
APPENDIX 9

Cost Estimates for Water, Wastewater and Stormwater Servicing

Wellington Elevated Tank - Conceptual Cost Estimate

DESCRIPTION	Option 1	Option 4 - Preferred site
1. SITE WORKS		
Excavation and disposal of fill	63,000	91,845
Yard piping (including watermain extension)	1,740,000	280,000
Access road	120,000	120,000
Landscaping and fencing	60,000	60,000
SUBTOTAL	1,983,000	551,845
2. PROCESS EQUIPMENT		
Elevated tank	\$ 2,850,000	\$ 2,850,000
Concrete pedestal	\$ 180,000	\$ 340,000
Tank mixing system	\$ 75,000	\$ 75,000
Recirculation line	\$ 20,000	\$ 20,000
Chemical feed system	\$ 35,000	\$ 35,000
SUBTOTAL \$	3,160,000	\$ 3,320,000
3. FINISHES	\$ 25,000	\$ 25,000
4. STRUCTURAL	\$ 167,500	\$ 167,500
5. MECHANICAL	\$ 60,000	\$ 60,000
6. ELECTRICAL	\$ 185,000	\$ 185,000
7. CONTROLS & INSTRUMENTATION	\$ 113,000	\$ 113,000
8. TESTING	\$ 36,500	\$ 36,500
9. WTP ASSOCIATED UPGRADES	\$ 225,000	\$ 225,000
10. OVERHEAD + CONTRACTOR MARKUP (20%)	\$ 1,191,000	\$ 891,769
11. COST ESTIMATE VARIANCE (20%)	\$ 1,430,000	\$ 1,116,000
TOTAL \$	8,580,000	\$ 6,700,000

Assumptions:

New tank size assumed at 4,500m³. Design to confirm tank size based on range of 4,200-4,800m³
 New tank size will completely replace the existing ET to service existing and future developments (to beyond 2042). ICI development timeline unknown (if this speeds up, then 2nd tank/reservoir may be needed sooner)

Ultimately second water tank/reservoir will be required to obtain total required system storage of 9,200m³ for full build out

Cost includes associated WTP upgrades to get the water up to new taller Elevated Tank

Cost does not include for engineering and field investigation fees, O&M

Wellington Millennium Trail Watermain Capital Cost

Assumptions

Phase 1 - New 500mm WM on Millennium Trail from Prince Edward Drive to Belleville St and ET (Wellington District Community Centre)
Does not include future watermain phases on local roads (i.e. Consecon St, Belleville St, and to extension to end of settlement boundary)

Given

Distance	4500 m
Diameter	0.5 m
Overburden depth	1 m
rock depth	1.5 m

trench width (0.5 on either side)	1.5 m	trench width (0.5 on either side)	1.5 m
asphalt restoration length	1400 m	gravel restoration length	3100 m
creek/culvert crossings	2 outfalls	landscaping reinstatement	10 m
length of crossing	30 m	creek/culvert crossings	3 Consecon & Wharf St.
		length of crossing	30 m

