APPENDIX B

Cost Estimate Sheets

THIS PAGE INTENTIONALLY LEFT BLANK

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
ACWPD North Plant Loadout Facility

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 152,000	Excludes misc. expenses
Division 1 Subtotal							**$ 152,000**	
Civil/ Sitework								
Site Improvements	1	LS	$ 30,000	$ 30,000			$ 30,000	Grading and paving
Civil Subtotal							**$ 30,000**	
Demolition -								
Demo conveyors	1	LS	$ 15,000	$ 15,000			$ 15,000	Belt conveyors to be replaced w/ screw
Demolition Subtotal							**$ 15,000**	
Architectural								
Loadout Building	2,500	SF	$ 200	$ 500,000			$ 500,000	Two bays (scaled up from Glens Falls project)
Architectural Subtotal							**$ 500,000**	
Mechanical -								
Sludge Loading Conveyors	2	EA	$ 250,000	$ 500,000	$ 83,333	$ 166,666	$ 667,000	Prices from Glens Falls project SOV
Mechanical Subtotal							**$ 670,000**	
Electrical and I&C -								
CCTV Monitoring	1	LS	$ 10,000	$ 10,000	$ 5,000	$ 5,000	$ 15,000	Scaled down from BSA project estimate
Electrical - 15% of Mechanical Subtotal	15%						$ 101,000	
I&C - 8% of Mechanical Subtotal	8%						$ 54,000	
Electrical and I&C Subtotal							**$ 170,000**	
Miscellaneous								
Miscellaneous Expenses	25%						$ 384,000	
Miscellaneous Subtotal							**$ 384,000**	
CONSTRUCTION COST - SUB TOTAL							$ 1,921,000	
GENERAL CONTINGENCIES				30%			$ 576,000	
CONTRACTOR OVERHEAD				8%			$ 154,000	
CONTRACTOR PROFIT				7%			$ 134,000	
TAXES+BOND+INSURANCE				4%			$ 77,000	
TOTAL CONSTRUCTION COSTS							**$ 2,862,000**	

Annual O&M	$ 13,400	2.0% mechanical	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
ACWPD South Plant Loadout Facility

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 143,000	
Division 1 Subtotal							**$ 143,000**	
Civil/ Sitework								
Site Improvements	1	LS	$ 30,000	$ 30,000			$ 30,000	Grading and paving
Civil Subtotal							**$ 30,000**	
Demolition -								
Demo conveyors, some grating on top floor	1	LS	$ 15,000	$ 15,000			$ 15,000	Belt conveyors to be replaced w/ screw
Demolition Subtotal							**$ 15,000**	
Structural								
Structural for new grating floor	1	LS	$ 100,000	$ 100,000			$ 100,000	Set grating floor at lower elevation
Structural Subtotal							**$ 100,000**	
Mechanical -								
Belt Filter Press	1	EA	$ 400,000	$ 400,000	$ 200,000	$ 200,000	$ 600,000	Assumed (SLC project)
Sludge Loading Conveyors	2	EA	$ 100,000	$ 200,000	$ 50,000	$ 100,000	$ 300,000	Assumed (Glens Falls project SOV)
Infrared Heaters	1	LS	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 30,000	Assumed
Lighting Fixtures	8	EA	$ 300	$ 2,400	$ 100	$ 800	$ 3,000	RS Means; high-bay pendant mounted
Mechanical Subtotal							**$ 930,000**	
Electrical and I&C -								
CCTV Monitoring	1	LS	$ 10,000	$ 10,000	$ 5,000	$ 5,000	$ 15,000	Scaled down from BSA project estimate
Electrical - 15% of Mechanical Subtotal	15%						$ 140,000	
I&C - 8% of Mechanical Subtotal	8%						$ 74,000	
Electrical and I&C Subtotal							**$ 229,000**	
Miscellaneous								
Miscellaneous Expenses	25%						$ 362,000	
Electrical and I&C Subtotal							**$ 362,000**	
CONSTRUCTION COST - SUB TOTAL							$ 1,809,000	
GENERAL CONTINGENCIES				30%			$ 543,000	
CONTRACTOR OVERHEAD				8%			$ 145,000	
CONTRACTOR PROFIT				7%			$ 127,000	
TAXES+BOND+INSURANCE				4%			$ 72,000	
TOTAL CONSTRUCTION COSTS							**$ 2,696,000**	

Annual O&M $ 18,600 2.0% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Biogas-Fired Thermal Oil Heater

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 127,000	
Division 1 Subtotal							**$ 127,000**	
Mechanical -								
Biogas/NG Thermal Oil Boiler	1	LS	$ 300,140	$ 300,140	$ 45,000	$ 45,000	$ 345,000	Quote from CDM Report
Gas Booster to Boiler	1	LS	$ 240,000	$ 240,000	$ 36,000	$ 36,000	$ 276,000	CDM Cost Estimate
Therminol Piping Modifications	1	LS	$ 100,000	$ 100,000	$ -	$ -	$ 100,000	Assumed (from EA)
Control Valves	1	LS	$ 25,000	$ 25,000	$ -	$ -	$ 25,000	Assumed (from EA)
Hot Water Piping modifications	1	LS	$ 50,000	$ 50,000	$ -	$ -	$ 50,000	Extending existing hot water loop to heat digesters (assumed).
Additional Biogas Conditioning System	1	LS	$ 200,000	$ 200,000	$ -	$ -	$ 200,000	Assumed (from EA) - add'l filters, activated carbon
Mechanical Subtotal							**$ 1,000,000**	
Electrical and I&C -								
Electrical - 10% of Mechanical Subtotal	10%						$ 100,000	
I&C - 5% of Mechanical Subtotal	5%						$ 50,000	
Electrical and I&C Subtotal							**$ 150,000**	
CONSTRUCTION COST - SUB TOTAL							$ 1,277,000	
GENERAL CONTINGENCIES				30%			$ 383,000	
CONTRACTOR OVERHEAD				8%			$ 102,000	
CONTRACTOR PROFIT				7%			$ 89,000	
TAXES+BOND+INSURANCE				4%			$ 51,000	
TOTAL CONSTRUCTION COSTS							**$ 1,902,000**	

Annual O&M	$	20,000	2.0% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Cake Receiving/Rewetting Facility

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 539,000	
Division 1 Subtotal							**$ 539,000**	
Architectural -								
Recoating of Sludge Holding Tanks	12,800	SF	$ 25	$ 320,000			$ 320,000	From CDM report: 6400 SF for 2 tanks
Architectural Subtotal							**$ 320,000**	
Civil/ Sitework								
Demolition of existing sludge holding tank mixers	1	LS	$ 60,000	$ 60,000			$ 60,000	Assumption (from EA)
Excavation for bunker to house hopper below grade	725	CY	$ 10	$ 7,250			$ 7,250	Based on min bunker dimensions from SPIRAC
Dewatering (Structure)	725	CY	$ 10	$ 7,250			$ 7,250	Unit price assumed from SLC digester project
Sheeting and Shoring next to Wetlands	3,890	SF	$ 25	$ 97,000			$ 97,000	Unit price assumed from SLC digester project
Structural backfill for 3-ft (aver depth)	103	CY	$ 15	$ 2,000	$ 10	$ 1,000	$ 3,000	Unit price assumed from SLC digester project
Backfill	120	CY	$ 15	$ 2,000	$ 10	$ 1,000	$ 3,000	Unit price assumed from SLC digester project
Civil Subtotal							**$ 177,500**	
Architectural -								
Truck offloading/hopper building	3,000	SF	$ 200	$ 600,000		$ -	$ 600,000	75'x36' (sized based on SLC project)
Truck weigh scale	1	LS	$ 80,000	$ 80,000	$ 40,000	$ 40,000	$ 120,000	Assumed from BSA project
Ventillation to Odor Control	1	EA	$ 50,000	$ 50,000	$ 25,000	$ 25,000	$ 75,000	Assumed
Architectural Subtotal							**$ 800,000**	
Mechanical -								
Top Mounted Linear Motion Mixers (1 per tank)	4	EA	$ 150,000	$ 600,000	$ 150,000	$ 150,000	$ 750,000	Sludge holding tanks
Cake Receiving System (100 CY hopper)	2	EA	$ 580,000	$ 1,160,000	$ 464,000	$ 464,000	$ 1,624,000	From CDM report Spirac quote
Cake Pump	2	EA	$ 100,000	$ 200,000	$ 80,000	$ 80,000	$ 280,000	Spirac quote for each hopper
Mechanical Mixer	2	EA	$ 40,000	$ 80,000	$ 40,000	$ 40,000	$ 120,000	Assumed from BSA project
General Piping and Fittings	1	LS	$ 150,000	$ 150,000	$ 75,000	$ 75,000	$ 225,000	Includes valves; assumed from BSA project
Rewetted Sludge Pumps	2	EA	$ 45,000	$ 90,000	$ 22,500	$ 45,000	$ 135,000	Assumed
Mechanical Subtotal							**$ 3,130,000**	
Electrical and I&C -								
Electrical - 10% of Mechanical Subtotal	10%						$ 313,000	
I&C - 5% of Mechanical Subtotal	5%						$ 157,000	
Electrical and I&C Subtotal							**$ 470,000**	
CONSTRUCTION COST - SUB TOTAL							$ 5,436,500	
GENERAL CONTINGENCIES				30%			$ 1,631,000	
CONTRACTOR OVERHEAD				8%			$ 435,000	
CONTRACTOR PROFIT				7%			$ 381,000	
TAXES+BOND+INSURANCE				4%			$ 217,000	
TOTAL CONSTRUCTION COSTS							**$ 8,101,000**	

O&M	$	62,600	2% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
CHP Turbine Unit

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 502,000	
Division 1 Subtotal							**$ 502,000**	
Mechanical -								
Turbine - incl compressor skid, freight, commisioning and training	1	EA	$ 2,666,700	$ 2,666,700	$ 266,670	$ 266,670	$ 2,933,000	Quote from Kinsley Energy
Thermal oil economizer	1	EA	$ 217,000	$ 217,000	$ 108,500	$ 108,500	$ 326,000	Assumed 75% of HW economizer from Kinsley quote
Ducting, piping modifications	1	LS	$ 100,000	$ 100,000	$ 50,000	$ 50,000	$ 150,000	Assumed (from EA)
Additional thermal oil piping mods	1	LS	$ 50,000	$ 50,000	$ -	$ -	$ 50,000	Assumed (from EA)
Additional control valves	1	LS	$ 50,000	$ 50,000	$ -	$ -	$ 50,000	Assumed (from EA)
Mechanical Subtotal							**$ 3,510,000**	
Electrical and I&C -								
Electrical - 10% of Mechanical Subtotal	20%						$ 700,000	
I&C - 5% of Mechanical Subtotal	10%						$ 350,000	
Electrical and I&C Subtotal							**$ 1,050,000**	
CONSTRUCTION COST - SUB TOTAL							$ 5,062,000	
GENERAL CONTINGENCIES				20%			$ 1,012,000	
CONTRACTOR OVERHEAD				8%			$ 405,000	
CONTRACTOR PROFIT				7%			$ 354,000	
TAXES+BOND+INSURANCE				4%			$ 202,000	
TOTAL CONSTRUCTION COSTS							**$ 7,035,000**	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Mesophilic Digester - Concrete

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 385,000	
Division 1 Subtotal							**$ 385,000**	
Civil/ Sitework								
Excavation (95-ft diam x 18-ft depth)	6,200	CY	$ 10	$ 62,000			$ 62,000	Assumed based on SLC digester
Dewatering (Structure)	6,200	CY	$ 10	$ 62,000			$ 62,000	Assumed based on SLC digester
Sheeting and Shoring next to Wetlands	6,840	SF	$ 25	$ 171,000			$ 171,000	Assumed based on SLC digester
Structural backfill for (108-ft diam x 3-ft (aver depth))	230	CY	$ 15	$ 3,000	$ 10	$ 2,000	$ 5,000	Assumed based on SLC digester
Backfill	1,150	CY			$ 10	$ 12,000	$ 12,000	Assumed based on SLC digester
Civil Subtotal							**$ 312,000**	
Architectural -								
Digester Control Building (SF per digester)	1,000	SF	$ 200	$ 200,000		$ -	$ 200,000	Assumed
Architectural Subtotal							**$ 200,000**	
Structural -								
Digester Walls - Cast in place	597	CY	$ 750	$ 448,000			$ 448,000	Labor and equipment included in price.
Digester Slab - Cast in place (x 1.25 for conical bottom)	656	CY	$ 750	$ 492,000			$ 492,000	Labor and equipment included in price.
Misc Metals	1	LS					$ 100,000	Assumed based on SLC digester
Structural Subtotal							**$ 1,040,000**	
Mechanical -								
Digester Top Mounted Linear Motion Mixers (1 per tank)	1	LS	$ 150,000	$ 150,000	$ 75,000	$ 75,000	$ 225,000	Ovivo quote
Digester Gas Handling Equipment (condensate trap, PRV, etc.)	1	LS	$ 50,000	$ 50,000			$ 50,000	Assumed based on SLC digester
General Piping and Fittings	1	LS	$ 250,000	$ 250,000			$ 250,000	Assumed based on SLC digester
Valves	1	LS	$ 50,000	$ 50,000			$ 50,000	20% of General Piping
Spiral Digester Heat Exchanger	1	EA	$ 20,000	$ 20,000	$ 10,000	$ 10,000	$ 30,000	Assumed based on SLC digester
Floating Steel Cover	1	EA	$ 611,000	$ 611,000	$ 305,500	$ 305,500	$ 916,500	Ovivo quote
Digested Sludge Pumps	2	EA	$ 45,000	$ 67,500	$ 22,500	$ 33,750	$ 101,250	Assumed
Mechanical Subtotal							**$ 1,620,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 243,000	
I&C - 5% of Mechanical Subtotal	5%						$ 81,000	
Electrical and I&C Subtotal							**$ 324,000**	
CONSTRUCTION COST - SUB TOTAL							$ 3,881,000	
GENERAL CONTINGENCIES				30%			$ 1,164,000	
CONTRACTOR OVERHEAD				8%			$ 310,000	
CONTRACTOR PROFIT				7%			$ 272,000	
TAXES+BOND+INSURANCE				4%			$ 155,000	
TOTAL CONSTRUCTION COSTS							**$ 5,782,000**	

Annual O&M per 1 MG	$ 23,100	2.5% mechanical
Cost Per 1 MG	$ 3,305,000.00	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Mesophilic Digester - Steel

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 336,000	
Division 1 Subtotal							**$ 336,000**	
Civil/ Sitework								
Excavation (95-ft diam x 18-ft depth)	6,200	CY	$ 10	$ 62,000			$ 62,000	Assumed based on SLC digester
Dewatering (Structure)	6,200	CY	$ 10	$ 62,000			$ 62,000	Assumed based on SLC digester
Sheeting and Shoring next to Wetlands	6,840	SF	$ 25	$ 171,000			$ 171,000	Assumed based on SLC digester
Structural backfill for (108-ft diam x 3-ft (aver depth))	230	CY	$ 15	$ 3,000	$ 10	$ 2,000	$ 5,000	Assumed based on SLC digester
Backfill	1,150	CY			$ 10	$ 12,000	$ 12,000	Assumed based on SLC digester
Civil Subtotal							**$ 312,000**	
Architectural -								
Digester Control Building (SF per digester)	1,000	SF	$ 200	$ 200,000		$ -	$ 200,000	Assumed
Architectural Subtotal							**$ 200,000**	
Structural -								
Digester Tank	1	EA	$ 196,431	$ 196,000	$ 57,791	$ 58,000	$ 254,000	Extrapolated from CDM quote
Pressurized Dome Adder	1	EA	$ 152,817	$ 153,000	$ 27,272	$ 27,000	$ 180,000	Kept from CDM quote
Foundation	1	EA	$ 2,500	$ 3,000			$ 3,000	Kept from CDM quote
Structural Subtotal							**$ 440,000**	
Mechanical -								
Digester Top Mounted Linear Motion Mixers (1 per tank)	1	EA	$ 150,000	$ 150,000	$ 75,000	$ 75,000	$ 225,000	Ovivo quote
Digester Gas Handling Equipment (condensate trap, PRV, etc.)	1	LS					$ 50,000	Assumed based on SLC digester
General Piping and Fittings	1	LS					$ 250,000	Assumed based on SLC digester
Valves	1	LS					$ 50,000	20% of General Piping
Spiral Digester Heat Exchanger	1	LS		$ 20,000		$ 10,000	$ 30,000	Assumed based on SLC digester
Gas Holder Cover	1	EA	$ 611,000	$ 611,000	$ 305,500	$ 305,500	$ 916,500	Ovivo quote
Digested Sludge Pumps	2	EA	$ 45,000	$ 67,500	$ 22,500	$ 33,750	$ 101,250	Assumed
Mechanical Subtotal							**$ 1,620,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 243,000	
I&C - 15% of Mechanical Subtotal	15%						$ 243,000	
Electrical and I&C Subtotal							**$ 486,000**	
CONSTRUCTION COST - SUB TOTAL							$ 3,394,000	
GENERAL CONTINGENCIES				30%			$ 1,018,000	
CONTRACTOR OVERHEAD				8%			$ 272,000	
CONTRACTOR PROFIT				7%			$ 238,000	
TAXES+BOND+INSURANCE				4%			$ 136,000	
TOTAL CONSTRUCTION COSTS							**$ 5,058,000**	

Annual O&M per 1 MG	$ 23,100	2.5% mechanical
Cost Per 1 MG	$ 2,891,000.00	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Engine CHP Unit

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 741,000	From WaterWorks
Air Permitting	1	LS	$ 30,000	$ 30,000			$ 30,000	
Division 1 Subtotal							**$ 771,000**	
Structural -								
Slab on Grade (2 ft Thick)	250	CY	$ 750	$ 187,500			$ 188,000	1 ft thick slab on grade in 20x60 space in mechanical building
Structural Subtotal							**$ 188,000**	
Architectural -								
Metal Framed Building	3,000	SF	$ 150	$ 450,000			$ 450,000	
Architectural Subtotal							**$ 450,000**	
Mechanical -								
Jenbacher 420 Engine Unit, Jacket water heat recovery, radiators, silencer, switchgear, controls, start-up and delivery	2	EA	$ 1,100,000	$ 2,200,000	$ 363,000	$ 726,000	$ 2,926,000	Assumed from SLC project
Thermal oil economizer	1	EA	$ 217,000	$ 217,000	$ 108,500	$ 108,500	$ 326,000	Assumed 75% of HW economizer from Kinsley quote
Emissions Controls	2	EA	$ 40,000	$ 80,000	$ 20,000	$ 40,000	$ 120,000	Assumed from SLC project
Metering	1	EA	$ 30,000	$ 30,000	$ 15,000	$ 15,000	$ 45,000	Assumed from SLC project
Hot Water Pumps	3	EA	$ 5,000	$ 15,000	$ 3,000	$ 9,000	$ 24,000	Assumed from SLC project
HRSG Adder	2	EA	$ 50,000	$ 100,000	$ 25,000	$ 50,000	$ 150,000	Assumed from SLC project
Interconnecting Piping and Valves	1	LS	$ 250,000	$ 250,000		$ -	$ 250,000	Assumed from SLC project
Additional Biogas Conditioning System	1	LS	$ 850,000	$ 850,000		$ -	$ 850,000	Additional biogas conditioning system - H2S removal
Mechanical Subtotal							**$ 4,690,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	20%						$ 940,000	
I&C - 10% of Mechanical Subtotal	10%						$ 470,000	
Electrical and I&C Subtotal							**$ 1,410,000**	
CONSTRUCTION COST - SUB TOTAL							$ 7,509,000	
GENERAL CONTINGENCIES				30%			$ 2,253,000	
CONTRACTOR OVERHEAD				8%			$ 601,000	
CONTRACTOR PROFIT				7%			$ 526,000	
TAXES+BOND+INSURANCE				4%			$ 300,000	
TOTAL CONSTRUCTION COSTS							**$ 11,189,000**	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
FOG Receiving Station

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 153,000	
Division 1 Subtotal							**$ 153,000**	
Structural -								
Concrete Foundation Slab	130	CY	$ 750	$ 98,000			$ 98,000	Labor and equipment included in price. Assumes 75x33 slab
Truck Unloading Slab	1	LS	$ 3,000	$ 3,000			$ 3,000	Labor and equipment included in price.
Tanks (40,000 gal insulated FRP)	3	EA	$ 180,000	$ 540,000	$ 27,000	$ 81,000	$ 621,000	From El Paso project (scaled up and adjusted for time and location)
Structural Subtotal							**$ 720,000**	
Mechanical -								
Grinder Type Feed/Recirculation Pumps	3	EA	$ 30,000	$ 90,000	$ 7,500	$ 22,500	$ 113,000	From El Paso project (adjusted for time and location)
Positive Displacement Feed Pumps to Digesters	3	EA	$ 15,000	$ 45,000	$ 3,750	$ 11,250	$ 56,000	From El Paso project (adjusted for time and location)
Spiral Heat Exchangers	3	EA	$ 60,000	$ 180,000	$ 15,000	$ 45,000	$ 225,000	From El Paso project (adjusted for time and location)
Piping, Metering and Valves	1	LS	$ 150,000	$ 150,000		$ -	$ 150,000	Installation included in price. Scaled up from El Paso project
Mechanical Subtotal							**$ 540,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 81,000	
I&C - 10% of Mechanical Subtotal	10%						$ 54,000	
Electrical and I&C Subtotal							**$ 135,000**	
CONSTRUCTION COST - SUB TOTAL							$ 1,548,000	
GENERAL CONTINGENCIES				30%			$ 464,000	
CONTRACTOR OVERHEAD				8%			$ 124,000	
CONTRACTOR PROFIT				7%			$ 108,000	
TAXES+BOND+INSURANCE				4%			$ 62,000	
TOTAL CONSTRUCTION COSTS							**$ 2,306,000**	

Annual O&M $ 10,800 2% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Gravity Belt Thickeners

