Hawkes Bay Regional Council

TANK Catchments

Lowland streams augmentation pre-feasibility assessment of capital and operating expenditure for the Tutaekuri, Ahurri, Ngaruroro, Karamu catchments

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1. Introduction

This report has been prepared for Hawkes Bay Regional Council to assess the potential capital and operating expenditure required to augment pre-determined lowland streams as set by Grant Pechey, Monique Benson and Simon Harper for the TANK (Tutaekuri, Ahurri, Ngaruroro, Karamu) catchments.

The streams identified as requiring augmentation are: Irongate; Karamu; Karewera; Mangateretere; Ruapare, Awanui and Louisa.

This report is a desktop analysis from information provided by Hawkes Bay Regional Council and is intended to be a preliminary assessment of the economic requirements of undertaking stream augmentation.

The assessment includes capital expenditure estimates. It also includes an assessment for the time period 2015-2032 of annual maintenance and depreciation estimates and annual running charges estimates for the average and extreme seasons for each of the streams.

2. Summary

2.1. Capital Expenditure

Capital expenditure varied by stream but averaging approximately $285,000 per stream, (approximately $225,000 per augmentation site). The Karamu being the most expensive with the highest flow, but also three proposed augmentation sites (identified further on in this report as K1, K2, K3). If it were possible to have all the augmentation at one site the capital cost would halve as the amount of infrastructure required would be significantly less.

To get the flow range to an acceptable level, it was required at each site to have between two and three bores and pumps (the exception being Louisa with only one bore and pump). I have modelled the use pumps fitted with variable speed drives (VSD's), which allow the pump to speed up or slow down in order to pump the desired amount of water. VSD's, however, are only efficient to approximately 50% of pumping volume (ie they operate well between 50% and 100% of potential flow rate). As VSD's only operate well within a finite range, to have a wide operating range of augmentation pumping volumes (say between 15 and 120 litres per second), a range of different capacity pumps was required at each augmentation site.

It is possible to make the install cheaper by having only one well per augmentation site, with one pump fitted with a VSD, and an actuated gate or butterfly valve. This system would see the pump operate between say 50% and 100% of potential pump capacity, and under the 50% flow rate, the actuated valve would begin to close to "choke" back the pump to reduce flow rate further. Choking the pump is energy inefficient and only practical to approximately 25% of potential pump capacity, as once flow rates get too low, pumps can overheat as there is not enough water flow to keep them cool. This "choking" system would not likely meet irrigation NZ's design code of practice.

Variable speed drives are more expensive than soft starters to install, but they save energy over the longer term.

Some of the sites would be able to be operated with artesian water in some seasons, however the longer term analysis suggests that from time to time the bores would not be artesian and would require pumping of the water to operate. I expect you would need the pumps as the seasons when you would most want to augment streams would likely be the seasons when pump systems would be required to operate the augmentation well.

I expect that total capital expenditure will reach approximately $2,000,000. This capital cost would provide the facilities to pump a peak 775 litres per second from all of the sites combined to the seven streams augmented. This is outlined in table 1 below.

Table 1: Estimated Capital Expenditure Required

CAPITAL EXPENDITURE REQUIRED							
Awanui	Irongate	Karamu	Karewarewa	Mangateretere	Louisa	Raupare	TOTAL
$195,516	$190,600	$842,131	$226,198	$250,984	$99,056	$192,090	$1,996,575

2.2. Operating Expenditure

Operating expenditure is made up of three key parts: electricity; depreciation; and maintenance. The depreciation is non-cash but still reflected in this analysis, the maintenance is required annually and the electricity is variable.

Operating expenditure is made up of three key parts: electricity; depreciation; and maintenance. The depreciation is non-cash but still reflected in this analysis as in time there will be a cost required to replace the infrastructure installed today. The maintenance is required annually irrespective of how many hours of use the pump and bore do, and therefore this cost is the same across all seasons. The electricity is variable made up by: fixed lines charges; and additional energy use charges paid for when pumps are used.

Because of the fixed costs of depreciation and maintenance (approximately $104,000), in a year where a low level of augmentation is required ("min" row in table 2), there is still a significant operating expenditure required. The annual charges increase as more electricity is required to run the pumps. In the years when a high level of augmentation is required ("max" row in table 2), up to $142,000 more than maintenance will need to be provisioned to operate the augmentation scheme. An outline of how operating charges may vary between years with high, mean and low levels of stream augmentation requirement is shown in table 2 below.

