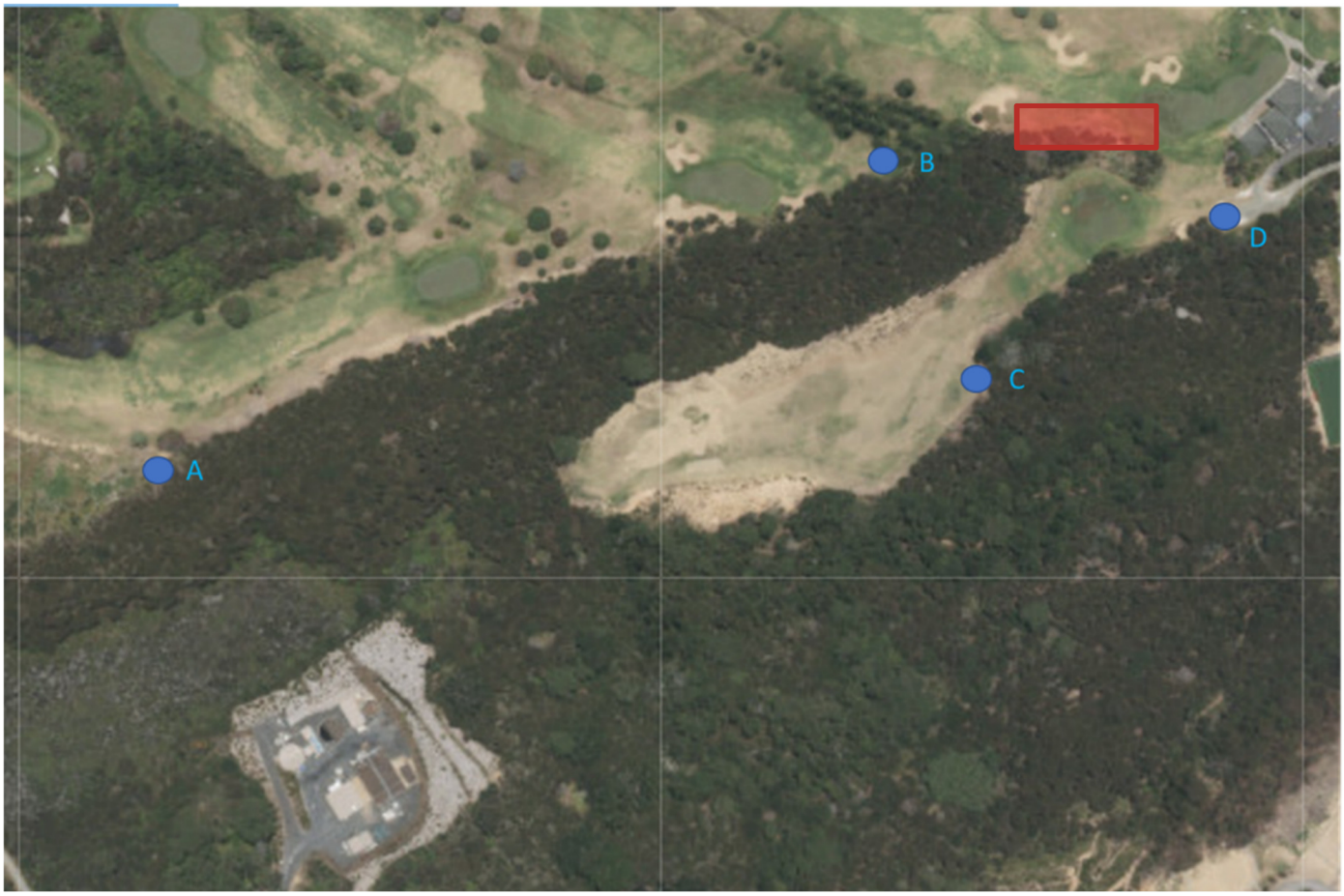

Figure 2 Possible storage tank locations at the Mangawhai Golf Course.

2.5.1 LOCATION A

Location A provides ample space on gentle slope adjacent to the fairway. As Location A is secluded it would require driving construction and service vehicles across the golf course, this will have an impact on day to day operation of the course, safety, and cost implications. Location A can potentially be accessed via Thelma Road for construction purposes but would likely require a resource consent for this access.

The irrigation system (pumps, pipelines and controls) will require power supply at the location. Power supply from Thelma road is probably insufficient as sized to support a few residential properties. If the power supply is from the Mangawhai CWWTP the WWTP will need a power upgrade. Power supply can also be taken from the main road transformer at the entrance to the golf course (estimated distance 760m) and be an independent supply, metered and charged to Mangawhai GC.

2.5.2 LOCATION B

Location B has limited space available as the area serves as a tee for a golf hole. The area contains mature bush at ~30° slope and would require removal of the bush and extensive earthworks to fit the tank into this location. Construction would cause significant disruption to the course.

