APPENDICES

APPENDIX 4

Water Budget Data Sheet

Water Budget Data Sheet

Aggregate Industries, Inc.
Chelsea Plant, Waterloo Township, Jackson County, Michigan

FTCH Project No.
G06088

Precipitation Station	May and October 30 Year Mean Monthly Precipitation						1971-2000
	May	June	July	August	September	October	subtotal
Jackson	2.90	3.26	3.27	3.48	3.44	2.29	*18.64*
						Total	***18.64***
						Average	***18.64***

MSU Agricultural Weather Office web site at www.agweather.geo.msu.edu.

From 1971 though 2000 thirty year record:

May-Oct = 184 days
Mean May-Oct Precip: 18.64 inches
Mean May-Oct. Daily Precip = 0.1013 inches
Mean May-Oct. Daily Evaporation = 25 inches per 184 period = 0.1359 inches per day

Change in storage = Precip - Evaporation = - 0.0346 inches per day (evaporation loss) = 0.0029 ft per day

May-Oct amount	Mean Values (inches)	
18.64	0.1013	Daily Precip
25	0.1359	Daily Evap
Change in Storage	-0.0346	(in/day)
	-0.0029	(ft/day)

Example Calculation: 19 acre lake x 43560 ft2 per acre = 827640 ft2 x 0.0029 ft per day evaporation = 2400.16 ft3 per day evaporative loss = 17953.17 gal per day or 12.47 gal/min

Projected Lake Size		Projected volume of Evaporative Loss		
Acres	Sq feet	Evaporative loss (ft^3/day)	gallon/day	gallon/minute
5	217800	631.62	4724.52	3.28
8	348480	1010.59	7559.23	5.25
8.8	383328	1111.65	8315.15	5.77
9	392040	1136.92	8504.13	5.91
19	827640	2400.16	17953.17	12.47
20	871200	2526.48	18898.07	13.12
21	914760	2652.80	19842.97	13.78
22	958320	2779.13	20787.88	14.44
23	1001880	2905.45	21732.78	15.09
24	1045440	3031.78	22677.68	15.75
25	1089000	3158.10	23622.59	16.40
26	1132560	3284.42	24567.49	17.06
27	1176120	3410.75	25512.40	17.72
28	1219680	3537.07	26457.30	18.37
29	1263240	3663.40	27402.20	19.03
30	1306800	3789.72	28347.11	19.69
40	1742400	5052.96	37796.14	26.25
50	2178000	6316.20	47245.18	32.81
60	2613600	7579.44	56694.21	39.37
70	3049200	8842.68	66143.25	45.93
80	3484800	10105.92	75592.28	52.49

conversion factors:

1 cubic ft per day = 5.19×10^{-3} gal/min
7.48 gallons = 1 cubic foot
1440 minutes = 1 day
43560 ft^2 per acre

Lake Water Residence Time				
Lake Area (Acres)	Lake Depth (ft)	Lake Volume (ft3)	Turn Over Time (days)	Lake Turn Over Time (Years)
19	25	20,691,000	1254	3.4

Calculation of Groundwater Flux and Lake Water Residence Time

Groundwater Flux
Q = K b w i

16500.00 **Q** = flow volume (ft^3/day) Q (gpm) = **86**
50 **b** = aquifer thickness (ft)
1100 **w** = aquifer width (ft) = max width of lake perpinducular to gw flow
0.002 **i** = hydraulic gradient (ft/ft) 981.86 at MW-4 to 978 contour at 2000 ft downgradient (Feb 2006 data)
150 **K** = hydraulic conductivity (ft/day)
7500.00 **T** = Transmissivity = bK (ft2/day)