Item	Units	New WM with asphalt restoration (Cleminson, Main St, Prince Edward Drive, Belleville)				New WM with gravel restoration (Millennium Trail)		
		Unit Price	Est. Qty	Total	Comments	Est. Qty	Total	Comments
CLEARING, GRUBBING, AND TREE PROTECTION	LS	1	10000	\$ 10,000.00		80000	\$ 80,000.00	a lot more trees and bushes along Millennium trail; Picton WM (1400m was at \$40K and less trees)
ROAD EXCAVATION AND EARTH GRADING; REMOVAL OF ASPHALT, FULL DEPTH	m3	40	3337.5	\$ 133,500.00	only for WM trench and assuming entire Main St is already excavated (550m); so only Prince Edward Drive and Cleminson need rock excavation	4650	\$ 186,000.00	only for WM trench
SUPPLY, PLACE AND MAINTAIN TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES	LS	1	10000	\$ 10,000.00		80000	\$ 80,000.00	
GRAVEL EXCAVATION AND EARTH GRADING	m3	30	0	\$ -		4185	\$ 125,550.00	
ROCK EXCAVATION WITHIN TRENCHES WITH GRANULAR BACKFILL UP TO UNDERSIDE OF ROAD	m3	230	1912.5	\$ 439,875.00	only for WM trench; assuming Main St. is already fully dug up and no rock there	6975	\$ 1,604,250.00	only for WM trench
GRANULARS	m3	50	525	\$ 26,250.00		1162.5	\$ 58,125.00	
GRANULAR A FOR ASPHALT and GRAVEL ROAD PREP (0.25m depth)	m3	50	945	\$ 47,250.00		2092.5	\$ 104,625.00	
GRANULAR B TYPE II FOR ASPHALT and GRAVEL ROAD PREP (0.45m depth)	m3	50	945	\$ 47,250.00	only for WM trench; not resurfacing whole road; wait for sanitary sewer and stormsewer work for that			
HL3 (50mm)	m2	60	2100	\$ 126,000.00	only for WM trench; not resurfacing whole road; wait for sanitary sewer and stormsewer work for that	0	\$ -	
HL8 (50mm)	M2	55	2100	\$ 115,500.00		0	\$ -	
Gravel road restoration for Millennium Trail	m3	30	0	\$ -		930	\$ 27,900.00	
WATERMAIN IN OPEN CUT - 500 dia PVC class 300 WM including fittings, bends, bedding	M	850	1400	\$ 1,190,000.00	average price from Picton WM tender	3100	\$ 2,635,000.00	average price from Picton WM tender
GATE VALVE AND GATE BOXES - 350 MM	EACH	11000	13	\$ 143,000.00		10	\$ 110,000.00	
UTILITY ADJUSTMENTS	EACH	500	30	\$ 15,000.00		10	\$ 5,000.00	
SELF DRAINING SAMPLE HYDRANT CONNECTION TO EXISTING WATERMANS (ALL SIZES)	EACH	3000	1	\$ 3,000.00		3	\$ 9,000.00	
Topsoil and grading	m2	10	1400	\$ 14,000.00	assuming only 1 side of grass needs fixing (1 m width)	3100	\$ 31,000.00	assuming only 1 side of grass needs fixing (1 m width)
hydroseeding	m2	2	2800	\$ 5,600.00	assuming only 1 side of grass needs fixing (1 m width)	6200	\$ 12,400.00	assuming only 1 side of grass needs fixing (1 m width)
trail restoraton and improvements	LS	1		\$ -		100000	\$ 100,000.00	MT maintenance and repair fund for public relations
Creek/culvert crossing (assuming trenchless)	m	2100	60	\$ 126,000.00		90	\$ 189,000.00	
			Subtotal (Capital Cost)	\$ 2,429,975.00		Subtotal (Capital Cost)	\$ 5,357,850.00	

20% contingency	\$ 1,557,565.00	prices mostly taken from tendered bid (Picton WM & past projects; assuming contractor's profit and overhead is built into tender unit rates)
Total Capital Cost	\$ 9,345,390.00	
	\$ 2,076.75	construction cost per linear m

10% Engineering, field investigation, CA/inspection	\$ 934,539.00
Total Project Cost	\$ 10,300,000.00

Wellington Millennium Trail Sanitary Sewer

Assumptions

Phase 1 - Sanitary Trunk Sewer (gravity) on Millennium Trail from Belleville to Cleminson, Main St to WWTP
 Does not include future sanitary sewers along local roads (i.e. Consecon St, Belleville St, and to extension to end of settlement boundary)
 Does not include cost for new WBE Development's SPS and associated forcemain to Millennium Trail Sanitary Sewer (see other sanitary sewer calc for that)
 assuming gravel trail restoration; not asphalt restoration; some creek crossings; asphalt restoration for Cleminson & Main St.

Given

Length on gravel 1500 m
 Length on asphalt 900 m
 depth of overburden 1 m
 depth into rock 3 m assuming depth of sewer 3.5-4m

Alternative 4 - New Sanitary Sewer on Millennium Trail

Item	pipe diameter (m)	length (m)	width (m); with 300mm on both sides	depth in overburden (m)	depth (1-3m of rock)	depth (3-6m rock)	Unit Rate (\$/m3)	Excavation cost in overburden	Excavation cost in 1-3m rock, with granular backfill, bedding up to underside of road	depth of gran A under road (m)	depth of gran B under road (m)	asphalt reconstruction width (m) (1 lane)	asphalt reconstruction width (m) (1 lane)	gravel restoration width (m) and 200mm depth	sewer pipe (inc. MHs, piping labour)	Complications factor (dewatering, creek crossings, approvals, tie-ins, commissioning, diversions, public, political etc.)	Millennium Trail restoration fund	Subtotal
							50			0.25	0.45	5	5	5				165.00

New sanitary sewer on Millennium Trail from Belleville St to Cleminson and Main St.