2.5.3 LOCATION C

Location C is located at the practice area on the top of the hill. Several areas at either end and the middle side of this area were discussed during the sit visit. The end nearest the CWWTP has a steep slope and gully which is covered in bush, this end is also on sand which could make construction difficult. Access to this end of the area will require a new track.

The middle side of the area has a medium slope and is covered in bush, access from the course would require a new track.

The end nearest the club house has a reasonable slope, it will also require fairly extensive bush removal and as with all the above, will require a new track.

There are however no other construction issues as with locations A and B as this is in the practise area.

2.5.4 LOCATION D

Location D is at the end of the overflow carpark, is flat and contains small trees (see Figure 3). Some shrub clearance (~3 medium trees) will be required, but the area is flat and large enough for two 500 m^3 tanks (if required in future). Location D is close to the power supply from the main road (estimated distance 185m) and provides ample space for safe construction. The area of land is council owned and already has road access. Location D is not visible from the lookout, golf club or bowls club and the storage tank will be located below the tree line. This site is immediately next to the Mangawhai GC so can connect to the irrigation system easily.

Figure 3 Location D at the end of the overflow carpark.

2.6 PIPELINE ROUTES

Based on the summary provided in Section 2.5, the preferred location for the storage tank is Location D. The transfer pipe from the CWWTP to Location D can either be trenched or directionally drilled see **Error! Reference source not found.** below

The following pipe distances were estimated for the two options:

- Trenching = ~720 m
- Directional drilling = ~648 m

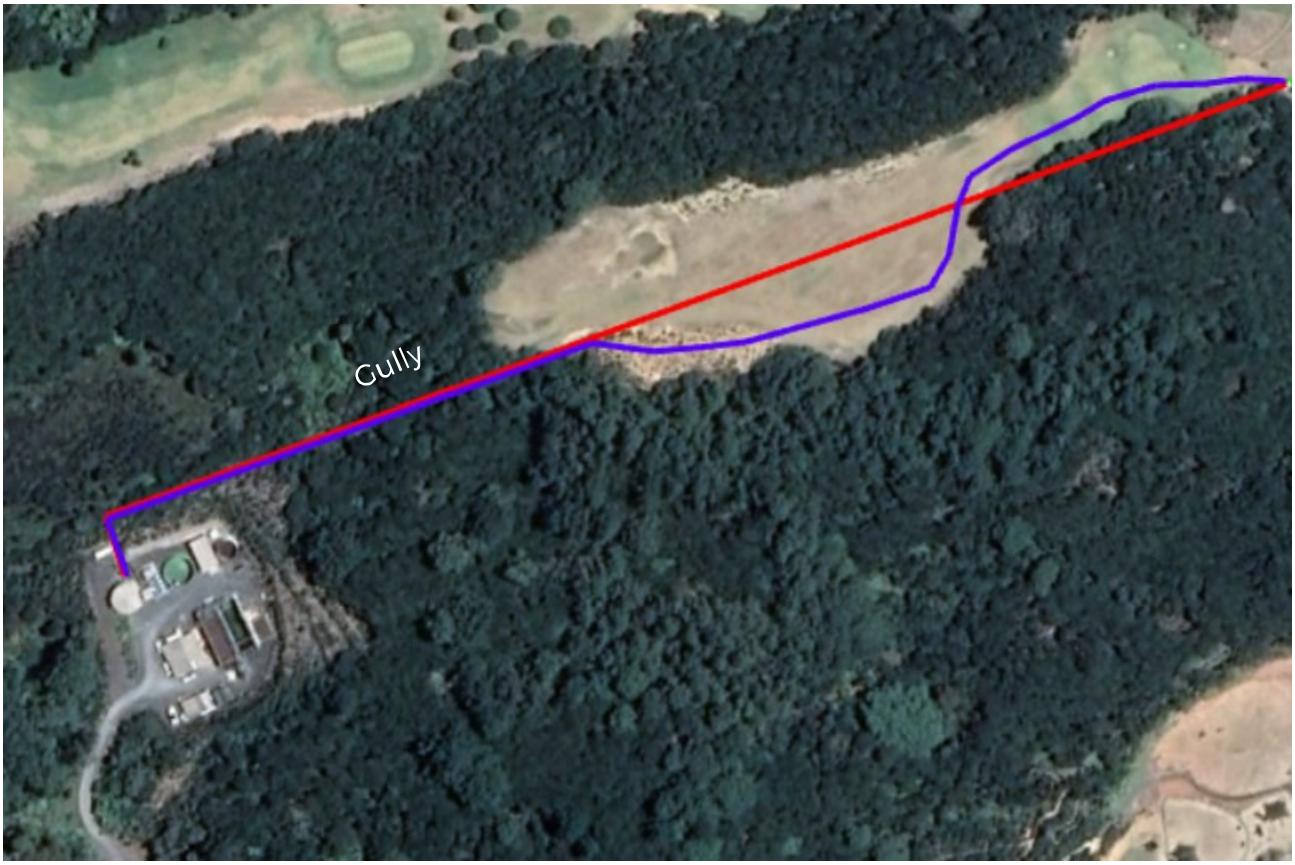

Figure 4, Pipeline routing options from WWTP to Location D. Red line indicates possible directional drilling route, and blue line possible trenching route.

