



# Supplementary Report - Alternative Land Treatment Sites

Rotorua WWTP

Report version 2: June 2015

Rotorua Lakes Council



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Rotorua Lakes Council

1061 Haupapa Street, Rotorua



# Issue and revision record

<b>Revision</b>	<b>Date</b>	<b>Originator</b>	<b>Checker</b>	<b>Approver</b>	<b>Description</b>
1	9 June 2015	Khem Limbu	Rebecca Bibby	Kevan Brian	Draft
2	22 June 2015	Khem Limbu	Kevan Brian	Kevan Brian	Draft

## **Information Class: Standard**

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# 1 Introduction

## 1.1 Background and Purpose of Report

Rotorua Lakes Council (RLC) had requested work additional to the original scope for the “Rotorua WWTP – Alternative Land Treatment Sites” project. It was agreed with RLC to integrate some of the additional scope changes within the main report whereas others would be best reported as a supplementary report. This supplementary report should be read in conjunction with the main report for the project.

## 1.2 Scope of Works

The additional scope of works has been tabulated below. The table also highlights where the additional scope changes will be reported – i.e. integration into the main report and/or within a supplementary report. This report does not consider consenting strategies or risks.

Additional Scope of Works	Reporting Location
Additional scenario utilising existing LTS trunk main and pump station for location B.	Supplementary Report
Additional scenario with 20mm/day loading rate.	Main Report and Supplementary Report
Addition of 20% within the irrigation areas as buffer zones.	Main Report and Supplementary Report
Check of lifestyle blocks within proximity of Area C.	Main Report
Exclusion of a landfill site located within Area B.	Main Report and Supplementary Report
Investigation of the potential use of Rapid Infiltration Beds utilising all existing LTS infrastructure from the WWTP to the holding ponds (excluding the existing irrigation system).	Supplementary Report



## 2 Infrastructure Requirements for Area B Utilising (Partially) Existing LTS

### 2.1 Introduction

This section presents the high level concept stage design and costing for the option to convey treated wastewater from the WWTP to the new holding pond at Area B by utilising the existing LTS pumping station and transfer main. Additional design and investigative work will be required at the next stage of the project to develop the design and to estimate the accuracy of each option (or any other option) is selected.

The new holding pond and irrigation system at Area B remain unchanged from the main report and thus information related to them has not been repeated in this supplementary report except for costing purposes.

### 2.2 Transfer Main Extension and Pump station Alignment

A plan showing the existing LTS transfer main route to the existing holding ponds and extension works required to reach Area B is included in Appendix A. The provisional location of an additional new pumping station is also shown. All proposed routes/locations are indicative only.

Design flows of 16.51 ML/day and 23.8 ML/day for Option 4 (66% to land) and Option 5 (100% to land) respectively have used for this assessment.

Table 2.1 shows the new infrastructure required to convey flows from the WWTP to the new holding pond at Area B utilising the existing infrastructure.

Table 2.1: Infrastructure Required to Convey Flows to Area B Utilising Existing Infrastructure.

Area & Option	Loading Rate (mm/day)	Land Area Including Buffer Zones (ha)	Flow (ML/Day)	Flow (l/s)	Total Head (m) [NB: Static + Pipe Losses]	New Pumping Station (No.)	Transfer Main ID (mm)	New Transfer Main Length (m)	Holding Ponds (m <sup>3</sup> )
Area B (Option 4)	5	420	16.51	191	144	1	600	6,780	28,000
	20	105	16.51	191	144	1	600	6,780	28,000
Area B (Option 5)	5	600	23.8	275	152	1	600	6,780	40,000
	20	150	23.8	275	152	1	600	6,780	40,000

The most appropriate location to connect the new extension transfer main into the existing transfer main would approximately 1215m north-west and upstream of the existing holding ponds. It is assumed that the new length of transfer main would be installed using open-cut excavations. It would initially follow the most direct route through the wooded area until the junction of State Highway (SH) 5 and 30. It would then follow the SH30 carriageway to Area B. Laying within existing road carriageways would minimise the need to get possible third party agreements for construction through private land (fields). The possibility and advantages,

if any, of laying in the private land could be explored further at the next stages of the project. The size of the new extension transfer main is dictated by the existing transfer main i.e. 600mm ID.

The total pump head (static and pipe losses) to Area B was calculated and it was found that the existing pumping station would have to overcome more head than it was doing so at present. Thus a new pumping station will be installed along the route of the extension transfer main to ensure that the existing pumping station does not have to overcome any more head than at present. It has been assumed that the new pumping station could be constructed within a road reserve. This would remove the need to acquire private land and should be investigated in more detail at the next stage of the project.

