9 Assessment of Effects of Construction and Occupation of the Ocean Outfall in the Coastal Marine Area

9.1 Introduction

The proposed offshore ocean outfall would start on the beach approximately 200m from the Ruakaka WWTP site and would extend approximately perpendicular to the beach for distance of just over 3000m, terminating in 8.4m water depth (Figure 4.7) at a location referred to as 'Location 22'. This preferred location was selected following a series of investigations, including numerical modelling of the wastewater dispersion processes in Bream Bay (DHI 2010) (Section 6.13 of this AEE and Support Documents 30, 31 and 32). This location was found to be the best performing of 22 alternative locations in terms on minimising frequency of plume contact and maximising dilutions at sensitive sites including the Mair Bank shellfish beds, the NIWA Aquaculture Park seawater intake and the Ruakaka Surf Club. It would also avoid construction and pipeline location in more sensitive ecological areas near the mouth of the Ruakaka River. Section 6.13 of this AEE summarises the investigations leading to selection of Location 22.

Construction of the outfall is currently planned to begin around 2025 (dependent on wastewater growth). If weather conditions are favourable it could be completed within 12 months.

As the landward section of the ocean outfall crosses (under) Crown land between the WWTP site and the beach, a concession approval is required under the Reserves Act 1977. WDC will work closely with Department of Conservation Officers in working through the concession process. Dialogue has recently commenced with Officers of the Department on this matter.

OCEL Consultants, specialist marine engineering consultants were engaged by WDC to advise on the constructability, including methods of construction for both the offshore and landward sections, material types and estimated cost of an ocean outfall system. The initial report looked at a range of outfall sites, and the final report focussed on Location 22 as now proposed. These reports are included in the Project as Support Document 35. They should be referred to for detailed discussed on the outfall options, constructability and estimated costs.

9.2 Description of Outfall Materials, Pre-Design Considerations and Construction Methods

The OCEL Report covers the following topics, each of which include information pertaining to the potential and actual effects that are likely to result from the outfall construction and ongoing pipeline occupation of the seabed. The nature and scale of the effects, particularly during construction will, to a large extent, be dependent on the material type(s) and method(s) of construction used.

The OCEL Report topic areas, with brief summary of the key sub-topics, are:

1. General Considerations for a Bream Bay Outfall
This covers:

- Wave Energy Environment.
- Tidal Currents.
- Geology.

In respect to these key topics, the Report concludes that *"there are no particular problems with the construction of an ocean outfall into Bream Bay offshore of the WWTP"* and *"The wave environment is relatively benign and shelter is available for marine plant and floating pipe strings close to the proposed outfall location."*

2. Pipe Materials

The two principal options for choice of an outfall pipeline material are concrete mortar-lined steel pipe and polyethylene (PE) pipe.

The Report concludes: *"There is no construction requirement at the Bream Bay outfall location to use steel pipe because of its ability to take high installation stresses. The best pipe material to use for the proposed outfall, and the one that allows the greatest choice of construction techniques, is PE pipe."*

3. Pipeline Design Considerations

Concept design work for the original (higher) treated wastewater flow and volume projections (Table 4.1 of this AEE) concludes that the outfall pipeline would have an external diameter of around 900mm (very similar to the Waimakariri outfall shown during launching as float and sink construction in Figure 9.3).

The terminal section of the outfall would consist of an outfall diffuser with vertical risers and an arrangement of discharge ports. The DHI dilution and dispersion assessment assumed a nominal 32 alternating horizontal discharge ports at 2m centres, giving a total diffuser length of 62m. However, optimisation during detailed design may result in a different diffuser arrangement. It is likely to incorporate an over trawl protective structure over the diffuser points to deflect trawl fishing nets.

4. Construction Methods for the Offshore Outfall

There is a wide range of construction methods available for the construction of ocean outfalls. The OCEL Report discusses these, giving New Zealand examples of where they have been used. That Report also records that the choice of method for Ruakaka is relatively uninfluenced by factors other than technical considerations.

For the offshore outfall length, the three principal methods are:

- **Bottom Tow Method**

  For this method the pipeline is fabricated as a series of pipe strings on a launchway on shore. The first section of the pipe is launched (pulled out) into the outfall trench and successive strings connected as the launch (pull out) continues.

- **Dig and Lay – Moving Island**

  This system, used for the Green Island (Dunedin) outfall extension, involves a walking temporary structure (the moving island) from which plant located on the platform lay lengths of pipes as the platform moves along the outfall alignment.