At this stage a 200 mm internal diameter polyethylene (PE) pipe is proposed and can be pumped at 25 l/s (0.8 m/s) This flow matches the flow through the sand filters and will prevent frequent stops starts on the transfer pumps.

From the information currently available the conditions are believed to be moderate for trenching conditions, being mostly sand with occasional hardpan layers (subject to geotechnical survey). Bush clearance will need to be managed (ecology risk) and the gully to the practise area (western end) may present some challenges.

Directional drilling needs some further evaluation, but potentially a straight route from the WWTP to the storage tank with no disruption to the course or bush areas can be achieved.

Table 1 provides a summary of Section 2.5 and 2.6.

Table 1 Comparative summary on storage location and pipeline routes.

	LOCATION A	LOCATION B	LOCATION C	LOCATION D
Suitable build site	Y	N	Y	Y
Sloped area	Moderate	Steep	Moderate	Flat
Bush covered /ecological risk	Rough area on course, not bush, Pipe route visible gap in tree line.	Dense mature bush	Bush, very visible removal	3 trees, no bush
Construction Access	Track from Thelma Road	Track from golf course	Track from overflow car park	Good no additional track
Safety in build	On course -high risk	On course moderate risk	Good – close practice area	Good- Area can be isolated.
Projectile damage	Occasional	Rare	Occasional	None
Change to course layout	Minor fairway narrowing Hole 5	Access track impact on Hole 7,8,9	Minor in practice area	None
Impact on Play	Limited	Significant	None	None
Pipe Route Issues	Ridge Crossing/ Ecology/Siphon	Ridge Crossing/ Golf Course disruption/Ecology /Siphon	Rising Gully/Practice Golf Course (lesser)/Ecology	Rising Gully/Golf Course/Ecology
Distance to Power Supply	672m Thelma Road	500m from Molesworth/GC entrance	760m from Molesworth/GC entrance	185m from Molesworth/GC entrance
Landowner	MGC	MGC	MGC	KDC
Recommended	Unlikely	No	Maybe	Yes

2.7 TRANSFER PUMPING

A new dedicated transfer pump set is required to pump the treated effluent from the existing treated effluent tank to the storage tank at the golf course. The proposal is to extend the manifold of the current treated effluent pumps and to locate the two new transfer pumps next to the treated effluent pumps. This proposal would require relocation of the current wash water pumps.

The current treated effluent pumps and the wash water pumps are located on a slab area next to the treated water effluent tank (see Figure 5). The modification required to install the new transfer pumps and relocate the wash water pumps are:

1. Relocate existing wash water pumps to the laydown area adjacent to the retaining wall (see Figure 6). The feed pipe can run along the retaining wall.
2. Replace transfer pump manifold with a longer manifold with a take-off for 2 new pumps (see layout drawing in Figure 8).
3. Additional pipework to take effluent from the pumps.

Figure 5 Current treated water pumps and wash water pumps next to the treated water tank.

Figure 6 Laydown area next to the retaining wall.

2.8 GOLF COURSE IRRIGATION

Puddicombe Golf was provided with a project brief (see Appendix A) that detailed the requirements for the irrigation system to provide a budget system design and quotation.

This brief outlined the key requirements of the system in terms of operational regime, volumes and limitations. This will enable irrigation of up to 500 m^3/d of reuse water. Of particular note there is a requirement that no effluent can pass directly to the wetlands on site. This will require moisture

deficit monitoring and directional irrigation to prevent discharge to the wetland. A weather station will monitor wind speed and direction and may be used to restrict areas being irrigated.

A key feature required in the irrigation system is the ability to fully irrigate in a few hours each day, to allow compliance with the drying off exclusion period before any access to the area. Therefore, the irrigation system must irrigate between 10 PM and 2 AM to allow all water to be applied before golfers use the course from 6AM. This will require new pumping and, in some areas, larger pipework than the existing to accommodate this flow pattern.

In future, following the 5,000-connection plant upgrade, Class A effluent will be available, suitable for irrigation at any time with no exclusion limitations. This will enable longer periods or multiple periods of irrigation, which with the upgraded system will enable greater volumes to be irrigated if required. Estimates are a maximum of 1,000 m^3/d may be achieved but will be subject to the environmental effects and moisture deficit at the time.

