

Akaroa Wastewater Alternate Disposal Options

Concept Stage Capital Cost Estimate (including allowance for Land Purchase Costs)

SUMMARY

		Date of Issue
Pompeys Pillar	Year-round spray irrigation to pasture with 10ML and 25ML storage ponds	27/03/2017
	Year-round drip irrigation to trees with 10ML and 7.5ML storage pond	27/03/2017
Takamatua Valley Hybrid	Year-round spray irrigation to pasture with 10ML and 25ML storage ponds	27/03/2017
	Year-round drip irrigation to trees with 10ML and 7.5ML storage pond	27/03/2017
Robinsons Bay	Year-round spray irrigation to pasture with 10ML and 25ML storage ponds	27/03/2017
	Year-round drip irrigation to trees with 10ML and 7.5ML storage pond	27/03/2017

Ref	DESCRIPTION	Pompeys Pillar		Takamatua Valley		Robinsons Bay	
		To Pasture	To Trees	To Pasture	To Trees	To Pasture	To Trees
1.0	Pipeline from WWTP to Pond A	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
2.0	Bypass Treatment - additional Membrane to WWTP	-\$240,000	-\$240,000	-\$240,000	-\$240,000	-\$240,000	-\$240,000
3.0	Storage Pond A	\$700,000	\$700,000	\$700,000	\$700,000	\$700,000	\$700,000
4.0	Pump Station	\$1,120,000	\$1,120,000	n/a	n/a	n/a	n/a
5.0	Pipeline to Irrigation Site	\$2,280,000	\$2,280,000	\$920,000	\$920,000	\$980,000	\$980,000
6.0	Storage Pond B	\$2,930,000	\$1,710,000	\$3,930,000	\$2,210,000	\$1,230,000	\$700,000
7.0	Treatment - Irrigation	\$500,000	\$580,000	\$510,000	\$580,000	\$510,000	\$580,000
	SUBTOTAL CONSTRUCTION	\$7,390,000	\$6,250,000	\$5,920,000	\$4,270,000	\$3,280,000	\$2,820,000
	Preliminaries & General and Margin	\$950,000	\$830,000	\$710,000	\$430,000	\$380,000	\$320,000
	GROSS CONSTRUCTION COST	\$8,340,000	\$7,080,000	\$6,630,000	\$4,700,000	\$3,660,000	\$3,140,000
	Contingency	\$2,670,000	\$2,320,000	\$1,990,000	\$1,200,000	\$1,060,000	\$890,000
	Allowance for Professional Fees	\$1,500,000	\$1,310,000	\$1,120,000	\$675,000	\$600,000	\$500,000
	Allowance for Resource Consents	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000
	Allowance for Land Purchases	\$1,010,000	\$980,000	\$1,850,000	\$1,600,000	\$2,130,000	\$1,820,000
	TOTAL ESTIMATE, rounded	\$13,700,000	\$11,900,000	\$11,800,000	\$8,400,000	\$7,700,000	\$6,600,000

General Estimate Exclusions

Goods and Services Tax (GST)
Construction escalation beyond date of estimate
Foreign Exchange costs
Staged or phased handover or commissioning
Council reserves and Development Contributions
Legal / accounting fees

Assumptions

Estimates include allowances for land purchase costs based on Rateable Valuation data
Pond location A at Location 10 on Old Coach Road across from WWTP
Pond location B = near selected treatment site
All quantities and dimensions are approximate
Measurements based on GIS and Googlemaps
Potential saving of up to \$2M-\$3M on capital cost of WWTP by detuning for Year-round Irrigation to Pasture option
Note: allowance for Professional Fees for design and management is based upon single design from preliminary design through to completion - excludes concept design stage costs

Limitation

The estimates above should be considered as high level, order of magnitude estimates intended for options appraisal.
Further design, investigation and cost estimation will be required prior to financial commitments are made. The probable accuracy range of estimate is -20% to + 30%.

Project Specific Exclusions

Christchurch City Council direct costs (project staffing etc)
Geotechnical investigations
Geotechnical ground improvement / treatment
Incurred costs to date
Fast track or accelerated programme
Work outside normal working hours
Treating & handling contaminated soil and materials
No allowance for working around or relocating existing services
Excavation spoil assumed disposed of on site (no cartage allowed for)
Archaeological costs
Temporary accommodation costs
Plantation management - pruning, thinning, etc
Pasture establishment/renewal



Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Pompeys Pillar: Year-round Irrigation to Pasture

Description of works:

Pump Station near WWTP

Bypass treatment facility

10km wastewater conveyance pipe from WWTP to Pompeys Pillar - 5km stainless and 5km PE pipe

Storage ponds - 1No x 5,000m³ at WWTP and 1No x 35,000m³ at Pompeys Pillar

Spray irrigation to pasture

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY Pipe	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
2.0	BYPASS TREATMENT	LS	1	-\$240,000	
2.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
3.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
3.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
4.0	PUMP STATION	LS	1	\$1,120,000	
4.01	Construct pump station including 75m ² building, 2No x 75kW pumps, mechanical, electrical, controls and civil works				
5.0	PIPELINE TO IRRIGATION SITE	LS	1	\$2,280,000	
5.01	High pressure pipeline from Pump Station to Storage Pond (B) at Pompeys Pillar - allow 5000m x DN100 316 SCH40 Stainless Steel pipe, butt welded joints, fully wrapped in denso tape, trenched in road, with CCS Firmmix bedding and backfill and 150 thick reinforced concrete cover slab full length				
5.02	Allow 5000m x DN160 PE100 PN12.5 trenched in road, with CCC Firm mix bedding and backfill, complete with a valving, thrust restraint, break pressure tank arrangements (1 per 100m drop in altitude), and traffic management				
6.0	STORAGE POND (B) - 25,000m³	LS	1	\$2,930,000	
6.01	Construct 1No x 25ML / 25,000m ³ pond including an earthen dam from stabilised locally won materials, complete with HDPE liner to pond base and sides, stormwater perimeter cut off drain, rock rip rap to perimeter, leak detection system and leachate return pump station, spillway and discharge channel, access road				
7.0	TREATMENT - SPRAY IRRIGATION	LS	1	\$500,000	
7.01	Construct spray irrigation system to service 27Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, K-line irrigation infrastructure				excludes pasture renewal / establishment
	SUBTOTAL CONSTRUCTION			\$7,390,000	
	Preliminaries & General and Margin	LS	1	\$950,000	
	GROSS CONSTRUCTION COST			\$8,340,000	
	Contingency	LS	1	\$2,670,000	
	Allowance for Professional Fees	LS	1	\$1,500,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$1,010,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$13,700,000	rounded

Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Pompeys Pillar: Year-round Irrigation to Trees

Description of works:

Pump Station near WWTP

Bypass treatment facility

10km wastewater conveyance pipe from WWTP to Pompeys Pillar - 5km stainless and 5km PE pipe

Storage ponds - 1No x 5,000m³ at WWTP and 1 No x 17,500m³ at Pompeys Pillar

Dripline irrigation to trees

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY Pipe	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
2.0	BYPASS TREATMENT	LS	1	-\$240,000	
2.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
3.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
3.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
4.0	PUMP STATION	LS	1	\$1,120,000	
4.01	Construct pump station including 75m ² building, 2No x 75kW pumps, mechanical, electrical, controls and civil works				
5.0	PIPELINE TO IRRIGATION SITE	LS	1	\$2,280,000	
5.01	High pressure pipeline from Pump Station to Storage Pond (B) at Pompeys Pillar - allow 5000m x DN100 316 SCH40 Stainless Steel pipe, butt welded joints, fully wrapped in denso tape, trenched in road, with CCS Firmmix bedding and backfill and 150 thick reinforced concrete cover slab full length				
5.02	Allow 5000m x DN160 PE100 PN12.5 trenched in road, with CCC Firm mix bedding and backfill, complete with a valving, thrust restraint, break pressure tank arrangements (1 per 100m drop in altitude), and traffic management				
6.0	STORAGE POND (B) - 7,500m³	LS	1	\$1,710,000	
6.01	Construct 1No x 7.5ML / 7,500m ³ pond including an earthen dam from stabilised locally won materials, complete with HDPE liner to pond base and sides, stormwater perimeter cut off drain, rock rip rap to perimeter, leak detection system and leachate return pump station, spillway and discharge channel				assumes pond created by damming a local watercourse
7.0	TREATMENT - DRIP LINE IRRIGATION	LS	1	\$580,000	
7.01	Construct drip-line irrigation system to service 25Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, drip-line irrigation infrastructure				
7.02	Plant and establish 25Ha of trees - assume native species				
	SUBTOTAL CONSTRUCTION			\$6,250,000	
	Preliminaries & General and Margin	LS	1	\$830,000	
	GROSS CONSTRUCTION COST			\$7,080,000	
	Contingency	LS	1	\$2,320,000	
	Allowance for Professional Fees	LS	1	\$1,310,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$980,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$11,900,000	rounded

Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Takamatua Valley: Year-round Irrigation to Trees

Description of works:

Bypass treatment facility at WWTP

2.5km PE wastewater conveyance pipe from WWTP to Takamatua Valley

2.5km PE wastewater conveyance pipe from Takamatua Valley to Robinsons Bay irrigation site

Storage ponds - 1No x 5,000m³ at WWTP and 1 No x 17,500m³ at Takamatua

Dripline irrigation to trees

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
2.0	BYPASS TREATMENT	LS	1	-\$240,000	
2.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
3.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
3.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
4.0	PUMP STATION	LS	1	\$0	assume gravity to Takamatua site - pump station not required
5.0	PIPELINE TO IRRIGATION SITE	LS	1	\$920,000	
5.01	Pipeline from Storage Pond A at WWTP to Storage Pond B at Takamatua Valley - allow 2500m x DN140 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
5.02	Pipeline from Takamatua Valley to Robinsons Bay irrigation site - allow 2500m x DN110 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
6.0	STORAGE POND (B) - 25,000m³	LS	1	\$3,930,000	
6.01	Construct 3No ponds of approximately 100m L x 60m W, stepped down the slope to provide 25,000m ³ storage, including earth embankments, complete with HDPE liner to pond base and sides, leak detection and under drainage system, access road; assumes embankments are constructed above existing ground level				
7.0	TREATMENT - SPRAY IRRIGATION	LS	1	\$510,000	
7.01	Construct spray irrigation system to service 27Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, K-line irrigation infrastructure, shelter belt trees				excludes pasture renewal / establishment
	SUBTOTAL CONSTRUCTION			\$5,920,000	
	Preliminaries & General and Margin	LS	1	\$710,000	
	GROSS CONSTRUCTION COST			\$6,630,000	
	Contingency	LS	1	\$1,990,000	
	Allowance for Professional Fees	LS	1	\$1,120,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$1,850,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$11,800,000	rounded

Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Takamatua Valley: Year-round Irrigation to Trees

Description of works:

Bypass treatment facility at WWTP

2.5km PE wastewater conveyance pipe from WWTP to Takamatua Valley

2.5km PE wastewater conveyance pipe from Takamatua Valley to Robinsons Bay irrigation site

Storage ponds - 1 No x 5,000m³ at WWTP and 1 No x 17,500m³ at Takamatua

Dripline irrigation to trees

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
2.0	BYPASS TREATMENT	LS	1	-\$240,000	
2.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
3.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
3.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
4.0	PUMP STATION	LS	1	\$0	assume gravity to Takamatua site - pump station not required
5.0	PIPELINE TO IRRIGATION SITE	LS	1	\$920,000	
5.01	Pipeline from Storage Pond A at WWTP to Storage Pond B at Takamatua Valley - allow 2500m x DN140 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
5.02	Pipeline from Takamatua Valley to Robinsons Bay irrigation site - allow 2500m x DN110 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
6.0	STORAGE POND (B) - 7,500m³	LS	1	\$2,210,000	
6.01	Construct 1 No x 7,500m ³ earth embankment storage pond - complete with HDPE lining and inlet and outlet structures				assume pond embankments constructed above existing GL, from imported materials
7.0	TREATMENT - DRIP LINE IRRIGATION	LS	1	\$580,000	
7.01	Construct drip-line irrigation system to service 25Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, drip-line irrigation infrastructure				
7.02	Plant and establish 25Ha of trees - assume native species				
	SUBTOTAL CONSTRUCTION			\$4,270,000	
	Preliminaries & General and Margin	LS	1	\$430,000	
	GROSS CONSTRUCTION COST			\$4,700,000	
	Contingency	LS	1	\$1,200,000	
	Allowance for Professional Fees	LS	1	\$675,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$1,600,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$8,400,000	rounded

Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Robinsons Bay: Year-round Irrigation to Pasture

Description of works:

Bypass treatment facility at WWTP

5km PE wastewater conveyance pipe from WWTP to Robinsons Bay

Storage ponds - 1No x 5,000m³ at WWTP and 1No x 35,000m³ at Robinsons Bay

Spray irrigation to pasture

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY Pipe	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
1.0	BYPASS TREATMENT	LS	1	-\$240,000	
1.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
2.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
2.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
3.0	PUMP STATION	LS	1	\$0	assume gravity to Robinsons Bay site - pump station not required
4.0	PIPELINE TO IRRIGATION SITE	LS	1	\$980,000	
4.01	Pipeline from Storage Pond A at WWTP to Storage Pond B at Robinsons Bay - allow 5000m x DN140 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
5.0	STORAGE POND (B) - 25,000m³	LS	1	\$1,230,000	
5.01	Construct 1No x 25,000m ³ pond, including earth embankments from stabilised locally won materials, complete with HDPE liner to pond base and sides, leak detection and under drainage system, access road				
6.0	TREATMENT - SPRAY IRRIGATION	LS	1	\$510,000	
6.01	Construct spray irrigation system to service 27Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, K-line irrigation infrastructure, shelter belt trees				excludes pasture renewal / establishment
	SUBTOTAL CONSTRUCTION			\$3,280,000	
	Preliminaries & General and Margin	LS	1	\$380,000	
	GROSS CONSTRUCTION COST			\$3,660,000	
	Contingency	LS	1	\$1,060,000	
	Allowance for Professional Fees	LS	1	\$600,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$2,130,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$7,700,000	rounded

Akaroa Wastewater Alternate Disposal Options

Concept Stage Cost Estimate

Robinsons Bay: Year-round Irrigation to Trees

Description of works:

Bypass treatment facility at WWTP

5km PE wastewater conveyance pipe from WWTP to Robinsons Bay

Storage ponds - 1No x 5,000m³ at WWTP and 1No x 17,500m³ at Robinsons Bay

Dripline irrigation to trees

All wastewater disposed on site

Ref	DESCRIPTION	UNIT	QUANTITY	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY	LS	1	\$100,000	
1.01	Pipeline from WWTP to Pond A Allowance for pipeline from WWTP to Storage Pond (A) - allow 200m x DN315 PE100, including valves and fittings, road crossings				
2.0	BYPASS TREATMENT	LS	1	-\$240,000	
2.01	Provisional WWTP saving for Bypass treatment design - additional membrane unit to WTP and increase size of Storage Pond A by 1,000m ³ ; remove disc filter, remove UV tank, remove 250m ³ Balance Tank				
3.0	STORAGE POND (A) - 10,000m³	LS	1	\$700,000	
3.01	Construct 1 No x 10,000m ³ pond with earth embankments (from locally won materials), including HDPE liner, HDPE cover, carbon filter and inlet and outlet structures				across road from WWTP in location 10
4.0	PUMP STATION	LS	1	\$0	assume gravity to Robinsons Bay site - pump station not required
5.0	PIPELINE TO IRRIGATION SITE	LS	1	\$980,000	
5.01	Pipeline from Storage Pond A at WWTP to Storage Pond B at Robinsons Bay - allow 5000m x DN140 PN12 PE100 pipe, trenched in road berm, including all valves, fittings, thrust restraint, pressure/air valve arrangements, road crossings and traffic management				
6.0	STORAGE POND (B) - 7,500m³	LS	1	\$700,000	
6.01	Construct 1 No x 7,500m ³ pond, including earth embankments complete with HDPE lining and inlet and outlet structures				assume pond embankments constructed by cut and fill, from locally won materials
7.0	TREATMENT - DRIP LINE IRRIGATION	LS	1	\$580,000	
7.01	Construct drip-line irrigation system to service 25Ha of pasture, including site clearance, modify site access and fencing, 22kW booster pump station, power supply to site, DN160 PE100 mainline from Storage Pond to irrigation sites, on site laterals, all valving, drip-line irrigation infrastructure				
7.02	Plant and establish 25Ha of trees - assume native species				
	SUBTOTAL CONSTRUCTION			\$2,820,000	
	Preliminaries & General and Margin	LS	1	\$320,000	
	GROSS CONSTRUCTION COST			\$3,140,000	
	Contingency	LS	1	\$890,000	
	Allowance for Professional Fees	LS	1	\$500,000	
	Allowance for Resource Consents	LS	1	\$200,000	
	Allowance for Land Purchase	LS	1	\$1,820,000	based on Rateable Valuation data and area required
	TOTAL ESTIMATE			\$6,600,000	rounded