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 148,000	
Division 1 Subtotal							**$ 148,000**	
Demolition -								
Demo DAFT tanks	1	LS	$ 125,000	$ 125,000			$ 125,000	Assumed (from EA)
Demolition Subtotal							**$ 130,000**	
Mechanical -								
GBT - 2.0m	3	EA	$ 255,000	$ 765,000	$ 63,750	$ 191,250	$ 956,000	GBT quote - includes odor enclosure, hopper, PLC, polymer system, booster pumps, star-up, freight, spares
General Piping and Fittings	1	LS	$ 30,000	$ 30,000	$ 15,000	$ 15,000	$ 45,000	Assumption
Valves	1	LS	$ 7,500	$ 7,500	$ 3,750	$ 3,750	$ 11,000	25% of General Piping
Mechanical Subtotal							**$ 1,010,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 152,000	
I&C - 5% of Mechanical Subtotal	5%						$ 51,000	
Electrical and I&C Subtotal							**$ 203,000**	
CONSTRUCTION COST - SUB TOTAL							$ 1,491,000	
GENERAL CONTINGENCIES				30%			$ 447,000	
CONTRACTOR OVERHEAD				8%			$ 119,000	
CONTRACTOR PROFIT				7%			$ 104,000	
TAXES+BOND+INSURANCE				4%			$ 60,000	
TOTAL CONSTRUCTION COSTS							**$ 2,221,000**	

O&M	$	20,200	2.0% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
SCSD Plant Loadout Facility

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	LS					$ 58,000	
Division 1 Subtotal							**$ 58,000**	
Civil/ Sitework								
Site Improvements	1	LS	$ 30,000	$ 30,000			$ 30,000	Grading and paving
Civil Subtotal							**$ 30,000**	
Demolition -								
Demo doors, steel, concrete	1	LS	$ 20,000	$ 20,000			$ 20,000	Bay doors, columns b/w doors, elevated steel platform
Demolition Subtotal							**$ 20,000**	
Structural								
Structural Improvements to Beams	1	LS	$ 100,000	$ 100,000			$ 100,000	Carry existing steel beams, move column
Structural Subtotal							**$ 100,000**	
Mechanical -								
Sludge Loading Conveyors	2	EA	$ 100,000	$ 200,000	$ 25,000	$ 50,000	$ 250,000	Assumed frm Glens Falls project SOV
Truck Bay Rollup Doors	3	EA	$ 3,100	$ 9,300	$ 900	$ 2,700	$ 12,000	RS Means 12'x12' rolling w/ motor operator
Loading Dock Rollup Door	1	EA	$ 3,100	$ 3,100	$ 800	$ 800	$ 4,000	RS Means 12'x12' rolling w/ motor operator
Stainless Steel Ductwork	1	LS	$ 15,000	$ 15,000	$ -	$ -	$ 15,000	Assumed
Lighting Fixtures	16	EA	$ 300	$ 4,800	$ 100	$ 1,600	$ 6,000	RS Means; high-bay pendant mounted
Mechanical Subtotal							**$ 290,000**	
Electrical and I&C -								
CCTV Monitoring	1	LS	$ 10,000	$ 10,000	$ 5,000	$ 5,000	$ 15,000	Scaled down from BSA project estimate
Electrical - 15% of Mechanical Subtotal	15%						$ 44,000	
I&C - 10% of Mechanical Subtotal	10%						$ 29,000	
Electrical and I&C Subtotal							**$ 88,000**	
Miscellaneous								
Miscellaneous Expenses	25%						$ 147,000	
Electrical and I&C Subtotal							**$ 147,000**	
CONSTRUCTION COST - SUB TOTAL							$ 733,000	
GENERAL CONTINGENCIES				30%			$ 220,000	
CONTRACTOR OVERHEAD				8%			$ 59,000	
CONTRACTOR PROFIT				7%			$ 51,000	
TAXES+BOND+INSURANCE				4%			$ 29,000	
TOTAL CONSTRUCTION COSTS							**$ 1,092,000**	

O&M	$	5,800	2.0% mechanical

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Strain Presses

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 59,000	
Division 1 Subtotal							**$ 59,000**	
Mechanical -								
Strain Press/Sludge Screen	2	EA	$ 150,000	$ 300,000	$ 37,500	$ 75,000	$ 375,000	From Huber quote
General Piping and Fittings	1	LS	$ 30,000	$ 30,000	$ 15,000	$ 15,000	$ 45,000	Assumption
Valves	1	LS	$ 7,500	$ 7,500	$ 3,750	$ 3,750	$ 11,250	25% of General Piping
Mechanical Subtotal							**$ 430,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 65,000	
I&C - 10% of Mechanical Subtotal	10%						$ 43,000	
Electrical and I&C Subtotal							**$ 108,000**	
CONSTRUCTION COST - SUB TOTAL							$ 597,000	
GENERAL CONTINGENCIES				30%			$ 179,000	
CONTRACTOR OVERHEAD				8%			$ 48,000	
CONTRACTOR PROFIT				7%			$ 42,000	
TAXES+BOND+INSURANCE				4%			$ 24,000	
TOTAL CONSTRUCTION COSTS							**$ 890,000**	

Annual O&M	$ 8,600	2% mechanical	

ACWPD/SCSD Regional Biosolids Facility
Capital Cost Estimate
Thermal Alkaline Hydrolysis

SCOPE OF WORK	QTY.	UNIT	MATERIAL		LABOR/EQUIPMENT		TOTAL AMOUNT	COMMENT
			Unit Rate	Amount	Unit Rate	Amount		
Division 1 Work - 11% of Subtotal	1	*LS*					$ 221,000	
Division 1 Subtotal							**$ 221,000**	
Structural -								
Concrete Slab on Grade	20	CY	$ 750	$ 15,000			$ 15,000	1 ft thick slab on grade
Structural Subtotal							**$ 15,000**	
Mechanical -								
PONDUS TCHP System	1.0	LS	$ 1,250,000	$ 1,250,000	$ 412,500	$ 412,500	$ 1,663,000	From Pondus TCHP Proposal 7/17/2016 Includes; (i) freight (ii)10 days with two trips start-up and commissioning (price halved for smaller system)
Mechanical Subtotal							**$ 1,660,000**	
Electrical and I&C -								
Electrical - 15% of Mechanical Subtotal	15%						$ 250,000	
I&C - 5% of Mechanical Subtotal	5%						$ 80,000	
Electrical and I&C Subtotal							**$ 330,000**	
CONSTRUCTION COST - SUB TOTAL							$ 2,226,000	
GENERAL CONTINGENCIES				30%			$ 668,000	
CONTRACTOR OVERHEAD				8%			$ 178,000	
CONTRACTOR PROFIT				7%			$ 156,000	
TAXES+BOND+INSURANCE				4%			$ 89,000	
TOTAL CONSTRUCTION COSTS							**$ 3,317,000**	

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

Vendor Quotes

THIS PAGE INTENTIONALLY LEFT BLANK

354 State Route 29 Greenwich, New York 12834
Phone No 518-695-6851
E-mail:dan@bdpindustries.com

Date: Monday, November 6, 2017

To: ARCADIS
855 Route 146 Suite 210
Clifton Park, NY 12065

Attn: Gary Hinds
Gary.Hinds@arcadis.com
518-250-7263

Re: Albany County, NY – Biosolids Handling Project
3 x 2.0m or 2 x 3.0m Enclosed Gravity Belt Thickener
Budget Proposal #: 101617-1117rev1

BDP Industries, Inc. is pleased to offer our quotation for three (3) 2.0 meter or two (2) 3.0 meter Enclosed Gravity Belt Thickener and accessories for the Albany County Sewer District waste water treatment facility. The units will achieve the performance as listed in the attached Design Calculations table. Below is a summary description of the scope.

EQUIPMENT DESCRIPTION

Two (2) or Three (3) BDP Gravity Belt Thickener (GBT) package including a complete Gravity Belt Thickener and appurtenant equipment described as follows:

1. Two (2) or Three (3) 316L stainless steel polymer injection and polymer/sludge mixing system consisting of an injection ring, variable vortex mixer, and reducing fittings.

2. Two (2) or Three (3) Gravity Belt Thickener as specified with the following design features:

    a.) 304 stainless steel plate frame.
    b.) Machined bearing pads.
    c.) Up-flow feedbox, conditioning tank / overflow weir distributor constructed of 304 stainless steel.
    d.) Variable speed paddle wheel distributor.
    e.) Sixteen Foot Long Gravity zone.
    f.) Ten (10) rows of adjustable, furrowing plows.
    g.) 304 stainless steel sludge dam.
    h.) 304 stainless steel wetted parts.
    i.) 316 stainless steel hardware.
    j.) Hydraulic tensioning and tracking system.
    k.) Self-cleaning, adjustable angle belt showers.
    l.) Machine mounted wash water pressure switch, solenoid valve, and pressure gauge.

354 State Route 29 Greenwich, New York 12834
Phone No 518-695-6851
E-mail:dan@bdpindustries.com

m.) Nylon coated rollers.
n.) Automatic hydraulic plow lift.
o.) Automatic hydraulic sludge dam lift.
p.) UHMW discharge blade.
q.) Dodge split case spherical bearings rated for 1,000,000 hours at 30 PLI.
r.) TEFC IP65 severe, variable speed drive motor.
s.) Schedule 40 PVC filtrate drains.
t.) PVC conduit.
u.) Emergency stop pull cords.
v.) Stainless steel NEMA 4X junction box.
w.) Machine filtrate pans.

3. Two (2) or Three (3) complete 304 stainless steel UL listed, NEMA 4X, electrical control panel for all Gravity Belt Thickener control functions. The control panel shall include an Allen Bradley 12" color Panelview Plus Operator Interface Terminal and an Allen Bradley Compact Logix PLC. The control panel will be capable of communicating via Ethernet communication. The panel shall include all motor starters for the wash water booster pump and hydraulic unit as well as the VFDs for the GBT drive motor.

4. Two (2) or Three (3) Goulds SSH wash water booster pump with 5 HP TEFC motors capable of boosting 45 GPM. Each wash water system will include y-strainer, pressure gauge, and solenoid valve.

5. Two (2) or Three (3) 1 HP hydraulic power units with 10 gallon 316 stainless steel reservoir.

6. Two (2) or Three (3) Siemens 6" magnetic flow meter with grounding rings and remote display.

7. Two (2) or Three (3) UGSI emulsion polymer make down system with 5 GPH neat pump and 2400 GPH dilution water capability.

8. Two (2) or Three (3) 304 stainless steel discharge hoppers with level control sensor.

9. Two (2) or Three (3) 304 stainless steel odor control hood.

10. One (1) lot of start up spare parts.

11. One year equipment warranty.

12. Seven (7) days over three (3) separate trips of start-up, mechanical checkout and operator training as required

13. Freight to job site.

354 State Route 29 Greenwich, New York 12834
Phone No 518-695-6851
E-mail:dan@bdpindustries.com

Each Gravity Belt Thickener will come completely factory-assembled, tested and will be shipped fully assembled. The polymer injection device, hydraulic unit, polymer system, flow meter, Wash Water Booster pump, discharge hopper, belt media, and electrical control panels will be packed separately. This quotation is for furnishing equipment only and does not include any other installation labor or field services other than checkout, start up and testing services as listed above. All installation, on-site assembly, and other work required to facilitate the setting of the equipment is to be by others. All materials and labor for interconnecting between the Gravity Belt Thickener and the auxiliary equipment is to be completed by others.

SUBMITTAL DATA

Submittals will be made in the number of copies specified and will be available within 4 to 6 weeks after firm purchase order and all information is received at the factory.

SHIPMENT

Approximate shipping weight of each gravity belt thickener is 12,000 pounds for the 2.0m GBT unit and 15,000 pounds for the 3.0m GBT. Estimated fabrication time is 20 to 24 weeks after receipt of submittal approval.

FIELD SERVICE

Installation observation, testing and operator instruction services as listed above will be supplied.

BUDGET PRICING

The total price for the above equipment is list below.

Qty	Description	Each	Total
3	2.0m EGBT	$160,000	$480,000
3	Odor enclosure	$12,000	$36,000
3	316 Stainless Steel Discharge Hopper	$10,000	$30,000
3	12” OIT Panelview Plus and Compact Logix PLC	$30,000	$90,000
3	Polymer System	$30,000	$90,000
3	Goulds SSH booster pumps	$4,500	$13,500
	Start-up services, Freight & Spares	$25,000	$25,000
	Total		$764,500

354 State Route 29 Greenwich, New York 12834
Phone No 518-695-6851
E-mail:dan@bdpindustries.com

Qty	Description	Each	Total
2	3.0m EGBT	$190,000	$380,000
2	Odor enclosure	$15,000	$30,000
2	316 Stainless Steel Discharge Hopper	$12,500	$25,000
2	12” OIT Panelview Plus and Compact Logix PLC	$30,000	$60,000
2	Polymer System	$30,000	$60,000
2	Goulds SSH booster pumps	$4,500	$9,000
	Start-up services, Freight & Spares	$25,000	$25,000
	Total		$589,000

This price includes the shipping cost to the job site or nearest unloading point. The price does not include unloading cost and applicable taxes of any kind. This quotation will be valid for sixty (60) days from the date of this proposal.

TERMS

Terms of payment are 90% upon shipment of equipment and 10% upon startup. The attached Conditions of Sale are hereby made a part of this proposal.

We appreciate this opportunity to extend our quotation and if we can answer questions or supply additional information, please do not hesitate to contact Peter Radosta of Koester Associates at 315-727-2534.

Sincerely,

Dan Fronhofer, PE
BDP Industries, Inc.

cc: A.J. Schmidt, BDP Industries, Inc.
Peter Radosta, Koester Associates

354 State Route 29 Greenwich, New York 12834
Phone No 518-695-6851
E-mail:dan@bdpindustries.com

THICKENING DESIGN CALCS
Albany County Sewer District, NY
Max Flow Conditions
Gravity Belt Thickeners

Design Performance	Condition 1 Blend 3.0m GBT	Condition 2 Primary & Rewetted Cake 2.0m GBT	Condition 3 WAS 2.0m GBT	UNITS
Maximum Flow Rate	500,000	200,000	385,000	GPD
Feed Solids	1.8	3.4	0.5	% Solids
Operation: Hours per Day	24	24	24	Hours per Day
Operation: Days per Week	7	7	7	Days per Week
Solids Throughput - Hourly	3,128	2,363	669	Dry Pounds per Hour
No. of GBTs in Operation	1	1	1	No. of Operating 3.0m GBT
Solids Loading per meter of belt width	1,043	1,182	334	Pounds per Hour per Meter
Hydraulic Loading per meter of belt width	116	69	134	GPM per Meter
Expect Polymer Dosage	4 - 6	3 - 5	8 - 14	lbs active per dry ton
Expected Discharge Solids	8	8	8	%
Expected Solids Capture	95	95	92	%

Operating Costs				UNITS
Hours per Day of operation	24	24	24	hours
Days per Week operating	7	7	7	Days
Total Hours per year	8,736	8,736	8,736	Hours - Total for all units
Annual Solids to Thickening	95,889	72,450	20,510	Dry Tons per Year
Polymer Costs				
Total Polymer Usage	383,557	217,349	164,077	Pounds of Active Polymer per year
Total Polymer Cost	$799,076.3	$452,809.9	$341,827.1	$ per year ($1.00 per neat lb)
Wear Parts Cost				
Total Cost of Belts	$3,145.0	$2,096.6	$1,572.5	
Total Cost Wear Parts	$262.1	$262.1	$262.1	
Hydraulic oil, Filters, & Misc.	$624.0	$624.0	$624.0	
Total Maintenance Cost	$4,031.0	$2,982.7	$2,458.6	$ per year
Energy Consumption				
Hydraulic Unit	1	1	1	HP
Gravity	5	3	2	HP
Booster Pump	7.5	5	5	HP
Total kW	8.0568	5.3712	4.7744	kW/hr for each Press operating
Yearly Energy Cost	$7,038.42	$4,692.28	$4,170.92	$ per Year (at $0.10 / kW-hr)
Water Usage				
Total Filtrate Water Usage	45	30	30	GPM

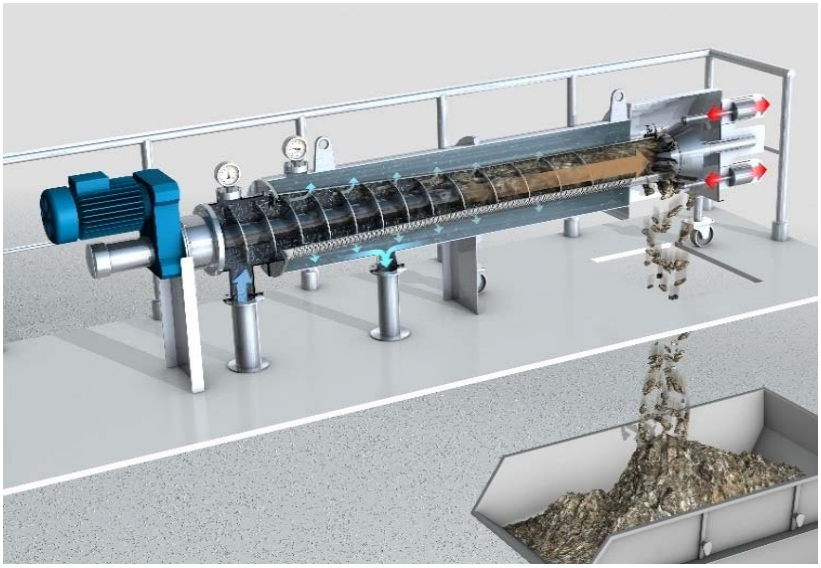
Total Costs	$810,145.7	$460,484.9	$348,456.5	$ per year

Budgetary Proposal

Project Name:
Albany WWTP, NY

Equipment Type:
Strainpress® 290 (5 mm)

Proposal Date:
10/17/2017



Huber Contacts:
Steve Macomber
Regional Sales Director - North
704-904-6349
Steve@hhusa.net

Ed Fritz, P.E.
Applications Engineer: Biosolids
704-990-2041
Ed.Fritz@hhusa.net

Represented by:
Peter Radosta
Koester Associates, Inc.
(315) 697-3800
peter@koesterassociates.com

HUBER TECHNOLOGY
WASTE WATER Solutions

Huber Technology, Inc.

9735 NorthCross Center Court
Suite A
Huntersville, NC 28078

Phone: (704) 949-1010
Fax: (704) 949-1020

Strainpress® 290 Design Summary

Albany WWTP, NY October 17, 2017

Sludge Characteristics

Upstream Process:	Information not provided
Upstream Process SRT:	Information not provided
Sludge Type:	WAS
Sludge Feed Rate:	367 gpm
Design Sludge Concentration:	1.9%

Equipment Design Parameters

Recommended Unit Quantity:	1		
Recommended Opening Size:	5 mm		
Maximum Hydraulic Loading Rate (per unit):	378 gpm	(85.9 m3/hr)	at 1.9% solids
Alternate Hydraulic Loading Rate (per unit):	287 gpm	(65.3 m3/hr)	at 3.9% solids
Alternate Hydraulic Loading Rate (per unit):	440 gpm	(99.9 m3/hr)	at 0.5% solids

NOTE: All performance is estimated based on typical Strainpress® 290 performance. In order to guarantee performance Huber must test the sludge or run a pilot test.

Estimated Screenings Dryness:	35-45% dry solids		
Maximum Screenings Removal Rate:	35 ft3/hr	(0.99 m3/hr)	
Typical Air Requirement:	0.53 SCFM at 102 psi		(15 L/min at 7 bar)
Maximum Air Requirement:	1.06 SCFM at 131 psi		(30 L/min at 9 bar)

Notes:

1. Equipment specification is available upon request.
2. If there are site-specific hydraulic constraints that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed system.
3. Electrical disconnects required per local NEC code are not included in this proposal.
4. Huber Technology warrants all components of the system against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever occurs first.
5. Budget estimate is based on Huber Technology's standard Terms & Conditions and is quoted in US dollars unless otherwise stated.
6. Equipment lead time from approval of shop drawings is expected to be around 8-10 weeks.
7. Equipment recommendations are based on information provided to Huber Technology. Subsequent information which differs from what has been provided may alter the equipment recommendation.

Equipment Summary

Albany WWTP, NY October 17, 2017

Strainpress® 290:

One (1) Strainpress® 290 in 304L stainless steel construction; with full submersion passivated surface treatment for superior corrosion protection. Each Including:

- Fully enclosed basket
- Perforated screening baskets (one conical and one cylindrical)
- 5.0 hp, 3 ph, 460 VAC, 60 Hz main drive motor, Class 1 Division 2

Ancillary Equipment:

- Compressor for pneumatic retention cone [2 hp, 13 gal. tank)
- Support legs
- Pressure monitor

Controls:

One (1) Huber Standard Main Control Panel design. Each Including:

- Enclosure, NEMA 4X, 304 Stainless Steel
- Motor Starter, IEC Non-Reversing, w/ Branch Circuit Protection [5 hp max, 3/60/480VAC]
- PLC, AB MicroLogix 1400
- HMI, AB PanelView Plus C400
- UL Label

One (1) Huber Standard Pneumatic Control Panel design. Each Including:

- Enclosure, NEMA 4X, 304 Stainless Steel
- Filter/regulator
- Pressure switch
- Solenoid and manual valves
- brass fittings

Freight and Startup:

- Standard Huber Recommended Start-up Services
- Freight to jobsite.

.¢zŘƎŜű Price: $150,000

HUBER Technology, Inc.
Huber Technology, Inc. · 9735 NorthCross Center Court STE A · Huntersville, NC 28078
Phone (704) 949-1010 · Fax (704) 949-1020 · huber@hhusa.net · www.huber-technology.com
A member of the HUBER Group

Lystek Budget Pricing – Albany – Saratoga
Prepared by: Jim Belcastro (jbelcastro@lystek.com 508-463-5444)
November 10th, 2017

Project Summary – Lystek proposes to install its Reactor system to process digested biosolids / organics, and refeed through the LysteMize process at the Albany Wastewater Treatment Plant. Budget proposal based upon information supplied by Eric Auerbach of Arcadis. Firm detailed pricing to be established upon a site meeting and further discussion / engineering.