The Puddicombe Golf proposal for the irrigation system is provided in Appendix B (B.1: Proposal and B.2 Irrigation Plan). The proposal contains details on the irrigation system and the infrastructure required and the impact on the Mangwhai Golf Club. Puddicombe Golf have indicated that installation of the irrigation system could take approximately 6 months to complete. Puddicombe Golf also described some of risks they have identified with the project, the biggest risk they have identified is related to supply chain and the impact of volatile pricing and stock availability. The cost estimate provided by Puddicombe Golf has not factored in any of the unknown increases discussed in their proposal. The cost estimate provided by Puddicombe Golf comes to $1,444,223 (see Appendix B.1 for detailed breakdown).

3 KEY DESIGN INFORMATION

The following key information was used in the development of the conceptual solution:

- Transfer Pumps
    - 2 transfer pumps rated for 25 L/s
    - Turbidity meter
    - Flow meter
    - Starter and control panel
- Transfer pipe
    - 200 mm ID polyethylene (PE) pipe
    - Trenching distance = ~720 m
- Directional drilling distance = ~648m
- Storage Tank
    - Type = glass coated steel tank
    - Volume = 500 m^3
    - Additional items:
        - Roof
        - Access ladder
        - Roof hatch
        - Side manway access
        - Overflow
        - Drain
        - Ultrasonic level indicator
        - Float switch
- Pump and control Shed
    - 3m x 4m light frame shed
- Power Supply
    - 185 m overhead power supply
    - Transformer
- Control and cables
    - Fibre optic cable (length of pipe)

4 CONCEPTUAL LAYOUTS

Figure 7 provides a conceptual layout of the storage tank with the soakage pit and pump shed (for irrigation pumps and control) at location D. The storage tank drain and overflow pipe are to be routed to the soakage pit.

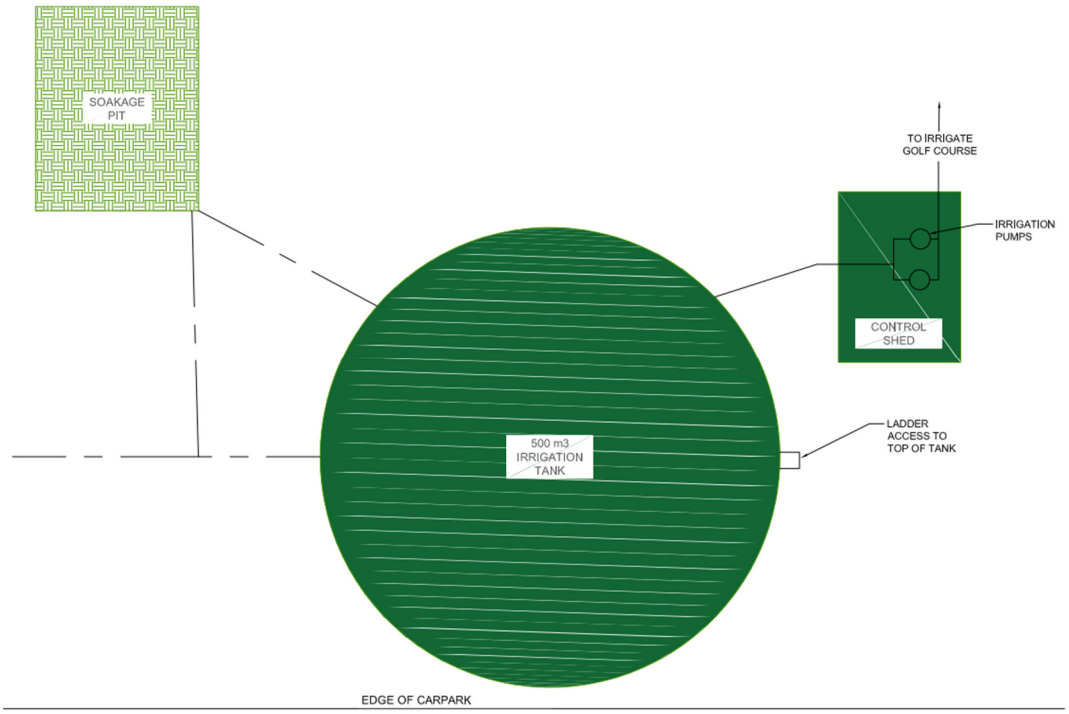

Figure 7 Conceptual layout of the storage tanks and pump shed at Location D.

Figure 8 is indicative layout of the proposed modifications to enable installation of the transfer pumps at the CWWTP.