The area around Lake Rotorua is considered likely to have a high water table as evidenced by the many water courses in the area and consideration of geothermal activity is required. Dewatering would probably be required during the construction works.

It has been assumed that the existing pumping station and transfer main are in good condition and have reasonable asset life remaining to adequately serve the new LTS. RLC have advised that there are no indications of issues in relation to the condition of the existing transfer main.

The existing LTS would remain operational until the new system had been tested and commissioned. The new infrastructure would be constructed offline without impacting the existing system until the works to connect into the existing transfer main. Flows to the existing holding ponds would have to be maintained during the connection works.

The decommissioning of the existing LTS system has not been considered at this time as it is outside the scope of this project.

### 2.3 CAPEX, OPEX and NPV Costs

Table 2.2 shows the CAPEX, OPEX and NPV costs for construction and operation of the infrastructure for area B utilising (partially) existing infrastructure. The CAPEX costs include an estimate for land acquisition and professional fees. Note that the NPV is based on a 20 year time period at 4% inflation (consistent with the main report).

Table 2.2: Capital and Operational Costs

	Area B (Option 4)		Area B (Option 5)	
	5mm / day	20mm / day	5mm / day	20mm / day
TOTAL CAPEX + MISC (\$M)	40.88	22.03	52.77	25.84
Pump Station Build Cost (\$M)	0.50	0.50	0.50	0.50
Transfer Main Build Cost (\$M)	8.28	8.28	8.28	8.28
Irrigation System Build Cost (\$M)	14.00	3.50	20.00	5.00
Holding Ponds Build Cost (\$M)	1.75	1.75	2.50	2.50
Land Purchase Cost (\$M)	4.20	1.05	6.00	1.50

		Area B (Option 4)		Area B (Option 5)
TOTAL CAPEX + MISC + CONTINGENCY	48.98	26.32	63.26	30.90
OPEX (\$M/Yr)	1.59	1.25	2.27	1.79
Pump Station Annual Energy Cost (\$M)	1.08	1.08	1.62	1.62
Irrigation System Annual Energy Cost (\$M)	0.46	0.12	0.65	0.17
Alum Dosing Annual Cost (\$M)	0.07	0.07	N/A	N/A
Year 1 Costs (\$M)	42.47	23.28	55.04	27.63
NPV (\$M) [Over 20 Yrs with 4% Inflation]	60.91	38.15	81.58	49.07

The high level costs for the transfer mains, pumping stations and holding ponds were developed using our costing database for projects of a similar nature to this scheme. The full cost estimates can be found in Appendix B.

## 2.4 Further Investigations Required

The following desktop/site investigations would be recommended to develop the pipeline and pump station design:

- Services/utilities information searches
- Services/utilities physical location (pot holing)
- Geotechnical investigations
- Topographical survey
- Investigations to confirm the viability of the existing physical infrastructure
- Review of the existing pipeline performance. Treated wastewater mains can be a risk of biofilm development which reduces their flow capacities. Review of the performance of the existing pipeline will provide design criteria for any new length of pipeline.

## 2.5 Special Construction and Commissioning Requirements

The following special construction and commissioning requirements have been identified for the new pipeline:

- The high geothermal activity in the Rotorua environment will potentially impact on choice of pipeline material to be used. Pipeline materials would be confirmed further to the geotechnical investigation.

## 3 Infrastructure Requirements for Rapid Infiltration Discharge/Disposal

### 3.1 Introduction

This section presents the high level concept stage design and costing of the required infrastructure to discharge/dispose treated wastewater from the existing holding ponds through the use of Rapid Infiltration (RI) beds.

An excerpt, covering RI systems, from a report titled “Review of Nutrients and Water Balances in the Whakarewarewa Effluent Irrigation Scheme” by Opus dated December 1999 was obtained from RLC. This information has been used as basis for the assessment of the RI beds.

Additional design and investigative work will be required at the next stage of the project, if RI beds are deemed to be a viable option, to develop the design and estimating accuracy.

### 3.2 Rapid Infiltration Beds

Design flows of 16.51 ML/day and 23.8 ML/day for Option 4 (66% to land) and Option 5 (100% to land) respectively have used for this assessment.

The Opus report excerpt advised that the existing LTS site had permeable soils and deep water table which made it suitable for the installation of RI beds.

Table 3.1 shows the new infrastructure required to convey flows from the existing holding ponds to the RI beds.

