

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	POND INFORMATION, GENERAL																						
2																							
3				POND OWNER, and CITY and STATE	Sample Town, State	Sample Town, State	Sample Town, State																
4				POND NAME OR #	CELL1	CELL2	CELL 3																
5				TYPE OF SYSTEM: % MUNICIPAL, % INDUSTRIAL WASTE, OR FRESH WATER	Municipal	Municipal	Municipal																
6				DISCHARGE METHOD; CONTINUOUS OR # TIMES PER YEAR	Continuous	Continuous	Continuous																
7				TYPE OF POND: FACULTATIVE, PAR-MIX, COMPLETE MIX, AIPS, ACT. SLUDGE, OTHER	Partial mix aerated system	Partial mix aerated system	Partial mix aerated system																
8				INFLUENT INTO THIS POND COMES FROM	Town	Cell 1	Cell 2																
9				EFFLUENT OUT OF THIS POND GOES TO	Cell 2	Cell 3	Discharge																
10																							
11				OVERVIEW OF PROBLEMS OR CONDITIONS OF THIS POND, SUCH AS:																			
12				BOD, ODOR, ENERGY, SHORT CIRCUITING, AMMONIA, STRATIFICATION	High energy cost	Same																	
13				ALGAE, SLUDGE, PHOSPHATES, DUCKWEED, INFILTRATION & INFLOW (I&I)	Exceeding BOD limit of 30 mg/l 50%	Same																	
14				CHEMICAL USAGE, CHLORINE, F.O.G., D.O., PH, FECAL, HIGH ENERGY	of time																		
15				MAINTENANCE, ICE, INCONSISTENCY, SHADING, LOW DO																			
16				CLOUDY OR SUNNY, FISHKILLS, OTHER																			
17																							
18				TYPE OF ANY AERATION EQUIPMENT NOW BEING USED IN THIS POND	4 20 hp aerators	3 20 hp aerators	1 20 hp aerator																
19																							
20				TOTAL INSTALLED HP FOR THIS POND	80 hp	60 hp	20 hp																
21																							
22																							
23				HP ATTRIBUTABLE TO THIS CELL IN SUMMER	80 hp	40 hp	10 hp																
24				HP ATTRIBUTABLE TO THIS CELL IN WINTER	80 hp	40 hp	10 hp																
25				# OF HOURS PER DAY THE AERATION SYSTEM IS OPERATED	24	16	12																
26				ELECTRICITY CONSUMPTION COST PER KW-HR, AND DEMAND CHARGE PER KW	\$0.06 per kwh, \$8/kw demand charge																		
27				TOTAL YEARLY ELECTRICAL COST FOR CONSUMPTION AND DEMAND CHARGE	See cost of ownership(COO) analysis																		
28																							
29				THE MOST IMPORTANT PERMIT LEVELS APPLICABLE TO THIS POND'S DISCHARGE	BOD, TSS, ammonia																		
30																							
31				TYPE OF BAR SCREEN USED? TYPE OF BAFFLES IN POND?	Has bar screen																		
32																							
33				INFLUENT PIPE CONFIGURATION IN THIS CELL :(HORIZONTAL, VERTICAL)	Horizontal	Horizontal	Horizontal																
34				DEPTH THE INFLUENT PIPE IS OFF BOTTOM OF POND, FEET	3 feet off bottom	3 feet off bottom	3 feet off bottom																
35																							
36				EFFLUENT PIPE CONFIGURATION IN THIS CELL :(HORIZONTAL, VERTICAL)	Vertical with tee	Vertical with tee	Vertical with tee																