Lystek Reactor System

Input Parameter	**Amount**
Dry Tons/Day to be processed	27.1 DT
Total Solids - Lystek Product (%)	15
Wet tons/Day to be processed	181
Operation time (per day)	10
Reactor capacity required (m3/per h)	9
Number of Reactors required (4 m3/h)	2
Footprint Required (sq ft)	1,200 – 1,500
CAPEX (USD)	**Amount**
Lystek System Capital Cost (See Note 1)	$6,000,000
Storage conveyance for LysteGro	To Be Determined
OPEX (USD)	**Amount**
Alkali (100 kg/DT) @ $.34/lb	< $74.80 – to be discussed
Electricity @ 70 kWh/DT @ $.16 c/kWh	$11.20
Natural Gas - 45 m^3/DT @ $6.67 per thousand cubic feet (1 m^3 = 35.3 ft^3)	$10.60
Propane – 15 m^3/DT @ $1.16 per gallon (1 gal = 1.02m^3)	$17.06
Maintenance Costs (~5% of total O&M) per Dry Ton	$4.83
Storage / Management of LysteGro	To Be Determined
Product application to land	Average Established Market ~ $20-$25 per wet ton applied – may vary by geography and county restrictions / approvals

Notes:

1. All budget pricing is in US Dollars. It includes the supply and delivery of Lystek reactor system and associated appurtenance. Assumes utilization of Lystek system for LysteGro production and LysteMize digester enhancement. Detailed proposal to follow upon further discussion of facility details and tour.

2. Assumes adequate utilities are within 100 feet of the installation and access into the building (ex. garage door) to allow clear and unencumbered access to the construction area. [Assumes installation in an existing building, with adequate headroom (approx. 24')].

3. Storage and management of the finished LysteGro product to be discussed further based upon facility requirements and client preferences.

4. Lystek would be willing to take responsibility for product marketing and application. Lystek is willing to discuss the additional conditions for this service.

OVIVO Worldwide Experts in Water Treatment

BUDGETARY PROPOSAL

JANUARY 8, 2018

ALBANY WWTP BIOSOLIDS PROJECT

ALBANY, NY

Ovivo® Steel Covers

PREPARED FOR

Arcadis

AREA REPRESENTATIVE

Siewert Equipment
Wendi Richards, P.E.
wrichards@siewertequipment.com

PREPARED BY

Nimesh Patel
c/o Luigi Tiberi
Phone: (801) 931-3000
Luigi.Tiberi@ovivowater.com

Ovivo USA, LLC
4246 Riverboat Road – Suite 300
Salt Lake City, Utah 84123-2583
http://www.ovivowater.com/SteelCover

DESIGN PARAMETERS

Number of Digester	Three (3)
Tank Diameter	95.00 ft
Top of Tank Elevation	28.00 ft
Maximum Liquid Level Elevation	26.00 ft
Minimum Liquid Level Elevation	24.00 ft
Corbel Elevation*	22.00 ft
Bottom of Wall Elevation	0.00 ft
Tank Height	28.00 ft
Cone Height	6.00 ft
Design Pressure*	16 in w.c
Operating Pressure*	10 in w.c
Live Load*	50 psf
Wind Load*	20 psf
Snow Load*	20 psf

** Assumed Parameters. Please confirm.*

PRODUCT HIGHLIGHTS

OVIVO® GASHOLDER STEEL COVER

Ovivo provides a variety of digester steel covers. Each digester cover is constructed as a dome-shaped segment of a sphere, offering maximum strength and structural integrity. The digester steel covers are radial beam designed to be erected quickly and efficiently, this is a simple, rigged structural design. The thrust ring is installed at the periphery of each cover to absorb all design loads without transmitting excessive forces to the concrete digester wall. During erection, the cover is supported by radial beams attached to a center ring and the thrust ring which add strength to the complete unit.

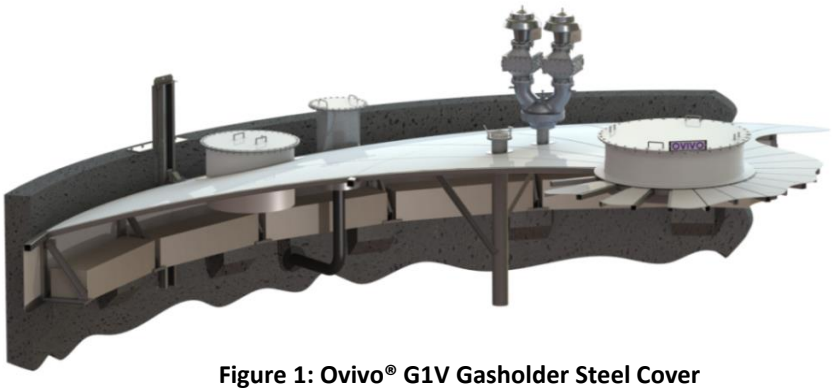


Figure 1: Ovivo® G1V Gasholder Steel Cover

Ovivo's radial beam design uses an added side sheet and ballast for digester gas storage. Submerged ballast blocks are used to maximize cover stability and maintain adequate gas pressure. The vertical guides are attached to the tank wall. Guide devices, spanning from the top to the bottom of the cover side-sheet, are engaged to stabilize the cover and protect the cover from substantial wind loads.

TECHNICAL DATA

For this application and based on the design parameters, Ovivo recommends three (3) Ovivo® 95 G1V Gasholder Steel Covers to be installed on the 3 digesters.

Model	95 G1V
Type	Ovivo® Gasholder Steel Cover
Size	95'Ø
Max Side Sheet Length	72 in
Gas Storage[1]	23,250 ft^3
Total Weight [2]	148,100 lbs
Estimated Field Welding[2]	4,500 ln ft
Estimated Field Painting (Inside and Outside)[2]	18,800 sq ft

[1] The gas storage capacity is based on the operating pressure and the side sheet length. Any modification to the skirt length will change the estimate cost and gas capacity.

[2] The weights, welding and painting requirement are estimates only. The contractor should verify these estimates prior to the bid.

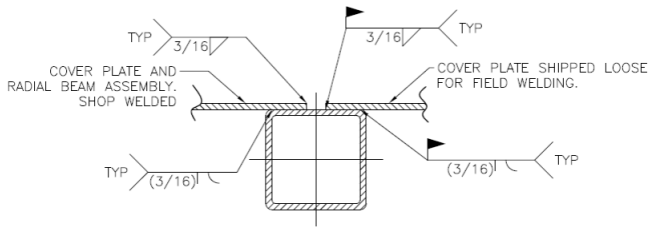


Figure 2: Typical Weld Detail for Radial Beam Connections

Ovivo's scope of supply does not include installation. We provide the estimate weight, welding and painting requirements and the contractor should verify these estimates prior to the bid. The above field welding estimate was based on the overall welding requirements on Figure 2

BUDGET INFORMATION[1]

Model	95 G1V
Quantity	Three (3)
Total Price	**$1,832,000**

[1] All prices in US Dollars

SCOPE OF SUPPLY

Items Included
One (1) 102"Ø center ring with cover plate, flange bolts, nuts and gasket
Two (2) 36"Ø manholes with bolts, gaskets and cover flange
Two (2) 8"Ø sample tubes. Covers provided by others
Two (2) 6"Ø flanged open nozzle for PRVB assembly. Valves provided by others
Forty (40) Erection radial beams
Forty (40) Cover plates
Forty (40) Ballast support brackets
Ten (10) Slide Guides, with chemical type anchors, as follows: - Slide guides mounted to the concrete tank, HDG - Slide guides mounted to the cover, 304 Stainless Steel - UHMW wear strips on three sides
Ten (10) Side skirts sections with 6 ft long side sheet plates
Mild Steel construction except as noted
EZ Rect™ System
Operation and Maintenance manuals
Service as noted in the "Field Service" segment of this proposal section
FCA Factory, Freight allowed to the jobsite
Items Not Included (But Not Limited To The Following)
Ballast blocks
Gas handling equipment, unless included above
Valves, unless included above
Sample tube covers
Cover position indicators
Sight glasses
Walkways, stairs, steps, ladders, unless included above
Handrails grates, platforms, grating, unless included above
Piping, fittings, tubing and pipe supports
Coating, prime paint, field touch up or finishing painting
Flange bolts, nuts and gaskets
Grout
Insulation or Roofing
Cover sealant, filling material, caulking, oakum or asphalt
Modifications digester tank or other equipment
Installation
Testing, testing materials and / or testing equipment

Conduit, wiring, or any other control or electrical items
Any items not specifically listed in the “Items Included” table

ADDITIONAL INFORMATION

FIELD SERVICE

Ovivo’s scope includes the service of a qualified service engineer for the following:
One (1) trip of two (2) days total of service, per digester at the site for the supervision of equipment start-up, testing supervision, and instructing the operators.

Additional service days can be purchased at the current rate.

EZ-RECT™ SYSTEM

The EZ-RECT™ cover erection system is a feature with the digester cover. Ovivo will provide the digester cover with cover plate/radial beam sections pre-assembled and finish welded in the shop to facilitate the erection of the cover. Each assembly will consist of two (2) beams and one (1) cover plate.

Ovivo offers this option to reduce the amount of field welding required to erect a cover of this diameter. **This will reduce the total amount of field welding for the digester steel cover.** Furthermore, this will reduce the number of pieces to be handled during erection.

Ovivo suggests a careful consideration of the various offerings in regards to the amount of field welding disclosed by the cover manufacturers. The variance in the various estimates should be within a reasonable amount of the quantity expressed in this proposal. Ultimately, the Contractor is required to make their own estimate of welding requirements.

Painting: The cover side sheets are shipped unpainted, so all necessary cleaning, sandblasting and painting must be done progressively as the assembly proceeds. Be aware that the side sheets will be difficult to paint if they are installed inside the tank. Do not paint within 3 inches of all areas to be welded. It is also imperative that all welds are per the erection drawings and gas tight. Therefore, the erector must be able to certify that no leaks exist prior to painting.

Cover erection is completed in five steps:

1- Side Sheet Assembly
2- Center Ring and Erection Beam Installation

3- EZ-Rect Cover Plate Assembly Installation
4- Remaining Cover Plate Installation
5- Manholes, Spools, Tubes, Etc., Installation

ESTIMATED LEAD TIMES

Submittals: Eight (8) weeks after Purchaser's receipt of Ovivo's written acknowledgement of an approved purchase order.
Shipping: Twenty four (24) weeks after receipt of approved drawings from Purchaser.

TESTING

After field erection is complete, the Contractor shall test the covers for gas tight construction by filling the tank with water and trapping air under the cover plates. All welded seams and appurtenances shall be checked for leaks by means of a soap suds solution.

The air pressure underneath the dome during the test shall be not less than 14" W.C.

FINISHES

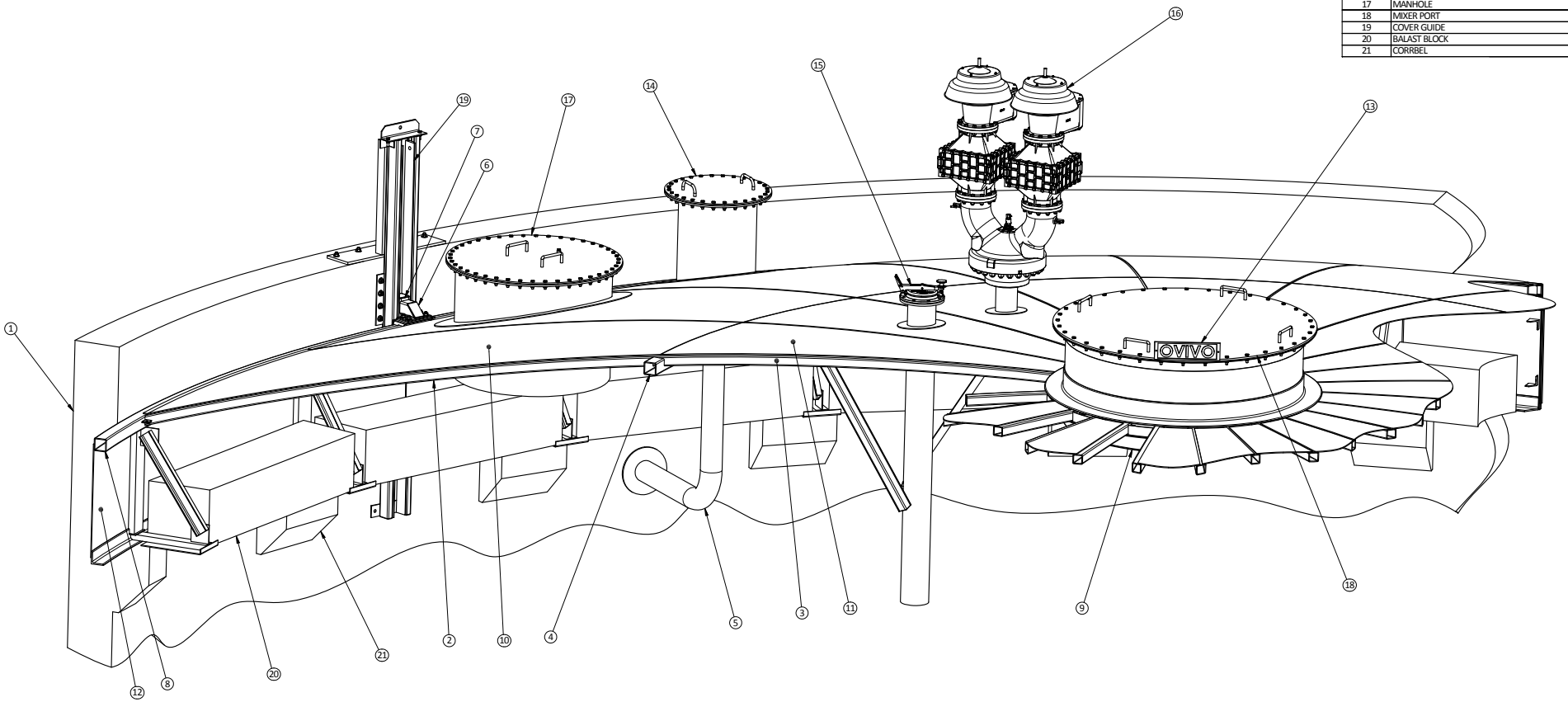
Steel plates, structural shapes and fabricated assemblies shall be shipped unpainted, for field painting by others. After erection, welding, testing and final inspection of erection by manufacturer's representative, the covers shall be painted (not by Ovivo).

GENERAL

The design of the digester steel cover does not fall under any specific code or standard for the design analysis. The current codes and standards are be used as guide lines for the design and analysis of the equipment. The analysis will result with a conservative approach that meets the intent of the present codes and standards.

EQUIPMENT LAYOUT

ITEM	DESCRIPTION
1	DIGESTER TANK WALL
2	OUTER ERRECTION BEAM
3	INNER ERRECTION BEAM
4	INTERMEDIATE THRUST RING
5	GAS TAKE-OFF PIPE
6	COVER SUPPORT
7	COVER SLIDE
8	THRUST RING
9	CENTER COMPRESSION RING
10	OUTER COVER PLATE
11	INNER COVER PLATE
12	SIDE SKIRT
13	NAME PLATE
14	GAS BONNET
15	SAMPLE TUBE
16	PRESSURE RELIEF - VACUUM BREAKER
17	MANHOLE
18	MIXER PORT
19	COVER GUIDE
20	BALAST BLOCK
21	CORRBEL



D

THIRD ANGLE PROJECTION

REF. FROM	DO NOT SCALE PRINTS
DATE Month/Year	3/13/2014
	WORKMANSHIP STANDARD ISO9001 APPLIES

REVISION DESCRIPTION	EN/ECO	BY	CHECK'D	DATE	REV
INITIAL RELEASE					A

DRAWN	JLQ	ORIGINAL S.O.
CHECK'D	EMH	

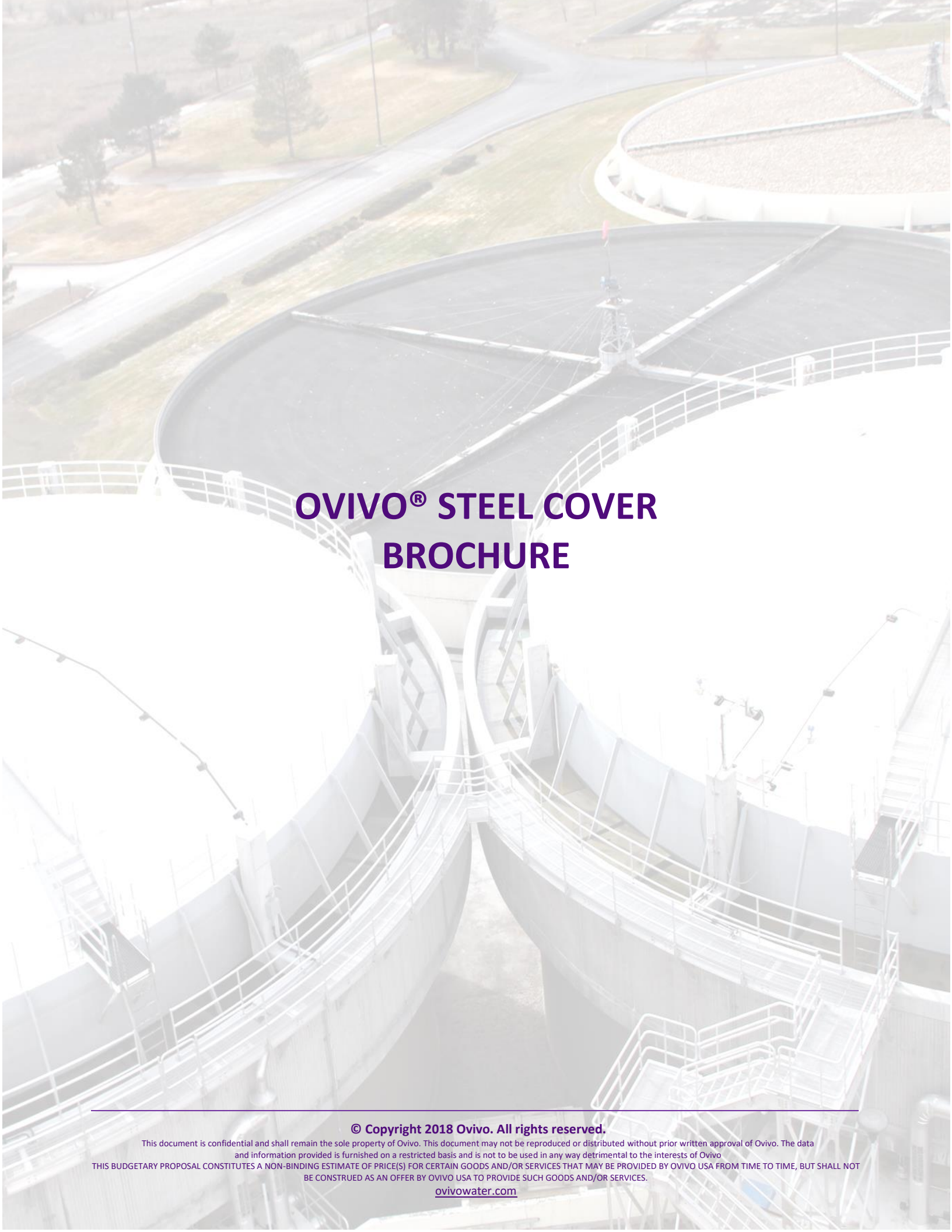
OVIVO
Bringing water to life

TYPE G1V
FLOATING
DIGESTER COVER

DWG. NO. -

SHEET 1 OF 1

REV



OVIVO® STEEL COVER BROCHURE

OVIVO

MUNICIPAL WATEWATER
ANAEROBIC DIGESTION

COST EFFECTIVE SLUDGE STABILIZATION

- Simple installation operation & maintenance
- Flexible design to suit many applications
- Variable sludge storage capabilities
- No moving parts for simplified maintenance
- 30+ year life span

Easy to insulate using commonly available roofing materials. Call us at 1.855.GO.OVIVO to learn more!

OVIVO® ANAEROBIC DIGESTER STEEL COVERS

A VARIETY OF STEEL DIGESTER COVERS

Ovivo provides a variety of steel digester covers. Each cover is constructed as a dome-shaped segment of a sphere, offering maximum strength and structural integrity. The steel digester covers are radial beam designed to be erected quickly and efficiently. A thrust ring is installed at the periphery of each cover to absorb all design loads without transmitting excessive forces to the digester wall. During erection, the cover is supported by radial beams attached to a center ring and the thrust ring which add strength to the complete unit.

Our radial beam design includes the following configurations: Fixed, Gasholder, HydroSeal® type and Buoyant steel cover. Ovivo will provide the best option for each application based on the customer needs.

Spanish Fork STP, UT (50' F1) :

Fixed Steel Cover Installation

Salt Lake City WRF, UT (90' G2VL) :

Gasholder Steel Cover Installation

Honouliuli WWTP, HI (90' G2VL):

Gasholder Steel Cover

DC WASA, DC (98.5' F2) :

Fixed Steel Cover

A NUMBER OF BENEFITS

- The use of radial beams allows the cover to be erected quickly and efficiently.
- Ovivo's cover design is compatible with all our available mixing systems to ensure adequate anaerobic digestion process.
- The covers are designed based on the requirements specified for each application, using the latest structural standards.
- A variety of accessories are available with our covers to effectively interface with the consulting engineer's design and comply with the customer requirements.

FIXED STEEL COVER (TYPE F)

The Type F cover is the most economical steel cover. The main application is on digesters with constant water level (primary or first stage digesters). The Fixed covers can be sealed against the tank to combat odors. For this design, the side sheet should be extended below the minimum liquid level. Otherwise, two options are recommended: 1) the supplier of the filler material should confirm that it can withstand the operating pressure 2) an independent clean liquid launder should be provided that allows for a pressure seal at any given sludge level (Contact Ovivo for additional details for this option).

GASHOLDER STEEL COVER (TYPE GV)

The Type GV uses the radial beam design structure with added side sheet and ballast for digester gas storage. Submerged ballast blocks are used to maximize cover stability and maintain adequate gas pressure. The design includes a vertical guide arrangement with guides attached to the tank wall. Guide devices, spanning from the top to the bottom of the cover side sheet, are engaged to stabilize the cover.