Akaroa Wastewater Alternate Disposal Options

Net Present Value Estimates

SUMMARY

10/03/2017

Ref	DESCRIPTION	Pompeys Pillar		Takamatua Valley Hybrid		Robinsons Bay	
		To Pasture	To Trees	To Pasture	To Trees	To Pasture	To Trees
	TOTAL NPV ESTIMATE	\$15,650,000	\$13,340,000	\$12,870,000	\$8,900,000	\$8,620,000	\$7,080,000

Akroa Wastewater Alternate Disposal Options

NPV Calculation

Pompeys Pillar

Year-round Irrigation to Pasture with Storage Pond

Discount Factor 5.7%
 General Inflation 2.7%
 Power Inflation 3.0%

Year		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Years from 2017		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CAPEX																											
CAPEX		\$13,700,000																									
OPEX	Annual Cost																										
Electricity:																											
Main Pump Station Electricity	\$/yr	\$32,850	\$33,836	\$34,851	\$35,896	\$36,973	\$38,082	\$39,225	\$40,401	\$41,613	\$42,862	\$44,148	\$45,472	\$46,836	\$48,241	\$49,689	\$51,179	\$52,715	\$54,296	\$55,925	\$57,603	\$59,331	\$61,111	\$62,944	\$64,832	\$66,777	\$68,781
Booster Pump Station Electricity	\$/yr	\$5,800	\$5,974	\$6,153	\$6,338	\$6,528	\$6,724	\$6,926	\$7,133	\$7,347	\$7,568	\$7,795	\$8,029	\$8,269	\$8,517	\$8,773	\$9,036	\$9,307	\$9,587	\$9,874	\$10,170	\$10,475	\$10,790	\$11,113	\$11,447	\$11,790	\$12,144
Maintenance:																											
Wastewater supply pipe - none	\$/yr																										
Valves and mechanical items	\$/yr	\$9,300	\$9,551	\$9,809	\$10,074	\$10,346	\$10,625	\$10,912	\$11,207	\$11,509	\$11,820	\$12,139	\$12,467	\$12,803	\$13,149	\$13,504	\$13,869	\$14,243	\$14,628	\$15,023	\$15,428	\$15,845	\$16,273	\$16,712	\$17,163	\$17,627	\$18,103
Storage pond	\$/yr	\$9,367	\$9,620	\$9,880	\$10,146	\$10,420	\$10,702	\$10,991	\$11,287	\$11,592	\$11,905	\$12,227	\$12,557	\$12,896	\$13,244	\$13,602	\$13,969	\$14,346	\$14,733	\$15,131	\$15,540	\$15,959	\$16,390	\$16,833	\$17,287	\$17,754	\$18,233
Main pump station - mech/elec	\$/yr	\$8,100	\$8,319	\$8,543	\$8,774	\$9,011	\$9,254	\$9,504	\$9,761	\$10,024	\$10,295	\$10,573	\$10,858	\$11,151	\$11,453	\$11,762	\$12,079	\$12,405	\$12,740	\$13,084	\$13,438	\$13,800	\$14,173	\$14,556	\$14,949	\$15,352	\$15,767
Main pump station - building	\$/yr	\$10,000	\$10,270	\$10,547	\$10,832	\$11,125	\$11,425	\$11,733	\$12,050	\$12,376	\$12,710	\$13,053	\$13,405	\$13,767	\$14,139	\$14,521	\$14,913	\$15,315	\$15,729	\$16,154	\$16,590	\$17,038	\$17,498	\$17,970	\$18,455	\$18,954	\$19,465
Booster pump station - mech/elec	\$/yr	\$1,990	\$2,033	\$2,088	\$2,145	\$2,203	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854
Booster pump station - building	\$/yr	\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569
Irrigation system	\$/yr	\$1,620	\$1,664	\$1,709	\$1,755	\$1,802	\$1,851	\$1,901	\$1,952	\$2,005	\$2,059	\$2,115	\$2,172	\$2,230	\$2,291	\$2,352	\$2,416	\$2,481	\$2,548	\$2,617	\$2,688	\$2,760	\$2,835	\$2,911	\$2,990	\$3,070	\$3,153
Irrigation operations	\$/yr	\$24,000	\$24,648	\$25,313	\$25,997	\$26,699	\$27,420	\$28,160	\$28,920	\$29,701	\$30,503	\$31,327	\$32,173	\$33,041	\$33,933	\$34,850	\$35,791	\$36,757	\$37,749	\$38,769	\$39,815	\$40,890	\$41,994	\$43,128	\$44,293	\$45,489	\$46,717
Site fencing	\$/yr	\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,808	\$1,856	\$1,906	\$1,958	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,625	\$2,696	\$2,768	\$2,843	\$2,920
Access Tracks	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Pasture maintenance (27Ha)	\$/yr	\$59,400	\$61,004	\$62,651	\$64,342	\$66,080	\$67,864	\$69,696	\$71,578	\$73,511	\$75,495	\$77,534	\$79,627	\$81,777	\$83,985	\$86,253	\$88,582	\$90,973	\$93,429	\$95,952	\$98,543	\$101,203	\$103,936	\$106,742	\$109,624	\$112,584	\$115,624
Income:																											
Baleage income	\$/yr	-\$56,700	-\$58,231	-\$59,803	-\$61,418	-\$63,076	-\$64,779	-\$66,528	-\$68,324	-\$70,169	-\$72,064	-\$74,010	-\$76,008	-\$78,060	-\$80,168	-\$82,332	-\$84,555	-\$86,838	-\$89,183	-\$91,591	-\$94,064	-\$96,603	-\$99,212	-\$101,890	-\$104,641	-\$107,467	-\$110,368
Total Annual Costs	\$/yr	\$ 13,700,000	\$ 112,810	\$ 115,770	\$ 119,019	\$ 122,359	\$ 125,794	\$ 129,324	\$ 132,955	\$ 136,687	\$ 140,524	\$ 144,470	\$ 148,526	\$ 152,697	\$ 156,985	\$ 161,394	\$ 165,927	\$ 170,588	\$ 175,380	\$ 180,307	\$ 185,372	\$ 190,581	\$ 195,936	\$ 201,442	\$ 207,103	\$ 212,924	\$ 218,908
Discounted Cost	\$/yr	\$ 13,700,000	\$ 106,538	\$ 103,621	\$ 100,794	\$ 98,025	\$ 95,342	\$ 92,732	\$ 90,194	\$ 87,726	\$ 85,325	\$ 82,990	\$ 80,720	\$ 78,511	\$ 76,363	\$ 74,274	\$ 72,243	\$ 70,267	\$ 68,345	\$ 66,476	\$ 64,658	\$ 62,890	\$ 61,170	\$ 59,498	\$ 57,871	\$ 56,289	\$ 54,750
Cumulative cash flow		\$ 13,700,000	\$ 13,806,538	\$ 13,910,159	\$ 14,010,943	\$ 14,108,968	\$ 14,204,310	\$ 14,297,042	\$ 14,387,236	\$ 14,474,982	\$ 14,560,287	\$ 14,643,278	\$ 14,723,997	\$ 14,802,508	\$ 14,878,872	\$ 14,953,146	\$ 15,025,388	\$ 15,095,655	\$ 15,164,000	\$ 15,230,475	\$ 15,295,133	\$ 15,358,023	\$ 15,419,193	\$ 15,478,690	\$ 15,536,561	\$ 15,592,851	\$ 15,647,601

Total NPV Cost	\$ 15,650,000	rounded	Check:	\$15,647,601
				\$ 15,647,601
CAPEX	\$13,700,000			
OPEX	\$ 3,794,676			
Total	\$ 17,494,676			
NPV				