37				DEPTH THE EFFLUENT PIPE IS OFF BOTTOM OF POND, FEET	2 feet off bottom	2 feet off bottom	2 feet off bottom																
38																							
39				LOCATION WITH RESPECT TO TOWN OR PEOPLE; IN TOWN OR	0.5 miles SE of town																		
40				# OF MILES OUT OF TOWN, WHICH DIRECTION FROM TOWN,																			
41				PREVAILING WIND DIRECTION, ETC.																			
42																							
43				OTHER NOTES AND COMMENTS, AND ANY																			
44				FUTURE PLANS.																			
45																							

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
46	SIZE INFORMATION																								
47																									
48																									
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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
90	FLOW RATE																						
91	BASED ON PRESENT CONDITIONS																						
92	CUSTOMER-SUPPLIED ESTIMATE OF INFLOW, GALLONS PER DAY																						
93																							
94	BASED ON OUR ESTIMATE OF PRESENT POPULATION																						
95	ESTIMATED CURRENT POPULATION																						
96	TYPICAL GALLONS PER DAY PER PERSON, INCLUDING I & I																						
97																							
98	ESTIMATED INFLOW, GALLONS PER DAY																						
99	BASED ON SYSTEM DESIGN CRITERIA AND FUTURE GROWTH																						
100	CUSTOMER-SUPPLIED ESTIMATE OF INFLOW, GALLONS PER DAY																						
101																							
102	OUR ESTIMATE OF POSSIBLE POPULATION IN 20 YEARS:																						
103	ESTIMATED FUTURE POPULATION																						
104	TYPICAL GALLONS PER DAY PER PERSON																						
105																							
106	ESTIMATED INFLOW, GALLONS PER DAY																						
107	FLOW RATE USED IN THIS POND IN THIS PROPOSAL, GALLONS PER DAY																						
108																							
109	DETENTION TIME																						
110	OPERATING VOLUME OF CELL, FROM ABOVE, GALLONS																						
111	FLOW RATE INTO CELL, FROM ABOVE, GALLONS PER DAY																						
112	DETENTION TIME USED IN THIS POND IN THIS PROPOSAL, DAYS																						
113																							
114	TOTAL DETENTION TIME IN THIS SYSTEM, DAYS																						
115																							
116	B.O.D. (BOD) LOADING																						
117	BASED ON CUSTOMER-SUPPLIED BOD LBS PER DAY:																						
118																							
119	BASED ON CUSTOMER-SUPPLIED BOD CONCENTRATION, MG/L OR PPM:																						
120	FROM FLOW RATE USED IN THIS PROPOSAL, GALLONS PER DAY																						
121	WEIGHT OF WATER, LBS PER GALLON																						
122																							
123	TOTAL BOD ENTERING POND, LBS PER DAY																						
124	ANOTHER METHOD OF ESTIMATION, FOR MUNICIPAL SYSTEMS ONLY:																						
125	TYPICAL CONCENTRATION FOR PRIMARY PONDS, IN MG/L OR PPM																						
126	TYPICAL CONCENTRATION FOR SECONDARY PONDS, IN MG/L OR PPM																						
127	TYPICAL CONCENTRATION FOR POLISHING PONDS, IN MG/L OR PPM																						
128	CONCENTRATION CHOSEN FOR THIS CALCULATION, MG/L OR PPM																						
129	FLOW RATE CHOSEN ABOVE, GALLONS/DAY																						
130																							
131	TOTAL BOD ENTERING POND, LBS PER DAY																						
132	BASED ON ESTIMATED PRESENT POPULATION SHOWN ABOVE																						
133	POUNDS OF BOD PER PERSON PER DAY																						
134																							
135	TOTAL BOD ENTERING POND, LBS PER DAY																						
136	BASED ON ESTIMATED FUTURE POPULATION ABOVE																						
137	POUNDS OF BOD PER PERSON PER DAY																						
138																							
139	TOTAL BOD ENTERING POND, LBS PER DAY																						
140	BASED ON RECEIVING WATER FROM A PRIOR POND:																						