- **Float and Sink**

  This method involves constructing pipeline strings (e.g. each typically 300 to 500m long), onshore and floating each out to the outfall location, sinking the string and joining to the adjacent placed (sunk) string. The OCEL Report highlights that this method is likely to have good application for Ruakaka. Accordingly, the indicative cost estimates are based on it.

  Figure 9.2 shows possible onshore construction areas where the pipeline strings could be assembled and launched from. Figure 9.3 shows the Waimakariri outfall with pipeline strings connected ready for launch, and Figure 9.4 shows the Christchurch outfall with a pipeline string floating prior to it being sunk.

5. Construction Methods for the Shoreline / Landline Section

Irrespective of the method of offshore outfall pipeline installation, a land and beach outfall pipeline crossing is required from the WWTP site. This distance is approximately 200m. The conventional method of shore crossing is inside a sheet piled trench. Recent developments in the field of Horizontal

Directional Drilling (HDD) and Micro-Tunnelling (MT) have given the opportunity to avoid open trench excavation.

The estimate for the entire outfall system, based on typical current-day prices, is $24.8 million using a trenched and sheet pile construction technique for the land and beach section, and $25.8 million based on a trenchless HDD method for the land and beach section.

Use of HDD or MT from the WWTP to the offshore outfall itself would avoid any surface disturbance between the WWTP site and the beach, and also avoid any excavation and access limitations across the beach along the outfall alignment.

WDC has considered the findings of the OCEL assessment and have decided to undertake the land and beach sections using the trenchless Horizontal Directional Drilling (HDD) or similar method, even although this is expected to be a more expensive option by approximately $1 million. Discussions have already commenced with Department of Conservation Officers over the concession requirements for crossing (under) the Crown land. The use of trenchless technology should assist in the issue of the concession as well as avoid adverse effects that would result from land and vegetation disturbance and beach access limitations if the previously traditionally trenched and sheet piled option was used.

Figure 9.1 Indicative Plan of Pipestring Assembly Area – For Trenched Shore Crossing Option

Figure 9.2 Possible Alternative Sites to Assemble and Launch the Ocean Outfall for Float and Sink Option