Akroa Wastewater Alternate Disposal Options

NPV Calculation

Pompeys Pillar

Year-round Irrigation under Trees with Storage Pond

Discount Factor
General Inflation
Power Inflation

5.7%
2.7%
3.0%

Year		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Years from 2017		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CAPEX																											
CAPEX		\$ 11,900,000																									
OPEX	Annual Cost																										
Electricity:																											
Main Pump Station Electricity	\$/yr	\$32,850	\$33,836	\$34,851	\$35,896	\$36,973	\$38,082	\$39,225	\$40,401	\$41,613	\$42,862	\$44,148	\$45,472	\$46,836	\$48,241	\$49,689	\$51,179	\$52,715	\$54,296	\$55,925	\$57,603	\$59,331	\$61,111	\$62,944	\$64,832	\$66,777	\$68,781
Booster Pump Station Power costs	\$/yr	\$5,700	\$5,871	\$6,047	\$6,229	\$6,415	\$6,608	\$6,806	\$7,010	\$7,221	\$7,437	\$7,660	\$7,890	\$8,127	\$8,371	\$8,622	\$8,880	\$9,147	\$9,421	\$9,704	\$9,995	\$10,295	\$10,604	\$10,922	\$11,249	\$11,587	\$11,935
Maintenance:																											
Wastewater supply pipe - none	\$/yr	\$9,300	\$9,551	\$9,809	\$10,074	\$10,346	\$10,625	\$10,912	\$11,207	\$11,509	\$11,820	\$12,139	\$12,467	\$12,803	\$13,149	\$13,504	\$13,869	\$14,243	\$14,628	\$15,023	\$15,428	\$15,845	\$16,273	\$16,712	\$17,163	\$17,627	\$18,103
Valves and mechanical items	\$/yr	\$3,896	\$4,001	\$4,109	\$4,220	\$4,334	\$4,451	\$4,572	\$4,695	\$4,822	\$4,952	\$5,086	\$5,223	\$5,364	\$5,509	\$5,658	\$5,810	\$5,967	\$6,128	\$6,294	\$6,464	\$6,638	\$6,817	\$7,001	\$7,190	\$7,385	\$7,584
Storage pond	\$/yr	\$8,100	\$8,319	\$8,543	\$8,774	\$9,011	\$9,254	\$9,504	\$9,761	\$10,024	\$10,295	\$10,573	\$10,858	\$11,151	\$11,453	\$11,762	\$12,079	\$12,405	\$12,740	\$13,084	\$13,438	\$13,800	\$14,173	\$14,556	\$14,949	\$15,352	\$15,767
Main pump station - mech/elec	\$/yr	\$10,000	\$10,270	\$10,547	\$10,832	\$11,125	\$11,425	\$11,733	\$12,050	\$12,376	\$12,710	\$13,053	\$13,405	\$13,767	\$14,139	\$14,521	\$14,913	\$15,315	\$15,729	\$16,154	\$16,590	\$17,038	\$17,498	\$17,970	\$18,455	\$18,954	\$19,465
Booster pump station - mech/elec	\$/yr	\$1,990	\$2,033	\$2,088	\$2,145	\$2,205	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854
Booster pump station - building	\$/yr	\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569
Irrigation system	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Site fencing	\$/yr	\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,808	\$1,856	\$1,906	\$1,958	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,625	\$2,696	\$2,768	\$2,843	\$2,920
Access Tracks	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Tree maintenance (25Ha)	\$/yr	\$4,025	\$4,134	\$4,245	\$4,360	\$4,478	\$4,599	\$4,723	\$4,850	\$4,981	\$5,116	\$5,254	\$5,396	\$5,541	\$5,691	\$5,845	\$6,002	\$6,164	\$6,331	\$6,502	\$6,677	\$6,858	\$7,043	\$7,233	\$7,428	\$7,629	\$7,835
Total Annual Costs	\$/yr	\$ 11,900,000	\$ 82,965	\$ 85,324	\$ 87,751	\$ 90,248	\$ 92,813	\$ 95,453	\$ 98,168	\$ 100,961	\$ 103,834	\$ 106,788	\$ 109,827	\$ 112,952	\$ 116,167	\$ 119,473	\$ 122,874	\$ 126,372	\$ 129,969	\$ 133,669	\$ 137,475	\$ 141,390	\$ 145,416	\$ 149,558	\$ 153,817	\$ 158,199	\$ 162,705
Discounted Cost	\$/yr	\$ 11,900,000	\$ 78,491	\$ 76,370	\$ 74,306	\$ 72,298	\$ 70,345	\$ 68,445	\$ 66,595	\$ 64,797	\$ 63,047	\$ 61,344	\$ 59,687	\$ 58,076	\$ 56,508	\$ 54,982	\$ 53,498	\$ 52,053	\$ 50,648	\$ 49,281	\$ 47,951	\$ 46,657	\$ 45,398	\$ 44,173	\$ 42,981	\$ 41,822	\$ 40,694
Cumulative cash flow		\$ 11,900,000	\$ 11,078,491	\$ 12,054,861	\$ 12,129,167	\$ 12,201,465	\$ 12,271,811	\$ 12,340,255	\$ 12,406,851	\$ 12,471,648	\$ 12,534,695	\$ 12,596,039	\$ 12,655,726	\$ 12,713,802	\$ 12,770,310	\$ 12,825,291	\$ 12,878,768	\$ 12,930,843	\$ 12,981,491	\$ 13,030,722	\$ 13,078,723	\$ 13,125,381	\$ 13,170,779	\$ 13,214,952	\$ 13,257,934	\$ 13,299,756	\$ 13,340,449
Total NPV Cost		\$ 13,340,000	rounded	Check:	\$13,340,449	\$13,340,449																					