Table 2: Expected Annual Operating Expenditure Ranges

ANNUAL OPERATING EXPENDITURE								
	Awanui	Irongate	Karamu	Karewarewa	Mangateretere	Louisa	Raupare	TOTAL
Max	$15,470	$20,482	$96,829	$51,212	$39,776	$7,708	$15,260	$246,738
Min	$11,596	$7,544	$44,053	$13,934	$16,905	$6,810	$10,123	$110,964
Average	$12,649	$11,333	$60,029	$25,875	$28,516	$6,880	$10,554	$155,837

2.3. Considerations

I recommend looking closely at the feasibility of augmenting the Karamu stream at one (or even two) point(s) rather than three, as this will save significant capital cost and ongoing maintenance. As the three augmentation sites all require a staged increase in augmentation flow, a total of 9 bores are required. If these bores were consolidated to a common cluster, this could be reduced to 4 bores and pumps, saving considerably on capital cost and maintenance.

All of these augmentation sites have assumed that there is sufficient lines (electricity) capacity to run the required pumps. No provision has been made for lines upgrades if required.

There has been no provision for cost of land acquisition/compensation or cost of establishing legal easements if required.

3. Methodology

3.1. Capital Expenditure

Pump size was first calculated. This is based on the operational range of flows required to augment the streams and expected total head pressure (suction required + pressure head to deliver to the stream head 100m from the bore site).

In the instance of most streams, there are three bores and three pumps required to give HBRC the ability to accurately augment the streams to the required level. Multiple pumps and wells have been assumed as it is difficult to get two pump intakes down one well and multiple pumps on one intake manifold often cavitate. The pumps are expected to be a combination of soft start and variable speed drive pumps controlled by a programmable logic controller (PLC).

The cost of the bore was established by multiplying the bore depth (provided by HBRC) by a digging rate (derived from HBRC provided schedule of drilling quantities and Lincoln University Financial Budget Manual). The depth has been estimated using the average of surrounding wells as provided by HBRC from the “wellstor’ data.

The cost of the pump station was then established using internal MRB database of install costs accompanied by Lincoln University Financial Budget Manual and discussions with irrigation plant suppliers.

Electricity supply is assumed to be 300 metres to the first site and 100m more to each subsequent site, with a multiple pump site utlilising one transformer connection.

3.2. Operating Expenditure

Calculated as follows:

Energy:

- Calculated based on kilowatt hours used multiplied by known rate (as supplied by HBRC from a local Hawkes Bay farmer).
- Assuming 0.5bar of pressure loss in headworks, 0.1bar of pressure loss in PVC, 1.0bar pressure at delivery to stream head, system losses through suction and manifolds of 0.2bar.

Depreciation:

- Pump cost depreciated over 10 years.
- Switch gear depreciated over 25 years.
- Bore cost depreciated 50 years.
- Headworks and depreciated over 25 years.

Maintenance:

- Bore re-development every 10 years.
- Flow meter calibration every 3 years.
- Annual check and service fee by irrigation company.
- Data telemetry.
- Pump and switch gear 'maintenance' calculated at 2.5% of capital cost annually. Typically this is a large expense (for example a pump failure), that occurs ahead of scheduled plant replacement.