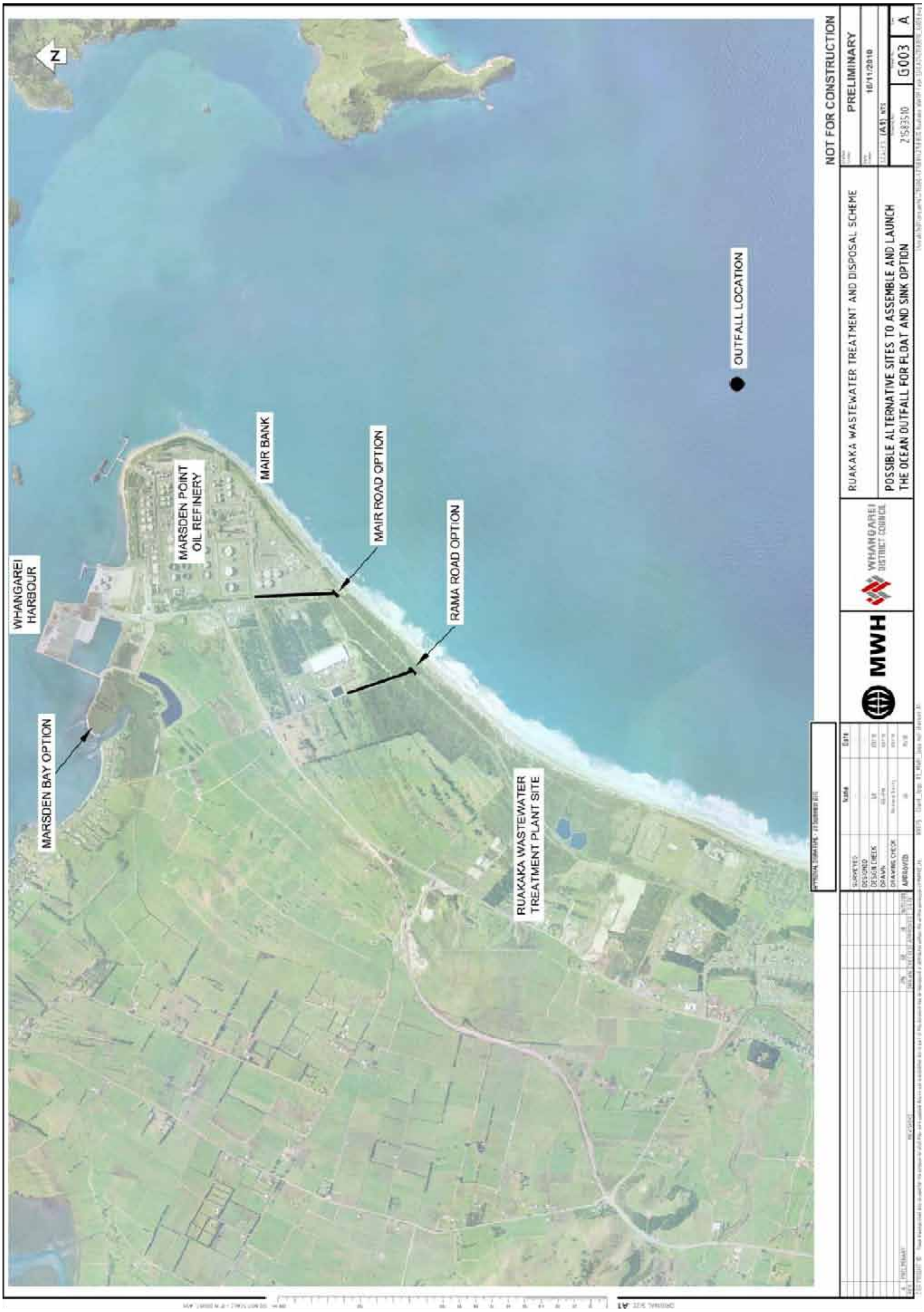


Figure 9.3 Outfall Pipeline Construction Typical Arrangement Prior to Launching for Float and Sink Option

9.3 Nature of Existing Environment

Bream Bay is an open embayment with the entrance to Whangarei Harbour at its northern extent. The Bay is affected by tidal flows from the Harbour and by the Ruakaka and Waipu Rivers. The coastal character, hydrodynamics and ecological values of Bream Bay have been described in Section 8.3. In summary:

- The seabed consists of sand to some depth with finer sediment material in deeper water.
- There are no known rock outcrops or hard seabed area in the vicinity of the outfall alignment.
- The benthic community found in the vicinity of the proposed outfall and throughout the wider Bream Bay area is typical of exposed (and sheltered) high salinity waters over sand substrates.
- There were no marine benthic communities found within the footprint of the proposed outfall that are unusual, rare or of high ecological significance.
- The Ruakaka River Estuary, located some 3.5km from the proposed outfall alignment, provides valuable feeding habitat for eleven threatened bird species and two of them (New Zealand dotterel and banded rail) also breed in the estuary.
- The coastal dunes adjacent to the Ruakaka WWTP are also utilised by a variety of bird species.

Figure 9.4 Christchurch Outfall Construction – Float and Sink

9.4 Proposed Construction Management Plan Approach

The recommended approach for outfall construction procurement is to seek 'Design Build' proposals from suitably qualified specialist contractors. This commonly used approach allows WDC to take best advantage of the experience and commercial position of firms in the industry at the time of undertaking the works. This will also encourage innovation and enable the risks to be managed by the most appropriate parties. This approach would offer the maximum commercial advantage to WDC in terms of costs and risk mitigation. Furthermore, it is not expected that the outfall will be constructed until around 2025/26, this being dependant on wastewater volume growth as set out in Section 4.

In following this approach WDC would, however, specify that the land and beach section of the outfall is constructed using trenchless technology – such as Horizontal Directional Drilling (HDD).

A Design Build approach means that the precise effects of the proposed activity are not known in advance. However, potential adverse effects can be anticipated and consent conditions can be imposed to ensure that such effects are avoided or minimised, together with a requirement to prepare a Construction Management Plan for the prior approval of the Northland Regional Council. This would set out the measures to be adopted to ensure these conditions would be complied with. This approach is a widely accepted Resource Management Act approach for dealing with 'Design Build' projects. In New Zealand the majority of the recent ocean land authority outfall ocean projects have been procured by a 'Design Build' approach. These include Dunedin (Tahuna), Waimakariri, Christchurch and prior to that the Green Island extension (Dunedin).

Discussions have previously been had with officers of the Northland Regional Council about the use of a Construction Management Plan approach.

9.5 Assessment of Effects of Proposed Outfall Pipeline

9.5.1 Introduction

As set out above, it is not appropriate at this time to obtain detailed methodologies for the construction of the outfall and it is therefore not possible to identify all of the potential adverse effects of construction and occupation of the seabed. However the following describes the likely impacts and issues that would need to be addressed via consent conditions stipulating the appropriate level of environmental performance, with a comprehensive Construction Management Plan specifying the measures by which those requirements would be met.