Akaroa Wastewater Alternate Disposal Options

NPV Calculation

Takamatua Hybrid

Year-round Irrigation to Pasture with Storage Pond

Discount Factor 5.7%
 General Inflation 2.7%
 Power Inflation 3.0%

Year		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Years from 2017		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CAPEX		\$11,800,000																									
OPEX	Annual Cost																										
Electricity:																											
Booster Pump Station Electricity	\$/yr	\$5,800	\$5,974	\$6,153	\$6,338	\$6,528	\$6,724	\$6,926	\$7,133	\$7,347	\$7,568	\$7,795	\$8,029	\$8,269	\$8,517	\$8,773	\$9,036	\$9,307	\$9,587	\$9,874	\$10,170	\$10,475	\$10,790	\$11,113	\$11,447	\$11,790	\$12,144
Maintenance:																											
Wastewater supply pipe - none	\$/yr	\$9,000	\$9,243	\$9,493	\$9,749	\$10,012	\$10,282	\$10,560	\$10,845	\$11,138	\$11,439	\$11,748	\$12,065	\$12,390	\$12,725	\$13,069	\$13,421	\$13,784	\$14,156	\$14,538	\$14,931	\$15,334	\$15,748	\$16,173	\$16,610	\$17,058	\$17,519
Valves and mechanical items	\$/yr	\$11,575	\$11,888	\$12,208	\$12,538	\$12,877	\$13,224	\$13,581	\$13,948	\$14,325	\$14,711	\$15,109	\$15,517	\$15,936	\$16,366	\$16,808	\$17,261	\$17,726	\$18,206	\$18,698	\$19,203	\$19,721	\$20,254	\$20,800	\$21,362	\$21,939	\$22,531
Storage pond	\$/yr	\$1,980	\$2,033	\$2,088	\$2,145	\$2,203	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854
Booster pump station - mech/elec	\$/yr	\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569
Irrigation system	\$/yr	\$1,620	\$1,664	\$1,709	\$1,755	\$1,802	\$1,851	\$1,901	\$1,952	\$2,005	\$2,059	\$2,115	\$2,172	\$2,230	\$2,291	\$2,352	\$2,416	\$2,481	\$2,548	\$2,617	\$2,688	\$2,760	\$2,835	\$2,911	\$2,990	\$3,070	\$3,153
Irrigation operations	\$/yr	\$24,000	\$24,648	\$25,313	\$25,997	\$26,699	\$27,420	\$28,160	\$28,920	\$29,701	\$30,503	\$31,327	\$32,173	\$33,041	\$33,933	\$34,850	\$35,791	\$36,757	\$37,749	\$38,769	\$39,815	\$40,890	\$41,994	\$43,128	\$44,293	\$45,489	\$46,717
Site fencing	\$/yr	\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,808	\$1,856	\$1,906	\$1,958	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,626	\$2,696	\$2,768	\$2,843	\$2,920
Access Tracks	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Pasture maintenance (27Ha)	\$/yr	\$59,400	\$61,004	\$62,651	\$64,342	\$66,080	\$67,864	\$69,696	\$71,578	\$73,511	\$75,495	\$77,534	\$79,627	\$81,777	\$83,985	\$86,253	\$88,582	\$90,973	\$93,429	\$95,952	\$98,543	\$101,203	\$103,936	\$106,742	\$109,624	\$112,584	\$115,624
Income:																											
Baleage income	\$/yr	-\$56,700	-\$58,231	-\$59,803	-\$61,418	-\$63,076	-\$64,779	-\$66,528	-\$68,324	-\$70,169	-\$72,064	-\$74,010	-\$76,008	-\$78,060	-\$80,168	-\$82,332	-\$84,555	-\$86,838	-\$89,183	-\$91,591	-\$94,064	-\$96,603	-\$99,212	-\$101,890	-\$104,641	-\$107,467	-\$110,368
Total Annual Costs	\$/yr	\$ 11,800,000	\$ 62,146	\$ 63,842	\$ 65,584	\$ 67,374	\$ 69,212	\$ 71,101	\$ 73,042	\$ 75,035	\$ 77,083	\$ 79,187	\$ 81,349	\$ 83,569	\$ 85,850	\$ 88,194	\$ 90,601	\$ 93,075	\$ 95,618	\$ 98,228	\$ 100,908	\$ 103,663	\$ 106,493	\$ 109,401	\$ 112,388	\$ 115,457	\$ 118,609
Discounted Cost	\$/yr	\$ 11,800,000	\$ 58,794	\$ 57,142	\$ 55,536	\$ 53,975	\$ 52,459	\$ 50,983	\$ 49,550	\$ 48,158	\$ 46,804	\$ 45,489	\$ 44,210	\$ 42,968	\$ 41,761	\$ 40,587	\$ 39,447	\$ 38,338	\$ 37,261	\$ 36,214	\$ 35,196	\$ 34,208	\$ 33,247	\$ 32,312	\$ 31,405	\$ 30,522	\$ 29,665
Cumulative cash flow		\$ 11,800,000	\$ 11,858,794	\$ 11,915,936	\$ 11,971,472	\$ 12,025,447	\$ 12,077,904	\$ 12,128,887	\$ 12,178,437	\$ 12,226,595	\$ 12,273,399	\$ 12,318,888	\$ 12,363,099	\$ 12,406,067	\$ 12,447,827	\$ 12,488,414	\$ 12,527,861	\$ 12,566,199	\$ 12,603,460	\$ 12,639,674	\$ 12,674,871	\$ 12,709,078	\$ 12,742,325	\$ 12,774,637	\$ 12,806,042	\$ 12,836,564	\$ 12,866,229
Total NPV Cost		\$ 12,870,000	rounded	Check:	\$ 12,866,229		\$ 12,866,229																				



Akaroa Wastewater Alternate Disposal Options

NPV Calculation

Takamatua Hybrid

Year-round Irrigation under Trees with Storage Pond

Discount Factor 5.7%
 General Inflation 2.7%
 Power Inflation 3.0%

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	
Years from 2017	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
CAPEX		\$ 8,400,000																									
OPEX																											
Annual Cost																											
Electricity:																											
Booster Pump Station Power costs	\$/yr	\$5,700	\$5,871	\$6,047	\$6,229	\$6,415	\$6,608	\$6,806	\$7,010	\$7,221	\$7,437	\$7,660	\$7,890	\$8,127	\$8,371	\$8,622	\$8,880	\$9,147	\$9,421	\$9,704	\$9,995	\$10,295	\$10,604	\$10,922	\$11,249	\$11,587	\$11,935
Maintenance:																											
Wastewater supply pipe - none	\$/yr	\$9,000	\$9,243	\$9,493	\$9,749	\$10,012	\$10,282	\$10,560	\$10,845	\$11,138	\$11,439	\$11,748	\$12,065	\$12,390	\$12,725	\$13,069	\$13,421	\$13,784	\$14,156	\$14,538	\$14,931	\$15,334	\$15,748	\$16,173	\$16,610	\$17,058	\$17,519
Valves and mechanical items	\$/yr	\$2,996	\$3,077	\$3,160	\$3,245	\$3,333	\$3,423	\$3,516	\$3,610	\$3,708	\$3,808	\$3,911	\$4,016	\$4,125	\$4,236	\$4,351	\$4,468	\$4,589	\$4,713	\$4,840	\$4,971	\$5,105	\$5,243	\$5,384	\$5,530	\$5,679	\$5,832
Storage pond	\$/yr	\$1,980	\$2,033	\$2,088	\$2,145	\$2,203	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854
Booster pump station - mech/elec	\$/yr	\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569
Booster pump station - building	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Irrigation system	\$/yr	\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,808	\$1,856	\$1,906	\$1,958	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,625	\$2,696	\$2,768	\$2,843	\$2,920
Site fencing	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Access Tracks	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Tree maintenance (25Ha)	\$/yr	\$4,025	\$4,134	\$4,245	\$4,360	\$4,478	\$4,599	\$4,723	\$4,850	\$4,981	\$5,116	\$5,254	\$5,396	\$5,541	\$5,691	\$5,845	\$6,002	\$6,164	\$6,331	\$6,502	\$6,677	\$6,858	\$7,043	\$7,233	\$7,428	\$7,629	\$7,835
Total Annual Costs	\$/yr	\$ 8,400,000	\$ 29,308	\$ 30,117	\$ 30,949	\$ 31,803	\$ 32,681	\$ 33,593	\$ 34,510	\$ 35,463	\$ 36,442	\$ 37,448	\$ 38,482	\$ 39,545	\$ 40,637	\$ 41,760	\$ 42,913	\$ 44,099	\$ 45,316	\$ 46,568	\$ 47,855	\$ 49,177	\$ 50,535	\$ 51,932	\$ 53,367	\$ 54,841	\$ 56,357
Discounted Cost	\$/yr	\$ 8,400,000	\$ 27,728	\$ 26,257	\$ 25,207	\$ 25,478	\$ 24,770	\$ 24,081	\$ 23,411	\$ 22,780	\$ 22,127	\$ 21,512	\$ 20,914	\$ 20,333	\$ 19,767	\$ 19,218	\$ 18,684	\$ 18,164	\$ 17,656	\$ 17,169	\$ 16,692	\$ 16,226	\$ 15,777	\$ 15,338	\$ 14,912	\$ 14,495	\$ 14,095
Cumulative cash flow		\$ 8,400,000	\$ 8,427,728	\$ 8,454,685	\$ 8,480,891	\$ 8,506,369	\$ 8,531,139	\$ 8,555,220	\$ 8,578,631	\$ 8,601,391	\$ 8,623,518	\$ 8,645,031	\$ 8,665,945	\$ 8,686,277	\$ 8,706,045	\$ 8,725,263	\$ 8,743,946	\$ 8,762,111	\$ 8,779,770	\$ 8,796,939	\$ 8,813,631	\$ 8,829,850	\$ 8,845,635	\$ 8,860,974	\$ 8,875,866	\$ 8,890,384	\$ 8,904,479
Total NPV Cost		\$ 8,900,000																									
			rounded		Check:	\$8,904,479																					
						\$ 8,904,479																					