0.45	2400	1.05	1	3	0	\$ 126,000.00	\$ 1,738,800.00	\$ 31,500.00	\$ 56,700.00	\$ 270,000.00	\$ 247,500.00	\$ 45,000.00	\$ 396,000.00	1.3	100000	\$ 3,884,950.00	30% construction	\$ 1,165,485.00	Total Capital Cost	\$ 5,050,435.00	10% Engineering Design, field investigations, CA/inspection	\$ 505,043.50	Total Project Cost	\$ 5,555,478.50
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Wellington Water Treatment Plant Options - Cost Estimate

DESCRIPTION	Alternate 4 - Expansion of Existing WTP		Alternative 5 - Build New WTP (Preferred Alternative)	
	2021	2042	2021	2042
1. SITE WORKS				
Excavation and disposal of fill	\$ 803,535	\$ 218,918	\$1,144,000	\$0
Backfill	\$ 13,640	\$ 1,870	\$62,000	\$0
Asphalt driveway	\$ 22,000	\$ -	\$22,000	\$0
SUMMARY	\$ 839,000	\$ 221,000	\$1,228,000	\$0
2. PROCESS EQUIPMENT				
Intake pipe	\$ -	\$ 5,700,000	\$400,000	\$6,100,000
Intake crib	\$ -	\$ 252,000	\$0	\$252,000
Low lift pumps	\$ 75,600	\$ 25,000	\$76,000	\$26,000
Filtration System	\$ 3,226,800	\$ 1,344,000	\$2,219,000	\$672,000
UV Disinfection	\$ 450,000	\$ 300,000	\$450,000	\$150,000
High Lift Pumps	\$ 75,600	\$ 25,000	\$76,000	\$26,000
Baffle curtains	\$ 121,500	\$ -	\$144,000	\$68,000
Coagulation system	\$ 45,500	\$ -	\$46,000	\$0
Chlorine system	\$ 267,100	\$ -	\$268,000	\$0
Residue Management	\$ 174,000	\$ 61,000	\$235,000	\$61,000
SUMMARY	\$ 4,436,000	\$ 7,808,000	\$3,912,000	\$7,353,000
3. STRUCTURAL				
Concrete	\$ 2,501,126	\$ 424,000	\$4,204,000	\$0
Waterproofing	\$ 189,198	\$ 41,000	\$316,000	\$0
SUMMARY	\$ 2,690,000	\$ 465,000	\$4,520,000	\$0
4. MECHANICAL				
diesel generator	\$ 600,000	\$ -	\$ 600,000.00	\$0
Piping, fittings, valves	\$ 500,000	\$ 500,000	\$1,000,000	\$150,000
HVAC system	\$ 846,560	\$ 889,000	\$1,066,000	\$0
SUMMARY	\$ 1,947,000	\$ 1,400,000	\$2,666,000	\$150,000
5. ELECTRICAL				
	\$ 847,000	\$ 900,000	\$1,066,000	\$110,000
6. CONTROLS & INSTRUMENTATION				
	\$ 847,000	\$ 900,000	\$1,066,000	\$751,000
7. OVERHEAD + CONTRACTOR MARKUP (15%)				
	\$ 2,321,000	\$ 2,339,000	\$2,892,000	\$1,673,000
8. COST ESTIMATE VARIANCE (30%)				
	\$ 696,000	\$ 702,000	\$3,470,000	\$2,008,000
SUBTOTAL	\$ 14,623,000	\$ 14,731,000	\$20,817,000	\$12,043,000
Future value (2% inflation rate)		\$ 22,328,000		\$ 18,254,000
Present value (3% interest rate)		\$ 12,003,000		\$ 9,813,000
TOTAL	\$ 26,700,000	\$ 26,700,000	\$ 30,700,000	\$ 30,700,000

	2021	2041	2021	2041
Total capital cost (total over 2021 & 2041)	\$29,354,000		\$32,860,000	
Engineering Cost, field investigation, CA/inspection	\$2,706,210.00	\$1,565,590.00	\$2,706,210.00	\$1,565,590.00
Total Project Cost (Capital & Engineer)	\$17,329,210.00	\$16,296,590.00	\$23,500,000.00	\$13,600,000.00
Total overall project cost (capital + engineering)	\$33,625,800.00		\$37,100,000.00	
Operating & Maintenance Cost (PV)	\$8,505,988		\$6,323,239	
Life Cycle Cost (Capital & O&M)	\$42,131,788		\$43,423,239	