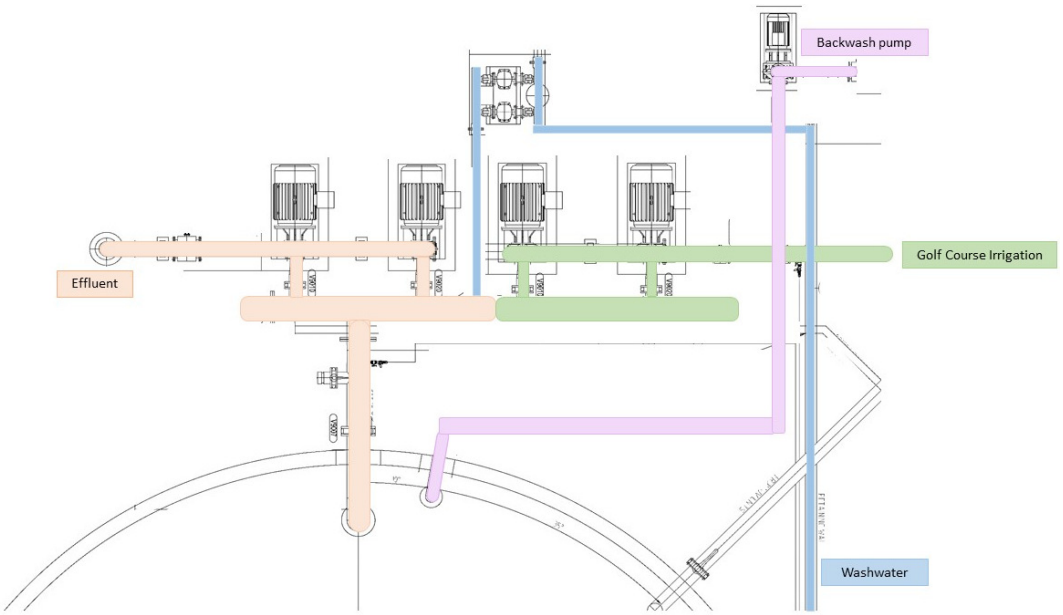

Figure 8 Conceptual layout of the modifications required to install the transfer pumps at the WWTP next to the treated effluent tank.

5 COST ESTIMATE

The conceptual solution considers two transfer pipe options. Both options were considered to evaluate best value for KDC. The cost estimate accuracy for the conceptual solution is -30%/+50% and can be used for preliminary budget approval. The estimated cost for the conceptual solution was determined based on the key design information given in Section 3 and the following assumptions:

- Trenching pipe distance is 720 m
- Directional drilling pipe distance is 648 m
- Transfer pumps based on 25 l/s flow rate
- Ladder access on the storage tank only
- Cost estimate excludes reestablishment of the golf course following trenching and construction
- Pump shed is a light frame steel shed with lights, power socket and fan.
- The cost estimate includes the following
    - A nominal $50,000 for surveys during the implementation phase.
    - Feasibility design fee and client managed costs
    - Detailed design fee and client managed costs
    - Fee for procurement and tendering
    - MSQA
    - 30% contingency and a further 20% funding risk contingency.
- Cost estimate excludes the irrigation system cost.

Based on the details above the estimated cost for the conceptual solution (excluding the irrigation system) with a trenched transfer pipe and a directionally drilled transfer pipe is shown in Table 2.

Table 2 Cost estimate for the conceptual solution excluding irrigation system.

	TRENCHED TRANSFER PIPE	DIRECTIONALLY DRILLED TRANSFER PIPE
Project Expected Cost Estimate	$2.8 million	$4 million
95th Percentile Project Cost Estimate	$3.2 million	$ 4.6 million

Puddicombe Golf have indicated that the cost of the irrigation system is $1,444,223 (excluding GST). The cost does not include any of the potential cost increases discussed in their proposal, as such 20% contingency has been added to the irrigation system costs to cover the expected material increases. Table 3 below show the total project cost estimate which includes the information in Table 2, and the cost for the irrigation system.

Table 3 Total project cost estimate.

	TRENCHED TRANSFER PIPE	DIRECTIONALLY DRILLED TRANSFER PIPE
Project Expected Cost Estimate	$4.5 million	$5.7 million
95th Percentile Project Cost Estimate	$4.9 million	$ 6.3 million

6 RISKS

The following describe the known risks associated with this project.

GROUND CONDITIONS.

This part of Mangawhai is known to be near surface layers of sandy material with occasional hard pan layers. Loose sand may occur and incur additional construction costs, particularly on the pipeline. Hard pan layers may cause additional construction cost on the pipeline. Associated with hard pan layers may be aquifers, and these can also contribute to construction issues.

Mitigation: A geotechnical survey of the pipeline route shall be undertaken to confirm the ground conditions at multiple points to select most appropriate construction methods.