As recorded above, WDC have decided to adapt the trenchless HDD or similar method of construction from the WWTP site out into Bream Bay. Such a method has the advantage that there will be no, or minimal, disturbance to the land and vegetation of the conservation estate, nor disruption to beach access along the outfall pipeline route.

9.5.2 Effects on Terrestrial Ecology

The use of the trenchless HDD method for crossing the conservation estate, beach and out past the surf line into Bream Bay means that there will be no disturbance of the land, vegetation or beach on, along or adjacent to the land and beach section along and adjacent to the outfall alignment.

Depending on the method chosen and onshore location of the temporary works for the assembly of the offshore pipeline strings, should a ‘float and sink’ or ‘bottom tow’ method be used, there will be some temporary disturbance of the beach and possibly sand hills along the launch line and adjacent to it.

Figure 9.2 shows the possible alternative sites for assembly and launching of pipeline lengths for a ‘float and sink’ method, namely at Rama Road or Mair Road, or adjacent to Marsden Bay in Whangarei Harbour. The Rama Road option is located on a WDC road reserve that extends to the foredune and does not have a conservation estate strip of land between the end of the respective roads and foredune sand hill. Rama Road is unformed at its seaward end. The Mair Road terminates at a carpark which is located on Conservation land.

Figure 9.3 shows the Waimakariri District Council’s outfall being launched in 2005-2006. It is a 900mm outside diameter PE (polyethylene) pipe, this being approximately the same diameter as is required for the proposed Ruakaka outfall. That outfall extended 900m offshore. The launching railway system is similar to that expected to be used by a contractor for a ‘float and sink’ construction method for Ruakaka, should that method be chosen. As can be seen in Figure 9.3, a temporary railway-type construction would cross the sandline and beach. This would cause some – but it is expected, minimal – loss / damage to sand hill vegetation along the launch structure route. Similarly, some localised excavation / levelling of sand hills maybe needed to give a suitable grade transition for the launch railway structure. Any such localised sand hill and vegetation disturbance would be reinstated following these temporary works.

As part of the conditions anticipated in the Department of Conservation-issued concession to cross under the conservation estate, Department of Conservation personnel would be involved in advising and monitoring the trenchless HDD activities.

9.5.3 Effects on Marine Ecology

The offshore outfall pipeline extending from the end of the trenchless technology (HDD) section will be laid within an excavated trench and buried approximately 1m below the lowest known sea bed level.

The excavation of the offshore trench will disturb the intertidal and sub-tidal benthic ecology along the outfall alignment in the short term. However, as described in Section 8.3, the benthic community within the footprint of the outfall is typical of an exposed high salinity waters over a sand substrate. These communities are not rare, unusual or of high ecological significance. As the outfall will be completely buried, benthic communities will re-colonise the area following completion. Consequently no significant loss of habitat is anticipated in the medium or long-term. This has been clearly evident with other ocean outfall pipelines.

9.5.4 Effects on Recreational Values

The outfall construction is expected to take around 12 months to complete. If a 'float and sink' method is used, then approximately 4 to 6 months construction activities will involve a railway line-type structure across the beach, or shoreline if the Marsden Bay option is used, to run the pipeline out into the marine waters. As noted above, Figure 9.3 shows a typical railway launch line arrangement. Defined access areas will be available over or under this railway line system at all times except when certain works such as launching pipeline strings are taking place.

Similarly, when offshore works are taking place, some limitations will be necessary on boating activities in Bream Bay near the outfall construction operations.

9.5.5 Effects of the Ocean Outfall Occupation of the Coastal Marine Area (CMA)

The proposed outfall will be buried under the seabed for its entire length except for the diffuser section. It is likely that the diffuser will incorporate an over trawl protective structure to deflect trawl nets. The experience elsewhere is that ocean outfall structures seldom cause any adverse effects post construction. This is likely to be the case for the proposed Ruakaka ocean outfall. Discussions will be held with the North Port Limited and (any) other marine authorities as to whether a marked buoy or buoys are required to mark the diffuser section.

9.5.6 Mitigation

A range of mitigation measures are available but cannot currently be defined in any detail until a detailed construction methodology is developed. The mitigation works will no doubt include a commitment to reinstate and replant areas of coastal dune if they are disturbed by construction activities, such as for the launch of pipeline strings from a Rama Road or Mair Road assembly and launch area for the 'float and sink' method.