Wellington WWTP Cost Estimate

Cost item	Alternative 3 Plant Upgrade and Expansion		Alternative 4A New CAS WWTP at Site		Alternative 4B New Extended Aeration at Site	
		Comments		Comments		Comments
Headworks building with screens	\$700,000		\$700,000		\$700,000	
Grit channels	\$100,000		\$100,000		\$100,000	
Wet well and primary sludge pump pit	\$521,200		\$521,200		\$521,200	
Primary clarifiers	\$1,224,173		\$1,108,858		-	No Primary Clarifiers
Aeration tanks	-		\$1,350,832	New aeration tanks in Alternative 4	\$1,804,840	Revise cost based on the footprint
Aeration Blowers	\$100,000		\$100,000		\$100,000	
Aeration diffusers and piping	-		\$300,000	New diffuser system/ping in Alternative 4	\$400,000	
Secondary clarifiers	\$1,458,290	made larger to suit treatment of 100% of flows	\$2,116,580	made larger to suit treatment of 100% of flows	\$2,116,580	
RAS/Electrical/Chemical building	\$973,197		\$1,307,640	New chemical building/enclosure for Alternative 4	\$1,807,640	Revised cost for addition of ground floor for blowers, by adding \$0.5M to the base Use 2 west aeration tanks for this
Sludge storage tank refurbish to digester	\$150,000		-		-	
Aeration tank refurbish to digester/storage	-		\$200,000		\$200,000	
Refurbishment of remaining tanks for reuse	\$1,000,000	including additional complications for tie- in and shutdowns for connection of new to ex. plant	\$600,000		\$600,000	
Demolition	\$100,000		\$100,000		\$100,000	
Site works	\$400,000		\$500,000		\$500,000	
Filter building	\$3,343,715		\$3,320,165		\$3,320,165	
UV disinfection system	\$324,004		\$324,004		\$324,004	
Additional train of biosolids storage tank	\$1,543,440		-		-	
Aeration system for biosolids storage	\$150,000		-		-	
UV Channel pipe to Outfall	\$271,350		\$271,350		\$271,350	
Odour control	\$500,000	covering, blowers, fans, piping of aerobic digesters; with biofilter	\$500,000		\$500,000	
New Admin/control bldg	\$800,000	including truck bay	\$800,000		\$800,000	
Diesel Generator	\$600,000	assuming approx 500kW unit, outdoor enclosure, hospital grade silencer	\$600,000	assuming approx 500kW unit; outdoor enclosure, hospital grade silencer	\$600,000	assuming approx 500kW unit; outdoor enclosure, hospital grade silencer
Construction cost - Sub-total	\$14,259,369		\$14,820,629		\$14,765,779	
Mobilization/demobilization	\$712,968	@5% of construction cost sub-total	\$741,031	@5% of construction cost sub- total	\$738,289	@5% of construction cost sub-total
Bonds and insurance	\$712,968	@5% of construction cost sub-total	\$741,031	@5% of construction cost sub- total	\$738,289	@5% of construction cost sub-total
Contractor Mark-Up	\$2,138,905	@15% of construction cost sub-total	\$2,223,094	@15% of construction cost sub-total	\$2,214,867	@15% of construction cost sub-total
Capital cost	\$17,800,000		\$18,525,786		\$18,457,224	
Estimating contingency (30%)	\$5,300,000		\$5,600,000		\$5,500,000	
Project Cost Estimate - High	\$23,100,000		\$24,100,000		\$24,000,000	
13% Engineering Fees, Field Investigation, CA/I	\$3,003,000.00		\$3,133,000.00		\$3,120,000.00	
Total Project Cost	\$26,103,000.00		\$27,233,000.00		\$27,120,000.00	

Conclusion:

Alternative 4A and 4B are fairly similar in capital cost; MSP is Schedule B to select preferred alternative approach; afterwards a Schedule C Class EA will be required to confirm preferred treatment technology

Evaluation table ultimately showed Alternative 4 (new WWTP) as preferred alternative

Although there is some phasing that can be allowed for Alternative 3 & 4, most of the excavation and construction needs to occur in Phase 1 due to deep rock excavation

Phase 2 upgrades are only modular additions of treatment systems to increase capacity to match growth

Assumptions

Rock is fractured limestone and can be mechanically broken with hoe ram & excavator (no blasting required)

Existing structures and buried tanks in good/fair condition and can be reused with some rehabilitation

O&M Cost - Existing Retrofit vs New WWTP	2020 to 2052
timeframe	32 years
interest	5%
inflation	3%