Table 3.1: Infrastructure Requirement from the Holding Ponds to the RI Beds

Option	Flow (ML/Day)	Gravity Pipe ID (mm)	Gravity Pipe Length (m)	Outlet Structure at Existing Holding Pond (No.)	Land Area Including Buffer Zones (ha)	Land Area of RI Beds (ha)	Hydraulic Loading Rate (mm/d)
RI Beds (Option 4)	16.51	500	1000	1	13.2	11	150
RI Beds (Option 5)	23.8	600	1000	1	19.2	16	150

Potential locations for RI beds are not known at this stage and carrying out a detailed assessment to select possible locations are outside the scope of this exercise. The Opus report had considered an RI scheme within a kilometre of the existing ponds although location data was not received with the excerpt information. For this assessment, it is assumed that the RI beds will located within a kilometre of the holding ponds. RLC had advised that flows should be conveyed by gravity from the existing holding ponds to the RI beds. The areas to the north and east of the holding ponds have higher ground levels so it would not be possible to install a gravity system there. The ground levels to the south and west of the holding ponds are generally

lower so it may be possible to install a gravity pipe to feed RI beds in those areas. This would need to be investigated in more detail at the next stage of the project.

It is assumed that the new gravity pipe from the holding ponds to the RI beds would be installed using open-cut excavations. The pipe size has been derived using an assumed (albeit relatively flat) gradient. This may need to be updated at the next stage of the project once more detailed information is available after investigations have been carried out.

Modifications will be required to the existing holding ponds for the installation of an outlet structure to feed and control flows to the gravity pipe for the RI beds. One of the two ponds may have to be taken offline for the duration of the modification/installation works.

The Opus report excerpt states that an area of 16 ha would be required for an RI system on site including surplus for resting the system. Accurately sizing RI beds require detailed information from hydro-geological investigations to be carried out. Nevertheless, based on the Opus information, the area required for RI beds is expected to be approximately 11 ha and 16 ha for Options 4 and Option 5 respectively. An additional 20% will be added to allow for buffer around the RI beds.

The existing LTS would remain operational until the new system had been tested and commissioned. The new infrastructure would be constructed offline without impacting the existing system if possible. However if the location identified for the RI beds already has an irrigation system in place, it would have to be removed prior to the installation of the RI beds.

The decommissioning of the existing LTS system has not been considered at this time as it is outside the scope of this project.

At the assumed hydraulic loading rates to the RI beds it is unlikely that any significant, long term phosphorus removal would be obtained from the soil. Hence in terms of phosphorus removal we have allowed for alum for all of the plant flows. This means that discharge of MBR effluent to water with the balance to land and the full discharge to land have the same alum dosing cost. As for nitrogen the soil is likely to remove most if not all the particulate nitrogen (provided loading at elevated TSS is sustainable). This would make the RI disposal option equivalent to filtration at the WWTP and leave an additional 8 tN/yr to remove to meet the 30tN/yr limit. At this stage it is very difficult to quantify what the removal of other species of nitrogen might be but it is likely that minimal additional removal would be achieved in the soil due to the very high application rate. Therefore to make the options comparable we have included for the additional of a denitrifying sand filter at the WWTP in the same configuration as that proposed as option 3A in "Detailed Feasibility Study of Alternative to Land Treatment – December 2014". Assumptions around nitrogen removal should be investigated further as this option is very sensitive to pre-treatment. This option may supersede the RI option that was investigated in "Detailed Feasibility Study for Alternatives to Land Disposal – Nov 2012" as it is essentially a disposal option rather than providing significant nitrogen removal. In terms of pathogen removal we are unsure without further investigations if these would be removed in the soil with this application rate before the treated effluent reached a surface water such as a stream. Hence we have allowed for UV to be included in the treatment cost.

### 3.3 CAPEX, OPEX and NPV Costs

Table 3.2 shows the CAPEX, OPEX and NPV costs for construction and operation of the infrastructure for the RI beds. The CAPEX costs include an estimate for land acquisition and professional fees. Note that the NPV is based on a 20 year time period at 4% inflation (consistent with the MM (2014) report).

Table 3.2: Capital and Operational Costs

Rapid Infiltration Beds		
	Option 4	Option 5
<b>TOTAL CAPEX + MISC (\$M)</b>	<b>28.92</b>	<b>31.26</b>
Gravity Pipe Build Cost (\$M)	1.20	1.22
Rapid Infiltration Beds Build Cost (\$M)	3.50	5.00
Land Purchase Cost (\$M)	0.14	0.20
Dentrifying Sand Filter (per option 3A) – incl UV and Alum Dosing	14.21	14.21
<b>TOTAL CAPEX + MISC + CONTINGENCY</b>	<b>34.49</b>	<b>37.29</b>
<b>OPEX (\$M/Yr)</b>	<b>1.68</b>	<b>2.07</b>
Pump Station Annual Energy Cost (\$M)	0.82	1.22
Dentrifying Sand Filter (per option 3A) – incl UV and Alum Dosing	0.85	0.85
<b>Year 1 Costs (\$M)</b>	<b>30.59</b>	<b>33.33</b>
<b>NPV (\$M)</b> [Over 20 Yrs with 4% Inflation]	<b>50.53</b>	<b>58.14</b>

The high level costs were developed using our costing database for projects of a similar nature to this scheme and have included for a pipe lateral system to distribute the effluent over each basin. Full cost estimates can be found in Appendix B.