Mitigation measures will be set out in the Construction Management Plan. As previously stated, separate concession application will be made to the Department of Conservation. Department of Conservation Officers will be involved with aspects of the plan as they relate to work and re-vegetation on the coastal crown land strip, particularly through the fore dune area.

9.5.7 Summary

There are no particular problems associated with the construction of an ocean outfall into Bream Bay offshore of the WWTP. The way energy environment is relatively benign and shelter is available for marine plant and floating pipe strings close to the proposed outfall location. The coastline is formed by a continuous sand beach that can be readily trenched. There are no special conditions that dictate the use of a particular installation technique. The outfall installation can be carried out using simple techniques accessible to a number of New Zealand contractors. The items of plant and marine support required are all available in New Zealand hence no need for costly mobilisation of equipment from overseas.

The Whangarei District Council's proposed approach to outfall procurement is to call tenders for a Design and Build contract at the time of the outfall implementation. WDC will, however, specifying trenchless technology such as Horizontal Directional Drilling (HDD) across the land and beach section from the WWTP.

Given that construction of the outfall could possibly be as far as 15 years away, there will inevitably be evolutionary changes in materials, design and construction techniques within that time.

The Design and Build approach has been used to get a competitive price for most of the New Zealand outfalls constructed in recent years, and the resource consenting procedure followed has accordingly been to handle this through management plans as will be set out in the project Assessment of Environment Effects (AEE). This approach of using a Construction Management Plan has been discussed with Officers of the Northland Regional Council (NRC) as Consent Authority as part of the pre-application consultation on this project.

The estimated cost (2010) for the outfall is $24.8 million based on typical present day costs, based on open trenching with sheet piling on the land and beach sections. The cost premium associated with the use of the trenchless HDD shore crossing technique – additional cost estimated at $1 million – is compensated by the fact that there is no disturbance to the conservation estate and beach access for the public is unimpeded. This will result in the higher total cost estimate of $25.8 million (again typical present day costs), associated with the use of the HDD technique.

10 Assessment of Effects of Subsurface Irrigation of Treated Wastewater on the Roger Hall Memorial Park (Ruakaka Sports Park)

10.1 Introduction

The Roger Hall Memorial Park has a gross land area of 8.91 ha, some of which is occupied by utility buildings. Parts of the site had been planted in trees but the trees were recently removed and a children's playground is being constructed near the southern boundary of the site. The balance of the site, most of which is covered by turf for playing fields, could potentially be irrigated using reclaimed wastewater of an appropriate quality.

