

**Dawson City Sewage Treatment Improvements**  
Dawson City, Yukon

Preliminary Design Level Construction Cost Estimate

Item	Description	Quantity	Unit	Unit Price	Extension (\$)
1.0	<b>General Requirements</b>	1	LS	NA	\$ 1,786,000
2.0	<b>Civil and Site Work</b>	1	LS	NA	\$ 5,845,425
3.0	<b>Architectural and Structural</b>	1	LS	NA	\$ 1,050,113
4.0	<b>Process Equipment</b>	1	LS	NA	\$ 2,454,698
	<i>Future Process Additions (Section 4.4 UV &amp; Salsnes not included in current estimate)</i>	1	LS	NA	\$ 417,300
5.0	<b>Building Mechanical</b>	1	LS	NA	\$ 690,788
6.0	<b>Electrical</b>	1	LS	NA	\$ 1,098,300
	Sub-Total				\$ 12,925,323
	Construction Contingency (approximately 15%)				\$ 1,940,000
	<b>TOTAL ESTIMATED CAPITAL COST</b>				<b>\$ 14,865,323</b>

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)
<b>1.0</b>	<b>GENERAL REQUIREMENTS</b>				
1.1	50% Performance & Labour Bonds	1	LS	60,000	\$ 60,000
1.2	Insurance	1	LS	150,000	\$ 150,000
1.3	Overhead - Indirect Costs (5% of project value)	1	LS	578,000	\$ 578,000
1.4	Profit (5% of project value)	1	LS	578,000	\$ 578,000
1.5	Site soft costs	12	months	35,000	\$ 420,000
	<b>TOTAL 1.0 - GENERAL REQUIREMENTS</b>				<b>\$ 1,786,000</b>

Overhead is based on 5% of the project cost before including the construction contingency and general requirements. The contractor overhead covers office management and support staff, main office costs, etc.

Profit is based on 2% of the total project cost before including the construction contingency and general requirements.

Site soft cost are for construction power, site office, site foreman, first-aid attendant, telephones, site trailers, crew trucks and other miscellaneous support equipment located on-site.

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)	Market Adjustment 50%
<b>2.0</b>	<b>CIVIL</b>					
<b>2.1</b>	<b>Earthwork</b>					
2.1.1	<u>Mob Demob</u> Allowance	1	LS	150,000	150,000	225,000
	Total 2.1.1 - Mob Demob				150,000	225,000
2.1.2	<u>Lagoons</u>					
	Excavation & stockpile	62000	m3	5	310,000	465,000
	Common Fill (replace & compact)	60000	m3	5	300,000	450,000
	Imported Fill (place & compact)	26800	m3	25	670,000	1,005,000
	Pond liner and sand cushion	36200	m2	28	1,013,600	1,520,400
	Total 2.1.2 - Lagoons				2,293,600	3,440,400
2.1.3	<u>Site Surfacing</u>					
	150mm Subgrade Preparation	6780	m2	8	50,850	76,275
	Imported Crush (place & compact)	1400	m3	50	70,000	105,000
	Site Gravel	300	m3	45	13,500	20,250
	Concrete	100	m2	180	18,000	27,000
	Total 2.1.3 - Site Surfacing				152,350	228,525
2.1.4	<u>Dewatering</u>					
	Dewatering Allowance	1	LS	75,000	75,000	112,500
	Total 2.1.4 - Dewatering				75,000	112,500
	<b>Total 2.1 - Earthwork</b>				<b>2,670,950</b>	<b>4,006,425</b>
<b>2.2</b>	<b>Piping</b>					
2.2.1	<u>Lagoon Piping</u>					
	Isolation valve allowance - 400mm Chamber valves	1	LS	300,000	300,000	450,000
	400mm piping supply & installation	540	Lin.m.	350	189,000	283,500
	350mm piping supply & installation	80	Lin.m.	325	26,000	39,000
	Yard piping	100	Lin.m.	300	30,000	45,000
	Precast manhole w. modifications	4	ea	20,000	80,000	120,000
	Total 2.2.1 Lagoon Piping				625,000	937,500
2.2.2	<u>Influent and Effluent Forcemains</u>					
	200mm forcemain supply & Installation	2160	Lin.m.	250	540,000	810,000
	Tie into existing piping	4	ea	2,500	10,000	15,000
	Tie into existing dyke manhole	1	ea	1,000	1,000	1,500
	Klondike Highway crossing (allowance)	1	LS	50,000	50,000	75,000
	Total 2.2.2 - Influent and Effluent Forcemains				601,000	901,500
	<b>TOTAL 2.2 - Piping</b>				<b>1,226,000</b>	<b>1,839,000</b>
	<b>TOTAL 2.0 - CIVIL</b>				<b>3,896,950</b>	<b>5,845,425</b>