141	STRENGTH OF B.O.D. WORST CASE OF SUMMER OR WINTER, MG/L OR PPM																						
142	TOTAL BOD ENTERING THE POND BASED ON ABOVE FLOW RATE, LBS/DAY																						
143																							
144	THE B.O.D. LOADING USED IN THIS POND IN THIS PROPOSAL, LBS/DAY																						
145	THE B.O.D. CONC. USED IN THIS POND IN THIS PROPOSAL, MG/L OR PPM																						
146	THE B.O.D. LOADING RATE PER SURFACE ACRE, LBS OF BOD / ACRE																						
147	(BASED ON SURFACE AREA SELECTED ABOVE)																						
148																							

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
149	AMMONIA LOADING																						
150	BASED ON CUSTOMER-SUPPLIED AMMONIA CONC., MG/L OR PPM:																						
151	AMMONIA, MG/L OR PPM (USUALLY USE 35 FOR RAW MUNICIPAL SEWAGE):																						
152																							
153	BASED ON RECEIVING WATER FROM A PRIOR POND:																						
154	STRENGTH OF AMMONIA, MG/L OR PPM																						
155	TOTAL AMMONIA ENTERING THE POND BASED ON ABOVE FLOW RATE, LBS/DAY																						
156																							
157	THE AMMONIA LOADING USED IN THIS PROPOSAL, LBS/DAY																						
158																							
159	ALKALINITY REQUIREMENTS (FOR YOUR INFORMATION)																						
160	AMOUNT OF INFLUENT ALKALINITY REQUIRED FOR START OF NITRIFICATION, MG/L																						
161																							
162	ANALYSIS OF MEETING THE D.O. NEEDS OF THE POND																						
163	D.O. FOR BOD REDUCTION:																						
164	AVERAGE SUMMER AIR TEMP, °C (0, 2, 5, 10, 15, 20, 25, OR 30)																						
165	SUMMER BIOLOGICAL GROWTH RATE COEFFICIENT (K _{e-s})																						
166	SUMMER D.O. SATURATION CONCENTRATION, PPM (C _{sat-S})																						
167	AVERAGE WINTER AIR TEMP, °C (0, 2, 5, 10, 15, 20, 25, OR 30)																						
168	WINTER BIOLOGICAL GROWTH RATE COEFFICIENT (K _{e-w})																						
169	WINTER D.O. SATURATION CONCENTRATION, PPM (C _{sat-W})																						
170																							
171	BOD ENTERING POND, FROM ABOVE, LBS/DAY																						
172	CONCENTRATION OF THE BOD ENTERING THE POND, MG/L OR PPM																						
173	BOD REDUCTION DESIGN GOAL, BASED ON THE MAXIMUM THEORETICALLY POSSIBLE																						
174	FOR THIS POND'S DETENTION TIME, BASED ON BIOLOGICAL GROWTH LIMITATIONS:																						
175	BOD REDUCTION FOR SUMMER (E _s)																						
176	BOD REDUCTION FOR WINTER (E _w)																						
177	CONCENTRATION OF BOD LEAVING THE POND, SUMMER GOAL, MG/L OR PPM																						
178	CONCENTRATION OF BOD LEAVING THE POND, WINTER GOAL, MG/L OR PPM																						
179																							
180	ELEVATION, FEET ABOVE SEA LEVEL (0 TO 7000, ROUNDED TO NEAREST 500)																						
181	ATMOSPHERIC PRESSURE AT THIS ELEVATION, INCHES HG																						
182	ATMOSPHERIC PRESSURE AT SEA LEVEL, INCHES HG																						
183	D.O. SAT. CONC. AT STANDARD CONDITIONS, PPM (C _{sat-SC})																						
184	DESIRED RESIDUAL DISSOLVED OXYGEN, D.O., PPM (USUALLY 2.0)																						
185	ALPHA; CORRECTS FOR POND GEOMETRY, SOAP, OIL, MIXING, OTHER (2-1.0)																						
186	BETA, CORRECTS FOR OXYGEN CONCENTRATION IN PONDS (.8-1.0)																						
187	THETA, CORRECTS FOR TEMPERATURE, USUALLY 1.024																						
188																							
189	LBS OF D. O. NEEDED FOR EACH LB OF BOD (1.30 - 2.00, 1.50 USUALLY)																						
190	OXYGEN NEEDED FOR STATED BOD REDUCTION GOAL, SUMMER, LBS/DAY																						
191	OXYGEN NEEDED FOR STATED BOD REDUCTION GOAL, WINTER, LBS/DAY																						
192																							
193	D.O. FOR AMMONIA REDUCTION DUE TO NITRIFICATION:																						