Akaroa Wastewater Alternate Disposal Options

NPV Calculation

Robinsons Bay

Year-round Irrigation to Pasture with Storage Pond

Discount Factor 5.7%
 General Inflation 2.7%
 Power Inflation 3.0%

Year			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Years from 2017			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CAPEX			\$7,700,000																									
OPEX	Annual Cost																											
Electricity:																												
Booster Pump Station Electricity	\$/yr	\$5,800		\$5,974	\$6,153	\$6,338	\$6,528	\$6,724	\$6,926	\$7,133	\$7,347	\$7,568	\$7,795	\$8,029	\$8,269	\$8,517	\$8,773	\$9,036	\$9,307	\$9,587	\$9,874	\$10,170	\$10,475	\$10,790	\$11,113	\$11,447	\$11,790	\$12,144
Maintenance:																												
Wastewater supply pipe - none	\$/yr	\$9,243	\$9,243	\$9,493	\$9,749	\$10,012	\$10,282	\$10,560	\$10,845	\$11,138	\$11,439	\$11,748	\$12,065	\$12,390	\$12,725	\$13,069	\$13,421	\$13,784	\$14,156	\$14,538	\$14,931	\$15,334	\$15,748	\$16,173	\$16,610	\$17,058	\$17,519	
Valves and mechanical items	\$/yr	\$3,496	\$3,500	\$3,595	\$3,692	\$3,792	\$3,894	\$3,999	\$4,107	\$4,218	\$4,332	\$4,449	\$4,569	\$4,692	\$4,819	\$4,949	\$5,083	\$5,220	\$5,361	\$5,506	\$5,654	\$5,807	\$5,964	\$6,125	\$6,290	\$6,460	\$6,635	
Storage pond	\$/yr	\$1,980	\$2,033	\$2,088	\$2,145	\$2,203	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854	
Booster pump station - mech/elec	\$/yr	\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569	
Irrigation system	\$/yr	\$1,620	\$1,664	\$1,709	\$1,755	\$1,802	\$1,851	\$1,901	\$1,952	\$2,005	\$2,059	\$2,115	\$2,172	\$2,230	\$2,291	\$2,352	\$2,416	\$2,481	\$2,548	\$2,617	\$2,688	\$2,760	\$2,835	\$2,911	\$2,990	\$3,070	\$3,153	
Irrigation operations	\$/yr	\$24,000	\$24,640	\$25,313	\$25,997	\$26,699	\$27,420	\$28,160	\$28,920	\$29,701	\$30,503	\$31,327	\$32,173	\$33,041	\$33,933	\$34,850	\$35,791	\$36,757	\$37,749	\$38,769	\$39,815	\$40,890	\$41,994	\$43,128	\$44,293	\$45,489	\$46,717	
Site fencing	\$/yr	\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,808	\$1,856	\$1,906	\$1,958	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,625	\$2,696	\$2,768	\$2,843	\$2,920	
Access Tracks	\$/yr	\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947	
Pasture maintenance (27Ha)	\$/yr	\$50,400	\$61,004	\$62,651	\$64,342	\$66,080	\$67,864	\$69,696	\$71,578	\$73,511	\$75,495	\$77,534	\$79,627	\$81,777	\$83,985	\$86,253	\$88,582	\$90,973	\$93,429	\$95,952	\$98,543	\$101,203	\$103,936	\$106,742	\$109,624	\$112,584	\$115,624	
Income:																												
Baleage income	\$/yr	-\$56,700	-\$58,231	-\$59,803	-\$61,418	-\$63,076	-\$64,779	-\$66,528	-\$68,324	-\$70,169	-\$72,064	-\$74,010	-\$76,008	-\$78,060	-\$80,168	-\$82,332	-\$84,555	-\$86,838	-\$89,183	-\$91,591	-\$94,064	-\$96,603	-\$99,212	-\$101,890	-\$104,641	-\$107,467	-\$110,368	
Total Annual Costs	\$/yr	\$ 7,700,000	\$ 53,759	\$ 55,228	\$ 56,738	\$ 58,289	\$ 59,882	\$ 61,519	\$ 63,201	\$ 64,929	\$ 66,704	\$ 68,527	\$ 70,401	\$ 72,326	\$ 74,304	\$ 76,335	\$ 78,423	\$ 80,567	\$ 82,770	\$ 85,034	\$ 87,360	\$ 89,749	\$ 92,203	\$ 94,725	\$ 97,316	\$ 99,978	\$ 102,713	
Discounted Cost	\$/yr	\$ 7,700,000	\$ 50,880	\$ 49,432	\$ 48,045	\$ 46,696	\$ 45,388	\$ 44,112	\$ 42,874	\$ 41,671	\$ 40,502	\$ 39,365	\$ 38,261	\$ 37,187	\$ 36,144	\$ 35,130	\$ 34,144	\$ 33,186	\$ 32,255	\$ 31,350	\$ 30,471	\$ 29,616	\$ 28,785	\$ 27,978	\$ 27,193	\$ 26,430	\$ 25,688	
Cumulative cash flow		\$ 7,700,000	\$ 7,750,860	\$ 7,800,292	\$ 7,848,337	\$ 7,895,033	\$ 7,940,419	\$ 7,984,531	\$ 8,027,406	\$ 8,069,077	\$ 8,109,579	\$ 8,148,944	\$ 8,187,205	\$ 8,224,392	\$ 8,260,536	\$ 8,295,666	\$ 8,329,810	\$ 8,362,996	\$ 8,395,252	\$ 8,426,602	\$ 8,457,073	\$ 8,486,689	\$ 8,515,475	\$ 8,543,453	\$ 8,570,646	\$ 8,597,076	\$ 8,622,765	
Total NPV Cost		\$ 8,620,000																										
			rounded		Check:	\$8,622,765																						
						\$ 8,622,765																						



Akaroa Wastewater Alternate Disposal Options

NPV Calculation

Robinsons Bay

Year-round Irrigation under Trees with Storage Pond

Discount Factor 5.7%
 General Inflation 2.7%
 Power Inflation 3.0%

Year			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Years from 2017			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CAPEX			\$ 6,600,000																									
OPEX		Annual Cost																										
Electricity:																												
Booster Pump Station Power costs	\$/yr	\$5,700		\$5,871	\$6,047	\$6,229	\$6,415	\$6,608	\$6,806	\$7,010	\$7,221	\$7,437	\$7,660	\$7,890	\$8,127	\$8,371	\$8,622	\$8,880	\$9,147	\$9,421	\$9,704	\$9,995	\$10,295	\$10,604	\$10,922	\$11,249	\$11,587	\$11,935
Maintenance:																												
Wastewater supply pipe - none	\$/yr		\$9,243	\$9,493	\$9,749	\$10,012	\$10,282	\$10,560	\$10,845	\$11,136	\$11,439	\$11,748	\$12,065	\$12,390	\$12,725	\$13,069	\$13,421	\$13,784	\$14,156	\$14,538	\$14,931	\$15,334	\$15,748	\$16,173	\$16,610	\$17,058	\$17,519	
Valves and mechanical items	\$/yr		\$1,496	\$1,537	\$1,578	\$1,621	\$1,664	\$1,709	\$1,756	\$1,803	\$1,852	\$1,902	\$1,953	\$2,006	\$2,060	\$2,115	\$2,173	\$2,231	\$2,291	\$2,353	\$2,417	\$2,482	\$2,549	\$2,618	\$2,689	\$2,761	\$2,836	\$2,912
Storage pond	\$/yr		\$1,980	\$2,033	\$2,088	\$2,145	\$2,203	\$2,262	\$2,323	\$2,386	\$2,450	\$2,517	\$2,584	\$2,654	\$2,726	\$2,800	\$2,875	\$2,953	\$3,032	\$3,114	\$3,198	\$3,285	\$3,373	\$3,465	\$3,558	\$3,654	\$3,753	\$3,854
Booster pump station - mech/elec	\$/yr		\$1,320	\$1,356	\$1,392	\$1,430	\$1,468	\$1,508	\$1,549	\$1,591	\$1,634	\$1,678	\$1,723	\$1,769	\$1,817	\$1,866	\$1,917	\$1,968	\$2,022	\$2,076	\$2,132	\$2,190	\$2,249	\$2,310	\$2,372	\$2,436	\$2,502	\$2,569
Irrigation system	\$/yr		\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Site fencing	\$/yr		\$1,500	\$1,541	\$1,582	\$1,625	\$1,669	\$1,714	\$1,760	\$1,809	\$1,859	\$1,909	\$1,960	\$1,998	\$2,011	\$2,065	\$2,121	\$2,178	\$2,237	\$2,297	\$2,359	\$2,423	\$2,488	\$2,556	\$2,625	\$2,696	\$2,768	\$2,843
Access Tracks	\$/yr		\$1,000	\$1,027	\$1,055	\$1,083	\$1,112	\$1,142	\$1,173	\$1,205	\$1,238	\$1,271	\$1,305	\$1,341	\$1,377	\$1,414	\$1,452	\$1,491	\$1,532	\$1,573	\$1,615	\$1,659	\$1,704	\$1,750	\$1,797	\$1,846	\$1,895	\$1,947
Tree maintenance (25Ha)	\$/yr		\$4,025	\$4,134	\$4,245	\$4,360	\$4,478	\$4,599	\$4,723	\$4,850	\$4,981	\$5,116	\$5,254	\$5,396	\$5,541	\$5,691	\$5,845	\$6,002	\$6,164	\$6,331	\$6,502	\$6,677	\$6,858	\$7,043	\$7,233	\$7,428	\$7,629	\$7,835
Total Annual Costs	\$/yr		\$ 6,600,000	\$ 27,768	\$ 28,638	\$ 29,324	\$ 30,134	\$ 30,967	\$ 31,823	\$ 32,703	\$ 33,607	\$ 34,536	\$ 35,490	\$ 36,472	\$ 37,490	\$ 38,546	\$ 39,642	\$ 40,779	\$ 41,958	\$ 43,200	\$ 44,516	\$ 45,908	\$ 47,387	\$ 48,954	\$ 50,609	\$ 52,354	\$ 54,189	\$ 56,115
Discounted Cost	\$/yr		\$ 6,600,000	\$ 26,270	\$ 25,541	\$ 24,831	\$ 24,141	\$ 23,471	\$ 22,819	\$ 22,185	\$ 21,569	\$ 20,970	\$ 20,387	\$ 19,821	\$ 19,271	\$ 18,736	\$ 18,216	\$ 17,710	\$ 17,218	\$ 16,740	\$ 16,275	\$ 15,824	\$ 15,384	\$ 14,957	\$ 14,542	\$ 14,139	\$ 13,745	\$ 13,365
Cumulative cash flow			\$ 6,600,000	\$ 6,626,270	\$ 6,651,811	\$ 6,676,642	\$ 6,700,783	\$ 6,724,254	\$ 6,747,073	\$ 6,769,258	\$ 6,790,826	\$ 6,811,796	\$ 6,832,184	\$ 6,852,005	\$ 6,871,276	\$ 6,890,011	\$ 6,908,227	\$ 6,925,937	\$ 6,943,155	\$ 6,959,895	\$ 6,976,171	\$ 6,991,994	\$ 7,007,370	\$ 7,022,336	\$ 7,036,878	\$ 7,051,017	\$ 7,064,764	\$ 7,078,129
Total NPV Cost			\$ 7,080,000																									
				rounded		Check:	\$7,078,129																					
							\$ 7,078,129																					