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)	Market Adjustment X%
<b>3.0</b>	<b>STRUCTURAL</b>					
<b>3.1</b>	<b>WWTP Building</b>					
3.1.1	<u>Sitework</u>					
	Excavation	1000	m3	15	15,000	22,500
	Backfilling	750	m3	35	26,250	39,375
	Gravel fill	100	m3	50	5,000	7,500
	Weeping tile	200	m	22	4,400	6,600
	Exterior sidewalks	100	sqm	60	6,000	9,000
	Total 3.1.1 - Siteworks				56,650	84,975
3.1.2	<u>concrete</u>					
	Foundation wall	70	m3	800	56,000	84,000
	Strip footing	10	m3	800	8,000	12,000
	Anchor bolts	50	each	200	10,000	15,000
	Interior pad footings	5	m3	800	4,000	6,000
	Sumps & trenches	2	m3	800	1,600	2,400
	Structural slab	65	m3	800	52,000	78,000
	Concrete on metal deck	200	m2	100	20,000	30,000
	Total 3.1.2 - Concrete				151,600	227,400
3.1.3	<u>Metals</u>					
	Beams	13	tnes	5,000	65,000	97,500
	Columns	3	tnes	5,000	12,500	18,750
	Bollards	8	each	350	2,800	4,200
	Misc steel	1	tnes	5,000	5,000	7,500
	Open web steel joists	5	tnes	5,000	25,000	37,500
	Metal deck	525	m2	25	13,125	19,688
	Handrails	4	m	300	1,200	1,800
	Grating	3	m2	200	600	900
	Stair treads	25	riser	200	5,000	7,500
	Total 3.1.3 - Metals				130,225	195,338
3.1.4	<u>wood and plastics</u>					
	Wood cladding and trim	660	m2	200	132,000	198,000
	Exterior stud walls	660	m2	100	66,000	99,000
	Decorative wood	1	each	3,000	3,000	4,500
	Plywood sheathing	1200	m2	8	9,600	14,400
	Millwork	6	m2	600	3,600	5,400
	Total 3.1.4 - wood & plastic				214,200	321,300
3.1.5	<u>Thermal and Moisture</u>					
	Batt insulation	660	m2	25	16,500	24,750
	Rigid insulation	1000	m2	16	16,000	24,000
	Vapour barrier	660	each	15	9,900	14,850
	Roofing	350	m2	70	24,500	36,750
	Metal cladding	75	m2	50	3,750	5,625
	Metal liner	750	m2	35	26,250	39,375
	Fire proofing spray	250	m2	40	10,000	15,000
	Total 3.1.5 - Thermal and Moisture				106,900	160,350
3.1.6	<u>Doors and Windows</u>					
	Hollow metal door	25	each	900	22,500	33,750
	Overhead door	9	m2	200	1,800	2,700
	Windows	20	m2	200	4,000	6,000
	Louvres	3	m2	500	1,500	2,250
	Total 3.1.6 - Doors and Windows				29,800	44,700
3.1.7	<u>Finishes</u>					
	Acoustic tile	25	m2	25	625	938
	Wallboard	200	m2	40	8,000	12,000
	Vinyl tile	25	m2	35	875	1,313
	Painting	200	m2	6	1,200	1,800
	Total 3.1.7 - Finishes				10,700	16,050
	<b>Total 3.1 - WWTP</b>				<b>700,075</b>	<b>1,050,113</b>
	<b>TOTAL 3.0 - STRUCTURAL</b>				<b>700,075</b>	<b>1,050,113</b>