194	AMMONIA ENTERING POND, FROM ABOVE, LBS/DAY																						
195	CONCENTRATION OF AMMONIA ENTERING THE POND, MG/L OR PPM																						
196	AMMONIA REDUCTION BASED ON THIS CELLS DETENTION TIME																						
197	AMMONIA REDUCTION BASED ON THIS CELLS BOD LOADING																						
198	AVERAGE AMMONIA REDUCTION BASED ON THIS CELLS DET. TIME AND BOD LOADING																						
199	CONC. OF AMMONIA LEAVING THE POND DUE TO NITRIFICATION, MG/L OR PPM																						
200																							
201	LBS OF DISSOLVED OXYGEN FOR EACH LB OF AMMONIA (4.60 USUALLY)																						
202	OXYGEN NEEDED FOR STATED AMMONIA REDUCTION, LBS/DAY																						
203																							
204	TOTAL D.O. FOR BOD AND AMMONIA REDUCTION:																						
205	TOTAL OXYGEN NEEDED FOR BOD AND AMMONIA RED. GOAL, SUMMER, LBS/DAY																						
206	TOTAL OXYGEN NEEDED FOR BOD AND AMMONIA RED. GOAL, WINTER, LBS/DAY																						
207																							

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
208	HP OF AERATORS THAT WOULD BE NEEDED																						
209	O.T.R. OF AERATORS IN CLEAN WATER IN LAB, LBS/HR PER HP (OTR-c)					3.0						3.0						3.0					
210	O.T.R. OF TYPICAL AERATORS IN THE FIELD FOR THESE CONDITION, (OTR-f):																						
211	IN SUMMER (OTR-fs), LBS OXYGEN / HOUR / HP									1.84					1.84							1.84	
212	IN WINTER (OTR-fw), LBS OXYGEN / HOUR / HP									1.89					1.89							1.89	
213	AERATOR DO OUTPUT RATING DESIRED @ STD.COND., FOR SUMMER, LBS/DAY									2,253					508							165	
214	AERATOR DO OUTPUT RATING DESIRED @ STD. COND., FOR WINTER, LBS/DAY									1,981					428							136	
215																							
216	AERATOR HP NEEDED FOR DO PRODUCTION:																						
217	EXPECTED HORSEPOWER FOR DO PRODUCTION @24 HOURS/DAY, SUMMER										31				7							2	
218	EXPECTED HORSEPOWER FOR DO PRODUCTION @24 HOURS/DAY, WINTER										28				6							2	
219																							
220	AERATOR HP NEEDED FOR MIXING:																						
221	CHOOSE HP PER MILLION GALLONS, FOR PARTIAL MIX THIS																						
222	IS USUALLY 8 TO 15 , FOR FULL MIX USE 30																						
223	HP NEEDED FOR MIXING:										53				39							33	
224	ACTUAL AERATOR HP THAT MOST LIKELY TO BE INSTALLED:																						
225	ADD A FACTOR FOR REDUNDANCY, LESS THAN 24 HOURS																						
226	PER DAY OPERATION, USUALLY 1.0 TO 1.2																						
227	EXPECTED INSTALLED HP OF AERATORS										53				39							33	
228																							
229	DETERMINE THE NUMBER OF SOLARBEEES NEEDED BASED ON																						
230	SURFACE AREA LIMITATIONS FOR ALGAE AND SURFACE RE-AERATION:																						
231	SIZE OF THIS POND, ACRES										2.66				1.98							1.90	
232	AMOUNT OF D.O. NEEDED IN PEAK SUMMER PERIOD, LBS OF D.O./DAY										1,381				358							101	
233	ACCEPTABLE LOADING IN NON-AERATED PONDS IN THIS CLIMATE,																						
234	LBS OF BOD /ACRE/DAY (22-35 IN COLD CLIMATES, OTHERWISE UP TO 60)														50							50	
235	CHOOSE THE SOLARBEE MODEL NUMBER(SB10000, SB10000-DM, SB4000, SB2500)														SB10000DM							SB10000DM	
236	ACRES PER MACHINE: FOR SB10000 USE 3, 6, 12, 24																						
237	AND FOR SB4000 AND SB2500 USE 2, 4, 8, 16. # OF ACRES/MACHINE														3							12	
238	# OF SOLARBEEES NEEDED										0.9				0.3							0.2	
239	# OF SOLAR MACHINES, ROUNDED OFF TO NEAREST WHOLE NUMBER														1							1	
240																							
241	TOTAL NUMBER OF SOLARBEEES NEEDED FOR THIS SYSTEM										3												
242																							
243	SOLARBEE ANTICIPATED EFFECT,BASED ON STANDARD SOLAR MACHINES:																						
244	MULTIPLIER EFFECT OVER NATURAL POND LOADING LIMIT, FOR SOLAR ONLY					5						5						5					