HYDROSEAL® STEEL COVER (TYPE GVL)

The separate launder and liquid seal between the digester tank and the cover eliminates gas and VOC emissions, improves service access and improves the maintenance access.

This design allows variable sludge storage capabilities since the side sheet operates independent of sludge storage in clean area. No components come in contact with the sludge.

BUOYANT STEEL COVER (TYPE B)

The Type B uses the radial beam design structure including a peripheral buoyant chamber. The cover floats directly on the digester contents. Precast concrete ballast blocks are placed to maintain a specified gas pressure. A major portion of the buoyant volume which keeps the cover afloat is located at the cover periphery; this feature provides an excellent resistance to tipping. The slide guide system will provide vertical movement without rotation or binding.

EZ-RECT™ SYSTEM

The EZ-RECT™ cover erection system is a feature with the digester cover. Ovivo offers this option to reduce the amount of field welding.

Ovivo will provide the digester cover with cover plate/radial beam sections pre-assembled and finish welding in the shop to facilitate the erection of the cover. Each assembly will consist of two (2) beams and one (1) cover plate.

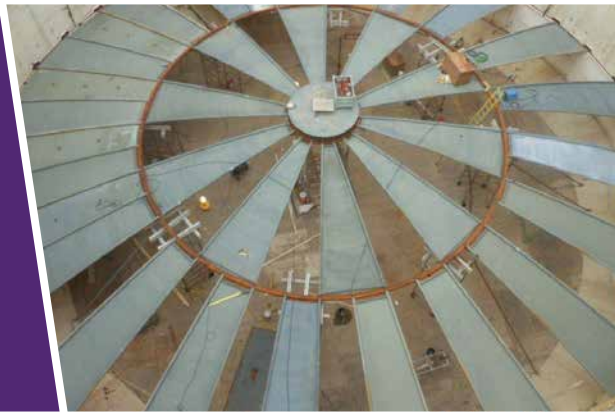
COVER ERECTION IS COMPLETED IN FIVE STEPS:

1. Side Sheet Assembly
2. Center Ring and Erection Beam Installation
3. EZ-Rect Cover Plate Assembly Installation
4. Remaining Cover Plate Installation
5. Manholes, Spools, Tubes, Etc., Installation

ANCILLARY EQUIPMENT

Ovivo can supply all plant required equipment for a complete Sludge Treatment / Anaerobic Digestion plant, including but not limited to:

- Ultrastore™ Membrane Gasholder
- Eimix® Mechanical Sludge Mixer
- LM™ Mixer
- Sonolyzer™ Ultrasound Sludge Disintegrator



ovivo®connect℠

Ovivo® Connect℠ portal is an innovative and intuitive application that allows our customers to use 'SmartTags' installed on our equipment (or a web URL) to access a personalized customer zone. Access your equipment documentation, find contract references, track service logs, manage spare parts, and plan your next maintenance to get the most out of your equipment.

NEED **ACCESS** TO YOUR **O&M MANUAL**?
NEED **SPARE PARTS**?
WANT THE **LATEST TIPS AND NEWS** ON YOUR ASSET?

GET CONNECTED!
ovivo.co

LEARN MORE!
Scan to view online.

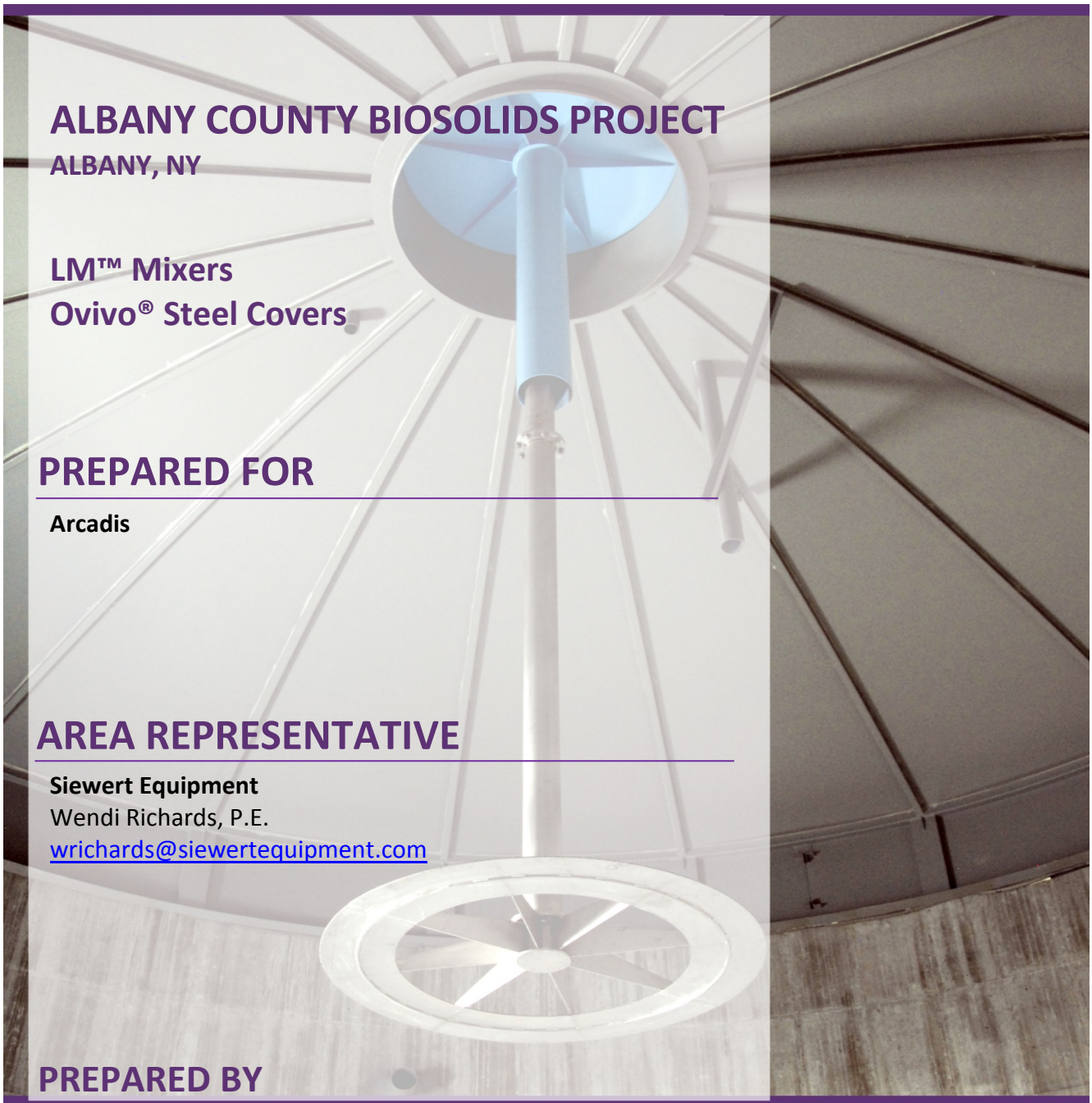
1.855.GO.OVIVO

info@ovivowater.com
ovivowater.com

OVIVO Worldwide Experts in Water Treatment

BUDGETARY PROPOSAL

NOVEMBER 3, 2017



ALBANY COUNTY BIOSOLIDS PROJECT

ALBANY, NY

LM™ Mixers
Ovivo® Steel Covers

PREPARED FOR

Arcadis

AREA REPRESENTATIVE

Siewert Equipment
Wendi Richards, P.E.
wrichards@siewertequipment.com

PREPARED BY

Luigi Tiberi
c/o Luigi Tiberi
Phone: (801) 931-3000
Luigi.Tiberi@ovivowater.com

Ovivo USA, LLC
4246 Riverboat Road – Suite 300
Salt Lake City, Utah 84123-2583
http://www.ovivowater.com/LMMixer

DESIGN PARAMETER

Number of Digesters	Three (3)
Cover Type	New-Fixed Steel
Tank Diameter	95 ft
Top of Wall Elevation	30 ft
Maximum Liquid Level Elevation	28 ft
Minimum Liquid Level Elevation	26 ft
Bottom of Wall Elevation	0ft
Bottom of Cone Elevation	-6 ft
Tank Height	30 ft
Cone Height	6 ft
Volume Approx.	1,590,000 gal
Concentration	3-5 %

** Assumed Parameters. Please confirm.*

PRODUCT HIGHLIGHTS

LM™ MIXERS

LM™ (Linear Motion) Mixers offer solutions to the challenges of mixing wastewater in both thin sludge and thick sludge applications, providing homogeneous mixing by creating a turbulent liquid-core of micro and macro eddy currents. These currents are accelerated rapidly through the central opening of an oscillating ring-shaped hydro-disk, which moves up and down through the mix, creating the distinctive linear motion mixing action of the LM™ Mixer.

The frequency, stroke and size of the hydro-disk control the force and velocity of the liquid-core. The LM™ Mixer's oscillating motion produces a flow pattern that approaches nearly isotropic (uniform) mixing. Additionally, LM™ Mixers use pulsating pressure waves in conjunction with the oscillating velocity. In this type of concurrent action the oscillating pressure wave and velocity are coupled together to enhance mass transfer and produce a uniform mixture of the tank's contents.

TECHNICAL DATA

For this application and based on the design parameters, Ovivo recommends one (1) LM™ Mixer per digester as follows:

Model	LM20X/20/96
Motor Size	20 hp
Estimated Dead Weight[1]	10,100 lbs
Estimated Max. Dynamic Load[1]	4,300 lbs
Number of Mixers per Tank	One (1)

[1] *Estimate per unit*

Figure 1: LM™ Mixer

ENERGY CONSUMPTION COMPARISON

LM™ Mixer vs. Conventional Mixing System

Motor Size	Years			
(hp)	1	5	10	20
7.5	$3,307	$19,169	$44,443	$119,456
20	$8,819	$51,116	$118,515	$318,549
Difference	**$5,512**	**$31,948**	**$74,072**	**$199,093**

The operation cost estimated is based on 0.09 $/kW-h, running the mixer at 75% of the total motor horsepower continuously.

BUDGET INFORMATION[1]

Model	LM20X/20/96
Total Quantity	Three (3)
Estimated Yearly Energy Cost[2][3]	$ 8,819
Price	**$742,000**

[1] *All prices in US Dollars*

[2] *Estimated per Digester. The estimated energy cost per mixer is $ 8,819*

[3] *The energy cost estimate based on 0.09 $/kW-hr, running the mixer at 75% of the horse power continuously.*

SCOPE OF SUPPLY

Items Included
20 hp Explosion proof, 1800 rpm 220/440 V, 3 Ø, 60 Hz
Mounting plate matching mounting port bolt pattern
Seal tube
Fasteners for mounting plate, 304 stainless steel
Hydro-disk, 304L stainless steel
Lower shaft, 304L stainless steel
Drive system including: - Drive mechanism stand, - Drive mechanism enclosure, - Driver mechanism (scotch yoke design), - Driving shaft with seals, - Gearbox and motor (as listed above)
Spare Parts per Digester: - Four (4) Mixer Sliding Blocks \Vertical Sliding Rollers - One (1) CAM Follower Assembly
Local control station, NEMA 7: - On/Off/Auto - Remote/local operation
Maintenance Platform Structural Members
Mild Steel construction except as noted
Coating: - Preparation SSPC-SP-10 - Tnemec 66HS, Two (2) Coats @ 4.0 - 6.0 DFT ea.
Service as noted in the "Field Service" segment
FCA Factory, Freight allowed to the jobsite
Items Not Included (But Not Limited To The Following)
Main control panel
VFD's or Motor Starters
Mixer port
Cover modifications/reinforcement
Piping, fittings, tubing and pipe supports
Digester cleaning and temporary dewatering
Wiring, conduit
Finish or field touch-up paint
Flooring walkways, stairs, steps, ladders, etc.
Sealant, insulation, lubricants
Unloading, storage, Installation
Any items not specifically listed in the "Items Included" table

ADDITIONAL INFORMATION

FIELD SERVICE:

Ovivo's scope includes the service of a qualified service engineer for the following:
One (1) trip of two (2) days total of service, per digester at the site for the supervision of equipment start-up, testing supervision, and instructing the operators.
Additional service days can be purchased at the current rate.

ESTIMATED LEAD TIMES:

Submittals: Eight (8) weeks after Purchaser's receipt of Ovivo's written acknowledgement of an approved purchase order.
Shipping: Twenty four (24) weeks after receipt of approved drawings from Purchaser.

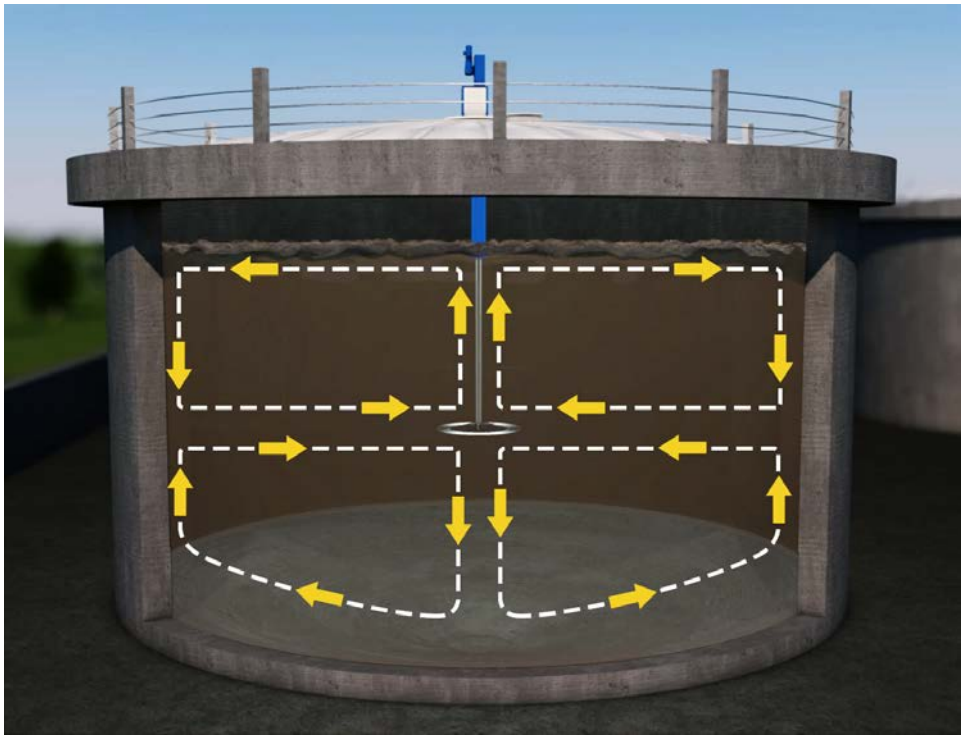


Figure 2: LM™ Mixer (showing flow pattern inside Digester)
(Click Link to Watch Video)

PRODUCT HIGHLIGHTS

OVIVO® FIXED STEEL COVER

Ovivo provides a variety of digester steel covers. Each digester cover is constructed as a dome-shaped segment of a sphere, offering maximum strength and structural integrity.

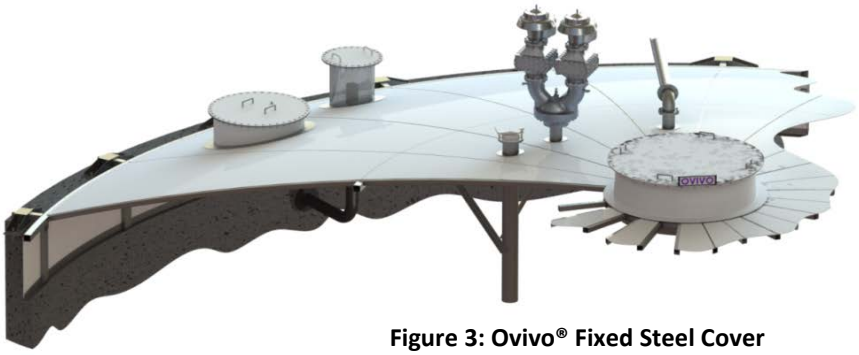


Figure 3: Ovivo® Fixed Steel Cover

The digester steel covers are radial beam designed to be erected quickly and efficiently, this is a simple, rigged structural design. The thrust ring is installed at the periphery of each cover to absorb all design loads without transmitting excessive forces to the concrete digester wall. During erection, the cover is supported by radial beams attached to a center ring and the thrust ring which add strength to the complete unit.

For the Fixed steel cover design, the side sheet should be extended 1 ft below the minimum liquid level (at least). Otherwise, two options are recommended: 1) the supplier of the filler material should confirm that it can withstand the design pressure 2) an independent clean liquid launder should be provided (pricing not included) that allows for a pressure seal at any given sludge level (Contact Ovivo for additional details should you like to pursue this option).

TECHNICAL DATA

For this application and based on the design parameters, Ovivo recommends three (3) Ovivo® Fixed Steel cover(s) to be installed on the digesters.

Model	95 F1
Type	Ovivo® Fixed Steel Cover
Size	95'Ø
Max Side Sheet Length	48 in
Total Weight[1]	135,500 lbs
Estimated Field Welding[1]	4,300 ln ft
Estimated Field Painting (Inside and Outside)[1]	17,200 sq ft

[1] *The weights, welding and painting requirement are estimates only. The contractor should verify these estimates prior to the bid.*

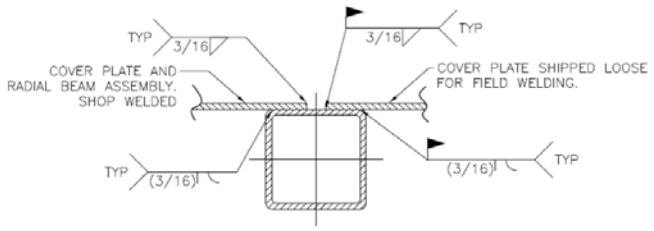


Figure 4: Typical Weld Detail for Radial Beam Connections

Ovivo's scope of supply does not include installation. We provide the estimate weight, welding and painting requirements and the contractor should verify these estimates prior to the bid. The above field welding estimate was based on the overall welding requirements on Figure 4

BUDGET INFORMATION[1]

Model	95 F1
Quantity	Three (3)
Total Price	**$1,587,600**

[1] *All prices in US Dollars*

SCOPE OF SUPPLY

Items Included
One (1) 102"Ø center ring with cover plate, flange bolts, nuts and gasket
Two (2) 36"Ø manholes with bolts, gaskets and cover flange
Two (2) 8"Ø sample tubes. Covers provided by others
Two (2) 6"Ø flanged open nozzles for PRVB assembly. Valves provided by others
Forty (40) Erection radial beams
Forty (40) Cover plates
Forty 940) Anchoring assemblies including necessary anchor bolts
Ten (10) Side skirts sections with 4 ft long side sheet plates
Mild Steel construction except as noted
EZ Rect™ System
Operation and Maintenance manuals
Service as noted in the "Field Service" segment of this proposal section
FCA Factory, Freight allowed to the jobsite
Items Not Included (But Not Limited To The Following)
Gas handling equipment, unless included above
Valves, unless included above
Sample tube covers
Cover position indicators
Sight glasses

Walkways, stairs, steps, ladders, unless included above
Handrails grates, platforms, grating, unless included above
Piping, fittings, tubing and pipe supports
Coating, prime paint, field touch up or finishing painting
Flange bolts, nuts and gaskets
Grout
Insulation or Roofing
Cover sealant, filling material, caulking, oakum or asphalt
Modifications digester tank or other equipment
Installation
Testing, testing materials and / or testing equipment
Conduit, wiring, or any other control or electrical items
Any items not specifically listed in the “Items Included” table

EZ-RECT™ SYSTEM

The EZ-RECT™ cover erection system is a feature with the digester cover. Ovivo will provide the digester cover with cover plate/radial beam sections pre-assembled and finish welded in the shop to facilitate the erection of the cover. Each assembly will consist of two (2) beams and one (1) cover plate.

Ovivo offers this option to reduce the amount of field welding required to erect a cover of this diameter. **This will reduce the total amount of field welding for the digester steel cover.** Furthermore, this will reduce the number of pieces to be handled during erection.

Ovivo suggests a careful consideration of the various offerings in regards to the amount of field welding disclosed by the cover manufacturers. The variance in the various estimates should be within a reasonable amount of the quantity expressed in this proposal. Ultimately, the Contractor is required to make their own estimate of welding requirements.

Painting: The cover side sheets are shipped unpainted, so all necessary cleaning, sandblasting and painting must be done progressively as the assembly proceeds. Be aware that the side sheets will be difficult to paint if they are installed inside the tank. Do not paint within 3 inches of all areas to be welded. It is also imperative that all welds are per the erection drawings and gas tight. Therefore, the erector must be able to certify that no leaks exist prior to painting.

Cover erection is completed in five steps:

1- Side Sheet Assembly
2- Center Ring and Erection Beam Installation
3- EZ-Rect Cover Plate Assembly Installation

4- Remaining Cover Plate Installation
5- Manholes, Spools, Tubes, Etc., Installation

ADDITIONAL INFORMATION

FIELD SERVICE

Ovivo's scope includes the service of a qualified service engineer for the following:
One (1) trip of two (2) days total of service, per digester at the site for the supervision of equipment start-up, testing supervision, and instructing the operators.

Additional service days can be purchased at the current rate.

ESTIMATED LEAD TIMES

Submittals: Eight (8) weeks after Purchaser's receipt of Ovivo's written acknowledgement of an approved purchase order.
Shipping: Twenty four (24) weeks after receipt of approved drawings from Purchaser.

TESTING

After field erection is complete, the Contractor shall test the covers for gas tight construction by filling the tank with water and trapping air under the cover plates. All welded seams and appurtenances shall be checked for leaks by means of a soap suds solution.

The air pressure underneath the dome during the test shall be not less than 14" W.C.