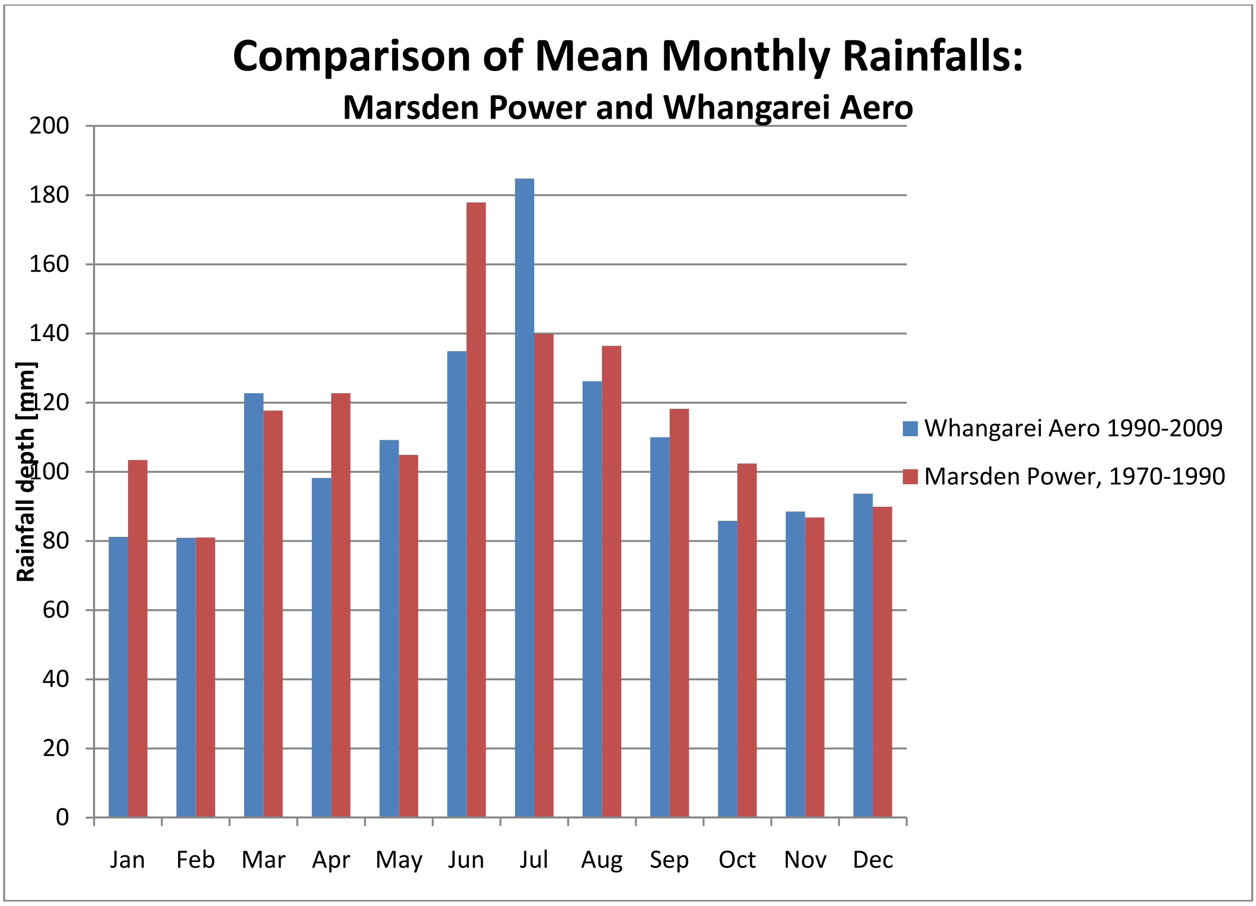
It is customary, when designing a system to irrigate reclaimed wastewater, to allow a buffer strip against site boundaries; a buffer width of 15 m is typical, subject to site details including the type of irrigation system, site exposure risks and wind run. Without prejudice to system design, for the Park, if a 15m buffer is provided from perimeter boundaries, utility areas and the playground, the irrigated footprint will resemble the shaded area in Figure 10.1. The consented area for irrigated area would then be around 5.95 ha, as shown shaded. Initially WDC, only propose to irrigate the grass area which is approximately 3.5ha. The balance which is the area from which the trees were recently removed (still shown in tree cover in Figure 10.1) would be available for irrigation once it was developed and grassed.

Figure 10.1 Indicative Footprint of Irrigable Area, Roger Hall Memorial Park

10.1.1 Rainfall

Rainfall data was downloaded from the NIWA website. Daily data was available for the Marsden Power Station site from 1970 to 1990 and for Whangarei Airport from 1990 through 2009. No overlap data was available and data such as evapotranspiration was not available for the Marsden Power site. However, comparing the two records using mean monthly rainfall depths showed that the two sites were very similar. It was then assumed that Whangarei Aero data – which includes daily records for evapotranspiration - could be adopted as representative for the Ruakaka area. Figure 10.2 shows a graphical summary of the monthly rainfall depths for the two stations.

Figure 10.2 Comparison of Mean Monthly Rainfall Depths at Marsden Power Station and Whangarei Airport



10.1.2 Evapotranspiration

Data for daily evapotranspiration (Whangarei Aero station) was downloaded from the NIWA website, along with daily rainfalls and monthly totals of wet days, covering the period 1990 through 2009.

From the collected data, maximum daily ET (Priestley-Taylor evapotranspiration) and average daily ET were determined on a month-by-month basis, using data from 2004 through 2009. This period was used as being considered the most current given trends due to climate change. A summary of the output from this analysis is presented in Table 10.1.

Table 10.1 Summary of ET and Wet Days Analysis

Month	Mean of Max Daily ET (mm)	Average Daily ET (without allowance for rainfall) [mm]	Mean Wet Days in Month	Mean Non-wet Days in Month
January	6.3	4.6	7.9	23.1
February	5.6	3.7	7.6	20.6
March	4.4	2.9	9.5	21.5
April	2.7	1.6	10.0	20.0
May	1.6	0.8	12.9	18.1
June	0.7	0.4	14	16.0
July	0.8	0.5	15.3	15.7
August	2.0	1.1	14.7	16.3
September	3.0	1.9	12.6	17.4
October	4.3	2.7	10.9	20.1
November	5.6	3.7	10.1	19.9
December	6.1	3.9	9.1	21.9

10.1.3 Soils and Geology

Subsoil investigations within the reserve were not carried out for this report. However, study of drillers' logs for wells drilled in the vicinity of Ruakaka found that the area is underlain by dune sands and alluvial materials to depths of at least 25 m and that the sands/alluvium overlies greywacke rock. An investigation borehole located west of the WWTP, near NZMG 2643018E 6591236N, was drilled to 25 m depth and did not encounter rock.