245	LBSOF BOD/ ACRE/DAY									250					250							250	
246	LBS OF D.O./ LB OF BOD					1.5						1.5						1.5					
247	CALCULATED AMOUNT OF D.O. SOLARBEE CAN PRODUCE, LBS OF D.O./ ACRE/DAY									375					375							375	
248	PSI'S MAXIMUM DESIGN LIMIT, LBS. OF D.O. /ACRE/DAY					300						300			300							300	
249	THE LESSER OF THE CALCULATED D.O. OR THE DESIGN LIMIT; LBS. OF D.O/ACRE/DAY									300					300							300	
250	EXPECTED TOTAL POSSIBLE FOR THIS MANY ACRES, LBS. OF D.O. /DAY									798					595							571	
251	PORTION OF D.O. NEEDS THAT THIS SURFACE AREA CAN SUPPLY									58%					166%							567%	
252										(**SEE NOTE IN ROW 279)					(**SEE NOTE IN ROW 279)							(**SEE NOTE IN ROW 279)	
253	SOLARBEE ANTICIPATED EFFECT, BASED ON 24-HOUR KIT MACHINES :																						
254	MULTIPLIER EFFECT OVER NATURAL POND LOADING LIMIT, WITH 24 HOUR KITS					7						7						7					
255	LBSOF BOD/ ACRE/DAY									350					350							350	
256	LBS OF D.O./ LB OF BOD					1.5						1.5						1.5					
257	CALCULATED AMOUNT OF D.O. SOLARBEE CAN PRODUCE, LBS OF D.O./ ACRE/DAY									525					525							525	
258	PSI'S MAXIMUM DESIGN LIMIT, LBS. OF D.O. /ACRE/DAY					450						450			450							450	
259	THE LESSER OF THE CALCULATED D.O. OR THE DESIGN LIMIT; LBS. OF D.O/ACRE/DAY									450					450							450	
260	EXPECTED TOTAL POSSIBLE FOR THIS MANY ACRES, LBS. OF D.O. /DAY									1,197					893							857	
261	PORTION OF D.O. NEEDS THAT THIS SURFACE AREA CAN SUPPLY									87%					249%							850%	
262										(**SEE NOTE IN ROW 279)					(**SEE NOTE IN ROW 279)							(**SEE NOTE IN ROW 279)	
263	FACTORS INDICATING 24-HOUR KITS (ANY YES INDICATES THE NEED):																						
264	IS THIS A PRIMARY CELL IN A CONTINUOUS DISCHARGE SYSTEM																						No
265	ARE THERE MOUNTAINS, TREES, A RAINY OR CLOUDY SEASON, ETC.?																						No
266	DOES THE EXTRA PERFORMANCE JUSTIFY 24 HOUR KITS?																						No
267																							

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268	ADDITIONAL AMMONIA REDUCTION DUE TO GAS OFF																												
269	IF SB10000-DM(DUAL MIX) USED:																												
270	EXPECTED % ADDITIONAL REDUCTION OF AMMONIA DUE TO GAS OFF(USUALLY 20%)					20%			17						20%			12						20%			9		
271	CONCENTRATION OF AMMONIA LEAVING THE POND, MG/L OR PPM																												
272																													
273	NOTES																												
274	** ABOUT THE % SHOWN IN ROW 198: THIS FIGURE REPRESENTS AN																												
275	AVERAGE AMMONIA REDUCTION FROM TWO AMMONIA REMOVAL EQUATIONS BASED																												
276	ON CELL DETENTION TIME (ROW 196) AND BOD LOADING ENTERING A CELL (ROW 197)																												
277	BY MIDDLEBROOKS AND PANO.																												
278																													
279	** ABOUT THE % SHOWN IN ROWS 251 AND 261: THESE FIGURES REFLECT																												
280	THE SURFACE AREA POTENTIAL TO PRODUCE THE REQUIRED D.O. THROUGH																												
281	PHOTOSYNTHESIS AND SURFACE RE-AERATION FOR PERHAPS 9 MONTHS OF THE																												
282	YEAR. IN THE WINTER, THE D.O. PRODUCTION IS LESS (ALMOST ZERO WITH ICE AND																												
283	SNOW ON A NORTHERN POND), BUT BOD REACTION RATES ARE SLOWER ALSO.																												
284	IN PRIMARY PONDS, SOLARBEE SPACING PER ACRE IS CLOSER TO ENSURE THAT																												
285	MOST OF THIS D.O. IS CAPTURED FOR HIGH BOD PROCESSING WITHOUT ODORS.																												
286	IN SECONDARY AND TERTIARY PONDS, SOLARBEEES ARE SPACED FURTHER APART																												
287	DUE TO LESS NEED TO CAPTURE ALL OF THE D.O. AND ALSO LESS RISK OF ODORS.																												