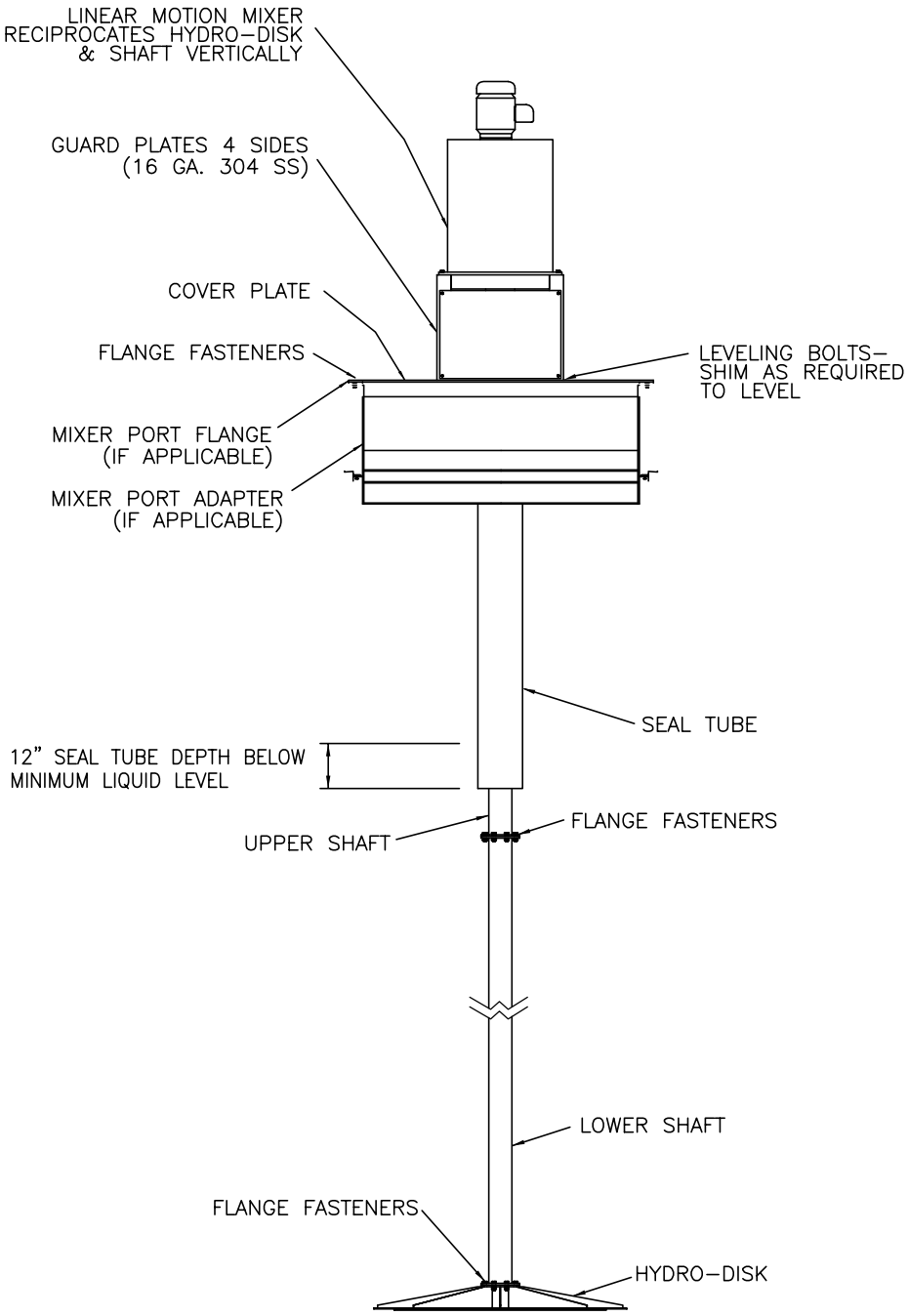
FINISHES

Steel plates, structural shapes and fabricated assemblies shall be shipped unpainted, for field painting by others. After erection, welding, testing and final inspection of erection by manufacturer's representative, the covers shall be painted (not by Ovivo).

GENERAL

The design of the digester steel cover does not fall under any specific code or standard for the design analysis. The current codes and standards are be used as guide lines for the design and analysis of the equipment. The analysis will result with a conservative approach that meets the intent of the present codes and standards.

EQUIPMENT LAYOUT



REVISION DESCRIPTION	EN/ECO	BY	CHECK'D	DATE	REV
INITIAL RELEASE				11/22/2016	A

A

THIRD ANGLE PROJECTION

OVIVO
Worldwide Experts in Water Treatment

LINEAR MOTION MIXER
GENERAL ARRANGEMENT

REF. FROM		DO NOT SCALE PRINTS				
DATE (mm/dd/yyyy)	11/22/2016	WORKMANSHIP STANDARD ES0001 APPLIES				
DRAWN	NP	ORIGINAL S.O.	DWG. NO.	LM MIXER	SHEET 1 OF 1	REV A
CHECK'D	JAG	-				

LM™ BROCHURE

OVIVO

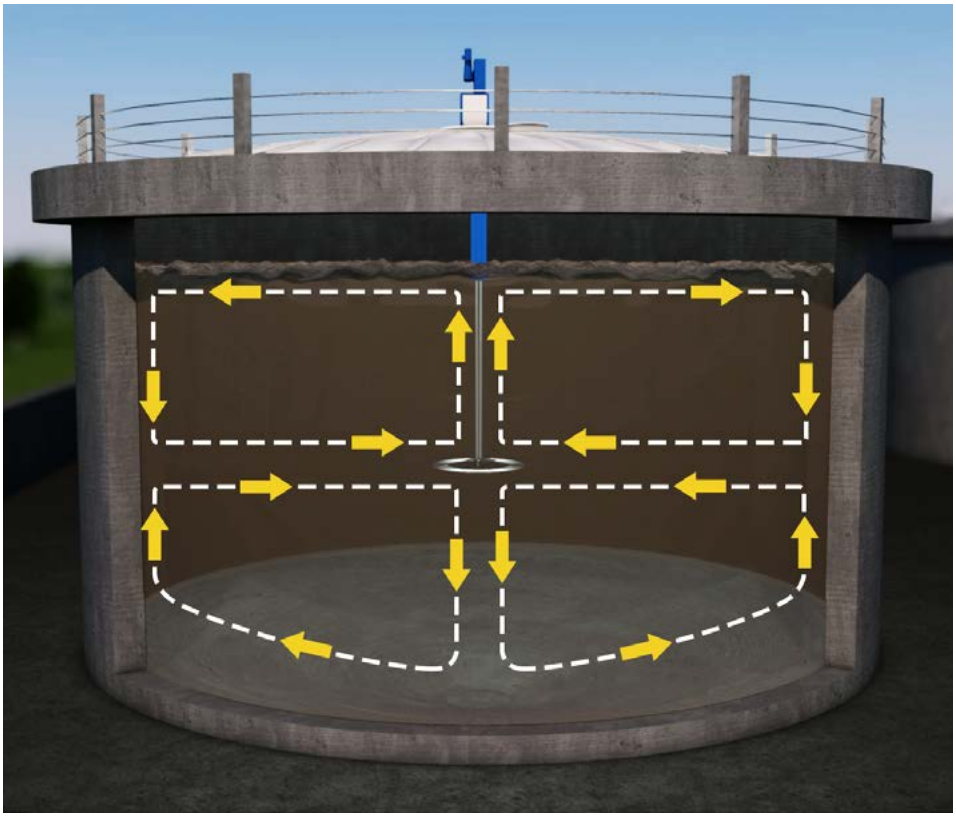
MUNICIPAL WATEWATER
ANAEROBIC DIGESTION

EFFICIENT LOW ENERGY SLUDGE MIXING

- Capable of mixing viscous fats, oils and greases
- Ragless design and low cost maintenance
- Significant energy savings compared to conventional mixing systems
- Installation and Capital cost savings
- Suitable for both new and existing tanks

Proven to achieve over 90% active tank volume! Give us a call at 1.855.GO.OVIVO to learn more.

LM™ MIXER



ANAEROBIC DIGESTION

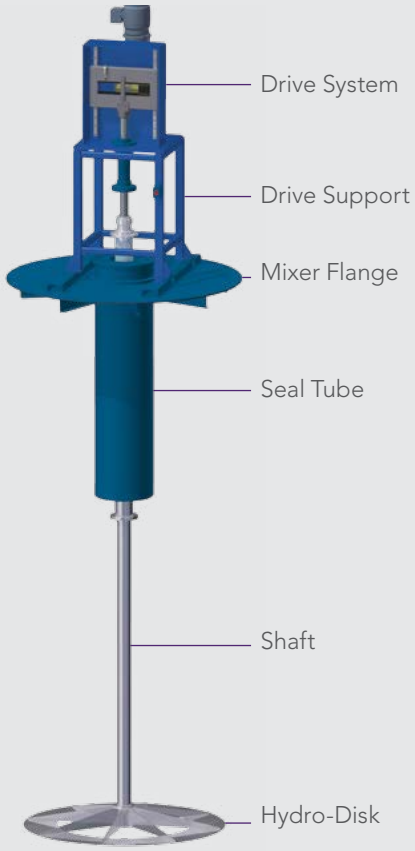
Anaerobic Digestion is highly dependent upon effective sludge mixing. When tank content is inadequately mixed, stratification occurs and the tank volume is not properly utilized. Most wastewater treatment facilities require thorough and complete mixing to ensure uniform temperature, solids distribution and microorganism contact with incoming sludge, to increase gas production and maximize the solids destruction.

MAJOR ENERGY SAVINGS

- Efficient mixing is critical; therefore, the goal is to achieve the optimal mixing efficiency with the least amount of power.
- Achieving a unique mixing pattern allows for efficient mixing while keeping the energy requirements lower (allowing for the amount saved to be used elsewhere at the plant).
- Independent full scale testing has proven the lower energy needs compared to conventional mixing systems.

ENGINEERING

DESIGNED FOR PERFORMANCE



MAIN CONFIGURATIONS FOR THE LM™ MIXER:

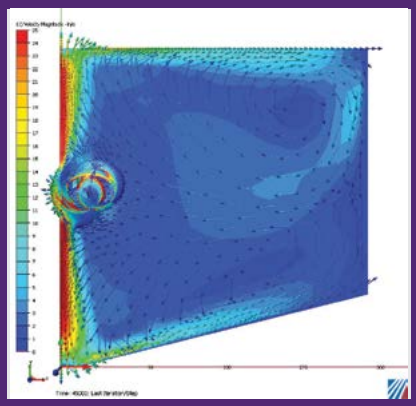
- Operating Speed:
  30 CPM (cycles per minute)
- Stroke Length:
  12 inches, 16 inches or 20 inches
- Disk Size:
  72 inches, 84 inches or 96 inches

LESS HP, MORE SAVINGS

Motor Size	1 Year	5 Years	10 Years	20 Years
10HP	$4,409	$25,558	$59,258	$159,275
90HP	$39,684	$230,023	$533,319	$1,433,471
Difference	$35,275	$204,465	$474,061	$1,274,197

Assuming $ 0.09/kWh, 75% nameplate power and 3% appreciation per year

HOW IT WORKS
UNIFORM MIXING



The LM™ mixer is designed to mix the viscous slurries in order to achieve a homogeneous mixture in the tank while using less energy at the same time. The LM mixer offers solutions to the challenges of mixing wastewater in both thin and thick sludge applications.

The frequency, stroke and size of the hydro-disk control the force and velocity of the liquid core. The LM mixer's oscillating motion produces a flow pattern that approaches nearly isotropic (uniform) mixing and does not display the turbulence intensity or vortices of rotary mixers. Additionally, LM mixers operate by using pulsating pressure waves in conjunction with the oscillating velocity. In this type of concurrent action the oscillating pressure wave and velocity are coupled together to enhance mass transfer and produce a uniform mixture of the tank's contents.

Each tank configuration is different and therefore the LM mixer is custom designed to meet a variety of mixing demands by varying the frequency, stroke and disk size. Utilizing the power of Computational Fluid Dynamics (CFD), tanks can be modeled and analyzed for proper mixer sizing.

KEY BENEFITS

EFFICIENT MIXING TO HELP IMPROVE THE DIGESTION PROCESS

- Does not rely on induced flow to create the necessary mixing.
- Rags do not build up on disk
- Uniform mixing throughout the tank

PROVEN TECHNOLOGY

- Multiple LiCl tests performed by third parties demonstrate an active volume of 90% or greater.

INSTALLATION COST SAVINGS

- Installation of a single mixer can be completed in a day or less.
- No additional piping needed.
- No core drilling necessary

SUITABLE FOR BOTH NEW AND EXISTING TANKS

- Little to no changes are needed on existing structures

THE **OVIVO** DIFFERENCE

200+ YEARS OF HERITAGE • 100% FOCUSED ON WATER

OUR EXPERTISE

Anaerobic Digestion is highly dependent upon effective sludge mixing. Ovivo sludge mixers are designed to provide powerful mixing, without accumulating stringy or fibrous material. Highly efficient and featuring low maintenance requirements, they can be used for existing or new digesters. Their configuration is adpated to suit best the specific tank design and application.

ANCILLARY EQUIPMENT

Ovivo can supply all plant required equipment for a complete Sludge Treatment / Anaerobic Digestion plant, including but not limited to:

- Ultrastore™ Membrane Gasholder
- Eimix® Mechanical Sludge Mixer
- Ovivo® Anaerobic Digester Steel Cover
- Sonolyzer™ Ultrasound Sludge Disintegrator

ovivo®connect℠

Ovivo® Connect℠ portal is an innovative and intuitive application that allows our customers to use 'SmartTags' installed on our equipment (or a web URL) to access a personalized customer zone. Access your equipment documentation, find contract references, track service logs, manage spare parts, and plan your next maintenance to get the most out of your equipment.

NEED **ACCESS** TO YOUR **O&M MANUAL**?
NEED **SPARE PARTS**?
WANT THE **LATEST TIPS AND NEWS** ON YOUR ASSET?

GET CONNECTED!
ovivo.co

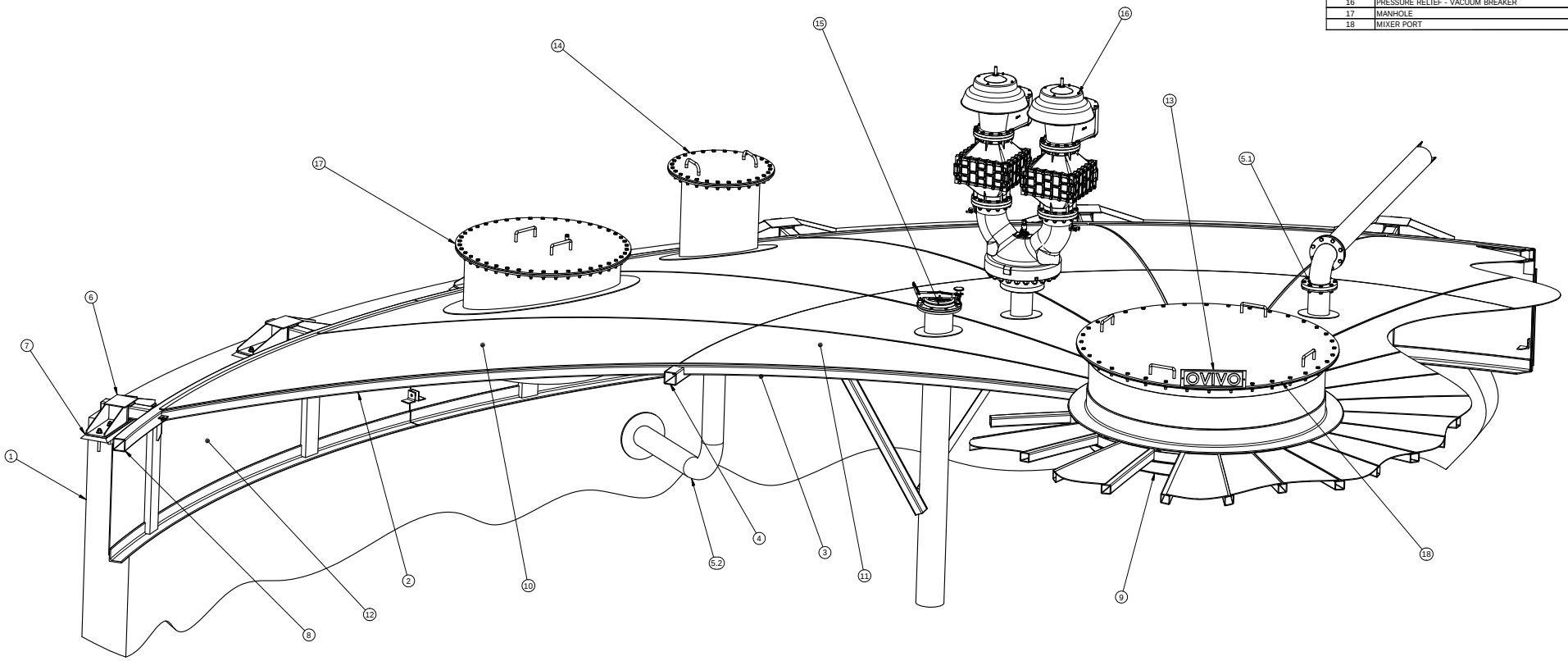
LEARN MORE!
Scan to view online.

1.855.GO.OVIVO

info@ovivowater.com
ovivowater.com

EQUIPMENT LAYOUT

ITEM	DESCRIPTION
1	DIGESTER TANK WALL
2	OUTER ERECTION BEAM
3	INNER ERRECTION BEAM (OPTIONAL)
4	INTERMEDIATE THRUST RING (OPTIONAL)
5.1	GAS TAKE-OFF PIPE (TOP-SIDE DESIGN)
5.2	GAS TAKE-OFF PIPE (UNDER-SIDE DESIGN)
6	COVER SUPPORT
7	BEARING PLATE
8	THRUST RING
9	CENTER COMPRESSION RING
10	OUTER COVER PLATE
11	INNER COVER PLATE
12	SIDE SKIRT
13	NAME PLATE
14	GAS BONNET
15	SAMPLE TUBE
16	PRESSURE RELIEF - VACUUM BREAKER
17	MANHOLE
18	MIXER PORT



D

THIRD ANGLE PROJECTION

REF. FROM	
DATE [month/day/year]	3/13/2014
DRAWN	JLQ
CHECK'D	EMH

DO NOT SCALE PRINTS

WORKMANSHIP STANDARD ISO9001 APPLIES

ORIGINAL S.O.

OVIVO
Bringing water to life

TYPE F1
FIXED
DIGESTER COVER

DWG. NO. -

SHEET 1 OF 1

REV A

REVISION DESCRIPTION	EN/ECO	BY	CHECK'D	DATE	REV
INITIAL RELEASE					A

OVIVO® STEEL COVER BROCHURE

OVIVO

MUNICIPAL WATEWATER
ANAEROBIC DIGESTION

COST EFFECTIVE SLUDGE STABILIZATION

- Simple installation operation & maintenance
- Flexible design to suit many applications
- Variable sludge storage capabilities
- No moving parts for simplified maintenance
- 30+ year life span

Easy to insulate using commonly available roofing materials. Call us at 1.855.GO.OVIVO to learn more!

OVIVO® ANAEROBIC DIGESTER STEEL COVERS

A VARIETY OF STEEL DIGESTER COVERS

Ovivo provides a variety of steel digester covers. Each cover is constructed as a dome-shaped segment of a sphere, offering maximum strength and structural integrity. The steel digester covers are radial beam designed to be erected quickly and efficiently. A thrust ring is installed at the periphery of each cover to absorb all design loads without transmitting excessive forces to the digester wall. During erection, the cover is supported by radial beams attached to a center ring and the thrust ring which add strength to the complete unit.

Our radial beam design includes the following configurations: Fixed, Gasholder, HydroSeal® type and Buoyant steel cover. Ovivo will provide the best option for each application based on the customer needs.

Spanish Fork STP, UT (50' F1) :

Fixed Steel Cover Installation

Salt Lake City WRF, UT (90' G2VL) :

Gasholder Steel Cover Installation

Honouliuli WWTP, HI (90' G2VL):

Gasholder Steel Cover

DC WASA, DC (98.5' F2) :

Fixed Steel Cover

A NUMBER OF BENEFITS

- The use of radial beams allows the cover to be erected quickly and efficiently.
- Ovivo's cover design is compatible with all our available mixing systems to ensure adequate anaerobic digestion process.
- The covers are designed based on the requirements specified for each application, using the latest structural standards.
- A variety of accessories are available with our covers to effectively interface with the consulting engineer's design and comply with the customer requirements.

FIXED STEEL COVER (TYPE F)

The Type F cover is the most economical steel cover. The main application is on digesters with constant water level (primary or first stage digesters). The Fixed covers can be sealed against the tank to combat odors. For this design, the side sheet should be extended below the minimum liquid level. Otherwise, two options are recommended: 1) the supplier of the filler material should confirm that it can withstand the operating pressure 2) an independent clean liquid launder should be provided that allows for a pressure seal at any given sludge level (Contact Ovivo for additional details for this option).

GASHOLDER STEEL COVER (TYPE GV)

The Type GV uses the radial beam design structure with added side sheet and ballast for digester gas storage. Submerged ballast blocks are used to maximize cover stability and maintain adequate gas pressure. The design includes a vertical guide arrangement with guides attached to the tank wall. Guide devices, spanning from the top to the bottom of the cover side sheet, are engaged to stabilize the cover.

HYDROSEAL® STEEL COVER (TYPE GVL)

The separate launder and liquid seal between the digester tank and the cover eliminates gas and VOC emissions, improves service access and improves the maintenance access.

This design allows variable sludge storage capabilities since the side sheet operates independent of sludge storage in clean area. No components come in contact with the sludge.

BUOYANT STEEL COVER (TYPE B)

The Type B uses the radial beam design structure including a peripheral buoyant chamber. The cover floats directly on the digester contents. Precast concrete ballast blocks are placed to maintain a specified gas pressure. A major portion of the buoyant volume which keeps the cover afloat is located at the cover periphery; this feature provides an excellent resistance to tipping. The slide guide system will provide vertical movement without rotation or binding.