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)	Market Adjustment 50%
<b>4.0</b>	<b>PROCESS MECHANICAL</b>					
<b>4.1</b>	<b>Townsite Mechanical Equipment</b>					
4.1.1.	<u>Pump Replacement</u>					
	Submersible Effluent Pump (37 l/s at 42 m)	3	ea	14,982	44,946	67,419
	Check Valve - 100mm	3	ea	2,500	7,500	11,250
	Demo / Salvage of existing piping	1	LS	25,000	25,000	37,500
	Total 4.1.1 - Pump Replacement				77,446	116,169
	<b>Total 4.1 Townsite Mechanical Equipment</b>				<b>77,446</b>	<b>116,169</b>
<b>4.2</b>	<b>WWTP Mechanical Equipment</b>					
4.2.1	<u>Aeration System</u>					
	Blowers	1	ea	70,000	70,000	105,000
	Aeration Grids and Piping	1	ea	800,000	800,000	1,200,000
	Miscellaneous and Installation	1	LS	10,500	10,500	15,750
	Total 4.1.1 - Aeration System				880,500	1,320,750
4.2.2	<u>Rotary Drum Screen &amp; Washer Compactor</u>					
	Rotary Drum Screen & Washer Compactor	1	ea	122,819	122,819	184,229
	Miscellaneous Piping and Installation	1	LS	15,000	15,000	22,500
	Screenings Collection Trailer	1	ea	11,000	11,000	16,500
	Total 4.1.2 - Rotary Drum Screen & Washer Compactor				148,819	223,229
4.2.3	<u>Septage Handling</u>					
	Metcon Hogwash Septage Receiving System	1	ea	275,000	275,000	412,500
	Miscellaneous Piping and Installation	1	LS	15,000	15,000	22,500
	Screening Collection Hopper	1	ea	5,000	5,000	7,500
	Total 4.1.3 - Septage Handling				295,000	442,500
4.2.4	<u>Effluent Pumps</u>					
	Self Priming Centrifugal - (46 l/s at 26 m), 30 HP	2	ea	20,100	40,200	60,300
	Check Valve (100mm)	2	ea	2,500	5,000	7,500
	Miscellaneous piping and installation	1	LS	10,000	10,000	15,000
	Total 4.1.6 - Effluent Pumps				55,200	82,800
	<b>Total 4.2 - WWTP Mechanical Equipment</b>				<b>1,657,719</b>	<b>2,486,579</b>
<b>4.3</b>	<b>Process Piping and Appurtenances</b>					
4.3.1	<u>Piping, Fittings, Valves</u>					
	Control valves & actuators	1	LS	33,000	33,000	49,500
	Process piping - 100 mm diameter	5	lin.m.	500	2,500	3,750
	Process piping - 250 mm diameter	15	lin.m.	800	12,000	18,000
	Process piping - 350 mm diameter	20	lin.m.	1,200	24,000	36,000
	Process piping - 400 mm diameter	5	lin.m.	1,600	8,000	12,000
	Installation allowance	1	LS	100,000	100,000	150,000
	Total 4.3.1 - Piping, Fittings, Valves				179,500	269,250
	<b>Total 4.2 - Piping, Fittings and Valves</b>				<b>179,500</b>	<b>269,250</b>
	<b>TOTAL 4.0 - PROCESS MECHANICAL</b>				<b>1,914,665</b>	<b>2,871,998</b>
<b>4.4</b>	<b>Future Process Additions</b>					
4.4.1	<u>UV</u>					
	Trojan UV 3300K c/w stainless steel channels, turnbox, 2 bank, 2 lamps	2	ea	57,750	115,500	173,250
	Miscellaneous Piping and Installation	1	LS	7,500	7,500	11,250
	Total 4.1.4 - UV				123,000	184,500
4.4.2	<u>Salsnes</u>					
	Filter supply	1	ea	134,200	134,200	201,300
	Filter shipping from Norway	1	ea	6,000	6,000	9,000
	Filter commissioning	1	LS	5,000	5,000	7,500
	Miscellaneous Piping and Installation	1	LS	10,000	10,000	15,000
	Total 4.1.5 - Salsnes				155,200	232,800
	<b>Total 4.4 - Future Process Additions</b>					<b>417,300</b>