4. Results

4.1. Awanui

SUMMARY - Awanui						
pump capacity required						
	Peak power required		25	kw		
	Max flow rate		110	lps		
	Min well water level		0.7	mbgl		
Production Year		Power use				
2015	-2016	6,652	KwH			
2016	-2017	7,030	KwH			
2017	-2018	3,158	KwH			
2018	-2019	14,115	KwH			
2019	-2020	6,132	KwH			
2020	-2021	964	KwH			
2021	-2022	4,058	KwH			
2022	-2023	6,218	KwH			
2023	-2024	1,360	KwH			
2024	-2025	4,472	KwH			
2025	-2026	6,659	KwH			
2026	-2027	3,738	KwH			
2027	-2028	1,089	KwH			
2028	-2029	1,073	KwH			
2029	-2030	4,304	KwH			
2030	-2031	5,102	KwH			
2031	-2032	8,620	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		31m	31m	-	-
	Screen Length		5m	5m	-	-
	Bore Drilling		$18,631	$18,631	-	-
	Bore Development		$3,576	$3,576	-	-
	Bore Screening		$6,229	$6,229	-	-
	Consent and Mgmt		$12,612	$12,612	-	-
	Pump Capacity		80lps	30lps	-	-
	Pump Size		21kw	8kw	-	-
	Pump Cost		$10,809	$4,054	-	-
	Switchgear Type		VSD	VSD	-	-
	Switchgear Cost		$10,535	$3,951	-	-
	Headworks Cost		$7,500	$7,500	-	-
	Flowmeter Cost		$2,600	$2,600	-	-
	Flowmeter Calibratio		$480	$480	-	-
	Pump Shed		$3,800	$3,800	-	-
	Underground Pipe		$5,000	$5,000	-	-
	Underground Power		$15,000	$5,000	-	-
	Lines Connection			$15,000		
	Ancillary Costs			$10,311		
	TOTAL CAPEX			$195,516		
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps				$1,486	
	Depreciation - Switchgear				$579	
	Depreciation - Bore				$1,642	
	Depreciation - Headworks				$808	
	Flowmeter calibration				$320	
	Telemetry Service				$1,440	
	Bore re-development				$715	
	Pump Maintenance				$1,263	
	Pump Service				$3,000	
	KwH used			14,115	964	4,985
	KwH cost			$4,216	$342	$1,396
	TOTAL OPEX			$15,470	$11,596	$12,649

4.2. Irongate

SUMMARY - Irongate						
pump capacity required						
	Peak power required		24	kw		
	Max flow rate		75	lps		
	Min well water level		6.7	mbgl		
Production Year		Power use				
2015	-2016	2,380	KwH			
2016	-2017	21,194	KwH			
2017	-2018	17,191	KwH			
2018	-2019	0	KwH			
2019	-2020	16,569	KwH			
2020	-2021	128	KwH			
2021	-2022	18,069	KwH			
2022	-2023	5,826	KwH			
2023	-2024	18,961	KwH			
2024	-2025	18,638	KwH			
2025	-2026	21,989	KwH			
2026	-2027	579	KwH			
2027	-2028	408	KwH			
2028	-2029	0	KwH			
2029	-2030	45,620	KwH			
2030	-2031	19,775	KwH			
2031	-2032	28,734	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		27m	27m	-	-
	Screen Length		5m	5m	-	-
	Bore Drilling		$16,227	$16,227	-	-
	Bore Development		$3,576	$3,576	-	-
	Bore Screening		$6,229	$6,229	-	-
	Consent and Mgmt		$12,612	$12,612	-	-
	Pump Capacity		50lps	30lps	-	-
	Pump Size		18kw	11kw	-	-
	Pump Cost		$9,258	$5,555	-	-
	Switchgear Type		VSD	VSD	-	-
	Switchgear Cost		$9,024	$5,414	-	-
	Headworks Cost		$7,500	$7,500	-	-
	Flowmeter Cost		$2,600	$2,600	-	-
	Flowmeter Calibratio		$480	$480	-	-
	Pump Shed		$3,800	$3,800	-	-
	Underground Pipe		$5,000	$5,000	-	-
	Underground Power		$15,000	$5,000	-	-
	Lines Connection		$15,000			
	Ancillary Costs		$10,301			
	TOTAL CAPEX		$190,600			
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps			$555		
	Depreciation - Switchgear			$217		
	Depreciation - Bore			$773		
	Depreciation - Headworks			$404		
	Flowmeter calibration			$160		
	Telemetry Service			$1,440		
	Bore re-development			$358		
	Pump Maintenance			$539		
	Pump Service			$3,000		
	KwH used			45,620	0	13,886
	KwH cost			$13,037	$99	$3,888
	TOTAL OPEX			$20,482	$7,544	$11,333

4.3. Karamu

SUMMARY - Karamu K1			
pump capacity required			
Peak power required	36	kw	
Max flow rate	114	lps	
Min well water level	4.1	mbgl	