EZ-RECT™ SYSTEM

The EZ-RECT™ cover erection system is a feature with the digester cover. Ovivo offers this option to reduce the amount of field welding.

Ovivo will provide the digester cover with cover plate/radial beam sections pre-assembled and finish welding in the shop to facilitate the erection of the cover. Each assembly will consist of two (2) beams and one (1) cover plate.

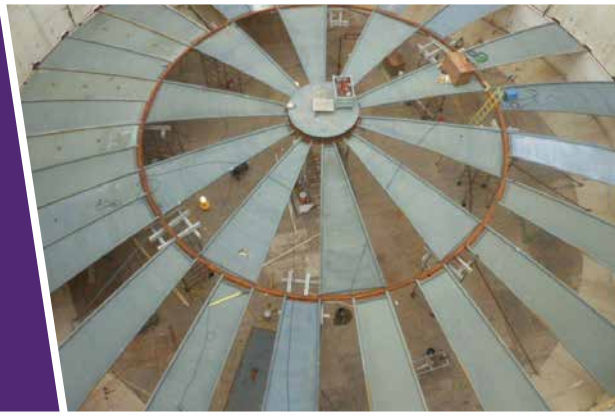
COVER ERECTION IS COMPLETED IN FIVE STEPS:

1. Side Sheet Assembly
2. Center Ring and Erection Beam Installation
3. EZ-Rect Cover Plate Assembly Installation
4. Remaining Cover Plate Installation
5. Manholes, Spools, Tubes, Etc., Installation

ANCILLARY EQUIPMENT

Ovivo can supply all plant required equipment for a complete Sludge Treatment / Anaerobic Digestion plant, including but not limited to:

- Ultrastore™ Membrane Gasholder
- Eimix® Mechanical Sludge Mixer
- LM™ Mixer
- Sonolyzer™ Ultrasound Sludge Disintegrator



ovivo®connect℠

Ovivo® Connect℠ portal is an innovative and intuitive application that allows our customers to use 'SmartTags' installed on our equipment (or a web URL) to access a personalized customer zone. Access your equipment documentation, find contract references, track service logs, manage spare parts, and plan your next maintenance to get the most out of your equipment.

NEED **ACCESS** TO YOUR **O&M MANUAL**?
NEED **SPARE PARTS**?
WANT THE **LATEST TIPS AND NEWS** ON YOUR ASSET?

GET CONNECTED!
ovivo.co

LEARN MORE!
Scan to view online.

1.855.GO.OVIVO

info@ovivowater.com
ovivowater.com

Hinds, Gary

From: Wendi Richards <WRichards@siewertequipment.com>
Sent: Tuesday, October 31, 2017 9:48 AM
To: Hinds, Gary
Cc: Will Stradling; Kathy Decker
Subject: Albany/Saratoga Biosolids Feasibility Study: PAD budget costs
Attachments: 01 2017-10-30-BW DigestivorePAD Proposal.pdf

Hi Gary,

Attached is the revised proposal (dated 10-20-17) for DigestivorePAD for Albany for **three** PAD tanks operating in parallel and 16' SWD. The budget price for the equipment described in the scope of supply of the attached proposal (3-tank system) is **$2,025,000.**

The SRT using three tanks is a little over 7 days and approximately 3.5% improvement in VSR vs 2 tanks for an overall VSR increase to 16.5% (was 13% VSR with two tanks).

The budget price for the 2-tank DigestivorePAD system proposal sent earlier is **$1,740,000**.

Please review and contact me with any questions.

Thanks,

Wendi Richards, P.E.
Process Engineering Manager
Siewert Equipment
A Division of Cummins-Wagner
Syracuse, New York

wrichards@siewertequipment.com
315-632-8406 (mobile)

www.siewertequipment.com
A 100% Employee Owned Company
Serving Industry & Trade Since 1949

OVIVO Worldwide Experts in Water Treatment

PROPOSAL LETTER

PROPOSAL # 10301717-1-BW-R1

OCTOBER 30, 2017

ALBANY COUNTY, NY WWTP

DigestivorePAD™

PREPARED FOR

Arcadis
855 NY-146, Clifton Park, NY 12065
518-250-7300

AREA REPRESENTATIVE

Siewert Equipment
Wendi Richards
WRichards@siewertequipment.com

PREPARED BY

Bryen Woo, PE
Phone: (512)-652-5818
bryen.woo@ovivowater.com
http://www.ovivowater.com/digestivorepad

Ovivo USA, LLC
2404 Rutland Drive
Austin, Texas, 78758, USA

INTRODUCTION

Albany County, New York is evaluating all options of solids handling. One of the solutions proposed for this plant is Post-Aerobic Digestion, DigestivorePAD™ biosolids stabilization process which places an aerobic digestion step after anaerobic digestion (mesophilic digestion) step with an internal recycle. The DigestivorePAD™ process will aerobically stabilize the sludge, improve dewater ability, and reduce disposal costs by achieving a 10% to 30% additional volatile solids reduction (VSR).

By creating an aerobic environment, the DigestivorePAD™ will reduce total nitrogen by removing approximately 90%-95% of ammonium nitrogen (NH4-N) and also help to minimize phosphorus in the system by facilitating phosphorus uptake by the microorganisms present in the sludge under aerobic conditions.

This proposal outlines the Ovivo technology and design of the DigestivorePAD™ process, as applied to the requirements of the facility.

BASIS OF DESIGN

The information used for design Post-Aerobic Digestion (PAD) is listed as follows:

- Three existing aeration basins each 68'-11" x 68'-11" x 12'-6" SWD to be used as process tanks. It is proposed to raise the tank walls approximately 3.5' in order for each basin to operate at a 16' SWD.
- Max TSS Load entering PAD tank, 72,000 lb/d
- Volatile fraction of sludge after anaerobic digestion = 0.59
- Temperature, < 35 ^{o}C
- Assumed Ammonium concentration entering PAD tank: 1,890 mg/L
- Tanks will not be covered
- The anaerobic step before the PAD is mesophilic digestion

Please inform Ovivo of any additional design criteria or changes to the assumptions made above.

DIGESTIVOREPAD™ SYSTEM GENERAL OPERATION

OVERVIEW

The DigestivorePAD™ process consists of anaerobic digestion followed by aerobic digestion step with an internal recycle. By adding an aerobic digestion step after anaerobic digestion additional volatile solids reduction (VSR) is accomplished. Prior studies have shown during sludge digestion certain organic compounds can be degraded only under anaerobic or only under aerobic conditions. By combining both in the DigestivorePAD™ process provides an additional mechanism to achieve additional VSR of up to 30% compared to that achieved by either anaerobic digestion or anaerobic digestion. The additional organic reduction will also improve the dewaterability of biosolids.

DigestivorePAD™ has built-in aerobic and anoxic zones which facilitate nitrification and denitrification processes. This Nit/Denit process results in total nitrogen removal. Since up to 95% of the ammonia is removed with aerobic treatment odors are reduced significantly.

DigestivorePAD™ reduces the chance of struvite scaling in process piping and on dewatering equipment. This is achieved by removing ammonium which is a key component required for struvite formation. Furthermore, the post aerobic digestion (also called PAD) step strips CO2 out of sludge, and stabilizes pH so that any possible struvite formed remains in the sludge (solid phase). This also results in significantly reduced phosphorus levels in the side stream (liquid phase).

It would be ideal if all digester equipment including blowers, pumps, controls, and instrumentations are in one package to ensure single source of responsibility.

Figure 1: Process Flow Diagram

The following is a description of the primary unit operations that's included in DigestivorePAD™ process. More details will be provided with the equipment.

THE AERATION EQUIPMENT

Ovivo's aeration equipment consists of coarse bubble diffusers designed to operate without the need for maintenance. The equipment is especially suited for digesters and sludge holding tanks which typically see a range of materials and handle thicker solids concentrations.

The TransMAX® diffuser is a single drop diffuser with upper deflector and an above-water orifice. This diffuser achieves medium bubble oxygen transfer rates of up to 16.8%. A figure of this diffuser is shown in Figure 2.

Both the TransMAX® and its larger diameter counterpart, the MS® diffuser, offer excellent mixing and aerating abilities by establishing a clear roll pattern within the basins. These diffusers are recognized as being truly non-clog diffusers. The air metering orifices are located above water level and can be accessed without draining the tank if the system is to be cleaned or altered. However, because the orifice is above water, the need for cleaning is eliminated, even if the air is turned off. This is a guarantee no other diffuser can make.

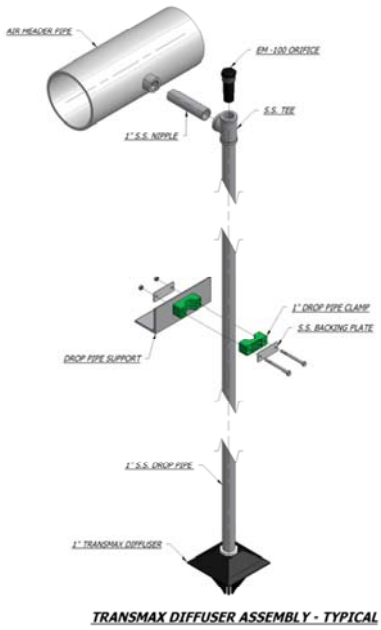


Figure:2. Transmax® Diffuser

In addition to the benefits of the diffuser assembly itself, the TransMAX® and MS® diffusers can be combined with shear tubes or draft tubes. This is done when the sludge to be aerated is thickened prior to aeration or when the tanks to be aerated are very deep. A shear tube assembly is shown in Figure 4 and a draft tube assembly is shown in Figure 4.

Due to the differential pressure between the bottom of the tube and the highly aerated sludge at the top of the tube, sludge is drawn up inside the tube and discharged out the top. This causes a rolling pattern out from each tube, down the depth of the water, and back up the tube. The pumping action is similar to that of an airlift pump and has been quantified with test data. By bringing the full pumped volume into the confined area of the tube the velocity is maintained between 4 and 6 fps thereby reducing the viscosity of the thickened sludge.

In deep tanks, blower horsepower is saved by reducing the submergence and extending the shear tubes. The diffuser heads are mounted only partially down the depth of the tank and thus the system saves blower horsepower compared to aerating a floor mounted system.

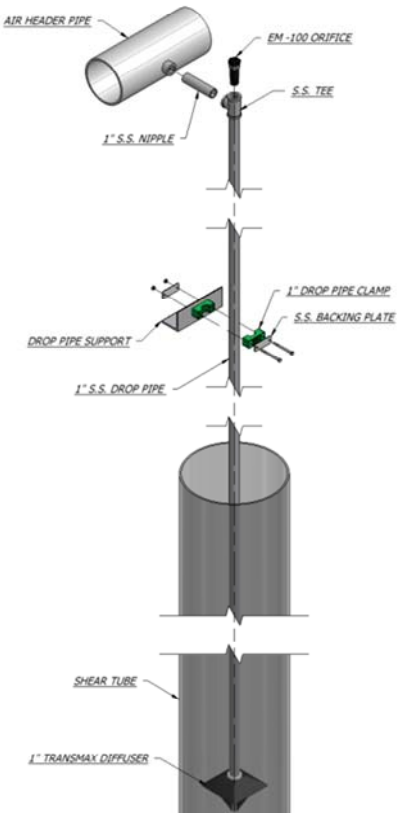


Figure:3 Shear Tube Assembly

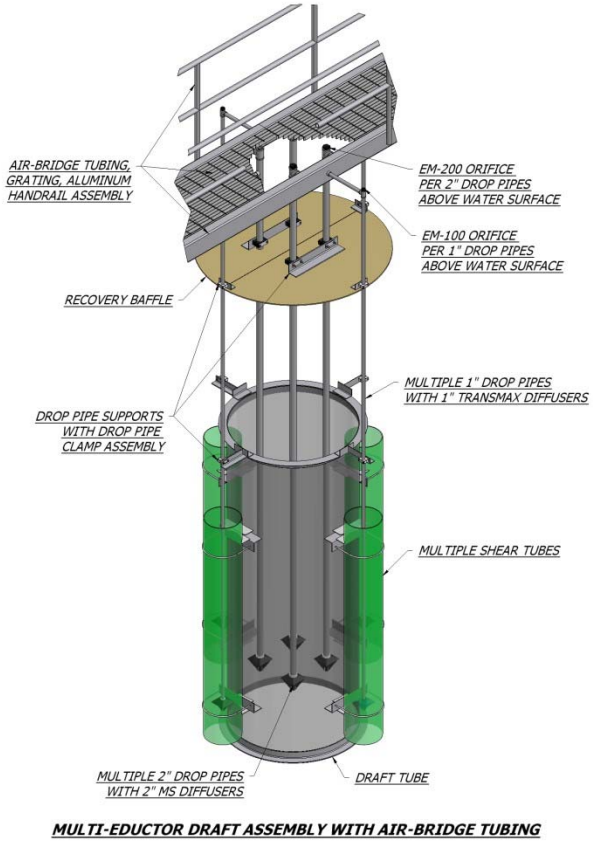


Figure:4 Draft Tube Assembly

DIGESTIVOREPAD^{TM} PROCESS

ADVANTAGES

The DigestivorePAD^{TM} process proposed for the Albany County facility will feed anaerobically digested sludge to three aerobic digesters operated in parallel. The process offers several advantages over the current anaerobic digestion system.

- By utilizing post aerobic digestion, the facility will increase the volatile solids destruction. This means there will be less solids to be disposed of.
- Post aerobic digestion virtually eliminates the ammonia present in the side-stream. This means that any decant that makes it back to the head of the liquid side of plant will have little to no impact on the liquid treatment process.
- Some Phosphorus will either be taken up by the microorganism in the aerobic conditions or will form struvite crystals in the sludge which will be removed when sludge is hauled out rather than being returned to the front of the liquid treatment process.

AERATION DESIGN

Aeration is required for mixing and biochemical oxygen demands. The summary of air requirements are shown in Table 1, below.

Table 1.Aeration Requirements			
Tank	Mixing Air, SCFM	Process Air, SCFM	Pressure, psig
Each PAD tank	3,040	7,346	6.7

Note: Underlined airflows are the design values.

The mixing airflow requirement calculation is based on 40 scfm per 1,000 cubic feet multiplied by the appropriate viscosity correction factor. The process air requirement for volatile solids destruction is based on 2 lbs O2/lbs VS destroyed. The oxygen requirement for ammonia removal is based on 4.6 lbs O2/lb NH4.

The equipment selected for each aerobic digester is a shear tube design which is very similar to the equipment shown in Figure 3 above. The shear tubes will be arranged in six rows and is fed air from three Airbridges allowing the operator to walk from each end of the tank for sampling and observation. Ovivo's scope shall terminate at a butterfly valves located at the air supply pipe feeding the Airbridge.

MATERIALS OF CONSTRUCTION

Table 2 lists the proposed construction materials for the elements proposed by Ovivo.

Table 2.Materials of Construction	
Item	Material
Drop Pipes	Type 304 Stainless Steel
MS Diffusers	ABS Plastic
Air Supply Piping	Hot Dipped Galvanized Steel
Shear Tubes	HDPE
Butterfly Valves	Cast Iron
Floor and Wall Supports	Hot Dipped Galvanized Steel
Fasteners	Type 304 Stainless Steel
Airbridge Grating	Aluminum
Airbridge Tubing	Type 304 Stainless Steel
Airbridge 2-Rail Handrail and Kickplates	Anodized Aluminum
Airbridge Grating	Aluminum

OVIVO SCOPE OF SUPPLY

The preliminary scope of supply for the DigestivorePAD™ process is as follows:

Items Included
Each PAD tank - Three (3) Airbridges each approximately 70 long (complete with 2-rail handrail, kickplates, and grating) - One Hundred Fifty (150) 18 inch diameter Shear Tubes and one hundred fifty (150) 1.5 inch diameter MS® Diffuser drops. Assemblies complete with orifice adapter, stainless steel drop pipe, and lower diffuser - Six (6) 10 inch Butterfly Valves - Supports and fasteners as needed
Recycle Pump - Four (4) recycle pumps that transfers 10-20% flow from Aerobic basin to Anaerobic basin to promote overall volatile solid reduction increase (3 duty and 1 standby).
Instruments - Three (3) PH Probe and controller - Three (3) DO probes
Control System: A PLC is included in the scope to control the instrumentations, pumps and blowers related to PAD operation.
Items Not Included (But Not Limited To The Following)
Vacuum break and associated piping and fittings
Yard Piping and associated fittings
Ground Supports for Yard Piping
Piping and fittings of any kind unless listed above
Air Supply Piping between tank walls and blowers
Wall sleeves or link seals
Installation
Concrete Work
Electrical Wiring
Blowers and VFDs
Valves unless specifically listed above
Hoist and Hoist Stand unless specifically listed above
Motor Starters and/or VFDs
Any items not specifically listed in the “Items Included” table

BROCHURE

OVIVO Worldwide Experts in Water Treatment

Municipal
BIOSOLIDS
MANAGEMENT

DigestivorePAD™

ANAEROBIC DIGESTION + POST-AEROBIC DIGESTION

HOW WE CREATE VALUE

Reduced biosolids management costs – up to 30% increased VSR

Improved nutrient removal – reduced total N and P in the sidestream

Odor reduction – due to 95% to 98% ammonia removal

Improved dewaterability – due to improved VSR

Struvite stabilization – Reduced struvite scaling

Easy Retrofits – Utilizing existing tanks

Based on DC Water Patent No. US 7,833,415 B2

THE CHALLENGE

Do you have these biosolids management issues?

- High biosolids management costs due to lack of volatile solids reduction
- Issues meeting total nitrogen and phosphorus effluent limits
- Reduced plant efficiency and high O&M costs due to struvite scaling formed in piping, pumps, and dewatering equipment
- Odor issues in the dewatering building or at your land application sites

OVIVO'S SOLUTION

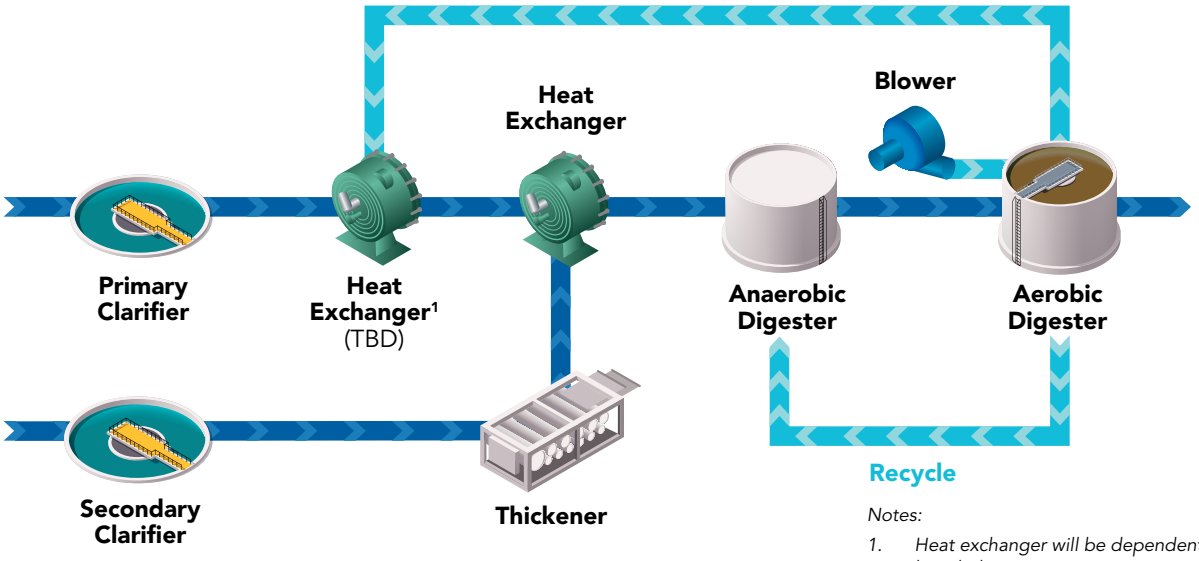
Ovivo brings its extensive experience and expertise in the areas of anaerobic digestion as well as aerobic digestion to offer utilities a revolutionary concept, DigestivorePAD™.

DigestivorePAD is a simple, easy-to-implement but a comprehensive solution to many common problems associated with biosolids management. Ovivo's DigestivorePAD process consists of anaerobic digestion followed by post-aerobic digestion. Aerobic digestion, operating in conjunction with anaerobic digestion, provides enhanced volatile solids reduction, increasing performance by 20% to 30%. Increased volatile solids reduction results in reduced biosolids management costs and improved dewaterability of biosolids.

DigestivorePAD uses anoxic and aerobic conditions in the post-aerobic digestion to create nitrification and denitrification environments. This results in more than 95% ammonia nitrogen removal and more than 90% total inorganic nitrogen (TIN) removal in the side stream. This is especially beneficial for utilities facing stringent nitrogen discharge limits. Almost complete removal of ammonia reduces the nuisance odor which is a common operational issue.

DigestivorePAD also reduces the struvite scaling issues by removing a key component required for its formation, the ammonium content. Further, the post-aerobic digestion step strips sludge off CO_2 and stabilizes the pH so that any struvite formed remains in the sludge. This results in significantly reduced phosphorous levels in the sidestream.