Akaroa Wastewater Upgrade

Ocean Outfall Pipeline Preliminary Design Cost Estimate

SUMMARY : OCEAN OUTFALL PIPELINE

Description of the work:

Connection to Deaeration structure near shoreline
PE pipeline laid and buried in trench in the sea bed, weighed down with balast blocks
Discharge diffusers, risers and protective structures

DESCRIPTION	ESTIMATE
Capital Cost Estimate (escalated to 2017 values)	\$7,400,000
NPV Estimate	\$7,620,000

Ref	DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	
1.0	Outfall pipeline					
	PE Pipe	1	LS	\$335,000	\$335,000	based on OCEL estimate 2014
	Fabricated pipe strings	1	LS	\$570,000	\$570,000	
	Near shore sheet pile and excavation	1	LS	\$558,000	\$558,000	
	Launch and secure	1	LS	\$780,000	\$780,000	
	Contractor Personnel	1	LS	\$297,000	\$297,000	
	Contractor's Risk	20%		\$2,540,000	\$508,000	
	NET CONSTRUCTION COST				\$3,048,000	
	Preliminaries & General Margin	12%	%		\$366,000	
		10%	%		\$341,000	
	TOTAL CONSTRUCTION BUDGET				\$3,755,000	
	Contingency	25%	%		\$939,000	
	Design and management Fees	12.5%	%		\$587,000	
	TOTAL CAPITAL COST ESTIMATE FOR OUTFALL DESIGN				\$5,280,000	2014 estimate
Ref	DESCRIPTION	QUANTITY	UNIT	RATE	TOTAL	
	Add allowance for pipeline from WWTP to Outfall	1	LS	\$400,000	\$400,000	based on Hawkins pricing 2015
	Road Crossing SH75	1	LS	\$100,000	\$100,000	
	Connection	1	LS	\$30,000	\$30,000	
	Add for Deaeration Chamber	1	LS	\$210,000	\$210,000	
	Allowance for Testing and commissioning, survey, approvals, CCTV etc	1	LS	\$60,000	\$60,000	
	Subtotal				\$800,000	
	Preliminaries & General Margin	12%	%	\$800,000	\$100,000	
		10%	%	\$900,000	\$90,000	
	Contingency	25%	%	\$990,000	\$250,000	
	Design and management Fees	12.5%	%	\$1,240,000	\$160,000	
	TOTAL CAPITAL COST ESTIMATE FOR PIPELINE				\$1,400,000	2014 estimate
	Outfall Estimate	1	LS		\$5,280,000	
	Pipeline Estimate	1	LS		\$1,400,000	
	TOTAL CAPITAL COST ESTIMATE FOR OCEAN OUTFALL OPTION				\$6,700,000	2014 estimate
	Allow for escalation to end 2017 based on CGP Index December 2016	10.4%	%	\$6,700,000	\$700,000	Capital Goods Price Index table 3, series CEPQ-S2CB
	ADJUSTED CAPITAL COST ESTIMATE, rounded				\$7,400,000	

NPV ESTIMATE	\$7,620,000
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Akaroa Wastewater Alternate Disposal Options

Bypass Treatment Options - Concept Stage Estimate

Ref	DESCRIPTION	BASE CASE	BYPASS POND	ADDITIONAL MEMBRANE
	Items in preliminary WWTP estimate:			
A	UV treatment	✓	x	x
B	250m3 buffer tank	✓	x	x
	Items in Land Disposal estimates to date:			
C	Disc Filter	✓	✓	x
	Additional Items:			
D	5ML covered pond	x	✓	x
E	1ML pond	x	x	✓
F	Additional Membrane Cassette	x	x	✓
G	Additional building / civil works	x	x	✓

Note:

Additional Membrane cassette option requires additional building modifications

All estimates below are shown **Extra Over to Base Case** allowances; all figures are rounded

Ref	DESCRIPTION	BASE CASE	BYPASS POND	ADDITIONAL MEMBRANE
	Items in preliminary design WWTP estimate:			
A	UV treatment		-\$400,000	-\$400,000
B	250m3 buffer tank		-\$780,000	-\$780,000
	Items in Land Disposal estimates to date:			
C	Disc Filter		no change	-\$200,000
	Additional Items:			
D	Additional 5,000m3 covered pond		\$1,035,000	no change
E	increase 5,000m3 pond by 1,000m3			\$230,000
F	Additional Membrane Cassette			\$750,000
G	Additional building / civil works			\$160,000
	Net Construction Cost - additional to Base Case		-\$145,000	-\$240,000
	Preliminaries & General and Margin	20%	-\$29,000	-\$48,000
	GROSS CONSTRUCTION COST		-\$174,000	-\$288,000
	Additional Contingency allowance	30%	-\$50,000	-\$90,000
	Additional allowance for Professional Fees	13%	-\$30,000	-\$50,000
	Additional allowance for land purchase		excluded	excluded
	TOTAL ESTIMATE		-\$250,000	-\$430,000

Note - land purchase of pond site is allowed for in Disposal to Land Options Estimates

Akaroa Wastewater Alternate Disposal Options
Upgraded WWTP DESIGN - FULL BNR
Concept Stage Cost Estimate

24/03/2017

Description of works:

Upgrade WWTP design for full Biological Nutrient Removal (BNR)
 Increase sludge reactor volume by 50%
 Double capacity of internal recirculation pumps
 Allow for additional ethanol dosing system

Note: allowances for process equipment are based on factors taken from table 3.6 in "Process Capital Cost Estimation" 2004