Production Year		Power use	
2015	-2016	10,899	KwH
2016	-2017	28,237	KwH
2017	-2018	24,418	KwH
2018	-2019	0	KwH
2019	-2020	27,400	KwH
2020	-2021	253	KwH
2021	-2022	23,321	KwH
2022	-2023	9,487	KwH
2023	-2024	22,335	KwH
2024	-2025	22,024	KwH
2025	-2026	27,147	KwH
2026	-2027	2,826	KwH
2027	-2028	5,133	KwH
2028	-2029	4,252	KwH
2029	-2030	62,439	KwH
2030	-2031	22,281	KwH
2031	-2032	39,183	KwH

CAPEX - Infrastructure Capital	Bore 1	Bore 2	Bore 3	Bore 4
Bore Depth	32m	32m	32m	-
Screen Length	7m	7m	7m	-
Bore Drilling	$19,232	$19,232	$19,232	-
Bore Development	$3,576	$3,576	$3,576	-
Bore Screening	$8,363	$8,363	$8,363	-
Consent and Mgmt	$12,612	$12,612	$12,612	-
Pump Capacity	30lps	40lps	50lps	-
Pump Size	11kw	15kw	19kw	-
Pump Cost	$5,895	$7,861	$9,826	-
Switchgear Type	VSD	VSD	Soft st	-
Switchgear Cost	$5,746	$7,661	$7,087	-
Headworks Cost	$7,500	$7,500	$7,500	-
Flowmeter Cost	$2,600	$2,600	$2,600	-
Flowmeter Calibratio	$480	$480	$480	-
Pump Shed	$3,800	$3,800	$3,801	-
Underground Pipe	$5,000	$5,000	$5,000	-
Underground Power	$15,000	$5,000	$5,000	-
Lines Connection	$15,000			
Ancillary Costs	$14,222			
TOTAL CAPEX	$287,787			

OPEX - Annual Costs	Max	Min	Average
Depreciation - Pumps		$2,358	
Depreciation - Switchgear		$820	
Depreciation - Bore		$2,627	
Depreciation - Headworks		$808	
Flowmeter calibration		$480	
Telemetry Service		$1,440	
Bore re-development		$1,073	
Pump Maintenance		$1,895	
Pump Service		$3,000	
KwH used	62,439	0	19,508
KwH cost	$17,902	$315	$5,637
TOTAL OPEX	$32,403	$14,816	$20,138

SUMMARY - Karamu K2			
pump capacity required			
Peak power required	36	kw	
Max flow rate	114	lps	
Min well water level	4.3	mbgl	

Production Year		Power use	
2015	-2016	10,936	KwH
2016	-2017	28,304	KwH
2017	-2018	24,495	KwH
2018	-2019	0	KwH
2019	-2020	27,485	KwH
2020	-2021	253	KwH
2021	-2022	23,395	KwH
2022	-2023	9,502	KwH
2023	-2024	22,424	KwH
2024	-2025	22,097	KwH
2025	-2026	27,242	KwH
2026	-2027	2,830	KwH
2027	-2028	5,139	KwH
2028	-2029	4,280	KwH
2029	-2030	62,685	KwH
2030	-2031	22,368	KwH
2031	-2032	39,234	KwH

CAPEX - Infrastructure Capital	Bore 1	Bore 2	Bore 3	Bore 4
Bore Depth	29m	29m	29m	-
Screen Length	7m	7m	7m	-
Bore Drilling	$17,429	$17,429	$17,429	-
Bore Development	$3,576	$3,576	$3,576	-
Bore Screening	$8,363	$8,363	$8,363	-
Consent and Mgmt	$12,612	$12,612	$12,612	-
Pump Capacity	30lps	40lps	50lps	-
Pump Size	12kw	15kw	19kw	-
Pump Cost	$5,941	$7,921	$9,901	-
Switchgear Type	VSD	VSD	Soft st	-
Switchgear Cost	$5,790	$7,720	$7,141	-
Headworks Cost	$7,500	$7,500	$7,500	-
Flowmeter Cost	$2,600	$2,600	$2,600	-
Flowmeter Calibratio	$480	$480	$480	-
Pump Shed	$3,800	$3,800	$3,801	-
Underground Pipe	$5,000	$5,000	$5,000	-
Underground Power	$15,000	$5,000	$5,000	-
Lines Connection	$15,000			
Ancillary Costs	$14,255			
TOTAL CAPEX	$282,750			