TYPICAL DigestivorePAD™ PROCESS FLOW DIAGRAM



Notes:

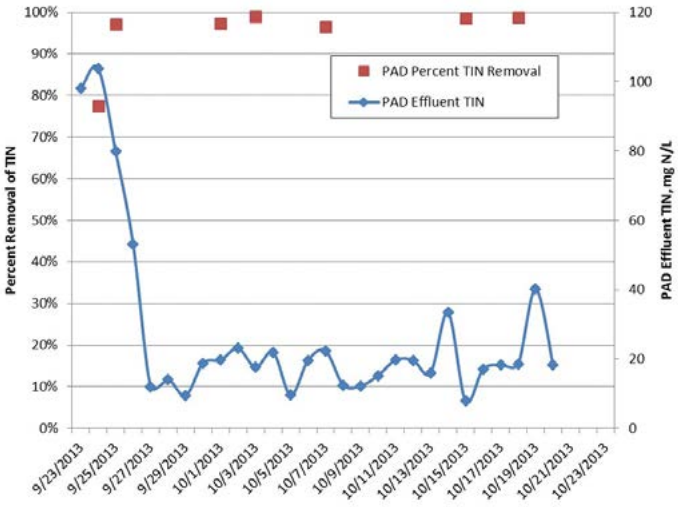
1. *Heat exchanger will be dependent upon heat balances.*

SPOKANE COUNTY REGIONAL WRF DigestivorePAD™ (BASED ON DATA PROVIDED BY CH2M)

VSR Results

Parameter	Acceptance Test
Anaerobic Digester Influent Volatile Solids, *kg/d (lb/d)*	11,600 (25,500)
Anaerobic Digester Effluent Volatile Solids, *kg/d (lb/d)*	3,920 (8,650)
PAD Effluent Volatile Solids, *kg/d (lb/d)*	2,330 (5,140)
Anaerobic Digester VSR	66.2%
Post-Aerobic Digester VSR	40.6%
DigestivorePAD VSR	79.9%

Nitrogen Removal Results



**Results achieved without chemical addition*

CONTACT

1-855-GO-OVIVO
info@ovivowater.com
www.ovivowater.com

Hinds, Gary

From: Eric Wanstrom <ewanstrom@schwingbioset.com>
Sent: Wednesday, October 25, 2017 6:16 AM
To: Hinds, Gary
Subject: RE: Cake rewetting station
Attachments: Rec Station Example.pdf

Gary,
Sorry I didn't get back to you last week.

For budget purposes a receiving bin and a cake discharge pump will be roughly $450K-$550K. This includes bin with bi-fold door cover discharge pump and controls.
This should get you in the ballpark.

Eric Wanstrom, PE
Northeast Regional Sales Manager

Schwing Bioset, Inc.
98 Mill Plain Rd
Danbury CT
Cell: (203) 731-0977
E-mail: ewanstrom@schwingbioset.com

From: Hinds, Gary [mailto:Gary.Hinds@arcadis.com]
Sent: Thursday, October 12, 2017 9:17 AM
To: Eric Wanstrom
Subject: RE: Cake rewetting station

Eric,

Thanks for getting back to me. At this point it is just preliminary, so a budget quote would be great.

For reference, the receiving station will intake approx. 170 CY/day maximum under current conditions, but we'd like to either have capacity or have the ability to add capacity to accept sludge from more sources (maybe another ~50 CY/day future). Majority of sludge is coming from 2 separate sources currently, at least one of which currently hauls to landfill in ~35 CY truckloads so probably safe to assume two sources sending 35 CY truckloads and the third just a single 6 CY load per day.

As far as how fast we can empty the bins, the rewetted cake is being sent to blending tanks to mix with other sludge, so I don't believe we're limited by a downstream process. Basically, I think we can empty the bins as fast as we can load it out on conveyors and rewet it. Do you have experience in the rewetting process as well, or just the receiving silo and conveyors?

Thanks,
-Gary

From: Eric Wanstrom [mailto:ewanstrom@schwingbioset.com]
Sent: Wednesday, October 11, 2017 8:14 PM
To: Hinds, Gary <Gary.Hinds@arcadis.com>
Subject: RE: Cake rewetting station

Hi Gary,
I was in the field today so I'm just catching up on emails.

- What's the difference between the sliding frame silos and push floors? Does this sound like a good application for either of these, or for the live bottom hopper?

A: This is an excellent application for the technology that we have done many times before. The technology is the same; a steel frame inside the silo or bin driven by a hydraulic cylinder on the outside. We use the different terminology to differentiate between a round silo (sliding frame) and a rectangular bin(push floor). The push floor will often have multiple frames. Check out the animation on youtube: https://www.youtube.com/watch?v=9Qa6bx8hUyE

- From the hopper, we need to drop the cake into a rewetting tank for mixing with WAS. Is it possible to use inclined screw conveyors coming out of the hopper to lift the cake into the tank? I've seen systems before that drop cake through the floor into a tank, but would probably prefer to have it all on the same level.

A: Yes conveyors can be used. Likely there would be two (2) conveyors. A horizontal conveyor to extract material out of the bin or silo, then an incline conveyor to the re-wetting tank. We can also use pumps.

The silos or bins can be just about any dimension or shape. We start with the volume of the trucks to be used, then design the conveyors for how many trucks/ how quickly the bin needs to be emptied.

If it's preliminary I can give you a quick budget quote for a similar application if needed.

Eric Wanstrom, PE
Northeast Regional Sales Manager

Schwing Bioset, Inc.
98 Mill Plain Rd
Danbury CT
Cell: (203) 731-0977
E-mail: ewanstrom@schwingbioset.com

From: Hinds, Gary [mailto:Gary.Hinds@arcadis.com]
Sent: Wednesday, October 11, 2017 3:07 PM
To: Eric Wanstrom
Subject: Cake rewetting station

Hi Eric,

I'm working on a feasibility study for a biosolids handling facility near Albany, NY. The facility would include a new sludge cake receiving station where imported cake would be rewetted. I had a couple questions about using some of your products as cake hoppers:

- What's the difference between the sliding frame silos and push floors? Does this sound like a good application for either of these, or for the live bottom hopper?
- From the hopper, we need to drop the cake into a rewetting tank for mixing with WAS. Is it possible to use inclined screw conveyors coming out of the hopper to lift the cake into the tank? I've seen systems before that drop cake through the floor into a tank, but would probably prefer to have it all on the same level.

Feel free to give me a call or email to discuss if you have any questions.

Thanks,
-Gary

Gary Hinds | Water Resources Engineer II | Gary.Hinds@arcadis.com
Arcadis | Arcadis of New York, Inc./Arcadis CE, Inc.
855 Rt 146 Ste 210 Clifton Park NY | 12065 | USA
T. +1 518 250 7263 |

Connect with us! www.arcadis.com | LinkedIn | Twitter | Facebook

RECORD OF MEETING

Arcadis of New York, Inc.
855 Route 146
Suite 210
Clifton Park
New York 12065
Tel 518 250 7300
Fax 518 250 7301
www.arcadis.com

Subject:

Casella Organics Call Log

Department:

Arcadis Project No.:

Meeting Location:

Phone Call

Meeting Date:

11/15/2017

Participants:

Gary Hinds

Glen (Casella Organics)

Copies :

Minutes by:

Gary Hinds

Issue Date:

11/15/2017

Revisited discussion from 10/10/17 regarding contract hauling of Class A, Class B material

- Confirmed: for Class B, can use $55-$60 per wet ton for design purposes
    - Asked how available storage impacts this price
        - For sufficient 6 month storage, can use $55/wt. For insufficient storage, price could be $60/wt or more.
        - Glen says we are safe using a design value of $60/wt
- Confirmed: for Class A, can use $25-$30 per wet ton for design purposes
    - Similar price impact of storage
- Asked if anything else might impact price
    - Quality of Class A material can have impact – some Class A material is not suitable for land application

COMBUSTION & ENERGY SYSTEMS LIMITED

www.combustionandenergy.com

February 2, 2018

Kinsley Energy Systems
14 Connecticut South Drive
East Granby, CT 06026

Our Proposal No: 218029R1

Attention: Brent Voelker

Reference: Stainless Steel Economizer Quote for Digester Gas Fired Turbine

Dear Brent:

We are pleased to provide the following proposal for the supply of a ConDex heat recovery unit, designed to pre-heat plant thermal oil through the recovery of waste heat from turbine exhaust gas.

DESIGN CONDITIONS

One (1) ConDex Economizer, designed for a thermal oil flow rate of 132,000 lb/hr, entering at 302^{o}F, and heating it to 431^{o}F, recovering energy from an exhaust gas flow of 72,540 lb/hr, entering at 802^{o}F, leaving at 353^{o}F.

Heat recovered: 8,836,305 BTU/hr.

The ***ConDex*** unit will save an estimated **$ 242,7650.00** per year at specified load. In addition to the financial benefits of the ConDex system, the expected reduction in CO2 greenhouse gas emissions will be 4,762 Tons per year, NOx emissions will be reduced by approximately 3.03 Tons per year (based on an existing 80 ppm stack NOx level). The above calculations are based on a fuel cost of $3.00/Mcf and 8700 hours of operation.

The unit will be supplied complete with:

- ASME Code construction,
- SA249 TP304 stainless steel tubes and fins,
- 2” thick mineral wool insulation,
- 16 gauge corrugated galvanized steel outer lagging,
- One (1) vent connection, 3/4" NPT,
- One (1) drain connection, 3/4" NPT,
- 3" flanged fluid inlet and outlet connections,
- 2" NPT condensate drain connection,
- 0.75” Threaded safety relief valve connection,
- Vertical gas flow up, Counter current water flow,

Total Price For One (1) Unit: …….$168,695.00

DESIGN CRITERIA

Our heat recovery system has been designed to satisfy customer thermal oil heating requirements by optimizing heat transfer surface area and pressure drop. The following criteria have been used in the design of this system:

1. For this service we have proposed a shop assembled, watertube, forced circulation ***ConDex*** system. The proposed system is modular and is designed to maximize the amount of shop assembly and minimize field labor.

2. The forced circulation heat exchanger utilizes thermal oil circulation pump head and minimal pressure drop to provide circulation to the heat transfer surfaces. Pressure drop and tube side velocities are optimized to develop the most cost-effective design.

3. This system will be designed to heat water using flue gases from a gas-fired turbine capturing waste heat.

4. The design conditions are as follows:

Exhaust gas flow:	72,540 lb/hr
Exhaust gas inlet temp:	802 °F
Thermal oil flow:	132,000 lb/hr
Thermal oil inlet temp:	302 °F
Thermal oil type:	Therminol

5. Triangular (staggered) tube arrangement has been selected to provide sufficient draft loss for a given cross sectional area and tube pitch allowing a more compact design.

6. Tubes are 1” OD 304 stainless steel and fins will be solid to provide optimum heat transfer and shall have a maximum density of 9 fins per inch

7. The heat exchanger coil is completely drainable.

Not Included:

- Piping to and from exchanger,
- Water outlet temperature control or display system,
- Unit support structure,
- Assembly, installation or commissioning,
- Piping insulation.

COMBUSTION & ENERGY SYSTEMS LIMITED

www.combustionandenergy.com

VALIDITY: This quotation is valid for acceptance for 30 days, for standard delivery times.

MANUALS: Three (3) copies of Operation & Maintenance Manuals are included in the above price.

FUNDS: U.S. dollars.

TAXES: Extra as applicable.

FREIGHT: F.O.B. Toronto, Ontario.

DELIVERY: 14 to 18 weeks after fabrication release.

TERMS: 10% upon order
20% upon submittal of approval drawings
20% upon receipt of materials at shop
20% upon notification of readiness to ship
20% upon delivery to sight
10% upon start up (not to exceed 90 days beyond delivery date)

PAYMENT: Net thirty days on units less then $40,000.00. Progress payments may be required if over this amount.

We thank you for the opportunity to submit our quotation and look forward to being of service.

Yours very truly,
COMBUSTION & ENERGY SYSTEMS LTD.

Cam Veitch.

cc. Joe Richter, Combustion & Energy Systems USA

Encl: Data Sheet
Dimensional Sketch
Terms and Conditions

COMBUSTION & ENERGY SYSTEMS LIMITED
25 Royal Crest Court, Markham, Ontario L3R 9X4
(P) 905.415.9400 (F) 905.415.9482

COMBUSTION & ENERGY SYSTEMS LIMITED

www.combustionandenergy.com

ConDex PERFORMANCE DATA SHEET

Date: February 2, 2018 Designed by: C Veitch
Customer: Kinsley Energy Systems
Reference: ConDex Economizer Heat Recovery Performance Data Sheet
Quotation No.: 218039

Heat recovery system in the ***Condensing*** mode.

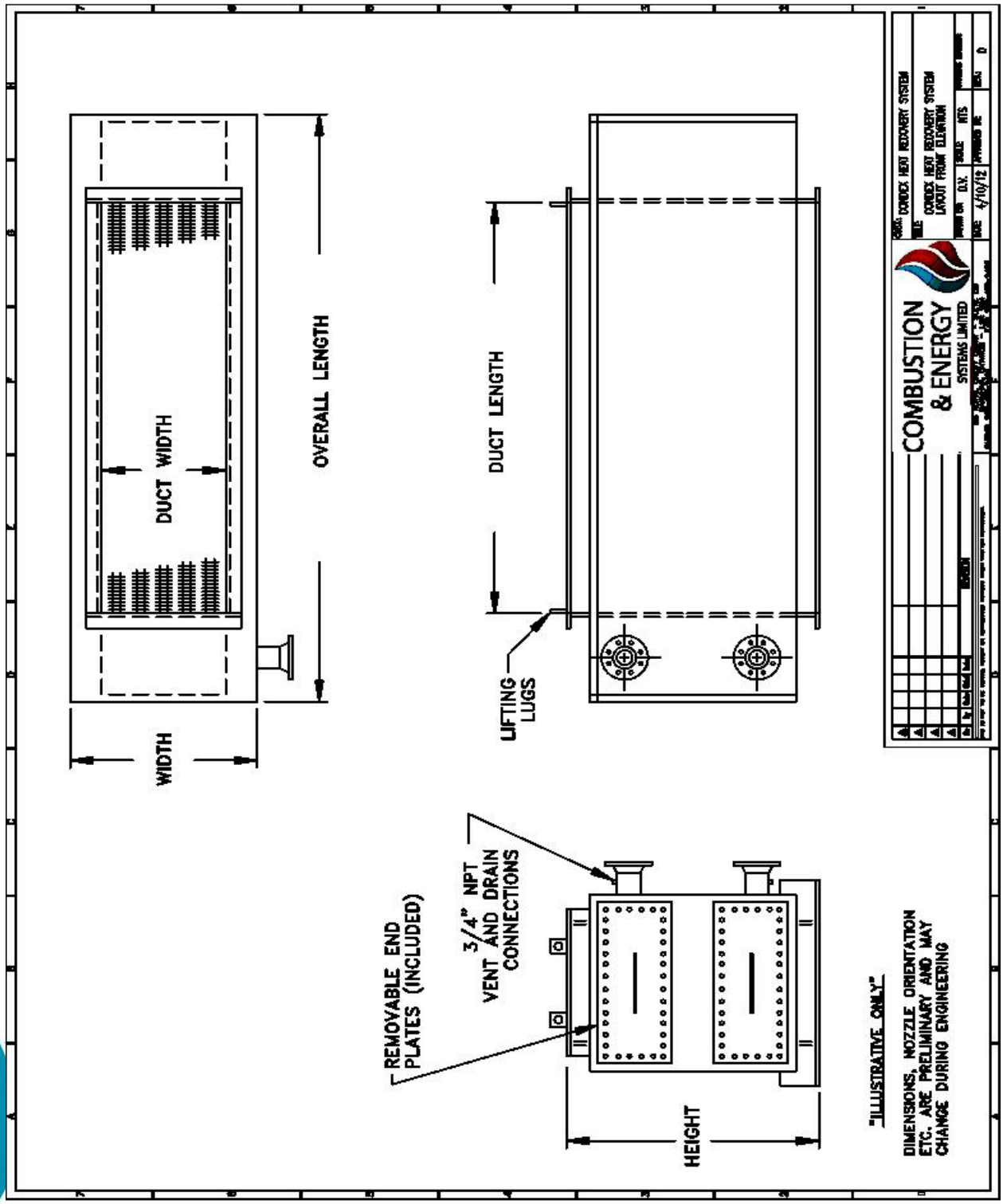
Fuel: Natural Gas

Gas side:	Gas type	Turbine Exhaust
	Total flow rate	72,540 lb/hr
	Inlet temperature	802 °F
	Outlet temperature	353 °F
	Dew point	126 °F
	H_2O vapor by weight @ inlet	9.0 %
	H_2O vapor flow @ inlet	6,528 lb/hr
	H_2O vapor flow @ outlet	6,528 lb/hr
	H_2O condensed	0 lb/hr
	Specific heat @ avg. temperature	0.277 Btu/lb·°F
	Pressure drop	1.25 inch w.c.
	Fouling factor	0.001 hr· ft^2· F/Btu
	Maximum velocity at inlet temperature through the new free area	25.7 fps
Liquid side:	Fluid type	Thermal Oil
	Total flow rate	132,000 lb/hr
	Inlet temperature	302 °F
	Outlet temperature	431 °F
	Pressure drop	8.12 psi
	Fouling factor	0.001 hr· ft^2· F/Btu
	Velocity at average temperature	5.31 fps

TOTAL HEAT RECOVERED (with 2% losses) 8,836,305 Btu/hr

Dimensions: 14.5 ‘ Long 6.05 ‘ High 5.5’ Wide
Unit Weight: 11,447 Lb. Dry 12,467 Lb. Wet

COMBUSTION & ENERGY SYSTEMS LIMITED
25 Royal Crest Court, Markham, Ontario L3R 9X4
(P) 905.415.9400 (F) 905.415.9482



COMBUSTION & ENERGY SYSTEMS LIMITED
25 Royal Crest Court, Markham, Ontario L3R 9X4
(P) 905.415.9400 (F) 905.415.9482

COMBUSTION & ENERGY SYSTEMS LIMITED

www.combustionandenergy.com

COMBUSTION & ENERGY SYSTEMS LTD.
TERMS & CONDITIONS

1.0 TERMS OF PAYMENT

1.1 F.O.B. factory, unless stated otherwise.
1.2 All payments to be made in Canadian dollars, unless stated otherwise.
1.3 All quotations shall remain valid for a period of 30 days for shipment in normal delivery times, unless otherwise stated.
1.4 All orders based on such quotations are subject to acceptance by Combustion & Energy Systems, Ltd., Markham, Ontario, hereafter referred to as "Company".
1.5 All payments shall be net 30 days unless stated otherwise.

2.0 PRICES

2.1 Prices do not include any sales, excise, use taxes or duties, which may be imposed by federal, provincial, local or foreign authorities. Such taxes, if applicable, are payable by the purchaser.
2.2 This quotation is based on present prices of materials and services and as such quotation and shipment.

3.0 TRANSPORTATION

3.1 Prepaid freight charges paid by Company at the request of the purchaser are due upon receipt
3.2 Freight charges are based upon current rates and classification. Should Company be required to pay additional charges due to changes in such rates and/or classifications, then the additional charges including penalties shall be charged to and paid by the purchaser.

4.0 DELIVERY

4.1 Delivery is based on present schedules subject to verification at the time order is placed. Company will maintain this delivery barring unforeseen circumstances beyond its control such as fires, floods, strikes, lockouts, riots or accidents within its plant or those of its suppliers, or, for any causes beyond Company's reasonable control.
4.2 Delivery forecasts are based on conditions at the time the estimate is made and are therefore subject to your immediate acceptance and our receipt of your written purchase order. The date shown is also subject to change for reasons beyond our control, such as transportation delays, strikes, riots, fires, or acts of God, including our inability to obtain necessary materials for fabrication from our suppliers. Company shall not be liable for consequential damages resulting from our failure to meet the shown delivery date for the above or any other causes.

5.0 CANCELLATION

5.1 In the event the purchase order is canceled for any reason, a charge will be made on the completed portion based upon cancellation charges by various vendors and work performed. Cancellation charges will include reasonable profit and overhead.

6.0 QUALITY OF MATERIALS

6.1 Materials are guaranteed for quality and workmanship for a period of one year after shipment in the same respect as such materials are guaranteed for quality and workmanship by the suppliers. Company accepts no responsibility for failures due to faulty operation.

7.0 WARRANTY

7.1 Company warrants that equipment of its own design shall be manufactured in accordance with specifications and the code requirements set out in the proposal and that such equipment shall be free from defects in material and workmanship under normal use and service for which the equipment was designed for a period of 12 months after shipment from factory. If such equipment designed and manufactured by Company shall fail through defect in workmanship or material specific written notice of such failure is made to Company within 12 months after date of shipment from factory, Company will repair or replace at Company option any such items of its own design and manufacture, F.O.B. its factory, without charge, provided that Company is given an opportunity to make an inspection and is furnished with satisfactory proof that equipment was used and properly operated within design limits.
7.2 Company warrants that equipment is manufactures pursuant to design and specifications provided by customer shall be manufactured in accordance with such design and specifications and that such equipment manufactured by Company shall fail through defect in workmanship or material and specific written notice of such failure is made to Company within 12 months after date of shipment, Company will repair or replace at Company option any such items of its own manufacture, F.O.B. its factory, without charge, provided that Company is given an opportunity to make inspection and is furnished with satisfactory proof of said defect.
7.3 If customer repairs or modifies unit without Company approval, all warranties are void.
7.4 Company is not liable for erosion, corrosion, natural wear or any failure, which may in any case be attributed to faulty operation.
7.5 Company liability shall, in no event, exceed the purchase price of the equipment and/or services furnished by Company and shall not be responsible for any consequential loss of damages.
7.6 No agent or employee of Company has any authority to make any verbal warranty or representation as to any equipment, parts or goods sold by Company.
7.7 **Company makes no warranties or guarantees that extend beyond those expressly stated herein.**

8.0 NOTICE

8.1 Company accepts no warranties and does not agree to be bound by any of the terms on any standard or form purchase order submitted by its customers in the normal course of ordering material or equipment warranties or guarantees beyond those expressly stated herein must be separately and mutually agreed upon.
8.2 Company will retain title to all equipment shipped until such time full and complete payment is received.

9.0 LIABILITY

9.1 The Company will not be liable for any damage caused by the operation or non-operation of the machinery or devices purchased whether or not operated in accordance with instructions or because of any failure to meet conditions of our guarantee. The Company shall not be liable for any consequential damages including loss of production. Our liability under any contract shall in no case exceed the price paid for goods furnished by the Company.

APPENDIX D

Governance Evaluation Memo

THIS PAGE INTENTIONALLY LEFT BLANK

RAFTELIS
FINANCIAL CONSULTANTS, INC.

952 Troy-Schenectady Road,
Latham, NY 12309

Phone 518.391.8944

www.raftelis.com

MEMO

To: Robert Ostapczuk, Arcadis of New York, Inc.