### 3.4 Further Investigations Required

The following desktop/site investigations would be recommended to develop the design of the RI beds for the disposal/discharge of final wastewater:

- Services/utilities information searches
- Geotechnical assessment, and geological testing and monitoring
- Preliminary geotechnical investigations to provide proof of concept
- Detailed modelling of the groundwater flow in the area – this would also need to include an analysis of the groundwater mounding due to the hydraulic load from the treatment plant
- Assessment of risk to the receiving environment
- Topographical survey
- Investigations to confirm the viability of the existing physical infrastructure

### 3.5 Special Construction and Commissioning Requirements

The following special construction and commissioning requirements have been identified for the pipelines:

The high geothermal activity in the Rotorua environment will potentially impact on choice of pipeline material to be used. Pipeline materials would be confirmed further to the geotechnical investigation.

## 4 Risks and Considerations

Option	Technical Considerations	Environmental Risks	Financial Risks
<b>RI Beds</b>	<ol style="list-style-type: none"> <li>1. Watercourses – crossings may require the transfer main to be installed at a greater depth. Construction methodologies may also have to be modified to suit (trenchless construction, etc.).</li> <li>2. Pumping stations downstream of WWTP – if these cannot be sited in favourable locations (protected land, unwilling third party, etc.) then redesign (e.g. larger pumps) may be required.</li> <li>3. Transfer main – if the existing transfer main is found to suffer from build-up within which restricts flow capacities, the client will either have to put in place a more onerous maintenance regime or this restriction will have to be factored into the design.</li> <li>4. RI system – detailed soil and geotechnical investigations need to be undertaken to confirm fate of applied wastewater</li> </ol>	<ol style="list-style-type: none"> <li>1. Nutrient removal performance</li> <li>2. Overland flow of wastewater from RI to watercourses likely at such high application rates</li> <li>3. Unknown effect of RI on removal of bacteria</li> <li>4. Maintenance likely to be required to ensure that application of any residual solids do not prevent vertical flow</li> </ol>	<ol style="list-style-type: none"> <li>1. Land availability in regard to ability to purchase and cost</li> <li>2. Ability to consent the activity</li> <li>3. Cultural acceptability</li> <li>4. Capital costs (infrastructure works) could potentially be higher</li> <li>5. Operational costs could potentially be higher</li> </ol>