Alternative 3: Existing WWTP Retrofitted and Expanded

Replacement Costs	Frequency (once every x years)	qty	\$/unit	present worth	Comments	
concrete tank rehabilitation	30	5175.1	60 \$	174,000.00	this is rehab near end of 2050; we already included cap cost for rehab of existing tanks	
diesel generator	30	1	600000 \$	337,000.00	taken from NT \$400K for 3 large ones; ours is about 1.5x smaller; assuming ex. will need to be replaced in 15 years, and then won't need to be replaced again until another 30 years	
diffuser replacement (fine bubble)	15	4	90000 \$	270,000.00	taken from NT \$300K for 3 large ones; ours is about 0.5x smaller; assuming ex. will need to be replaced in 15 years, and then won't need to be replaced again until another 30 years	
diffuser replacement (coarse bubble)	15	4	50000 \$	150,000.00	another 30 years	
wet well pump	10	3	9000 \$	55,818.89	NT had 4 for \$70K; twice as large	
RAS pumps & WAS pumps	10	6	10625 \$	131,794.60	NT had 8 (4 and 4) RAS, WAS for \$170K; twice as large	
BWP pumps	15	2	30000 \$	78,661.37		
sludge loading pumps	10	3	10750 \$	66,672.56	NT had \$43K, but it's 2x as large	
bar screens	30	2	150000 \$	168,484.14	NT had 2 for \$322K, but it's 2x as large	
secondary clarifier mechanisms	15	4	270937.5 \$	812,000.00	NT has \$1.445M for 4 of them; but it is 2x larger; assuming ex. will need to be replaced in 15 years, and then won't need to be replaced again until another 25 years	
blowers	15	4	17500 \$	91,771.59	NT had \$140K for 4 blowers; approx 2x the size	
Total Maintenance cost over 32 (in PV)				\$	2,336,203.14	

Annual Costs	Qty	\$/unit	annual cost	present worth	comments
diesel generator maintenance	1	1500	1500 \$	23,704.02	assumed diesel will last about 30 years
UV lamp replacement	16	1000	16000 \$	252,842.83	assuming 14000hr life per lamp at about \$1000 per lamp; and 12 lamps per bank, with 2 banks per train (1 duty, 1 standby) and 2 trains; total number of lamps = 12*2*2 (48) but not all of them will need to be replaced at once
wet well pump maintenance	3	300	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
RAS pumps & WAS pumps maintenance	6	150	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
BWP pumps maintenance	2	100	200 \$	3,160.54	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
sludge loading pumps maintenance	3	300	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
bar screens maintenance	2	200	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
secondary clarifier mechanisms maintenance	4	100	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
blowers maintenance	4	100	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
Chlorine	12	1.34	16.08 \$	254.11	mainly using UV for disinfection, but have some Cl2 for standby (assume 2-3 days a year when UV system is down); assuming 1mg/L @ 4000m3/day; \$1.34/kg
Ferric chloride	1460	1.1	1606 \$	25,379.10	1.42kg/L; \$1.1/kg; assuming 2-3mg/L @4000m3/day for 365days/year
sodium bisulphite	12	1.34	16.08 \$	254.11	assuming 1:1 reactivity with Cl2; price is \$1.34/kg
labour	2920	30	87600 \$	1,384,314.48	assuming 1 operator at WWTP full time; 8hrs/day; 365 days/yr
troubleshooting (overhead time above typical da	780	45	35100 \$	554,673.95	assuming 15hr/week more over the next 32 years
existing fine bubble aeration diffuser maintenanc	4	2500	10000 \$	103,796.58	assuming all 4 of existing tanks need yearly maintenance
existing coarse bubble aeration diffuser maintenanc	2	2000	4000 \$	41,518.63	assuming both of existing tanks need yearly maintenance
existing secondary clarifier maintenance	2	1000	2000 \$	20,759.32	assuming both of existing tanks need yearly maintenance
new coarse bubble aeration diffuser maintenanc	2	1500	3000 \$	47,408.03	assuming both of existing tanks need yearly maintenance
new secondary clarifier maintenance	2	500	1000 \$	15,802.68	assuming both of existing tanks need yearly maintenance

\$ 165,938.16 \$ 4,871,701.93
 annual cost Total operating cost over 32 years (PV)

Alternative 4: New WWTP (Preferred Option)

Replacement Costs	Frequency (once every x years)	qty	\$/unit	present worth	Comments	
concrete tank rehabilitation	30	5175.1	60 \$	174,000.00	this is rehab near end of 2050; we already included cap cost for rehab of existing tanks	
diesel generator	30	1	600000 \$	337,000.00		
diffuser replacement (fine bubble)	30	4	90000 \$	202,000.00	taken from NT \$400K for 3 large ones; ours is about 1.5x smaller	
diffuser replacement (coarse bubble)	30	4	50000 \$	112,000.00	taken from NT \$300K for 3 large ones; ours is about 0.5x smaller	
wet well pump	10	3	9000 \$	55,818.89	NT had 4 for \$70K; twice as large	
RAS pumps & WAS pumps	10	6	10625 \$	131,794.60	NT had 8 (4 and 4) RAS, WAS for \$170K; twice as large	
BWP pumps	15	2	30000 \$	78,661.37		
sludge loading pumps	10	3	10750 \$	66,672.56	NT had \$43K, but it's 2x as large	
bar screens	30	2	150000 \$	168,484.14	NT had 2 for \$322K, but it's 2x as large	
secondary clarifier mechanisms	25	4	270937.5 \$	670,000.00	NT has \$1.445M for 4 of them; but it is 2x larger	
blowers	15	4	17500 \$	91,771.59	NT had \$140K for 4 blowers; approx 2x the size	
Total Maintenance cost over 32 (in PV)				\$	2,088,203.14	