From: John Mastracchio, Raftelis Financial Consultants, Inc.

Date: October 25, 2017

Re: Governance Evaluation for Albany County Water Purification District and Saratoga County Sewer District Regional Biosolids Handling Facility

The purpose of this technical memorandum is to identify and evaluate governance structure alternatives for the potential regional biosolids handling facility that is currently being considered as a joint project between the Albany County Water Purification District ("ACWPD") and the Saratoga County Sewer District ("SCSD").

Background

The ACWPD and the SCSD have engaged Arcadis of New York, Inc. ("Arcadis") to evaluate a regional biosolids handling facility that will consist of solids handling and energy recovery, and provide a long-term solution for both sewer districts pertaining to municipal wastewater sludge disposal. Both sewer districts have independently evaluated biosolids handling systems for their respective facilities.

The ACWPD owns and operates two conventional activated sludge wastewater treatment plants, each equipped with sewage sludge incinerators ("SSI") and ash lagoons for sludge disposal. The ACWPD manages biosolids from its wastewater treatment operations, and also accepts biosolids from numerous communities with small wastewater treatment plants within the County and the region, and also accepts scavenger wastes.

SCSD owns and operates a conventional activated sludge wastewater treatment plant that is equipped with a SSI that is currently offline in response to the US EPA SSI MACT Rule (40 CFR60) that went into effect March 21, 2016. Dewatered sludge cake is hauled to a landfill, which has added a significant operating expense to their annual budget.

Arcadis is in the process of evaluating multiple alternatives for implementing a joint biosolids handing facility that could be utilized to serve both the ACWPD and the SCSD. To support this effort, Raftelis Financial Consultants, Inc. ("Raftelis") was engaged to identify and evaluate various governance structure alternatives to support the ownership, operation, maintenance, and funding of the facility.

Existing Governance Structure

Both the ACWPD and the SCSD were formed under Article 5-A of the New York State General Municipal Law, which allows for the board of supervisors of each county to establish a district with a resolution of the County legislature. Among other purposes, a district can be established for the purposes of (a) the conveyance from other municipalities and districts within the county of sewage, and treatment and disposal thereof, (b) collection, except as hereinafter provided, or (c) both such conveyance and such collection.[1] The ACWPD was established by County Resolution in 1968 and has provided wastewater services since 1974. The District's activities are directed by a five-member Board of Commissioners, who are appointed by the Albany County Legislature. The SCSD activities are directed by a nine-member Board of Commissioners, who are appointed by the Saratoga County Board of Supervisors.

The status quo alternative would consist of both SCSD and SCSD constructing separate biosolids handling facilities to serve each of their needs.

Regional Biosolids Handling Facility Governance Alternatives

There are many statutes that empower local governments to act cooperatively or jointly between and among themselves in order to provide facilities and services in a more efficient and economical manner. The most general grant of authority is Article 5-G of the General Municipal Law. Article 5-G (§§119-m – 119-ooo) provides broad authority for "municipal corporations" and "districts" to cooperate with each other in carrying out their responsibilities. It generally provides that certain local governments "may join together pursuant to law in providing any municipal facility, service, activity or undertaking which each of such units has the power to provide separately."[2] Therefore, with this grant of authority, there are several governance and management alternatives that the ACWPD and SCSD could consider for jointly developing a Regional Biosolids Handling Facility. These alternatives are discussed below.

Alternative 1 – Establish a Separate Regional Authority

One alternative that is available to the ACWPD and SCSD is to establish an independent regional authority to own, operate, and manage the biosolids handling facility. Public authorities are corporate instruments of the State of New York, created by the State Legislature to further public interest.[3] A public authority may be established under New York, Public Utility Authorities Law, Article 5, which provides for the establishment of authorities as public benefit corporations to provide water, sewer, or other services to the public. Authorities are typically established for the benefit of a city or county, but may be established for the benefit of multiple counties, cities, towns, and villages. Public authorities have various levels of autonomy from the State based on powers, as well as the constraints, built into their legislative mandate. Some public authorities are completely self-supporting, whereas others rely on state appropriations to fund operations.

Establishment of a regional authority for biosolids management would require an act of the New York State Legislature to pass legislation authorizing the formation of the authority.

---

[1] Article 5-1, Section 250.
[2] NY Const, Article VIII, §1; see also NY Const, Article IX, §1[c]
[3] http://www.osc.state.ny.us/pubauth/whatisauthority.htm

Public authorities may incur debt and collect user charges, but may not levy taxes or benefit assessments on real property unless specified upon their establishment. A public authority associated with the biosolids facility would be independent and autonomous and have legal flexibility not otherwise permitted to a state department or agency. For example, authorities can circumvent public debt limits, issue bonds without voter approval and have fewer restrictions on financial reporting, employment, procurement and contracting. Public authorities usually raise money through the sale of bonds, and are able to meet debt obligations through revenues obtained from user fees or service charges.

If such an authority were created in response to Albany County and Saratoga County needs, it could take the form of a Biosolids Treatment Authority (the first of a new category of Authorities in New York State), a Sewer Authority, or a Solid Waste Management Authority. The new Authority would enter into service agreements with the ACWPD and the SCSD after its formation. Both counties could be democratically represented on the board of the new Authority and could influence its services and performance through those representatives.

Authority Examples

Although we are not aware of any authorities exclusively dedicated to biosolids services in New York State, there are numerous relevant examples of authorities across the state. Several Sewer, Water/Sewer, and Solid Waste Management authorities are authorized to manage biosolids. Water Authorities do not manage biosolids, but are also prevalent across New York State demonstrating the range of intergovernmental collaborations that currently exists.

Sewer or Water/Sewer Authorities

The Rensselaer County Water and Sewer Authority was established by the New York State Legislature in 1986. It finances, manages, and operates public water and sewer utilities in Rensselaer County as well as in neighboring local governments such as the Town of Schodack. This authority has raised bonds on behalf of municipalities in its service area to finance improvements in those jurisdictions[4].

Another relevant local authority is the Town of Wilton Water and Sewer Authority, founded in 1991. The Authority operates three water supply facilities and a sanitary sewer collection system, which discharges into the Saratoga County Sewer District #1 system (SCSD #1).[5] In 2005, the SCSD #1 expanded its service area to include all of the Town of Wilton, but the Town of Wilton Authority continues ownership and maintenance of collectors and pump stations within the Town that were previously under its jurisdiction[6].

The Buffalo Sewer Authority has been in existence since 1938, providing sewage collection and treatment to the City of Buffalo as well as to 11 other municipalities in Western New York. The Authority has taken over Erie County's industrial pre-treatment program and has sought sources of sludge and grease from outside of the Authority's purview to increase revenues.

[4] Audit of Renssalaer County Water and Sewer Authority. 2014. https://www.osc.state.ny.us/localgov/audits/specialdists/2014/rensselaerwatersewer.pdf

[5] http://water.townofwilton.com/

[6] Town of Wilton Water and Sewer Authority Annual ABO Report. 2016. http://water.townofwilton.com/public-authority-info/2016-abo-annual-report/

One relevant out-of-state example of a biosolids management authority is the Joint Meeting of Essex and Union Counties, New Jersey. The "Joint Meeting" is a special organization created by the New Jersey Legislature in 1898 in response to the desire of various municipalities to manage wastewater together, and thus fulfills a similar role as an authority does in New York State. It now provides wastewater and biosolids services for eleven member and four customer communities. It currently owns and operates a wastewater treatment facility that services over 600,000 residents.[7] It also uses methane gas, a byproduct of its wastewater treatment, to run its biosolids facilities.

Solid Waste Authorities

Authorities can also be constituted in New York State to handle solid waste of member municipalities. This category of authority is permitted to manage sludge, making this a viable option and an alternative to a sewer authority for regional management of wastewater biosolids.

One example is the Eastern Rensselaer County Solid Waste Management Authority, which provides solid waste disposal and management services to its members, protects its members from outside municipalities who seek to site landfills and burn plants on less populated towns in the County, earns tipping fees to help pay for closure costs of landfills, and gives each participating government an equal vote in management decisions[8]. The Authority uses sludge from Hoosick Falls as landfill cover, demonstrating how a solid waste authority can also participate in wastewater sludge management.

The Ulster County Resource Recovery Agency is another example. This agency is a public authority recognized by the State of New York. Its enabling legislation, Public Authorities Law Article, Title 13-G, stipulates that the agency can "collect, receive, transport, process, dispose of, sell, store, convey, recycle, and deal with, in any lawful manner and way, solid waste and any products or by-products thereof now or hereafter developed or discovered, including any energy generated by the operation of any solid waste management-resource recovery facility." Moreover, the Agency is allowed to "plan, develop and construct projects and to pay the cost thereof and to have the right to contract in relation thereto with municipalities or persons within or without the county."[9] The City of Kingston, pays the Agency a fee to manage its wastewater sludge.[10]

One intercounty authority example is the Oneida-Herkimer Solid Waste Authority, established in 1939. The Authority processed around 3,604 tons of sewage sludge in 2009, but is primarily dedicated to recyclables and other waste types.[11] Another example, the Montgomery, Otsego, Schoharie Solid Waste Management Authority, which was a three-county waste management authority established in 1987, was dissolved in 2014 after intercounty disputes.[12]

---

[7] See information about the Joint Meeting of Essex and Union Counties (NJ) at: http://www.jmeuc.com/index.php

[8] Eastern Rensselaer County Solid Waste Management mission statement and performance measurements. 2011. http://ercswma.org/ercdocs/MissionMeas.pdf

[9] NY State Public Authorities Law, Article 8, Title 13-G, § 2050-E5. See https://www.nysenate.gov/legislation/laws/PBA/2050-E

[10] See http://www.dailyfreeman.com/general-news/20170126/kingston-sludge-total-puts-ulster-county-trash-agency-near-limit

[11] See Oneida-Herkimer SWA Management Plan here: http://www.ohswa.org/assets/Uploads/Management-Plan/Final-LSWMP.pdf

[12] See information about the defunct intercounty solid waste authority: http://www.thedailystar.com/news/local_news/counties-agree-to-pull-plug-on-mosa/article_7dbe07e8-6a5c-5a1c-9e34-aeea715ccb1e.html

Alternative 2 – Intermunicipal Agreement

Another alternative that is available to the ACWPD and SCSD is to establish an independent regional authority to own, operate, and manage the biosolids handling facility. Municipal corporations and districts within New York State have the power under New York State, General Municipal Law ("GML"), Article 5-G to enter into cooperative or joint agreements between and among other corporations and districts. Two basic types of municipal cooperation agreements are possible pursuant to this law. Participating municipalities may agree to jointly or cooperatively perform a particular activity or project (called a "joint agreement"), in which case there may be a pooling of resources to achieve a mutually beneficial goal. Alternatively, one or more of the participants may contract to provide a service or perform a function for the other participants for an established price, creating, in effect, a provider-recipient relationship (called a "service agreement").[13]

GML Article 5-G sets forth a few basic requirements for entering into municipal cooperation agreements. Fundamentally, a municipal corporation or district may participate in a cooperation agreement only for the performance of those functions that it is empowered to perform individually. In other words, each participant in the agreement must have statutory authority, independent of Article 5-G, to perform the function. Each participating corporation or district must approve these agreements through a vote of the governing body with majority support. Additionally, if certain functions to be served by the agreement locally require public hearings or referendums then the agreement itself must engage in these efforts as well.[14]

GML Article 5-G also states that the agreement may contain provisions related to a method or formula for equitably providing for and allocating revenues, and for equitably allocating and financing the capital and operating costs, including payments to reserve funds authorized by law and payments of principal and interest on obligations. Such method or formula shall be established by the participating corporations or districts on a ratio of full valuations of real property, or on the basis of the amount of services rendered or to be rendered, or benefits received or conferred or to be received or conferred, or on the increase in taxable assessed value attributable to the function, facility, service, activity or project which is the subject of an agreement, or on any other equitable basis, including the levying of taxes or assessments to pay such costs on the entire area of the corporation or district, or on a part thereof, which is benefited or which receives the service.

Therefore, an intermunicipal agreement could be established to support the joint development of the biosolids facility. The facility could be owned and operated by either ACWPD or SCSD, and the non-owning party could agree to send biosolids waste to the owning party. The cost of operations and maintenance, as well as the capital costs could be shared as a user fee or as a capital contribution. The non-owning party could simply pay a user fee that pays for a proportional share of operation, maintenance, and capital costs (e.g. debt service), or it could have the right to a certain capacity share in the facility if a "take or pay" type agreement is established, or if the non-owning party provides up-front capital for their portion of the facility.

[13] Intergovernmental Cooperation. 2008. New York Department of State. https://www.dos.ny.gov/lg/publications/Intergovernmental_Cooperation.pdf
[14] New York General Municipal Law,GMU § 119-o. Performance of municipal cooperative activities.

Intermunicipal Agreement Examples

Intermunicipal agreements ("IMAs") have been used in New York State to handle resolve a variety of wastewater and sludge challenges. With regard to biosolids, collaboration has been necessary given that in New York State, approximately 52% of biosolids is sent directly to landfills, 30% is put to "beneficial use" (e.g. composted), and 17% is incinerated.[15] Landfills and incineration facilities are often located outside of municipal jurisdictions, requiring collaboration between municipalities and counties. A few examples of these IMAs are highlighted below.

One example of an IMA related to the provision of wastewater services in the Capital District is the intermunicipal Agreement that was entered into by and among the City of Albany, the Albany Water Board, the City of Cohoes, the Village of Green Island, the City of Troy, the City of Rensselaer, and the City of Watervliet ("the Albany Pool Communities") related to the preparation and implementation of a Combined Sewer Overflow Long Term Control Plan ("LTCP").[16] This agreement is a "joint agreement" type and provides for the implementation of the LTCP by the parties, establishes the parties' respective responsibilities, provides for the creation of a local development corporation, and authorizes the financing of the costs of the LTCP through the issuance of debt by the parties. The agreement establishes a Board of Directors with representatives of each of the parities for the purposes of joint decision making associated with financing of the implementation of the LTCP, revisions to the LTCP or Consent Order, and revisions to the responsibility matrix contained within the agreement. The agreement also specifies that each of the parties shall pay their respective allocated share of the LTC project costs.

The Albany Pool Communities IMA also contains provisions that allow for the joint financing of the LTCP projects, defined as "a joint sewage project" in New York Local Finance Law. The agreement allows for "joint indebtedness", which is the indebtedness related to a joint project for which the joint faith and credit of the municipal corporations or municipalities would be pledged for its repayment. This joint indebtedness referenced in the intermunicipal agreement is consistent with New York Local Finance Law,[17] and highlights the potential ability for a joint biosolids handing facility to be jointly financed and paid for through an IMA between ACWPD and SCSD.

Many other examples can be found where municipalities in New York State have shared wastewater related services through an IMA. A few of these examples are highlighted below:

- The Rockland County Solid Waste Management Authority, which has 20-year agreements for sludge processing for all six Rockland County wastewater treatment plants. The agreements are with the Joint Regional Sewer District, Town of Orangetown, Village of Suffern, Rockland County Sewer District No. 1 (two plants) and Town of Stony Point. The Authority also accepts sludge on an as-needed basis from the United States Military Academy at West Point and Joint Meeting of Essex and Union Counties, New Jersey.[18]

[15] See 2011 report on Biosolids Management in New York State: http://www.dec.ny.gov/docs/materials_minerals_pdf/bioreprt.pdf
[16] Combined Sewer Overflows, Long-Term Control Plan, Inter-Municipal Agreement for Phase II Implementation, dated February 25, 2015.
[17] New York Local Finance Law § 15.00.
[18] Details as described in Rockland County SWM bond filing: https://emma.msrb.org/ES784634-ES616926-ES1012629.pdf

- The Buffalo Sewer Authority and the Town of Amherst in 2008 have established an IMA related to the sharing of wastewater treatment services. As part of this IMA, the Town decommissioned its Water Pollution Control Facility, and now conveys its wastewater to the Buffalo Sewer Authority, saving the town $1 million annually. The projected was awarded $414,615 as part of NY State's Local Government Efficiency Grant Program, which provides technical assistance and competitive grants to local governments for projects that achieve savings through municipal efficiency.[19][20]

- The City of Newburgh and the Town of Newburgh entered into an intermunicipal sewer agreement in 1988 and updated it in 2004 to construct additional sewage treatment capacity. The Town pays the City a charge for operation and maintenance per volume of sewer treated by the City. The agreement stipulates that both parties will adopt identical sewer ordinances when possible.[21] This example highlights how ACWPD and SCSD biosolids legislation and ordinances may need to be synchronized.

There are also many biosolids-related IMAs agreement examples from outside of New York State. One example is the City of Rehoboth Beach and Sussex County, Delaware, which signed a 2017 contract in which the County will handle the town's biosolids treatment. In return, the city will pay an annual fee to the county.[22] Similarly, Mason County and the City of Shelton, WA entered into an agreement in 2017 to better manage treatment of digested sewer sludge. In this case, the County desired extra treatment of its sludge, and the City had the capacity to treat extra sludge. An annual price per unit was agreed upon, escalated 3% each year, with technical specifications detailed for sludge quality that the County can deliver to the City and the specific service that the City will deliver for the County.[23]

Evaluation of Governance Alternatives

The following is a summary of the potential advantages and disadvantages of the governance alternatives that were identified above.

Alternative 1 – Regional Authority

Advantages

- Combining biosolid waste streams of both the ACWPD and SCSD would provide for increased economies of scale over the status quo alternative, and could allow for lower overall unit costs and more dedicated and specialized staff.

[19] See an announcement of the grant at: https://www.ci.buffalo.ny.us/Mayor/Home/Leadership/Archived_Press_Releases/2009Archives/July2009/SharedServiceGrantBuffaloSewerAuthorityTownAmherst

[20] See more details about the program here: https://www.dos.ny.gov/lg/lge/index.html

[21] See the intermunicipal sewer agreement between the Town and City of Newburgh at https://www.dos.ny.gov/lg/lge/ima.html#utility

[22] See text of Rehoboth Beach and Sussex County, DE agreement here: https://www.cityofrehoboth.com/sites/default/files/Agreement%20for%20Wastewater%20%26%20Biosolids%20Services_0.pdf

[23] See text of agreement between Mason County and Shelton, WA here: http://www.sheltonwa.gov/document_center/Departments/PublicWorks/Interlocal%20Agreement%20Mason%20County%20Biosolids%20201702270.pdf

- Autonomous organization with independent finances and credit rating would likely be able to obtain financing without diluting the debt capacities of either the ACWPD or the SCSD.
- Independence from both ACWPD and SCSD could have the advantage of separation from potential sewer district budget constraints and broader sewer district priorities.
- A regional authority could be governed and directed with representation from both counties or sewer districts providing a balanced level of management and control.

Disadvantages

- More complex solution than Alternative 2. In addition to the formation of a separate authority, the Authority would like need to enter into intermunicipal agreements with both ACWPD and SCSD for the provision of biosolids handling services.
- Potentially slower implementation timeline (requires state legislation) and project execution (must pass through democratic board voting process).
- Both sewer districts would cede some level of control over the management of biosolids depending upon the board makeup. A balanced authority board may require compromise by both ACWPD and SCSD priorities and vision if they both are not highly aligned. Due to its autonomy, the new Authority may not always act in coordination with or have the same overall vision as the Authority's individual customers.
- Potential for administrative and some operational costs to be higher than Alternative 2 due to the formation and management of a separate government entity, which would likely require some redundant administrative functions to those that already exist within the ACWPD and the SCSD. This could diminish the cost effectiveness from the economies of scale that would be gained by jointly developing the biosolids facility.
- Adds another governmental unit in New York State, which may be considered contrary to state and local priorities and objectives.

Alternative 2 – Intermunicipal Agreement

Advantages

- Combining biosolid waste streams of both the ACWPD and SCSD would provide for increased economies of scale over the status quo alternative, and could allow for lower overall unit costs and more dedicated and specialized staff.
- Simpler solution than Alternative 1 with potentially a faster implementation timeline because it would not require state government action or formation of a separate government entity.
- Could allow for balanced level of control over management of biosolids and project risks depending upon the terms and conditions of the intermunicipal agreement. Likely that both parties can exert influence on outcomes through the contract and hold the other party accountable through legal means.

- Potential for operational costs to be lower than Alternative 1 because an intermunicipal agreement arrangement could allow sharing of staff time and responsibilities across sewer district functions, including biosolids management. May also limit the need for separate and independent management and administration functions as would be required under Alternative 1.
- Management of biosolids facility cash flows could be combined with other cash flows of the sewer districts, thereby potentially providing a buffer for mitigating the effects of potential short-term variability of biosolids facility revenues and expenses.
- Would not create another separate governmental entity or agency, which may be consistent with State and local priorities and objectives.

Disadvantages

- Less autonomy and independence related to financing capacity and associated timing could result in suboptimal financing decisions. However, financing combined with other district funding needs could increase economies of scale and lower overall financing administration and transaction costs.
- Operational funding decisions may be subject to potential sewer district budget constraints and broader sewer district priorities.
- Potential to result in more of an owner-customer relationship between the ACWPD and the SCSD rather than a partnership relationship with less balanced joint control over decisions than Alternative 1, depending upon the terms and conditions of the intermunicipal agreement.

Conclusions

There are two predominate alternatives that ACWPD and SCSD could utilize for the governance and management of a joint biosolids handling facility. These are (1) forming a separate, independent Authority, and (2) entering into an “joint services” IMA. Both of these alternatives are enabled under New York State Municipal Law, and both would allow the districts to take advantage of the economies of scale associated with jointly developing a biosolids handling facility. However, sharing services under an IMA has advantages over the Authority alternative in that it is simpler, requires the least amount of change, may be the most cost-effective alternative to establish and maintain, and is likely to take the least amount of time to establish. Therefore, it is recommended that the ACWPD and SCSD consider this alternative first prior to considering a more involved and complex alternative of forming an Authority.

THIS PAGE INTENTIONALLY LEFT BLANK

Arcadis of New York, Inc.

855 Route 146

Suite 210

Clifton Park, New York 12065

Tel 518 250 7300

Fax 518 250 7301

www.arcadis.com