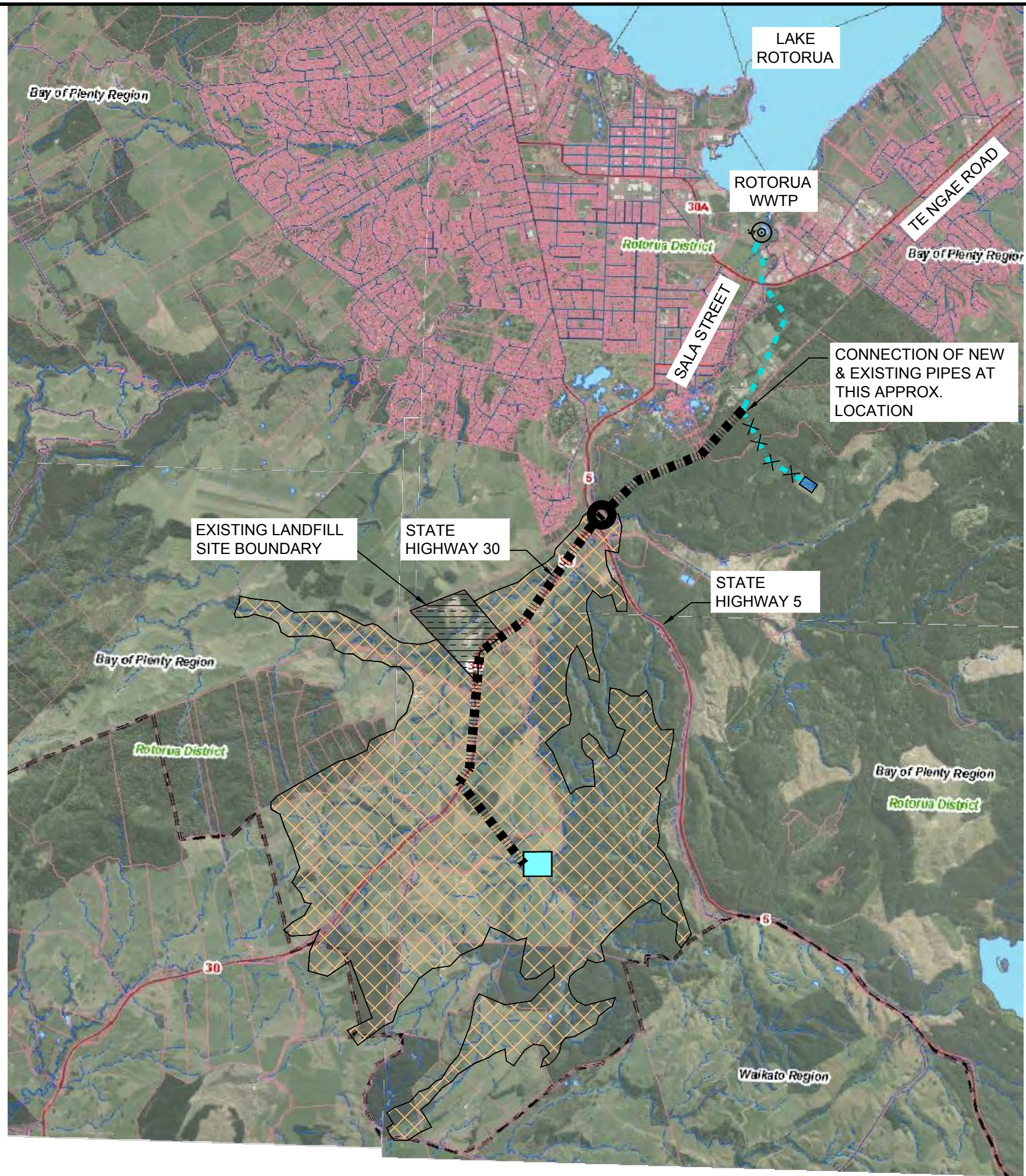
# Appendices



# Appendix A. Layout Plan







- Notes
1. This is a concept design stage drawing.
  2. Areas B extent is indicative only & the exact size will be confirmed at the next stages of the project.
  3. Location of transfer main, pumping stations & holding pond are indicative only.
  4. 600mm ID transfer mains for both options 4 & 5.

Key to symbols

	Existing Pumping Station
	New Pumping Station
	New Transfer Main (To area B)
	New Final Effluent Holding Pond
	Existing Final Effluent Holding Pond To Be Abandoned
	Existing Transfer Main
	Existing Transfer Main To Be Abandoned
	Extent Of Area B
	Existing Landfill Area

Reference drawings

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1	10.06.15	HH	Concept Design	KL	RB
Rev	Date	Drawn	Description	Ch'k'd	App'd

Level 2, 125 The Strand  
 Parnell, Auckland  
 PO Box 37525  
 New Zealand  
 T +64 (0)9 375 2400  
 W www.motmac.com

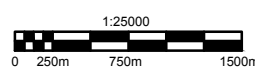
Client

Title

Rotorua WWTP Effluent  
 Alternate Disposal Site  
 Pumping Stations & Transfer Main  
 Route To Area B Utilising Existing  
 Infrastructure (Options 4 & 5)

Designed	KL	Eng check	RW
Drawn	HH	Coordination	RB
Dwg check	KL	Approved	RB
Scale at A1	1:25000	Status	Concept
Rev	1		

Drawing Number MMD-353265-GA-005







## Appendix B. CAPEX Cost Estimates







12 June 2015

Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD  
 Prepared by: KL  
 Checked by:  
 Revision: \_\_\_\_\_  
 Date: 8-Jun  
 Date: \_\_\_\_\_