Soils within the reserve are understood to be imported soils.

10.1.4 Surface Water

No surface water bodies have been identified within the Park.

The Ruakaka River passes within 500 m of the Park.

10.1.5 Groundwater

The Park is located approximately 1 km from the sea. Detailed groundwater investigations associated with the WWTP site found that groundwater levels at a distance of 1km from the sea are typically 3.0 to 3.5 m above m.s.l. Subject to confirming the elevation of the Park, it is estimated the groundwater surface is 2 to 4 metres below ground surface.

Subject to detailed site investigation, based on considerations of topography and the site's location relative to the Ruakaka River and the sea, it is expected that groundwater from beneath the Park flows partly towards the river and partly to the sea.

10.2 Description of Proposal

It is proposed that irrigation will be applied just sufficient to match daily crop demand, the 'crop' being the turf grasses. On that basis, and assuming uniform distribution, the actual irrigation need is given by:

$$Actual\ irrigation\ need = ET_0 * K_c$$

where ET_0 = Reference Evapotranspiration and
K_c = Crop Factor

Reference evapotranspiration is taken to be the ET value obtained from NIWA. Crop factor represents the fraction of ET required by the subject crop (turf) compared to the reference crop (pasture).

Representative values for crop factor for turf under New Zealand conditions were not found but overseas literature (e.g. Ritchie, 1997[6]) indicates typical values in a range 0.6 to 0.9 for good quality turf and depending on season.

Adopting a crop factor value of 0.7 and using the ET values and non-rain days per month in Table 10.1, estimates of maximum daily irrigation volume and mean monthly volumes were calculated. Results of the calculations are presented in Table 10.2.

Table 10.2 Estimated Turf Demands and Potential Irrigation Volumes, By Month

Month	Potential Maximum Day Demand (m^3/d)	Average Day Application (m^3/d)	Average Irrigation (Non-Wet) Days	Potential Month Total Volume [m^3]
January	260	190	23.1	4389
February	232	154	20.6	3172
March	183	119	21.5	2559
April	113	67	20.0	1340
May	66	33	18.1	597
June	27	17	16.0	272
July	35	20	15.7	314
August	81	44	16.3	717
September	123	78	17.4	1357
October	179	113	20.1	2271
November	231	153	19.9	3045
December	253	163	21.9	3570
Annual Total				23603

10.3 Assessment of Effects

10.3.1 Effects on Groundwater

If irrigation is applied at a rate which just matches turf demand, the discharge to groundwater would be minimal. Consequently, no mounding would occur at the groundwater surface and no changes would be induced to groundwater flows. The potential for nutrient leach is addressed elsewhere in this report.

The constituents in the wastewater will not reach the groundwater directly. However, nutrients or salts which could build up in the soil could be leached through the soil into the underlying groundwater by

[6] Richie, W. E., Green, R. L. & Gibeault, V. A. 1997, 'Using ET(0) (Reference Evapotranspiration) for Turfgrass Irrigation Efficiency', California Turfgrass Culture, vol. 47, no. 3 & 4, pp. 9-16.

rainfall. The primary parameter of concern would be nitrate, but it is expected that given the relatively small quantities of wastewater involved and uptake by the turf, the effect of this on the underlying groundwater would be no more than minor.

10.3.2 Effects on Surface Water

The nearest surface water body is the Ruakaka River which is 500 m away.

Given the proposed method of application there is minimal potential for surface runoff to reach the Ruakaka River. In the unlikely event that it did reach the river, either as surface water or groundwater flow, the potential effect on river water quality is negligible due to the high quality of treated wastewater and low rate of application.

10.3.3 Effects on Soil

The soil will be monitored to ensure that heavy metals and nutrients do not build up in the underlying soil and to monitor soil structure to ensure that the application of the wastewater does not result in significant changes to the soil structure or productivity.

The following trigger values are proposed to monitor the potential build up of metals, which are based on the maximum soil concentrations given in the NZ Guidelines for the Utilisation of Sewage Effluent on Land (Table A.4.3 (NZ Land Treatment Collective 2000) and the Guidelines for the Safe Application of Biosolids to Land in New Zealand, August 2003, Table 4.2. These guidelines were developed to protect the productivity of the soil to which the wastewater and biosolids were applied.