	Qty	\$/unit	annual cost	present worth	comments
diesel generator maintenance	1	1500	1500 \$	23,704.02	assumed diesel will last about 30 years
UV lamp replacement	16	1000	16000 \$	252,842.83	assuming 14000hr life per lamp at about \$1000 per lamp; and 12 lamps per bank, with 2 banks per train (1 duty, 1 standby) and 2 trains; total number of lamps = 12*2*2 (48) but not all of them will need to be replaced at once
wet well pump maintenance	3	300	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
RAS pumps & WAS pumps maintenance	6	150	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
BWP pumps maintenance	2	100	200 \$	3,160.54	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
sludge loading pumps maintenance	3	300	900 \$	14,222.41	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
bar screens maintenance	2	200	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
secondary clarifier mechanisms maintenance	4	100	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
blowers maintenance	4	100	400 \$	6,321.07	assuming normal wear and tear maintenance, checks and replacement of parts, not the whole new pump
Chlorine	12	1.34	16.08 \$	254.11	mainly using UV for disinfection, but have some Cl2 for standby (assume 2-3 days a year when UV system is down); assuming 1mg/L @ 4000m3/day; \$1.34/kg
Ferric chloride	1460	1.1	1606 \$	25,379.10	1.42kg/L; \$1.1/kg; assuming 2-3mg/L @4000m3/day for 365days/year
sodium bisulphite	12	1.34	16.08 \$	254.11	assuming 1:1 reactivity with Cl2; price is \$1.34/kg
labour	2920	30	87600 \$	1,384,314.48	assuming 1 operator at WWTP full time; 8hrs/day; 365 days/yr
troubleshooting (overhead time above typical day's wc	260	45	11700 \$	184,891.32	assuming 5hr/week more over the next 32 years
new fine bubble aeration diffuser maintenance	4	1000	4000 \$	63,210.71	
new coarse bubble aeration diffuser maintenance	4	500	2000 \$	31,605.35	
new secondary clarifier maintenance	4	1000	4000 \$	63,210.71	

\$ 132,538.16 \$ 4,182,660.83
 annual cost Total operating cost over 32 years (PV)

Wellington MSP Stormwater Management Alternatives	Unit Rates					
Cost Estimating	overburden excavation	50 \$/m3	CSP pipe cost (mat + labour)	200 \$/m	HL3 (50mm)	60 \$/m2
RVA 184179	rock excavation (1-3m)	125 \$/m3	disposal of material (uncontaminated)	10 \$/m3	HL38 (80mm)	55 \$/m2
	rock excavation (3-6m)	180 \$/m3	disposal of material (contaminated: non leachate)	150 \$/m3	gravel	20 \$/m2
	topsoil (150mm) & hydroseeding	15 \$/m2	Gran A	55 \$/m3	concrete	1200 \$/m3
	Regrading	30 \$/m3	Gran B	50 \$/m3		