TERRESTRIAL ECOLOGY

Mangawhai CWWTP and Golf course are surrounded by bushland. Although much of this bush is regenerating, there may be ecological value in the area, so there may be restrictions on bush clearance. The pipeline route will require clearance of a strip, approximately 6-8m in width for pipeline construction, and this corridor should be retained long term for maintenance access.

Mitigation: An ecological walkthrough survey can be undertaken on the pipeline route to determine any control measures necessary. Potentially, although of higher cost, the use of directional drilling will enable the construction without bush clearance.

AQUATIC ECOLOGY

It is known that the wetland that forms a central feature of the Mangawhai GC, although artificial in nature is recognised as an important wetland in the area and must be respected. It will be necessary to explain the proposed course irrigation to Northland Regional Council (NRC) and the measures proposed to protect the wetland from effluent irrigation.

Mitigation: Aquatic ecology assessment of the wetland has already been undertaken. Further mitigation maybe required following discussion with NRC.

CONSTRUCTABILITY – GULLY AREA

The pipeline route selected rises to the Mangawhai GC through a fairly steep gully. As this is an area of sand there may be site instability requiring additional measures in construction and potential retaining walls to prevent slips following disturbance.

Mitigation: A geotechnical survey and topographical survey of the pipeline route shall be undertaken to confirm the ground conditions in the gully area and determine the most appropriate construction technique and other mitigations.

SITE SECURITY

Consideration has been given to unwanted attention of the new assets.

Mitigation: The following are proposed to minimise risk to people and equipment. The Tank shall have a rigid cover, with lockable access hatch. The vertical access ladder to the roof shall be provided with an anti-climb plate that is locked in position, preventing use of the ladder. The irrigation pump shed will be lockable. It is not recommended that equipment is not left in this shed when not in use as the sites are remote and not monitored.

SAFETY

It is essential that all equipment shall be provided in an appropriate way for safe installation, operation, maintenance and removal.

Mitigation: During the project development safety in design processes shall be followed to ensure that the risk to operations, golf course users and others is managed, and the system is safe. Selection of Site D has considered the impact of construction on the safety of workers (from projectiles), equipment and golf course users (from machinery or excavations).

VISUAL IMPACT.

A local feature in the Mangawhai area is the lookout. This is a platform on a small hill overlooking much of Mangawhai and is notably adjacent to the Mangawhai GC. Although the proposed location is adjacent to the lookout, initial assessment indicates that a 5m tall green tank will largely be screened by mature trees from the lookout. The selection of colour reduces visual impact from the viewpoint and when viewing the tree line from other angles.

The pipeline route may aesthetically change the appearance of the bush when viewed from around Mangawhai. The track will be permanent.

Mitigation: To minimise visual impact of the project, a visual impact assessment shall be undertaken to consider the visual impact from around Mangawhai and the lookout. Where possible routing and assets will be modified to reduce impact. A directionally drilled pipeline will avoid removal of bush in this area, and the need for a permanent track.

PUBLIC ACCESS.

The proposed location is accessible to the public. This is to be considered during construction and operation. This will be reflected in the project safety plan during construction but will likely restrict access to the overflow car park during activity. The Mangawhai Bowls Club and GC will need to be informed.

A number of public walking tracks exist across this area. This must be considered in the selection of pipeline routing, and temporary measures incorporated. This may require temporary closures or bridges over excavations. The former is preferred.

CONSENTING AND COMMUNITY ACCEPTANCE.

In New Zealand there are many differing views on the fate of wastewater, even if treated to a high standard. To recognise these views engagement has commenced with local iwi regarding the cultural impact of effluent reuse. Verbal feedback is that there are no reasons that the use of wastewater for a golf course irrigation will be seen negatively in a cultural context and the iwi is encouraging for longer term sustainable use of water.

However, it is recognised that others may object to this approach, and as the discharge will require a resource consent, objections may be expected from some parties.

Mitigation: To minimise the impact it is recommended that community engagement is undertaken before the consent application so that community views are heard, and concerns are discussed.

OWNERSHIP AND RESPONSIBILITY

The proposed system will be provided by KDC. High quality effluent will be provided to the storage tank as required at no cost to the Mangawhai GC. However, the boundary of operational and maintenance liability has not been established, and there is a risk that KDC will pay for the Mangawhai GC system and its maintenance.

Mitigation: On acceptance by Council that the Reuse Project can be progressed, it is necessary to meet with Mangawhai GC and KDC to develop a Memorandum of Understanding (MoU) that sets out roles, responsibility and liability for equipment in this system.

POWER SUPPLY

There currently is power cables and a local 50 kVA transformer at the entrance to the Mangawhai GC from Molesworth Drive. It has been assumed that a power cable can be pole mounted and provided to the new storage tank along the route of the gravel track to the overflow car park site. It is uncertain as to the land ownership of this property and the scheme may be opposed. It has been assumed that no significant network upgrades are required to increase the capacity of this power supply, with at most an upgrade of the pole mounted transformer to 70 kVA for the project.
Mitigation: Confirm land ownership and engage with Mangawhai Bowls Club on the potential impacts that the project may have. Power supply could be buried, but at greater cost and greater disruption to the golf club and bowls club.