RAPID INFILTRATION BEDS (OPTION 4)					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
1.0	<b>Preliminary and General</b> (15% of works costs)	%	15%		\$ 2,888,000
2.0	<b>New Outlet Structure to Existing Holding Ponds</b>				\$ 350,000
	This item covers all the cost and supply of all labour plant and materials required for the modification of the existing holding ponds and the installation of an outlet structure.	LS	1	\$ 350,000	\$ 350,000
3.0	<b>New Pipeline</b>				\$ 1,200,000
	This item covers all the cost and supply of all labour plant and materials required for the installation of pipes and manholes.				
3.1	500mm PE pipe	m	1000	\$ 1,200	\$ 1,200,000
4.0	<b>Rapid Infiltration System</b>				\$ 3,493,497
4.1	Topsoil / vegetation clearance	m <sup>2</sup>	110000	\$ 5	\$ 550,000
4.2	Bunding and liners at sides	m <sup>3</sup>	3 980	\$ 50	\$ 198,997
4.3	Transition layer	m <sup>3</sup>	11 000	\$ 128	\$ 1,402,500
4.4	Irrigation / delivery network				\$ -
	Delivery piping	m	560	\$ 1,000	\$ 560,000
	Inlets to basins and low pressure irrigation system	No.	5 600	\$ 120	\$ 672,000
4.5	re-establish site	m <sup>2</sup>	11 000	\$ 10	\$ 110,000
5.0	Sandfiltration UV and Flow balancing	LS	1	\$ 14,205,270	\$ 14,205,270
6.0	<b>As Built Information by Contractor</b>				\$ 4,500
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 5,000	\$ 4,500
7.0	<b>Land Purchase Cost</b>	Ha	13.2	\$ 10,000	\$ 132,000
	<b>Sub Total - Works Costs</b>				\$ 22,273,267
	<b>Contingency</b>	%	25%		\$ 5,568,317
	<b>Professional Fees</b>	%	15%		\$ 3,321,190
	<b>Other Non Works Costs</b>	%	15%		\$ 3,321,190
	<b>Total Cost</b>				\$ 34,483,965

**NOTES**

The above costs do not include GST and are a best estimate at the time of pricing. No allowance has been made for inflation, currency and commodity fluctuations and other factors unknown at the time. These costs have been prepared for the Project & Client listed above based on the project described to us and its extent is limited to the scope of work agreed. No responsibility is accepted by Mott MacDonald or its directors, servants, staff or employees for the accuracy of information provided by third parties and/or the use of any part of these costs in any other context or for any other purposes. These costs do not include the following services which cannot be quantified at this time: Geotechnical Investigations, Surveying, Feasibility Studies & Fast Tracking.



12 June 2015

Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD Revision: \_\_\_\_\_  
 Prepared by: KL Date: 8-Jun  
 Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

RAPID INFILTRATION BEDS (OPTION 5)					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
1.0	<b>Preliminary and General</b> (15% of works costs)	%	15%		\$ 3,117,000
2.0	<b>New Outlet Structure to Existing Holding Ponds</b>				\$ 350,000
	This item covers all the cost and supply of all labour plant and materials required for the modification of the existing holding ponds and the installation of an outlet structure.	LS	1	\$ 350,000	\$ 350,000
3.0	<b>New Pipeline</b>				\$ 1,220,000
	This item covers all the cost and supply of all labour plant and materials required for the installation of pipes and manholes.				
3.1	600mm PE pipe	m	1000	\$ 1,220	\$ 1,220,000
4.0	<b>Rapid Infiltration System</b>				\$ 5,000,000
4.1	Topsoil / vegetation clearance	m <sup>2</sup>	160000	\$ 5	\$ 800,000
4.2	Bunding and liners at sides	m <sup>3</sup>	4 800	\$ 50	\$ 240,000
4.3	Transition layer	m <sup>3</sup>	16 000	\$ 128	\$ 2,040,000
4.4	Irrigation / delivery network				\$ -
	Delivery piping	m	800	\$ 1,000	\$ 800,000
	Inlets to basins and low pressure irrigation system	No.	8 000	\$ 120	\$ 960,000
4.5	re-establish site	m <sup>2</sup>	16 000	\$ 10	\$ 160,000
5.0	<b>Sand Filter UV and Flow balancing</b>	LS	1	\$ 14,205,270	\$ 14,205,270
6.0	<b>As Built Information by Contractor</b>				\$ 5,000
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 5,000	\$ 5,000
7.0	<b>Land Purchase Cost</b>	Ha	19.2	\$ 10,000	\$ 192,000
	<b>Sub Total - Works Costs</b>				\$ 24,089,270
	<b>Contingency</b>	%	25%		\$ 6,022,318
	<b>Professional Fees</b>	%	15%		\$ 3,584,591
	<b>Other Non Works Costs</b>	%	15%		\$ 3,584,591
	<b>Total Cost</b>				\$ 37,280,769

**NOTES**

The above costs do not include GST and are a best estimate at the time of pricing. No allowance has been made for inflation, currency and commodity fluctuations and other factors unknown at the time. These costs have been prepared for the Project & Client listed above based on the project described to us and its extent is limited to the scope of work agreed. No responsibility is accepted by Mott MacDonald or its directors, servants, staff or employees for the accuracy of information provided by third parties and/or the use of any part of these costs in any other context or for any other purposes. These costs do not include the following services which cannot be quantified at this time: Geotechnical Investigations, Surveying, Feasibility Studies & Fast Tracking.



Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD Revision:  
 Prepared by: KL Date: 8-Jun  
 Checked by: Date:

AREA B RE-USING EXISTING INFRA (OPTION 4) 5mm/day Loading					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
1.0	<b>Preliminary and General (15% of works costs)</b>	%	15%		\$ 3,679,000
2.0	<b>New Transfer Main</b>				\$ 8,271,600
2.1	600mm PE pipe	m	6780	\$ 1,220	\$ 8,271,600
3.0	<b>New Pumping Stations</b>	No.	1	\$ 500,000	\$ 500,000
4.0	<b>New Holding Ponds (28,000m<sup>3</sup>)</b>				\$ 1,750,000
4.1	Ponds pipework	LS	1	\$ 140,000	\$ 140,000
4.2	Inlet/outlet Structures / valve chambers / flowmeter chamber	LS	1	\$ 175,000	\$ 175,000
4.3	Bulk Earthworks	LS	1	\$ 977,200	\$ 977,200
4.4	Storage chamber for filters backwash water	LS	1	\$ 175,000	\$ 175,000
4.5	PE lining installation	LS	1	\$ 210,000	\$ 210,000
4.6	Storage ponds testing / commissioning / reinstatement	LS	1	\$ 4,200	\$ 4,200
4.7	Security fence and gate (5m wide, 2 winged)	LS	1	\$ 68,600	\$ 68,600
5.0	<b>New Irrigation System</b>				\$ 14,000,000
5.1	Fixed Irrigation Type	Ha	350	\$ 40,000	\$ 14,000,000
6.0	<b>As Built Information by Contractor</b>				\$ 8,000
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 8,000	\$ 8,000
7.0	<b>Land Purchase Cost</b>	Ha	420	\$ 10,000	\$ 4,200,000
	<b>Sub Total - Works Costs</b>				\$ 32,408,600
	<b>Contingency</b>	%	25%		\$ 8,102,150
	<b>Professional Fees</b>	%	15%		\$ 4,231,290
	<b>Other Non Works Costs</b>	%	15%		\$ 4,231,290
	<b>Final Total</b>				\$ 48,973,330

**NOTES**

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Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD Revision:  
 Prepared by: KL Date: 8-Jun  
 Checked by: Date:

AREA B RE-USING EXISTING INFRA (OPTION 4)					
20mm/day Loading					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
1.0	<b>Preliminary and General (15% of works costs)</b>	%	15%		\$ 2,104,000
2.0	<b>New Transfer Main</b>				\$ 8,271,600
2.1	600mm PE pipe	m	6780	\$ 1,220	\$ 8,271,600
3.0	<b>New Pumping Stations</b>	No.	1	\$ 500,000	\$ 500,000
4.0	<b>New Holding Ponds (28,000m<sup>3</sup>)</b>				\$ 1,750,000
4.1	Ponds pipework	LS	1	\$ 140,000	\$ 140,000
4.2	Inlet/outlet Structures / valve chambers / flowmeter chamber	LS	1	\$ 175,000	\$ 175,000
4.3	Bulk Earthworks	LS	1	\$ 977,200	\$ 977,200
4.4	Storage chamber for filters backwash water	LS	1	\$ 175,000	\$ 175,000
4.5	PE lining installation	LS	1	\$ 210,000	\$ 210,000
4.6	Storage ponds testing / commissioning / reinstatement	LS	1	\$ 4,200	\$ 4,200
4.7	Security fence and gate (5m wide, 2 winged)	LS	1	\$ 68,600	\$ 68,600
5.0	<b>New Irrigation System</b>				\$ 3,500,000
5.1	Fixed Irrigation Type	Ha	87.5	\$ 40,000	\$ 3,500,000
6.0	<b>As Built Information by Contractor</b>				\$ 8,000
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 8,000	\$ 8,000
7.0	<b>Land Purchase Cost</b>	Ha	105	\$ 10,000	\$ 1,050,000
	<b>Sub Total - Works Costs</b>				\$ 17,183,600
	<b>Contingency</b>	%	25%		\$ 4,295,900
	<b>Professional Fees</b>	%	15%		\$ 2,420,040
	<b>Other Non Works Costs</b>	%	15%		\$ 2,420,040
	<b>Final Total</b>				\$ 26,319,580

#### NOTES

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Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD Revision:  
 Prepared by: KL Date: 8-Jun  
 Checked by: Date:

AREA B RE-USING EXISTING INFRA (OPTION 5) 5mm/day Loading					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
<b>1.0</b>	<b>Preliminary and General (15% of works costs)</b>	%	15%		<b>\$ 4,692,000</b>
<b>2.0</b>	<b>New Transfer Main</b>				<b>\$ 8,271,600</b>
2.1	600mm PE pipe	m	6780	\$ 1,220	\$ 8,271,600
<b>3.0</b>	<b>New Pumping Stations</b>	No.	1	\$ 500,000	<b>\$ 500,000</b>
<b>4.0</b>	<b>New Holding Ponds (40,000m<sup>3</sup>)</b>				<b>\$ 2,500,000</b>
4.1	Ponds pipework	LS	1	\$ 200,000	\$ 200,000
4.2	Inlet/outlet Structures / valve chambers / flowmeter chamber	LS	1	\$ 250,000	\$ 250,000
4.3	Bulk Earthworks	LS	1	\$ 1,396,000	\$ 1,396,000
4.4	Storage chamber for filters backwash water	LS	1	\$ 250,000	\$ 250,000
4.5	PE lining installation	LS	1	\$ 300,000	\$ 300,000
4.6	Storage ponds testing / commissioning / reinstatement	LS	1	\$ 6,000	\$ 6,000
4.7	Security fence and gate (5m wide, 2 winged)	LS	1	\$ 98,000	\$ 98,000
<b>5.0</b>	<b>New Irrigation System</b>				<b>\$ 20,000,000</b>
5.1	Fixed Irrigation Type	Ha	500	\$ 40,000	\$ 20,000,000
<b>6.0</b>	<b>As Built Information by Contractor</b>				<b>\$ 9,000</b>
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 9,000	\$ 9,000
<b>7.0</b>	<b>Land Purchase Cost</b>	Ha	600	\$ 10,000	<b>\$ 6,000,000</b>
	<b>Sub Total - Works Costs</b>				<b>\$ 41,972,600</b>
	<b>Contingency</b>	%	25%		<b>\$ 10,493,150</b>
	<b>Professional Fees</b>	%	15%		<b>\$ 5,395,890</b>
	<b>Other Non Works Costs</b>	%	15%		<b>\$ 5,395,890</b>
	<b>Final Total</b>				<b>\$ 63,257,530</b>

#### NOTES

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Job Name: ROTORUA WWTP - ALTERNATIVE LAND DISPOSAL SITES  
 Job No. 353265  
 Client: RDC  
 Currency: NZD Revision:  
 Prepared by: KL Date: 8-Jun  
 Checked by: Date:

AREA B RE-USING EXISTING INFRA (OPTION 5)					
20mm/day Loading					
Level of Accuracy: ± 25%					
Item	Description	Unit	QTY	Rate	Estimate
1.0	<b>Preliminary and General (15% of works costs)</b>	%	15%		\$ 2,442,000
2.0	<b>New Transfer Main</b>				\$ 8,271,600
2.1	600mm PE pipe	m	6780	\$ 1,220	\$ 8,271,600
3.0	<b>New Pumping Stations</b>	No.	1	\$ 500,000	\$ 500,000
4.0	<b>New Holding Ponds (40,000m<sup>3</sup>)</b>				\$ 2,500,000
4.1	Ponds pipework	LS	1	\$ 200,000	\$ 200,000
4.2	Inlet/outlet Structures / valve chambers / flowmeter chamber	LS	1	\$ 250,000	\$ 250,000
4.3	Bulk Earthworks	LS	1	\$ 1,396,000	\$ 1,396,000
4.4	Storage chamber for filters backwash water	LS	1	\$ 250,000	\$ 250,000
4.5	PE lining installation	LS	1	\$ 300,000	\$ 300,000
4.6	Storage ponds testing / commissioning / reinstatement	LS	1	\$ 6,000	\$ 6,000
4.7	Security fence and gate (5m wide, 2 winged)	LS	1	\$ 98,000	\$ 98,000
5.0	<b>New Irrigation System</b>				\$ 5,000,000
5.1	Fixed Irrigation Type	Ha	125	\$ 40,000	\$ 5,000,000
6.0	<b>As Built Information by Contractor</b>				\$ 9,000
6.1	Provision of As Built drawings to meet Council Standards	LS	1	\$ 9,000	\$ 9,000
7.0	<b>Land Purchase Cost</b>	Ha	150	\$ 10,000	\$ 1,500,000
	<b>Sub Total - Works Costs</b>				\$ 20,222,600
	<b>Contingency</b>	%	25%		\$ 5,055,650
	<b>Professional Fees</b>	%	15%		\$ 2,808,390
	<b>Other Non Works Costs</b>	%	15%		\$ 2,808,390
	<b>Final Total</b>				\$ 30,895,030

**NOTES**

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