Scenario	East End Option 1	East End Option 2	North End Option 1	North End Option 2	West End Option 1	West End Option 2							
Stormwater Pond	South Pond	South Pond	North Pond	Hirschfield West Pond	Hirschfield East Pond	Kaitlin Pond	Hirschfield West Pond	Hirschfield East Pond	Kaitlin Pond	Upper Pond	Lower Pond	West Pond	East Pond
volume (m3)	6300	4200	5500	11500	19300	10400	11500	19300	10400	10500	13300	10500	13300
area (m2)	6300	4200	2750	5750	9650	10400	5750	9650	10400	5250	8870	5250	8870
depth in overburden (up to 1m)	1	1	1	1	1	1	1	1	1	1	1	1	1
depth in rock (1-3m)	0	0	1	1	1	0	1	1	0	1	0.5	1	0.5
disposal of material	\$ 63,000.00	\$ 42,000.00	\$ 55,000.00	\$ 115,000.00	\$ 193,000.00	\$ 104,000.00	\$ 115,000.00	\$ 193,000.00	\$ 104,000.00	\$ 105,000.00	\$ 133,050.00	\$ 105,000.00	\$ 133,050.00
Excavation cost in overburden	\$ 315,000.00	\$ 210,000.00	\$ 137,500.00	\$ 287,500.00	\$ 482,500.00	\$ 520,000.00	\$ 287,500.00	\$ 482,500.00	\$ 520,000.00	\$ 262,500.00	\$ 443,500.00	\$ 262,500.00	\$ 443,500.00
Excavation cost in rock (1-3m)	\$ -	\$ -	\$ 343,750.00	\$ 718,750.00	\$ 1,206,250.00	\$ -	\$ 718,750.00	\$ 1,206,250.00	\$ -	\$ 656,250.00	\$ 554,375.00	\$ 656,250.00	\$ 554,375.00
landscaping	\$ 28,350.00	\$ 18,900.00	\$ 12,375.00	\$ 25,875.00	\$ 43,425.00	\$ 46,800.00	\$ 25,875.00	\$ 43,425.00	\$ 46,800.00	\$ 23,625.00	\$ 39,915.00	\$ 23,625.00	\$ 39,915.00
Regrading against natural topography to drain in different direction	\$ 6,045,832.80	\$ 4,756,494.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SWP Cost	\$ 6,452,182.80	\$ 5,027,394.90	\$ 548,625.00	\$ 1,147,125.00	\$ 1,925,175.00	\$ 670,800.00	\$ 1,147,125.00	\$ 1,925,175.00	\$ 670,800.00	\$ 1,047,375.00	\$ 1,170,840.00	\$ 1,047,375.00	\$ 1,170,840.00
	reduce excav. By building up berm on sloping topography												
Stormsewer outfall													
pipe diameter (m)	1.2	1.2	0.9	0.9	0.9	100	0.9	0.9	100	0.9	0.9	0.9	0.9
length (m)	150	150	300	300	325	100	1000	350	100	1200	0	200	550
width (m), with 500mm on both sides of trench for large diameter	2.2	2.2	1.9	1.9	1.9	2	1.9	1.9	2	1.9	1.9	1.9	1.9
depth in overburden (up to 1m)	1	1	1	1	1	1	1	1	1	1	1	1	1
depth in rock (1-3m)	2	2	1.5	1.5	1.5	0	1.5	1.5	0	1.5	0.5	1.5	0.5
depth in rock (3-6m)	0	0	0	0	0	0	0	0	0	0	0	0	0
length that needs to be re-landscaped (m)	100	100	0	10	40	100	150	40	100	150	0	0	150
length that needs to be re-asphalted (m)	50	50	0	125	125	0	450	0	0	900	0	0	300
length that needs to be restored as gravel trail (m)	0	0	300	100	100	0	550	370	0	300	0	300	0
rip rap/energy dissipation boulders	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ -	\$ -	\$ 2,500.00	\$ -	\$ -	\$ 2,500.00	\$ 5,000.00	\$ -	\$ 5,000.00	\$ -
concrete (for open channel)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 228,000.00	\$ -	\$ -	\$ 228,000.00	\$ 0	\$ -	\$ -	\$ -
Excavation cost in overburden	\$ 16,500.00	\$ 16,500.00	\$ 28,500.00	\$ 28,500.00	\$ 30,875.00	\$ 10,000.00	\$ 95,000.00	\$ 33,250.00	\$ 10,000.00	\$ 114,000.00	\$ -	\$ 19,000.00	\$ 52,250.00
Excavation cost in rock (1-3m)	\$ 82,500.00	\$ 82,500.00	\$ 106,875.00	\$ 106,875.00	\$ 115,781.25	\$ -	\$ 356,250.00	\$ 124,687.50	\$ -	\$ 427,500.00	\$ -	\$ 71,250.00	\$ 65,312.50
Excavation cost in rock (3-6m)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Bedding (Gran A)	\$ 10,890.00	\$ 10,890.00	\$ 18,810.00	\$ 18,810.00	\$ 20,377.50	\$ 6,600.00	\$ 62,700.00	\$ 21,945.00	\$ 6,600.00	\$ 75,240.00	\$ -	\$ 12,540.00	\$ 34,485.00