OPEX - Annual Costs	Max	Min	Average
Depreciation - Pumps		$2,376	
Depreciation - Switchgear		$826	
Depreciation - Bore		$2,519	
Depreciation - Headworks		$808	
Flowmeter calibration		$480	
Telemetry Service		$1,440	
Bore re-development		$1,073	
Pump Maintenance		$1,904	
Pump Service		$3,000	
KwH used	62,685	0	19,569
KwH cost	$17,975	$317	$5,655
TOTAL OPEX	$32,400	$14,743	$20,081

SUMMARY - Karamu K3						
pump capacity required						
	Peak power required		36	kw		
	Max flow rate		114	lps		
	Min well water level		4.2	mbgl		
Production Year		Power use				
2015	-2016	10,894	KwH			
2016	-2017	28,226	KwH			
2017	-2018	24,408	KwH			
2018	-2019	0	KwH			
2019	-2020	27,390	KwH			
2020	-2021	252	KwH			
2021	-2022	23,311	KwH			
2022	-2023	9,483	KwH			
2023	-2024	22,295	KwH			
2024	-2025	21,963	KwH			
2025	-2026	27,138	KwH			
2026	-2027	2,825	KwH			
2027	-2028	5,131	KwH			
2028	-2029	4,250	KwH			
2029	-2030	62,236	KwH			
2030	-2031	22,272	KwH			
2031	-2032	39,169	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		23m	23m	23m	-
	Screen Length		7m	7m	7m	-
	Bore Drilling		$13,823	$13,823	$13,823	-
	Bore Development		$3,576	$3,576	$3,576	-
	Bore Screening		$8,363	$8,363	$8,363	-
	Consent and Mgmt		$12,612	$12,612	$12,612	-
	Pump Capacity		30lps	40lps	50lps	-
	Pump Size		12kw	15kw	19kw	-
	Pump Cost		$5,900	$7,866	$9,833	-
	Switchgear Type		VSD	VSD	Soft st	-
	Switchgear Cost		$5,750	$7,667	$7,092	-
	Headworks Cost		$7,500	$7,500	$7,500	-
	Flowmeter Cost		$2,600	$2,600	$2,600	-
	Flowmeter Calibratio		$480	$480	$480	-
	Pump Shed		$3,800	$3,800	$3,801	-
	Underground Pipe		$5,000	$5,000	$5,000	-
	Underground Power		$15,000	$5,000	$5,000	-
	Lines Connection			$15,000		
	Ancillary Costs			$14,225		
	TOTAL CAPEX			$271,594		
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps				$2,360	
	Depreciation - Switchgear				$820	
	Depreciation - Bore				$2,302	
	Depreciation - Headworks				$808	
	Flowmeter calibration				$480	
	Telemetry Service				$1,440	
	Bore re-development				$1,073	
	Pump Maintenance				$1,896	
	Pump Service				$3,000	
	KwH used			62,236	0	19,485
	KwH cost			$17,846	$315	$5,631
	TOTAL OPEX			$32,025	$14,494	$19,810