Ref	DESCRIPTION	UNIT	QUANTITY	RATE	TOTAL	COMMENT
	ADD				\$1,000,000	
1	Increase the capacity of Sludge Reactors by 50%	LS	1	\$300,000	\$300,000	based on estimate for WWTP Sludge Reactors; assume structure is not pushed out into hill side (as higher and more extensive retaining wall required)
2	Additional allowance for extending building platform into the hillside - additional excavation, increase height of proposed retaining wall	LS	1	\$250,000	\$250,000	2014 estimate assumed a 3m high timber pole retaining wall; allowance here is additional cost for extending building platform 5m into hillside and increase retaining wall to 3.5m high face retained
3	Allowance to increase pumping capacity, blower capacity, air pipelines and diffuser capacity, increased pipe and valve diameters	LS	1	\$200,000	\$200,000	
4	Allowance for ethanol dosing system, including: storage tank, dosing pumps and lines, additional control, hazardous substance management costs	LS	1	\$200,000	\$200,000	
5	Civil and structural modifications including bunded area for tanker unloading, bunded internal area for ethanol storage tank and equipment	LS	1	\$50,000	\$50,000	
	OMIT				\$0	
	Rounding	LS	1		0	
	SUBTOTAL CONSTRUCTION				\$1,000,000	
	Preliminaries & General and Margin		20%	\$1,000,000	\$200,000	
	GROSS CONSTRUCTION COST				\$1,200,000	
	Contingency		30%	\$1,200,000	\$360,000	
	Allowance for Professional Fees		13%	\$1,560,000	\$200,000	
	Additional allowance for Resource Consents	LS	1	\$50,000	\$50,000	included in WWTP estimate
	Land Purchase					excluded
	TOTAL ESTIMATE				\$1,810,000	rounded

General Estimate Exclusions:

Goods and Services Tax (GST)
 Construction escalation beyond date of estimate
 Foreign Exchange costs
 Staged or phased handover or commissioning
 Council reserves and Development Contributions
 Legal / accounting fees

Project Specific Exclusions

Christchurch City Council direct costs (project staffing etc)
 Geotechnical ground improvement / treatment
 Incurred costs to date
 Fast track or accelerated programme
 Work outside normal working hours
 Treating & handling contaminated soil and materials
 No allowance for working around or relocating existing services
 Excavation spoil assumed disposed of off site

Akaroa Wastewater Alternate Disposal Options

Non-potable Irrigation Reuse Option - Concept Stage Estimate

Non-potable reuse of WWTP discharge for irrigation of CCC parks and reserves, and public toilet flushing
 New reticulation pipe from WWTP to Akaroa township
 Assumes 50% of new pipeline is laid in shared trench with proposed wastewater upgrades
 New connections to 3No. public toilet blocks
 Subsurface irrigation laid in Jubilee Park
 Surface drippers laid in L'Aube Hill Reserve
 Combination of sub-surface and surface drip irrigation laid in Stanley Park
 Allowance for telemetry and controls at each irrigation site

SUMMARY : NON-POTABLE REUSE OPTION

DESCRIPTION	ESTIMATE
Capital Cost Estimate	\$1,700,000
NPV Estimate	\$2,110,000

Based on high-level concept design information; subject to further investigation, design and cost estimation
 No allowance for tree planting, landscaping, pasture renewal/establishment

Ref	DESCRIPTION	UNIT	QUANTITY	Rate	TOTAL	COMMENT
1.0	WASTEWATER SUPPLY PIPE	LS	1		\$660,000	
	Pipeline from WWTP to Akaroa					
	Allowance for pipeline from WWTP to Stanley Park - assume DN100 PE100 PN160, including valves and fittings, road crossings; allow 3500m total					allow 2400m from WWTP to Stanley Park, plus 2 x 300m branches to Jubilee and L'Aube Hill Reserve plus 500m for connections to 2No toilet blocks = 3500 m total (approximate measure from Google Earth)
1.01	Allow 1000m down Old Coach Rd in shared trench with proposed wastewater infrastructure upgrade	M	1000	\$100.00	\$100,000.00	
1.02	Allow 50% of remainder in shared trench with proposed wastewater infrastructure upgrade	M	1250	\$100.00	\$125,000.00	
1.03	Allow 50% of remainder trenched separately	M	1250	\$200.00	\$250,000.00	
1.04	Offtake connections - fittings, valving	No	6	\$30,000.00	\$180,000.00	3No parks, 3No toilet blocks
2.0	TOILET BLOCK CONNECTIONS	LS	1		\$30,000	
2.01	Allowance for toilet block connections	No	3	\$10,000.00	\$30,000.00	
3.0	JUBILEE PARK IRRIGATION	LS	1		\$60,000	
3.01	Sub-surface irrigation	Ha	1.5	\$15,000.00	\$22,050.00	assume installed by machine
3.02	Allowance to reinstate Sports Field Surface	Ha	1.5	\$3,500.00	\$5,145.00	
3.03	Allowance for pump station	LS	0	\$150,000.00	\$0.00	
3.04	Control valving	LS	1	\$10,000.00	\$10,000.00	
3.05	Telemetry, RTU system per site, SCADA integration	LS	1	\$20,000.00	\$20,000.00	
4.0	L'Aube Hill Reserve IRRIGATION	LS	1		\$180,000	
4.01	Surface-laid irrigation	Ha	6.1	\$25,000.00	\$153,050	assume laid by hand through L'Aube Hill Reserve
4.02	Allowance for pump station	LS	0	\$150,000.00	\$0.00	
4.03	Control valving	LS	1	\$10,000.00	\$10,000.00	
4.04	Telemetry, RTU system per site, SCADA integration	LS	1	\$20,000.00	\$20,000.00	
5.0	STANLEY PARK IRRIGATION	LS	1		\$60,000	
5.01	Sub-surface irrigation	Ha	1.4	\$15,000.00	\$20,400.00	1.7Ha total, assume approximately 80% subsurface, 20% surface laid
5.02	Allowance to reinstate Sports Field Surface	Ha	1.4	\$3,500.00	\$4,760.00	
5.03	Surface-laid irrigation	Ha	0.3	\$25,000.00	\$8,500.00	1.7Ha total, assume approximately 80% subsurface, 20% surface laid
5.04	Allowance for pump station	LS	0	\$150,000.00	\$0.00	
5.05	Control valving - irrigation	LS	1	\$10,000.00	\$10,000.00	
5.06	Telemetry, RTU system per site, SCADA integration	LS	1	\$20,000.00	\$20,000.00	
	SUBTOTAL CONSTRUCTION				\$988,905	
	Preliminaries & General and Margin	LS	1	\$120,000	\$120,000	12%
	GROSS CONSTRUCTION COST			\$120,000	\$1,108,905	
	Contingency - allow 30%	LS	1	\$330,000	\$330,000	30%
	Allowance for Professional Fees	LS	1	\$190,000	\$190,000	13%
	Allowance for Resource Consents	LS	1	\$100,000	\$100,000	
	Allowance for Land Purchase	LS	1			assume all owned by CCC
	TOTAL ESTIMATE				\$1,700,000	rounded

NPV ESTIMATE	\$2,110,000
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Akaroa Wastewater Alternate Disposal Options

Reverse Osmosis Treatment Option - Concept Stage Estimate

Ref	DESCRIPTION	BASE CASE	REVERSE OSMOSIS
	Items in preliminary design WWTP estimate:		
A	UV treatment	✓	✓
B	250m3 buffer tank	✓	x
	Items in Land Disposal estimates to date:		
C	Disc Filter	✓	x
	Additional Items:		
D	5,000m3 uncovered pond	x	✓
F	Additional Membrane Cassette	x	✓
G	Reverse Osmosis plant	x	✓
H	Additional building / civil works	x	✓

Note:

Reverse Osmosis option also includes for additional Membrane cassette

Reverse Osmosis and additional Membrane cassette options require additional building modifications

All estimates below are shown **Extra Over to Base Case** allowances; all figures are rounded

Ref	DESCRIPTION	BASE CASE	REVERSE OSMOSIS
	Items in preliminary WWTP estimate:		
A	UV treatment		no change
B	250m3 buffer tank		-\$780,000
	Items in Land Disposal estimates to date:		
C	Disc Filter		-\$200,000
	Additional Items:		
D	Additional 5,000m3 <i>uncovered</i> pond		\$770,000
F	Additional Membrane Cassette		\$750,000
G	Reverse Osmosis plant		\$520,000
H	Additional building / civil works		\$1,360,000
Net Construction Cost - additional to Base Case			\$2,420,000
Preliminaries & General and Margin		20%	\$484,000
GROSS CONSTRUCTION COST			\$2,904,000
Additional Contingency allowance		30%	\$870,000
Additional allowance for Professional Fees		13%	\$490,000
Additional allowance for land purchase			excluded
TOTAL ESTIMATE			\$4,260,000

NPV ESTIMATE	\$8,990,000
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Note - land purchase of pond site is allowed for in Disposal to Land Options Estimates