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)	Market Adjustment 50%
<b>5.0</b>	<b>BUILDING MECHANICAL</b>					
<b>5.1</b>	<b>Plumbing</b>					
	DCW Piping - 100 mm diameter	10	lin.m.	140	1,400	2,100
	Double Check Backflow Preventer	1	ea	400	400	600
	DCW Piping - 50 mm diameter	25	lin.m.	40	1,000	1,500
	DCW Piping - 25 mm diameter	25	lin.m.	20	500	750
	Hose Reels	2	ea	2,000	4,000	6,000
	DHW Piping - 50 mm diameter	20	lin.m.	40	800	1,200
	DHW Piping - 25 mm diameter	15	lin.m.	20	300	450
	DHW/DCW Fittings	20	ea	30	600	900
	DHW/DCW Valves	10	ea	50	500	750
	25 mm fibreglass insulation for DCW/DHW	95	lin.m.	10	950	1,425
	Sanitary Piping - 100 mm diameter	50	lin.m.	40	2,000	3,000
	Sanitary Fittings	20	ea	20	400	600
	Floor Drains	10	ea	400	4,000	6,000
	P Traps	10	ea	100	1,000	1,500
	Fuel Oil Piping	100	lin.m.	50	5,000	7,500
	Outdoor Piping	1	LS	10,000	10,000	15,000
	Fuel Oil Fittings	20	ea	20	400	600
	Fuel Oil Valves	10	ea	50	500	750
	Fuel Oil Pumps	2	ea	1,000	2,000	3,000
	Outdoor Tank	1	ea	25,000	25,000	37,500
	Daytank	2	ea	3,000	6,000	9,000
	Electric Hot Water Heater	1	ea	2,000	2,000	3,000
	Washroom Fixtures	1	ea	2,500	2,500	3,750
	Oil-Fired Boilers	4	ea	3,000	12,000	18,000
	Fire Extinguishers	10	ea	200	2,000	3,000
	Misc. Plumbing	1	LS	1,000	1,000	1,500
	<b>Total 5.1 - Plumbing</b>				<b>86,250</b>	<b>129,375</b>
<b>5.2</b>	<b>HVAC</b>					
	Glycol Piping - 50 mm diameter	75	lin.m.	30	2,250	3,375
	Glycol Specialities	1	LS	5,000	5,000	7,500
	Unit Heaters	10	ea	700	7,000	10,500
	Motorized Dampers	10	ea	500	5,000	7,500
	Balancing Dampers	30	ea	50	1,500	2,250
	Fire Dampers	1	LS	1,000	1,000	1,500
	SS Ducting - 600 mm diameter	140	lin.m.	50	7,000	10,500
	SS Ducting - 350 mm diameter	20	lin.m.	30	600	900
	Supply Air Grilles	30	ea	200	6,000	9,000
	Return Air Grilles	30	ea	80	2,400	3,600
	MUA (4000 cfm)	2	ea	40,000	80,000	120,000
	MUA (1000 cfm for elec. Rm)	1	ea	10,000	10,000	15,000
	Intake Air Louvres	10	ea	1,000	10,000	15,000
	Exhaust Air Louvres	5	ea	1,000	5,000	7,500
	Exhaust Fan (10000 cfm)	1	ea	5,000	5,000	7,500
	Exhaust Fans	5	ea	1,000	5,000	7,500
	Insulation for Ducting	1	LS	3,000	3,000	4,500
	Insulation for Piping	1	LS	2,250	2,250	3,375
	Misc. HVAC	1	LS	5,000	5,000	7,500
	<b>Total 5.1 - HVAC</b>				<b>163,000</b>	<b>244,500</b>
<b>5.3</b>	<b>Controls</b>	1	LS	30,000	<b>30,000</b>	<b>45,000</b>
<b>5.4</b>	<b>Foul Air System</b>	1	LS	50,000	<b>50,000</b>	<b>75,000</b>
<b>5.5</b>	<b>O&amp;M Manuals</b>	1	LS	10,000	<b>10,000</b>	<b>15,000</b>
<b>5.6</b>	<b>Air/Water Testing and Balancing</b>	1	LS	10,000	<b>10,000</b>	<b>15,000</b>
<b>5.7</b>	<b>Mechanical General Conditions</b>	1	LS	5,000	<b>5,000</b>	<b>7,500</b>
<b>5.8</b>	<b>Labour (30% of Total)</b>	30	%	-	<b>106,275</b>	<b>159,413</b>
	<b>TOTAL 5.0 - BUILDING MECHANICAL</b>				<b>460,525</b>	<b>690,788</b>