4.4. Karewarewa

SUMMARY - Karewarewa						
pump capacity required						
	Peak power required		39	kw		
	Max flow rate		83	lps		
	Min well water level		17.6	mbgl		
Production Year		Power use				
2015	-2016	30,207	KwH			
2016	-2017	42,559	KwH			
2017	-2018	56,698	KwH			
2018	-2019	13,109	KwH			
2019	-2020	47,574	KwH			
2020	-2021	1,182	KwH			
2021	-2022	44,867	KwH			
2022	-2023	10,813	KwH			
2023	-2024	80,216	KwH			
2024	-2025	49,496	KwH			
2025	-2026	90,462	KwH			
2026	-2027	2,118	KwH			
2027	-2028	1,622	KwH			
2028	-2029	16,006	KwH			
2029	-2030	133,794	KwH			
2030	-2031	41,529	KwH			
2031	-2032	100,714	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		35m	35m	-	-
	Screen Length		7m	7m	-	-
	Bore Drilling		$21,035	$21,035	-	-
	Bore Development		$3,576	$3,576	-	-
	Bore Screening		$8,363	$8,363	-	-
	Consent and Mgmt		$12,612	$12,612	-	-
	Pump Capacity		30lps	60lps	-	-
	Pump Size		16kw	32kw	-	-
	Pump Cost		$8,270	$16,540	-	-
	Switchgear Type		VSD	VSD	-	-
	Switchgear Cost		$8,060	$16,121	-	-
	Headworks Cost		$7,500	$7,500	-	-
	Flowmeter Cost		$2,600	$2,600	-	-
	Flowmeter Calibratio		$480	$480	-	-
	Pump Shed		$3,800	$3,800	-	-
	Underground Pipe		$5,000	$5,000	-	-
	Underground Power		$15,000	$5,000	-	-
	Lines Connection		$15,000			
	Ancillary Costs		$12,275			
	TOTAL CAPEX		$226,198			
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps			$2,481		
	Depreciation - Switchgear			$967		
	Depreciation - Bore			$1,823		
	Depreciation - Headworks			$808		
	Flowmeter calibration			$320		
	Telemetry Service			$1,440		
	Bore re-development			$715		
	Pump Maintenance			$1,754		
	Pump Service			$3,000		
	KwH used			133,794	1,182	44,880
	KwH cost			$37,904	$625	$12,567
	TOTAL OPEX			$51,212	$13,934	$25,875

4.5. Louisa

SUMMARY - Louisa						
pump capacity required						
	Peak power required		4	kw		
	Max flow rate		12	lps		
	Min well water level		6.6	mbgl		
Production Year		Power use				
2015	-2016	215	KwH			
2016	-2017	16	KwH			
2017	-2018	16	KwH			
2018	-2019	0	KwH			
2019	-2020	16	KwH			
2020	-2021	0	KwH			
2021	-2022	0	KwH			
2022	-2023	0	KwH			
2023	-2024	137	KwH			
2024	-2025	0	KwH			
2025	-2026	0	KwH			
2026	-2027	0	KwH			
2027	-2028	0	KwH			
2028	-2029	0	KwH			
2029	-2030	3003	KwH			
2030	-2031	0	KwH			
2031	-2032	846	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		32m	-	-	-
	Screen Length		3m	-	-	-
	Bore Drilling		$19,232	-	-	-
	Bore Development		$1,788	-	-	-
	Bore Screening		$4,095	-	-	-
	Consent and Mgmt		$12,612	-	-	-
	Pump Capacity		15lps	-	-	-
	Pump Size		6kw	-	-	-
	Pump Cost		$3,228	-	-	-
	Switchgear Type		VSD	-	-	-
	Switchgear Cost		$3,146	-	-	-
	Headworks Cost		$7,500	-	-	-
	Flowmeter Cost		$2,600	-	-	-
	Flowmeter Calibratio		$480	-	-	-
	Pump Shed		$3,800	-	-	-
	Underground Pipe		$5,000	-	-	-
	Underground Power		$15,000	-	-	-
	Lines Connection			$15,000		
	Ancillary Costs			$5,575		
	TOTAL CAPEX			$99,056		
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps				$323	
	Depreciation - Switchgear				$126	
	Depreciation - Bore				$755	
	Depreciation - Headworks				$404	
	Flowmeter calibration				$160	
	Telemetry Service				$1,440	
	Bore re-development				$179	
	Pump Maintenance				$424	
	Pump Service				$3,000	
	KwH used			3,003	0	250
	KwH cost			$898	$0	$70
	TOTAL OPEX			$7,708	$6,810	$6,880