GOLF COURSE REHABILITATION.

The selection of Location D, on the overflow car park minimises the construction disruption and damage to the golf course. The proposal for the irrigation system includes for all course remediation. However, there is a risk that some remediation is required along the pipeline route in the practice area. Cost has not been allowed for additional remediation, other than soil replacement and levelling and reseeding with no specialised remediation of greens, and tees or fairways included.

Mitigation: Following geotechnical surveys the pipe route can be selected and the extent of course rehabilitation determined. Where possible, tees and greens shall be avoided, but due to confines of the site, may not be achieved. Although of higher cost, the use of directional drilling will minimise the rehabilitation required.

INSUFFICIENT WATER.

At times the Mangawhai CWWTP will be unable to provide effluent of a high quality due to operational constraints or periods of high flow and sand filter bypass. At these times, the system will be unable to provide sufficient water for use at the Mangawhai GC and irrigation will not occur. However, many of the conditions that will have this effect will be short lived, such as high flow storm events, and normal supply will be resumed within 1-2 days. Mangawhai GC have discussed this condition and are considering the impacts on the course.

Mitigation: This risk may be deemed appropriate and no further action is required. However, it may be a requirement that a connection is made to the existing bore supply on the course to the network to provide additional water at times. Further understanding of this connection is required.

7 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Kaipara District Council ('Client') in relation to initial budget estimation and business case development of effluent re-use on the Mangawhai Golf Course ('Purpose') and in accordance with offer of service data 12 February 2021 on Mangawhai Golf Course Effluent Reuse – Planning Assessment. The findings in this Report are based on and are subject to the assumptions specified in the Report WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

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APPENDIX A

APPENDIX A: IRRIGATION SYSTEM BRIEF

APPENDIX B.1: PUDDICOMBE GOLF: MANGAWHAI GOLF CLUB RE-USE PROJECT

APPENDIX B.2: PUDDICOMBE GOLF: IRRIGATION PLAN

APPENDIX C: PROJECT COST ESTIMATE WITH TRENCHED TRANSFER PIPE

Project Estimate

Project: Mangawhai Effluent Re-Use Planning (Trenching Option)

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	$ -	$ -	$ -
	Project Development Phase (Feasibility)	$ -		
	- Survey	$ 50,000.00	$ 15,000.00	$ 10,000.00
	- Consultancy Fees	$ 78,009.18	$ 23,402.75	$ 15,601.84
	- Client Managed Costs	$ 10,921.28	$ 3,276.39	$ 2,184.26
B	**Total Project Development**	$ 138,930.46	$ 41,679.14	$ 27,786.09
	Pre-Implementation Phase			
	- Consultancy Fees (Detailed Design)	$ 187,222.03	$ 56,166.61	$ 37,444.41
	- Client Managed Costs	$ 19,502.29	$ 5,850.69	$ 3,900.46
C	**Total Pre-implementation**	$ 206,724.32	$ 62,017.30	$ 41,344.86
	Implementation Phase			
	Implementation Fees			
	- Procurement	$ 62,407.34	$ 18,722.20	$ 12,481.47
	- Consultancy Fees (MSQA)	$ 124,814.68	$ 37,444.41	$ 24,962.94
	- Client Managed Costs	$ 15,601.84	$ 4,680.55	$ 3,120.37
	- Consent Monitoring Fees	$ 7,800.92	$ 2,340.28	$ 1,560.18
	Sub Total Base Implementation Fees	$ 210,624.78	$ 63,187.43	$ 42,124.96
	Physical Works			
1	Environmental and compliance	$ -	$ -	$ -
2	Earthworks	$ 71,910.59	$ 21,573.18	$ 14,382.12
3	Ground improvements	$ 5,428.67	$ 1,628.60	$ 1,085.73
4	Drainage	$ -	$ -	$ -
5	Pavement and surfacing	$ 215,288.48	$ 64,586.54	$ 43,057.70
6	Bridges and structures	$ 284,975.82	$ 85,492.75	$ 56,995.16
7	Retaining walls	$ -	$ -	$ -
8	Mechanical	$ 312,180.00	$ 93,654.00	$ 62,436.00
9	Electrical and control	$ 374,400.00	$ 112,320.00	$ 74,880.00
10	Piping	$ 288,000.00	$ 86,400.00	$ 57,600.00
11	Landscaping	$ -	$ -	$ -
12	Comissioning	$ 8,000.00	$ 2,400.00	$ 1,600.00
13	P&G	$ -	$ -	$ -
	Sub total Base Physical Works	$ 1,560,183.56	$ 468,055.07	$ 312,036.71
D	**Total construction**	$ 1,770,808.34	$ 531,242.50	$ 354,161.67
E	Project base estimate (A+C+D)	**$ 2,116,463.13**		