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Item	Description	Quantity	Unit	Unit Price	Extension (\$)	Market Adjustment 50%
<b>6.0</b>	<b>ELECTRICAL</b>					
<b>6.1</b>	<b>Townsite Liftstation</b>					
	Modifications	1	LS	45,000	45,000	67,500
	<b>Total 6.1 - Townsite Liftstation</b>				<b>45,000</b>	<b>67,500</b>
<b>6.2</b>	<b>New WWTP</b>					
6.2.1	<u>Distribution</u>					
	Site Servicing	1	LS	20,000	20,000	30,000
	New MDP	1	LS	60,000	60,000	90,000
	Motor Control	1	LS	65,000	65,000	97,500
	Emergency Generator	1	LS	180,000	180,000	270,000
	General Receptacles	1	LS	2,000	2,000	3,000
	<b>Total 6.2.1 - Distribution</b>				<b>327,000</b>	<b>490,500</b>
6.2.2	<u>Lighting</u>					
	Interior	1	LS	16,000	16,000	24,000
	Exterior	1	LS	4,000	4,000	6,000
	Control	1	LS	2,000	2,000	3,000
	<b>Total 6.2.2 - Lighting</b>				<b>22,000</b>	<b>33,000</b>
6.2.3	<u>Low Tension System</u>					
	Telephone Service	1	LS	5,000	5,000	7,500
	Telephone Outlets	1	LS	2,000	2,000	3,000
	Miscellaneous	1	LS	1,000	1,000	1,500
					<b>8,000</b>	<b>12,000</b>
	<b>Totoal 6.2 - New WWTP</b>				<b>357,000</b>	<b>535,500</b>
	<b>TOTAL 6.0 - INSTRUMENTATION</b>				<b>402,000</b>	<b>603,000</b>
<b>7.0</b>	<b>INSTRUMENTATION</b>					
<b>7.1</b>	<b>Townsite Lift Station (Upgrades)</b>					
	Demolition / removal of old system components	1	LS	5,000	5,000	7,500
	Temporary systems for use during control system retrofit	1	LS	3,000	3,000	4,500
	PLC based control system hardware	1	LS	16,000	16,000	24,000
	PLC based control system software and programming	1	LS	16,000	16,000	24,000
	Operator Interface terminal and peripherals	1	LS	3,500	3,500	5,250
	Operator Interface Software and Programming	1	LS	14,000	14,000	21,000
	Process Measurement Field Instruments (Xmitters & primary elements)	1	LS	14,000	14,000	21,000
	Gas Detection system	1	LS	14,000	14,000	21,000
	Control system field wiring and field terminations	1	LS	8,000	8,000	12,000
	Control system communications wiring and configuration	1	LS	12,500	12,500	18,750
	Control system cabinet wiring, components & terminations	1	LS	14,000	14,000	21,000
	Calibrations, Testing, Commissioning & Start-up	1	LS	9,500	9,500	14,250
	<b>Total 7.1 - Townsite Lift Station</b>				<b>129,500</b>	<b>194,250</b>
<b>7.2</b>	<b>New WWTP</b>					
	PLC based control system hardware	1	LS	28,000	28,000	42,000
	PLC based control system software and programming	1	LS	30,000	30,000	45,000
	Operator Interface Computer and peripherals	1	LS	6,200	6,200	9,300
	Operator Interface Software and Programming	1	LS	18,000	18,000	27,000
	Process Measurement Field Instruments (Xmitters & primary elements)	1	LS	32,000	32,000	48,000
	Gas Detection system	1	LS	14,000	14,000	21,000
	Control system field wiring and field terminations	1	LS	26,000	26,000	39,000
	Control system communications wiring and configuration	1	LS	12,500	12,500	18,750
	Control system cabinet wiring, components & terminations	1	LS	20,000	20,000	30,000
	Calibrations, Testing, Commissioning & Start-up	1	LS	14,000	14,000	21,000
	<b>Total 7.2 - WWTP</b>				<b>200,700</b>	<b>301,050</b>
	<b>TOTAL 7.0 - INSTRUMENTATION</b>				<b>330,200</b>	<b>495,300</b>
	<b>TOTAL COST E &amp; I</b>				<b>732,200</b>	<b>1,098,300</b>