4.6. Mangateretere

SUMMARY - Mangateretere						
pump capacity required						
	Peak power required		34	kw		
	Max flow rate		110	lps		
	Min well water level		5.5	mbgl		
Production Year		Power use				
2015	-2016	56,506	KwH			
2016	-2017	59,809	KwH			
2017	-2018	53,487	KwH			
2018	-2019	11,762	KwH			
2019	-2020	53,377	KwH			
2020	-2021	26,585	KwH			
2021	-2022	58,742	KwH			
2022	-2023	57,985	KwH			
2023	-2024	64,828	KwH			
2024	-2025	78,788	KwH			
2025	-2026	69,825	KwH			
2026	-2027	34,825	KwH			
2027	-2028	31,335	KwH			
2028	-2029	44,354	KwH			
2029	-2030	93,130	KwH			
2030	-2031	54,699	KwH			
2031	-2032	62,089	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		18m	18m	18m	-
	Screen Length		5m	5m	5m	-
	Bore Drilling		$10,818	$10,818	$10,818	-
	Bore Development		$3,576	$3,576	$3,576	-
	Bore Screening		$6,229	$6,229	$6,229	-
	Consent and Mgmt		$12,612	$12,612	$12,612	-
	Pump Capacity		30lps	40lps	50lps	-
	Pump Size		10kw	13kw	16kw	-
	Pump Cost		$4,986	$6,648	$8,311	-
	Switchgear Type		VSD	VSD	VSD	-
	Switchgear Cost		$4,860	$6,480	$8,100	-
	Headworks Cost		$7,500	$7,500	$7,500	-
	Flowmeter Cost		$2,600	$2,600	$2,600	-
	Flowmeter Calibratio		$480	$480	$480	-
	Pump Shed		$3,800	$3,800	$3,801	-
	Underground Pipe		$5,000	$5,000	$5,000	-
	Underground Power		$15,000	$5,000	$5,000	-
	Lines Connection		$15,000			
	Ancillary Costs		$13,753			
	TOTAL CAPEX		$250,984			
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps				$1,995	
	Depreciation - Switchgear				$778	
	Depreciation - Bore				$1,994	
	Depreciation - Headworks				$808	
	Flowmeter calibration				$480	
	Telemetry Service				$1,440	
	Bore re-development				$1,073	
	Pump Maintenance				$1,778	
	Pump Service				$3,000	
	KwH used			93,130	11,762	53,654
	KwH cost			$26,431	$3,559	$15,171
	TOTAL OPEX			$39,776	$16,905	$28,516

4.7. Raupare

SUMMARY - Raupare						
pump capacity required						
	Peak power required		11	kw		
	Max flow rate		43	lps		
	Min well water level		2.1	mbgl		
Production Year		Power use				
2015	-2016	0	KwH			
2016	-2017	1,283	KwH			
2017	-2018	0	KwH			
2018	-2019	0	KwH			
2019	-2020	1,028	KwH			
2020	-2021	0	KwH			
2021	-2022	73	KwH			
2022	-2023	0	KwH			
2023	-2024	1,998	KwH			
2024	-2025	183	KwH			
2025	-2026	5,511	KwH			
2026	-2027	0	KwH			
2027	-2028	0	KwH			
2028	-2029	0	KwH			
2029	-2030	18,166	KwH			
2030	-2031	1,484	KwH			
2031	-2032	1,004	KwH			
CAPEX - Infrastructure Capital						
			Bore 1	Bore 2	Bore 3	Bore 4
	Bore Depth		37m	37m	-	-
	Screen Length		8m	8m	-	-
	Bore Drilling		$22,237	$22,237	-	-
	Bore Development		$3,576	$3,576	-	-
	Bore Screening		$9,430	$9,430	-	-
	Consent and Mgmt		$12,612	$12,612	-	-
	Pump Capacity		20lps	30lps	-	-
	Pump Size		5kw	8kw	-	-
	Pump Cost		$2,807	$4,211	-	-
	Switchgear Type		VSD	VSD	-	-
	Switchgear Cost		$2,736	$4,104	-	-
	Headworks Cost		$7,500	$7,500	-	-
	Flowmeter Cost		$2,600	$2,600	-	-
	Flowmeter Calibratio		$480	$480	-	-
	Pump Shed		$3,800	$3,800	-	-
	Underground Pipe		$5,000	$5,000	-	-
	Underground Power		$15,000	$5,000	-	-
	Lines Connection		$15,000			
	Ancillary Costs		$8,762			
	TOTAL CAPEX		$192,090			
OPEX - Annual Costs						
				Max	Min	Average
	Depreciation - Pumps				$702	
	Depreciation - Switchgear				$274	
	Depreciation - Bore				$1,914	
	Depreciation - Headworks				$808	
	Flowmeter calibration				$320	
	Telemetry Service				$1,440	
	Bore re-development				$715	
	Pump Maintenance				$875	
	Pump Service				$3,000	
	KwH used			18,166	0	1,808
	KwH cost			$5,211	$75	$506
	TOTAL OPEX			$15,260	$10,123	$10,554