F	Contingency (Assessed/Analysed)	(A+C+D)	$ 634,938.94	
G	Project expected estimate	(E+F)	$ 2,751,402.07	
Nett Project Property Cost Expected Estimate			$ -	
Project Development Phase Expected Estimate			$ 180,609.60	
Pre-implementation Phase Expected Estimate			$ 268,741.62	
Implentation Phase Expected Estimate			$ 2,302,050.84	
H	Funding risk (Assessed/Analysed)		(A+C+D)	$ 423,292.63
I	95th percentile Project Estimate		(G+H)	$ 3,174,694.69
Project property cost 95th percentile estimate				$ -
Investigation and reporting 95th percentile estimate				$ 208,395.69
Design and project documentation 95th percentile estimate				$ 310,086.48
Construction 95th percentile estimate				$ 2,656,212.51

APPENDIX D: PROJECT COST ESTIMATE WITH DIRECTIONALLY DRILLED TRANSFER PIPE

Project Estimate

Project: Mangawhai Effluent Re-Use Planning (Directionally Drilled Option)

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	Nett Project Property Cost	$ -	$ -	$ -
	Project Development Phase	$ -		
	- Surveying	$ 50,000.00	$ 15,000.00	$ 3,000.00
	- Consultancy Fees	$ 127,365.84	$ 38,209.75	$ 25,473.17
	- Client Managed Costs	$ 17,831.22	$ 5,349.37	$ 3,566.24
B	**Total Project Development**	$ 195,197.06	$ 58,559.12	$ 32,039.41
	Pre-Implementation Phase			
	- Consultancy Fees (Detailed Design)	$ 269,319.84	$ 80,795.95	$ 53,863.97
	- Client Managed Costs	$ 28,054.15	$ 8,416.25	$ 5,610.83
C	**Total Pre-implementation**	$ 297,373.99	$ 89,212.20	$ 59,474.80
	Implementation Phase			
	Implementation Fees			
	- Procurement	$ 89,773.28	$ 26,931.98	$ 17,954.66
	- Consultancy Fees (MSQA)	$ 179,546.56	$ 53,863.97	$ 35,909.31
	- Client Managed Costs	$ 22,443.32	$ 6,733.00	$ 4,488.66
	- Consent Monitoring Fees	$ 11,221.66	$ 3,366.50	$ 2,244.33
	Sub Total Base Implementation Fees	$ 302,984.82	$ 90,895.45	$ 60,596.96
	Physical Works			
1	Environmental and compliance	$ -	$ -	$ -
2	Earthworks	$ 86,236.39	$ 25,870.92	$ 17,247.28
3	Ground improvements	$ 5,428.67	$ 1,628.60	$ 1,085.73
4	Drainage	$ -	$ -	$ -
5	Pavement and surfacing	$ 215,288.48	$ 64,586.54	$ 43,057.70
6	Bridges and structures	$ 284,975.82	$ 85,492.75	$ 56,995.16
7	Retaining walls	$ -	$ -	$ -
8	Mechanical	$ 312,180.00	$ 93,654.00	$ 62,436.00
9	Electrical and control	$ 338,446.67	$ 101,534.00	$ 67,689.33
10	Piping	$ 993,776.00	$ 298,132.80	$ 198,755.20
11	Landscaping	$ -	$ -	$ -
12	Comissioning	$ 8,000.00	$ 2,400.00	$ 1,600.00
13	P&G	$ -	$ -	$ -
	Sub total Base Physical Works	$ 2,244,332.03	$ 673,299.61	$ 448,866.41
D	**Total construction**	$ 2,547,316.85	$ 764,195.06	$ 509,463.37
E	Project base estimate (A+C+D)	**$ 3,039,887.91**		

F	Contingency (Assessed/Analysed)	(A+C+D)	$ 911,966.37
G	Project expected estimate	(E+F)	$ 3,951,854.28
Nett Project Property Cost Expected Estimate			$ -
Project Development Phase Expected Estimate			$ 253,756.18
Pre-implementation Phase Expected Estimate			$ 386,586.19
Implentation Phase Expected Estimate			$ 3,311,511.91

H	Funding risk (Assessed/Analysed)	(A+C+D)	$ 600,977.58
I	95th percentile Project Estimate	(G+H)	$ 4,552,831.86
Project property cost 95th percentile estimate			$ -
Investigation and reporting 95th percentile estimate			$ 285,795.59
Design and project documentation 95th percentile estimate			$ 446,060.99
Construction 95th percentile estimate			$ 3,820,975.28