Dawson City  
 Sewage Treatment Improvements  
 Operation and Maintenance Cost Estimate

Date 18-May-05

Preliminary Design Operation and Maintenance Cost Estimate

Description	Quan.	Req'd power <sup>1</sup>	UofM	Unit Usage/day	Cost/ Unit of Measure <sup>2</sup> \$	Total Annual Cost \$
<b>PROCESS</b>						
Septage	1	1.40	kW	3	\$0.14 /kWH	\$ 215
Rotary Drum Screen	2	0.84	kW	24	\$0.14 /kWH	\$ 2,060
Blowers (100 hp)	2	52.22	kW	24	\$0.14 /kWH	\$ 128,085
Effluent Pumps	1	15.40	kW	20	\$0.14 /kWH	\$ 15,739
Small motors	3	0.26	kW	12	\$1.14 /kWH	\$ 3,880
					<b>subtotal &gt;</b>	<b>\$ 149,764</b>
<b>MECHANICAL</b>						
Electric - Auxillary Consumption						\$ 5,482
Electric - Auxillary Demand						\$ 1,190
Electric - Ventilation Consumption						\$ 17,095
Electric - Ventilation Demand						\$ 1,891
Electric - Heating Consumption						\$ 50
Electric - Heating Demand						\$ 38
Fuel Oil - Ventilation Consumption						\$ 23,891
Fuel Oil - Space Heating Consumption						\$ 10,148
					<b>subtotal &gt;</b>	<b>\$ 59,785</b>
<b>ELECTRICAL</b>						
Exterior Lighting	10	0.12	kW	8	\$0.14 /kWH	\$ 491
Interior Lighting	40	0.063	kW	4.00	\$0.14 /kWH	\$ 515
Receptacles	20	0.6	kW	4.00	\$0.14 /kWH	\$ 2,453
					<b>subtotal &gt;</b>	<b>\$ 3,458</b>
<b>Total Annual O&amp;M Material Cost</b>						
						\$ 213,008
<b>Miscellaneous Supplies and Replacement Items (10%)</b>						
						\$ 21,301
<b>Total Annual O&amp;M Labour Cost<sup>3</sup></b>						
						\$ 59,353
<b>Total Annual O&amp;M Cost</b>						
						\$ 293,662
<b>Recommended Equipment Replacement Fund<sup>4</sup></b>						
						\$ 124,296

(GST not incl.)

**Notes:**

- 1 - 0.7 power factors used for all pumps
- 2 - Based on a power cost in Dawson City of \$0.14/kWH
- 3 - Labour costs is assumed 2.5 h/day at \$65/h comprehensive labour cost.
- 4 - The Equipment replacement fund is based on 4% of the capital equipment costs for the mech & elect equipment.