backfill (Gran B)	\$ 33,000.00	\$ 33,000.00	\$ 42,750.00	\$ 42,750.00	\$ 46,312.50	\$ -	\$ 142,500.00	\$ 49,875.00	\$ -	\$ 171,000.00	\$ -	\$ 28,500.00	\$ 26,125.00
landscaping (topsoil, hydroseed)	\$ 3,300.00	\$ 3,300.00	\$ -	\$ 285.00	\$ 1,140.00	\$ 3,000.00	\$ 4,275.00	\$ 1,140.00	\$ 3,000.00	\$ 4,275.00	\$ -	\$ -	\$ 4,275.00
HL3 (50mm; assuming asphalt resurfacing of just trench width)	\$ 6,600.00	\$ 6,600.00	\$ -	\$ 14,250.00	\$ 14,250.00	\$ -	\$ 51,300.00	\$ -	\$ -	\$ 102,600.00	\$ -	\$ -	\$ 34,200.00
HL8 (50mm; assuming asphalt resurfacing of just trench width)	\$ 6,050.00	\$ 6,050.00	\$ -	\$ 13,062.50	\$ 13,062.50	\$ -	\$ 47,025.00	\$ -	\$ -	\$ 94,050.00	\$ -	\$ -	\$ 31,350.00
gravel trail restoration	\$ -	\$ -	\$ 11,400.00	\$ 3,800.00	\$ 3,800.00	\$ -	\$ 20,900.00	\$ 14,060.00	\$ -	\$ 11,400.00	\$ -	\$ 11,400.00	\$ -
sewer pipe (inc. MHS, piping labour)	\$ 30,000.00	\$ 30,000.00	\$ 60,000.00	\$ 60,000.00	\$ 65,000.00	\$ -	\$ 200,000.00	\$ 70,000.00	\$ -	\$ 240,000.00	\$ -	\$ 40,000.00	\$ 110,000.00
Stormsewer & outfall Rehabilitation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 375,000.00	\$ -	\$ -	\$ 375,000.00	shared cost with other pond	\$ 375,000.00	shared cost with other pond
Complications factor (dewatering, creek crossings, approvals, tie-ins, commissioning, diversions, public, political etc.)	\$ 1.20	\$ 1.20	\$ 1.20	\$ 1.30	\$ 1.30	\$ 1.20	\$ 1.20	\$ 1.20	\$ 1.20	\$ 1.50	\$ 1.20	\$ 1.20	\$ 1.20
Stormsewer Cost	\$ 232,608.00	\$ 232,608.00	\$ 328,002.00	\$ 374,832.25	\$ 403,778.38	\$ 300,120.00	\$ 1,625,940.00	\$ 377,949.00	\$ 300,120.00	\$ 2,430,097.50	\$ -	\$ 675,228.00	\$ 429,597.00
	includes 150m of outfall replacement with larger size pipe on ex. easement property												
Subtotal	\$ 6,684,790.80	\$ 6,136,629.90	\$ 4,821,830.63	\$ 6,047,109.00	\$ 7,860,000.00	\$ 6,047,109.00	\$ 7,860,000.00	\$ 6,047,109.00	\$ 7,860,000.00	\$ 4,648,312.50	\$ 3,323,040.00	\$ 4,648,312.50	\$ 3,323,040.00
30% contingency	\$ 2,005,437.24	\$ 1,840,988.97	\$ 1,446,549.19	\$ 1,814,132.70	\$ 2,358,000.00	\$ 1,814,132.70	\$ 2,358,000.00	\$ 1,814,132.70	\$ 2,358,000.00	\$ 1,394,493.75	\$ 996,912.00	\$ 1,394,493.75	\$ 996,912.00
Total Capital Cost	\$ 8,690,000.00	\$ 7,980,000.00	\$ 6,270,000.00	\$ 7,860,000.00	\$ 10,218,000.00	\$ 7,860,000.00	\$ 10,218,000.00	\$ 7,860,000.00	\$ 10,218,000.00	\$ 6,040,000.00	\$ 4,320,000.00	\$ 6,040,000.00	\$ 4,320,000.00
Engineering (15%)	\$ 1,303,500.00	\$ 1,197,000.00	\$ 940,500.00	\$ 1,179,000.00	\$ 1,532,700.00	\$ 1,179,000.00	\$ 1,532,700.00	\$ 1,179,000.00	\$ 1,532,700.00	\$ 906,000.00	\$ 648,000.00	\$ 906,000.00	\$ 648,000.00
Interest Rate	3%												
Inflation Rate	2%												
Timeframe	32												
Operation and Maintenance Cost	O&M PV East End Option 1	O&M PV East End Option 2	O&M PV North End Option 1	O&M PV North End Option 2	O&M PV West End Option 1	O&M PV West End Option 2							
Annual maintenance (\$15,000/pond/year)	\$ 305,831.48	\$ 611,662.97	\$ 917,494.45	\$ 917,494.45	\$ 611,662.97	\$ 611,662.97							
Sediment Removal (\$500/m3 of sediment/pond/10 years); assuming sediment accumulation is 1.5m3/hectare/year; assuming sediment disposal is 'contaminated'	\$ 11,699.27	\$ 18,740.77	\$ 21,355.81	\$ 35,840.63	\$ 19,313.08	\$ 24,698.46							
O&M PV Total (over 32 years)	\$ 317,530.75	\$ 630,403.73	\$ 938,850.26	\$ 953,335.08	\$ 630,976.05	\$ 636,361.43							
Total Life Cycle Cost	\$ 9,007,530.75	\$ 8,610,403.73	\$ 7,264,000.00	\$ 8,854,000.00	\$ 6,695,860.21	\$ 4,975,860.21							