Table 10.3 Proposed Soil Limits for Metals

Parameter	Trigger level (mg/kg dry soil)
Arsenic	20
Cadmium	1
Copper	100
Lead	300
Mercury	1
Zinc	300
Chromium	600
Nickel	60

10.3.4 Microbiological Risk Assessment and Public Health Assessment

Given the proposed subsurface irrigation method and the low microbiological content of the treated wastewater, no significant public health risks are anticipated. The subsurface irrigation system, placed some 200 to 250mm below the turf's surface, would ensure there is little chance of the discharge coming into direct contact with users of the park. Furthermore the proposed low application rate would minimise the risk of migration of any remaining pathogens to groundwater or to surface water.

10.3.5 Odour and Noise Effects

The potential cause of odour from land application of wastewater occurs when treated wastewater ponds on the surface. The proposed irrigation method and quantity will ensure that surface ponding does not occur thus minimising any potential odour effects.

There will be no noticeable noise effects associated with the irrigation of the wastewater.

10.3.6 Recreational Use

The Roger Hall Memorial Park is located adjacent to Ruakaka Recreational Centre and provides the home grounds for Ruakaka's soccer and touch teams. A small children's playground is located at the south eastern corner of the park. This is outside the area to be sub-surface irrigated.

10.3.7 Tangata Whenua Cultural Effects

The application to land is considered preferable to discharge to water, in light of this PTB has expressed preference for discharge to Roger Hall Memorial Park over other options i.e. Bream Bay, Ruakaka River, and Whangarei Harbour.

Discharge to land is generally perceived to be more consistent with natural processes i.e. filtration and cleansing through land application. Iwi consider that land application should continue for the quantum of wastewater management in Te Poupouwhenua until such time as it is no longer considered viable.

Support for discharge to Roger Hall Memorial Park is conditional and subject to confirmation that potential seepage to groundwater will be controlled and regular monitoring of surface water will occur to ensure the sports fields are safe for community use.

In addition to the above, iwi seek assurances that air quality will not be adversely affected in the immediate area, and seek to monitor potential impacts and the effects that could occur to the mauri of the air in the surrounding environment. For further information see Section 12.2.6 of this AEE.

10.4 Mitigation

The 'Proposed Scheme' along with the proposed subsurface irrigation system for the Roger Hall Memorial Park includes the following measures to avoid or mitigate adverse effects associated with the Rama Road treated wastewater irrigation:

- Construction and operation after about 2016 of a new, state of the art wastewater treatment plant at Ruakaka, designed and operated to achieve a high standard of treated wastewater.
- Setting of an irrigation regime based on the irrigation need and benefit of the turf with maximum irrigation rates being no greater than the water soil moisture deficient.
- Development of a Management Plan for the operation and maintenance of the irrigation system and monitoring of the site.
- Use of resource conditions to ensure appropriate buffer zones to the property boundary, public health protection and irrigation scheme application and management.
- Use of review conditions in the consent to address any new matters should they arise.

10.5 Summary of Effects

This evaluation of potential adverse effects of the proposed sub soil irrigation of treated wastewater onto the Roger Hall Memorial Park identifies some potential and actual adverse effects on the soils and groundwater surface. The magnitude and extent of these effects, taking into account the mitigation measures outlined in the previous section, are summarised below. There are also positive of beneficial effects as summarised in the table below.

Table 10-6 Summary of Effects of the Proposed Sub-Surface Irrigation of Treated Wastewater on the Roger Hall Memorial Park

Adverse Effect	*Magnitude and Extent of Effect*	*Relevant Section of this AEE*
(Potential) contamination of soil and groundwater from nutrients, salts and other micro-pollutants.	Considered to be no more than minor.	Section 1.5
Potential for wastewater ponding if sub-surface irrigation system malfunctions – with associated public health risk.	Low risk, design and operational procedures will minimise risk – effect would be localised and short-term until problem rectified.	Section 10.1

Positive Effect	*Magnitude and Extent of Effect*	*Relevant Section of this AEE*
Beneficial reuse of treated wastewater to enhance turf health and thus playing experience.	Healthy turf (grass growth on park playing surface).	Section 10.3.4
Reduction in volume to be discharged to land application areas and ocean outfall.	Reduces any adverse effects.	Sections 8 and 11
Probable positive effect from a Maori cultural perspective, as this is land application.	Refer tangata whenua sections of Report.	Sections 10.3.7 and16
Overall positive effect of having a safe water borne wastewater scheme.	Considerable positive effects.	Section 17.1